



BRIEFING-DEBRIEFING: USING A REFLEXIVE ORGANIZATIONAL LEARNING MODEL FROM THE MILITARY TO ENHANCE THE PERFORMANCE OF SURGICAL TEAMS

**DANA R. VASHDI, PETER A. BAMBERGER,
MIRIAM EREZ, AND AHUVA WEISS-MEILIK**

We adopt an action-research approach to examine the applicability of briefing-debriefing sessions—a team-based, reflexive learning model being used in the Israel Air Force—to the surgical departments of a major, civilian tertiary center in Israel, and explore the potential impact of such a model on the incidence of preventable adverse events in these departments. Taking into account the similarities and differences between the two team contexts (i.e., surgical team and flight crew), we examine potential barriers to the implementation of such a briefing-debriefing technology in the surgical world, discuss the ways in which such barriers have been largely overcome in the particular case examined, and present the model currently being implemented by the surgical departments in our study. Additionally, based on a grounded theory approach, we generate propositions regarding the way in which briefing-debriefing frameworks might enhance the quality-related outcomes of hospital surgical teams. We pay particular attention to those aspects of the team-based learning model—such as a focus on status-free transparency and systems-based analysis—intended to promote double- as opposed to simply single-loop learning. © 2007 Wiley Periodicals, Inc.

Between 45,000 and 98,000 patients die as the result of medical errors in American hospitals each year, making deaths in hospitals due to preventable adverse events the eighth-leading cause of death in the United States

(just before motor vehicle accidents) (Kohn, Corrigan, & Donaldson, 1999). Although efforts have been made in recent years to reduce the number of preventable adverse events (e.g., implementation of mandatory and voluntary reporting systems), progress

Correspondence to: Peter A. Bamberger, Davidson Faculty of Industrial Engineering and Management, Technion: Israel Institute of Technology, Haifa, Israel 32000, Phone: 972-4-829-4510, Fax: 972-4-829-5688, E-mail: peterb@tx.technion.ac.il

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...a key challenge for hospital administrators is the design and implementation of a system of organizational learning appropriate for a dynamic, team-based work environment.

has been limited by a work environment that is, as noted by the Institutes of Medicine Committee on the Quality of Health Care in America, “anything but conducive to recognizing and learning from errors” (Kohn, Corrigan, & Donaldson, 1999, p. 94). In the context of deeply entrenched status hierarchies (Freidson, 1984) and physician and administrator concerns about patient litigation (Kohn, Corrigan, & Donaldson, 1999), many hospitals still are governed by a set of norms that strongly discourage the questioning of decisions made by those with superior status, as well as low-transparency decision processes serving to limit the liability of those at the top of the medical hierarchy (Bate, 2000). Consequently, a key challenge for hospital administrators is the design and implementation of a system of organizational learning appropriate for a dynamic, team-based work environment. Implementing such a system requires overcoming resistance to change at both the team and organizational levels, as those upon whom the success of such a system ultimately rests are also those likely to see such systems as posing a direct threat to their own professional status and well-being.

As noted by Balkundi and Harrison (2006, p. 49), “teams have become the basic unit through which work is carried out in organizations.” Recognizing that a large and increasing proportion of employees in contemporary organizations conduct their work in a team context, HR researchers have sought to gain a better understanding of how team structure (e.g., Balkundi & Harrison, 2006) and processes (e.g., M. D. Johnson et al., 2006) influence overall team effectiveness and team members’ attitudes and behaviors (Kozlowski & Bell, 2003). Similarly, given the intensification of competitive pressures, managers have become increasingly concerned with their organizations’ learning capabilities (Senge, 1990) and absorptive capacity (Cohen & Levinthal, 1990), with such

issues receiving greater attention among human resource strategy researchers and practitioners (Bamberger & Fiegenbaum, 1996; Bamberger & Meshoulam, 2000).

Given the widespread attention that team-based work systems (Cannon-Bowers & Salas, 1998; Guzzo & Dickson, 1996; Kozlowski & Bell, 2003) and organizational learning (Senge, 1990) have received in recent years, one would expect that these literatures would have much to contribute toward meeting this team-based learning challenge in health administration. Several factors, however, have limited this contribution. First of all, much of the research on organizational learning (Senge, 1990) focuses on the organizational level of analysis, thus offering little insight into the enhancement of learning in a team-based work context.

Even those studies directed at the team level (Cannon-Bowers & Salas, 1998; West, 1996, 2002) may have limited applicability to the types of teams that perform much of the work of hospitals. For example, West’s (2002) concept of team reflexivity offers significant insights into the way some workgroups naturally reflect upon their actions, thereby enhancing their performance level. However, the applicability of such reflexivity models appears limited to relatively stable workgroups established to maintain a continuing work process and/or achieve some long-term objective. In contrast, as noted by Edmondson (2003), the work of hospitals often revolves around action teams—short-term mission teams that are formed around a certain task (such as a surgical procedure) and are dissolved upon its completion (Sundstrom, DeMeuse, & Futrell, 1990).

In addition, perhaps because team reflexivity has been viewed as a naturally evolving team characteristic (Swift & West, 1998), few researchers have examined the tools organizations can adopt to actively promote reflexivity at the level of the team in general, and the action team in particular. One notable exception is the recent work of Tannenbaum, Smith-Jentsch, and Behson (1998), which introduces the concept of team prebriefings and post-action reviews as a means by which administrators may proactively

promote reflexivity at the team level. Pre-briefings refer to a scheduled team meeting prior to the performance of a team activity, in which team members set and confirm strategies, roles, expectations, and key performance issues. Post-action reviews refer to the systematic process of sharing observations and interpretations of team processes and performance. While elements of Tannenbaum et al.'s (1998) model have been examined on an experimental basis, to date we are unaware of any study reporting on the application of such a team-learning framework in a nonexperimental, civilian context.

Interestingly, a model similar to that discussed by Tannenbaum et al. (1998), involving proactively promoted team reflexivity based on pre-action briefings and post-action reflective analyses or "debriefings," has over the past 20 years become a routine procedure in the Israel Air Force (IAF) (Lipshitz, Ron, & Popper, 2002). According to the IAF model, itself based on the preflight briefing and post-flight review process adopted by the British and American armed forces several decades ago, all missions are preceded by a briefing session, designed to clarify the task, its goals, and the conditions of operation. Returning crews go straight to a debriefing session, at which they analyze the operation vis-à-vis the mission's task requirements and objectives, identify and discuss any system-level assumptions or processes that may have limited mission effectiveness, and determine how to apply the lessons learned to future operations.

The purpose of the current study is to examine the applicability and implications of such a military-based model of team learning to hospital surgical departments in Israel. We focus on the potential impact of such a model and consider the obstacles potentially blocking its adoption in such institutions. Specifically, we use the IAF briefing-debriefing technology as an empirical referent to examine how to enhance team learning and self-regulation and, hence, overall team performance, without requiring managers to cede administrative control in high-accountability work contexts such as hospitals. No less important, by drawing from the literature and applying an action-research

framework, we identify obstacles limiting such a technology transfer from the military to the civilian sector, explore how some of these obstacles may be overcome, and finally generate grounded propositions regarding the possible impact that successful adoption might have on hospital surgical teams.

We begin by reviewing the literature on organizational and team learning and then describe the methodology we adopted in order to examine the briefing-debriefing technology in the IAF and its application in a hospital context. Our empirical analyses focus first on the team briefing-debriefing technology implemented in the IAF, its use of double-loop learning, and its potential applicability to the hospital context. We then cull from our data some of the challenges complicating the adoption and institutionalization of such systems, as well as the ways in which these challenges have been met by a team of surgeons and air force pilots adapting the military template to the surgical context. Finally, based on initial experiences in the implementation of the briefing-debriefing technology in a hospital setting, we use our qualitative data to generate a number of grounded propositions regarding the way in which the briefing-debriefing technology may enhance surgical teams' quality-related outcomes.

Team Reflexivity: Nature versus Nurture

Argyris and Schon first introduced the notion of organizational learning in 1978, defining it largely as the process by which organizational members seek to detect and correct error. Noting that such processes can occur either within the framework of taken-for-granted assumptions and shared mental models or by questioning the validity of such assumptions, they differentiated between two types of organizational learning—namely, single-loop and double-loop learn-

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ing. Single-loop learning takes place when the lessons learned from an action are framed within existing shared mental models and are incorporated into existing norms, policies, and objectives. In contrast, double-loop learning occurs when error is detected and corrected in ways that require the questioning of these shared mental models, and perhaps even the modification of an organization's underlying norms, policies, and objectives (Argyris & Schon, 1978).

While the past few decades have seen a growing interest in the notion of organizational learning as an organizational- or individual-level construct, much less

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attention has been paid to learning in teams (Cannon-Bowers & Salas, 1998; Edmondson, 2002; West, 1996). Tannenbaum et al. (1998) emphasize the extra value teams possess by virtue of promoting learning among team members, and Edmondson (1999) defines team learning as a process in which teams acquire and reflect upon the feedback generated by their actions. However, to our knowledge, no attempt has been made to incorporate the notion of double-loop learning at the team level.

As noted above, team-based learning models have largely been based on the notion of collective reflexivity. Swift and West (1998, p. 4) describe reflexivity as "a turning back on the self," encompassing both self-awareness and agency. According to their model, team reflexivity incorpo-

rates three main activities: reflection, planning, and adaptation (Swift & West, 1998). In the first stage, reflection, team members identify discrepancies between actual and desired performance. In the planning stage, they identify ways to minimize these discrepancies and specify patterns of action for doing so, taking time constraints and other potential obstacles into account. In the final stage, adaptation, they implement this plan-directed behavior.

Teams engaging in such activities are involved in a continuous cycle of self-appraisal and behavioral change (West, 1996). Members of these teams continuously appraise their own and their teammates' performance along criteria related to the team's strategic objectives and processes. Based on the results of this self-appraisal, they seek to effect change in their individual and collective logics and repertoires of action (Bacharach, Bamberger, & McKinney, 2000; Bacharach, Bamberger, & Sonnenstuhl, 1996). Thus, while nonreflexive teams often are unable to identify patterns of action that consistently generate less-than-satisfactory performance, reflexive teams work to identify problems and resolve them in order to improve performance. Reflexive groups differ from their nonreflexive counterparts in three main ways: They are more likely to structure their members' behaviors so that they are transparent and open to appraisal by the individual and his or her teammates. They are more likely to reflect on the relationship between their team and other organizational groups, or the organization as a whole. Finally, drawing from the notion of double-loop learning (Argyris & Schon, 1978), reflexive teams typically are prepared to challenge the appropriateness of team and organizational objectives and the assumptions that underlie them.

While West and colleagues (Swift & West, 1998; West, 2000), as well as Schippers, Den Hartog, Koopman, and Wienk (2003), have empirically demonstrated that team reflexivity has significant and robust effects on a variety of team-related outcomes, little is known regarding the mechanisms underlying team reflexivity. In fact, Swift and West (1998, p. 6) posit that there is no "prescription of specific tools or techniques" that promotes reflexivity. Indeed, they argue that team reflexivity is not something that can be proactively introduced by administrators into the organization, suggesting instead that reflexivity is a characteristic that team members nurture over time through a variety of self-development processes. Just what these self-development processes are and how they can be introduced (if at all) into the organization has yet to be specified, with

even West (2000) acknowledging the need to identify the formal mechanisms that may promote and enhance team reflexivity.

Research on reflexivity in organizational learning (Argyris & Schon, 1978; Senge, 1990) offers a good place to begin elucidating these formal mechanisms. Senge (1990), basing his theories on Argyris and Schon, claims that reflection takes place when we consciously refrain from the “leap of abstraction”—that is, moving from direct observation to generalization without testing the reasoning behind the abstraction. To promote reflection and inquiry, Senge (1990) proposes that organizational members make their own reasoning on issues explicit and encourage others both to challenge the ideas of colleagues and to suggest their own opinions.

As challenging as it may be to introduce the concept of reflexivity to organizations in general, the matter becomes far more complex for organizations with team-based work processes that are largely fluid, dynamic, and multidisciplinary (such as surgical teams in hospitals), rather than being stable, well defined, and unidisciplinary (like the project teams in high-technology firms). While team members may develop an attachment to their team, the sense of psychological safety required for members to challenge one another or expose themselves to review by their teammates is unlikely to emerge if members only work together for a short period of time (Edmondson, 1999).

Such short-lived, highly fluid, and dynamic teams are becoming a more prevalent phenomenon in the workplace, with Sundstrom et al. (1990, p. 121) referring to them as “action teams.” As defined by Sundstrom et al. (1990), action teams are those formed specific to a particular action event or set of action events, and whose goals and objectives are likely to change as the action event proceeds over time. The dynamic nature of the team’s objectives often results in the need for fluid team membership, with new members, often from varying disciplines, added as needed, and others, no longer deemed necessary, removed and perhaps assigned to alternative teams. Such conditions require the design of team-reflexivity frameworks that are

not adversely affected by the high prevalence of what are essentially “moving targets.”

Further complicating the introduction of mechanisms designed to enhance team reflexivity are strict organizational hierarchies that often discourage the questioning of assumptions or decisions made by those with superior organizational or occupational status. In such organizations, leaders may face a significant social dilemma when considering the introduction of mechanisms designed to enhance team reflexivity. While such mechanisms may enhance the effectiveness of the organization’s teams, they may impose significant pecuniary costs on the team or organization leadership, for instance by placing team members in a position to question core organizational assumptions, or to request access to data that might expose the leadership to claims of poor judgment.

Finally, the introduction of formal systems designed to enhance team reflexivity may be complicated by a high-velocity work environment—that is, an environment characterized by the need to make a substantial number of decisions, most having highly salient (i.e., life-and-death) outcomes, in the context of extreme uncertainty and severe time constraints (Eisenhardt, 1989, p. 1997). Indeed, West and Poulton (1997) discovered that teams operating in such contexts tend to be far less reflexive than teams working in lower-demand contexts, most likely because they tend to view all workplace demands as requiring “fire-fighting”—an immediate response with limited regard to implicit strategic priorities and to the results of such responses in the past. The implementation of mechanisms designed to promote team reflexivity in such contexts is likely to be complicated by collective logics of action grounded on the need for impulsive, as opposed to reflexive, response.

The analysis above suggests that the potential for team reflexivity may be most lim-

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ited in organizations having dynamic teams, strict organizational hierarchies, and a high-velocity work environment. Perhaps more so than any other set of organizations, military organizations are characterized by precisely such traits. In many military organizations, teams are fluid as a result of varying and relatively short periods of member

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service, combined with a highly dynamic set of team-based objectives requiring frequent shifts in human resource deployments (Hackman, 1993). Moreover, military organizations typically are characterized by strict hierarchical structures within which are embedded highly defined chains of command and control (Shamir & Ben-Ari, 2000; Siebold, 2001).

Finally, particularly during periods of conflict, teams operate in a high-velocity environment characterized by a high degree of uncertainty and extremely tight time constraints. To the extent that some military organizations have nevertheless successfully developed structured mechanisms aimed at enhancing team reflexivity, these organizations and the mechanisms they have developed may provide a useful model for civilian organizations seeking to do the same. After first describing our research methodology, we describe one such mechanism—structured team reflexivity sessions—in the IAF, the factors contributing to its introduction, and the impact that this intervention has had on the organization

and its fighter formations (i.e., flight teams).

Action-Research Methodology

Our examination of structured team reflexivity in the IDF and the transfer of this technology to a civilian hospital setting was conducted in the context of an action-research framework aimed at generating a grounded theory (Glaser & Strauss, 1967) of structured

reflexivity in action teams. Interested in shedding light both on how such a military-based technology might be adopted and applied in a civilian setting as well as on how such a technology might affect quality-based team outcomes, we collected data in two stages. In the first stage, we adopted an action-research approach and focused on gaining a better understanding of both the briefing-debriefing technology itself and the surgical context within which we hoped to apply this military-based technology. As action researchers, we implicitly generated and tested hypotheses as we worked with key players in the IAF and hospital to identify and resolve problems related to the transfer of the briefing-debriefing technology to the surgical context. In phase two, we switched to a semiexperimental field design. Working with the hospital administration, we identified a set of matched surgical departments, three of which would be involved in a pilot effort to adopt the briefing-debriefing technology, and three that would not. As we describe in more detail below, we collected qualitative data from all six wards with the aim of generating grounded theory.

Action Research

Schon (1983) describes action research as essentially experimentation in the field. Underlying the action-research approach is the assumption that practitioners, in attempting to change a given situation, in effect carry out an experiment that tests a set of implicit hypotheses. Control, distance, and objectivity take on new meanings in such research designs, where the action used to conduct preliminary hypothesis testing serves as both the experimental manipulation designed to elicit change and as a probe to explore the surrounding context and its possible condition effects (Schon, 1987).

As this action research is both qualitative and theory-generating in nature, our discussion follows the guidelines recommended by Martin (2002) of authenticity, plausibility, and criticality. In order to enhance authenticity, we present what we *repeatedly* observed both in the IAF and in the hospital, focusing

on the jargon used by the actors themselves, describing salient interactions, and quoting frank conversations. In addition, following Golden-Biddle and Locke's (1993) approach, we provide numerous examples as well as schematic diagrams of conceptual relations identified in the data in order to enhance the plausibility of our arguments (Martin, 2002). As for criticality, we sought to draw a distinction between common accepted theory and our own theory (Martin, 2002). We therefore emphasize the distinction between

team learning processes in general and what we refer to as *team*-based single- and double-loop learning.

Using such a qualitative action-research framework, we worked with both the IAF and one of Israel's leading tertiary centers (a public hospital) to develop and study a civilian-oriented application of the IAF briefing-debriefing technology. Prior to developing this model, we examined the existing research literature with the aim of identifying those factors that might serve as obstacles limiting the

TABLE I Factors Identified in the Literature as Potentially Affecting Cross-Sector Technology-Transfer

Column 1 Origin of Factor	Column 2 Factor	Column 3 Effect on Ability to Transfer the Briefing/ Debriefing Technology	Column 4 Probability of Occurrence in IAF Briefings- Debriefings	Column 5 Probability that Briefings- Debriefings in Israeli Public Hospital Surgical Teams Will Be Characterized by This Factor:	Column 6 How Hospital Is Seeking to Overcome Obstacle
Research literature	1. Team identity and leadership open to criticism: Mission-driven, collective identity; leaders view errors as opportunities to learn and encourage status-free inquiry and dialogue (Bass & Avolio, 1994; Schein, 1983).	Positive	High (During debriefing the discussion is open and enabling; each team member reports his own mistakes and feels free to comment on others)	Low (Due to the fear of litigation and hierarchy-based backlash, errors are rarely discussed in a team forum)	Creating and teaching the team a briefing-debriefing process, which is conducted by the head surgeon but structured so as to encourage comments by other team members.
Research literature	2. Organizational culture: Existence of a dialogue between various subgroups within the organization (Schein, 1992). Exploring and testing shared mental models (Kim, 1993).	Positive	High (Both pilots and navigators participate in the briefing/debriefing process equally)	Low (Due to status-based communication between various professional groups)	Emphasis is placed on giving low status members a structured opportunity to speak and comment during briefings and debriefings.
Research literature	3. Process design: Reliance upon standard operating procedures (Nystrom & Starbuck, 1984; Walsh & Ungson, 1991; Weick & Westley, 1996)	Negative	High (The use of SOPs is common practice in the armed forces)	Medium (General use of SOPs; however, special cases may not be covered by SOPs and improvisation may be required)	Briefing/debriefing encourages the questioning of the effectiveness of taken-for-granted SOPs in particular situations. This is where double-loop learning is most clearly manifested.

(continued)

TABLE I (continued)

Column 1 Origin of Factor	Column 2 Factor	Column 3 Effect on Ability to Transfer the Briefing/ Debriefing Technology	Column 4 Probability of Occurrence in IAF Briefings- Debriefings	Column 5 Probability that Briefings- Debriefings in Israeli Public Hospital Surgical Teams Will Be Characterized by This Factor	Column 6 How Hospital Is Seeking to Overcome Obstacle
Action research	4. Scheduled pre- and postaction meeting	Positive	High (Part of the routine briefing- debriefing process)	Low (Head surgeons may not always be present at the very beginning and very end of surgery)	Senior surgeons will assist in preliminary operative activities as well as in stitching up.
Action research	5. Concern with liabilities	Negative	Low (What goes on in the briefing- debriefing sessions is strictly for purposes of learning and is classified as secret)	High (Real fear of medical liabilities)	Reports of the debriefing sessions are in general terms, with no reference made to a specific surgery or a specific team member.

transferability of the briefing-debriefing technology from the IAF to Israeli public hospitals. The factors identified, as well as their suggested impact on transferability, are presented in the first two columns of Table I.

Sample and Data Collection

We collected extensive qualitative data in both the IAF and the hospital, with the aim of (1) better understanding and mapping out the role of each of these factors in potentially limiting the transferability of the briefing-debriefing technology (Columns 4 and 5 of Table I), (2) identifying additional obstacles (bottom half of Table I) as well as potential mechanisms by which to overcome these obstacles (Column 6 of Table I), and (3) generating propositions regarding the way in which reflexivity might ultimately affect the quality-related performance of surgical teams. In addition to examining archival data (e.g., transcripts of IAF briefings and debriefings, memoranda regarding briefings and debriefings in the IAF), we also collected interview data from 40 key informants both from the air force and the hospital, including two base commanders, eight pilots, six navigators, nine surgeons, six nurses, four anesthesiologists,

and five members of the hospital's top management. In addition, a dozen IAF briefing-debriefing sessions and 30 surgeries were observed by the authors and additional observers (medical students trained to undertake such observation), taking extensive field notes. Additionally, 40 surgeries were observed by the authors and additional observers in the pilot-study phase. Twenty surgeries were observed from wards implementing the briefing-debriefing technology, and twenty from wards that were not. In all cases, observers paid special attention to intrateam communication processes focusing on such parameters as communication direction (i.e., downward, upward, or bidirectional), tone (e.g., instructional, punitive), and content (constructive versus nonconstructive).

Data Analysis

We analyzed the data using the constant comparative method (Glaser & Strauss, 1967; Strauss, 1987; Strauss & Corbin, 1990), which is designed to develop rich descriptions of social phenomena, allowing the researcher to make discoveries and to generate hypotheses and theory. Using this method, we began to identify theoretical categories and make com-

parisons across categories prior to starting the formal process of data analysis. These comparisons allowed us to develop construct definitions and associated coding criteria. These criteria played a key role in allowing us to identify and categorize characteristics of the potential problems (and associated solutions) in transferring the briefing-debriefing technology from the IAF to the hospital setting, and to search for patterns in the way that such a technology, applied in a surgical context, may affect quality-related outcomes.

Using this coding scheme, the analysis of our qualitative data was structured around three main issues: (1) problems in transferring the briefing-debriefing technology from the IAF to the hospital setting, (2) possible solutions to such problems, and (3) the likely means by which the adoption of such a technology in a hospital context might affect quality-related outcomes. The analysis process was iterative, in that patterns identified early in the analysis served as the basis for additional field-based inquiry. Specifically, as suggested by Glaser and Strauss (1967), patterns suggestive of a particular relationship among constructs guided subsequent data collection. We collected additional data regarding these possible relationships with the intent of either finding disconfirming evidence or evidence of contingency (i.e., the notion that relations held on under certain conditions). Only when additional data reflected patterns already identified (a condition referred to by Glaser and Strauss [1967] as “saturation”) did we halt our data-collection efforts with regards to this particular relationship and focus on others.

Briefing-Debriefing in the IAF

The IAF’s system of team-based learning consists of the preflight briefing and postmission debriefing technology developed decades earlier by the U.S. Air Force and Royal Air Force (personal communication from an anonymous reviewer). The IAF initially adopted this technology during the 1980s. All flight teams must participate in preflight briefing and postflight debriefing sessions involving the use of “high-tech” in-flight

recording systems, regardless of the particular nature of the flight (i.e., training or combat).

Key System Elements

The IAF’s team-based briefing-debriefing system may be viewed as a form of structured reflexivity, in that team-based reflective sessions are a scheduled and routine element of formations’ daily activity, and in that these sessions follow a regular and almost scripted pattern. Although formation members are free to fill in the content as they see fit, briefing and debriefing sessions follow set and predetermined protocols. Following a classic action learning pattern (Zuber-Skerritt, 2002), formations—a varying number of typically two-person (pilot and navigator) flight crews, depending on the nature of the mission—meet just prior to takeoff to discuss the objectives of the mission, and then again after the flight to review the extent to which those objectives were met, events during the flight that contributed to or complicated achievement of these objectives, why these complications emerged, and how such problems might be avoided in the future.

Briefing and debriefing sessions are led by the team leader for that particular mission, with all other team members participating. The team leader is designated prior to the briefing session, through a mechanism by which each pilot and navigator is assigned a number according to his qualifications (leader, wingman, etc.). The individual assigned number 1 is then appointed team leader. Numbers are assigned for a particular mission regardless of rank, such that despite the strict hierarchy governing day-to-day air force activities, it is not unusual for, say, a lieutenant to lead the briefing session, while a colonel sits and takes notes with the other team members (who may have 20 years less experience than him). All briefing sessions address the topics presented in Table II. In cases where the briefing involves a large

Although formation members are free to fill in the content as they see fit, briefing and debriefing sessions follow set and predetermined protocols.

TABLE II Briefing and Debriefing Agenda

BRIEFING	DEBRIEFING
General information—What is the mission? Where is it going to take place?	Review of objectives
Constraints—Which runways are open? What heights are designated for flying? What is the weather forecast?	Extent to which objectives were met
Things to emphasize for today's flight— What are the rules for the training air battle? How many planes should be hit? How long should the mission last?	Review of videos and data
Three specific goals for today's flight—such as duration, cooperation, and safety issues	Why where the objectives not met, or what facilitated meeting the objectives?
Things to emphasize from yesterday's debriefings —What were the main points that were problematic yesterday?	What can be improved for next time?
Safety and personal risk management—zero safety incidents as a goal, self rating of how confident each person feels about flying today	Summary of the lessons learned
What should be prepared for the debriefing—prepare videotapes, make sure the computer is updated	

number of flight crew assigned to multiple formations, members of particular formations may conduct small, follow-up sessions to discuss formation-specific tactics, responsibilities, and issues requiring special attention.

At the end of the combat or training mission, the formation members immediately gather for a debriefing session. Over the years, these structured briefing-debriefing sessions have become increasingly centered around in-flight recorded data. Indeed, one of our informants told us that the growing use of such data created a minor revolution in the IAF. As he described it:

Veteran pilots with a great reputation were used to describing their amazing maneuvers in the air on the basis of dramatic hand motions. Suddenly we have data that indicates that these maneuvers were not nearly so dramatic and perhaps downright flawed. Now these guys had to bow their heads in shame and slide over to let those with

truly exceptional, documented performance finally get some of the glory.

Like the briefing session, the debriefing session is led by the mission commander and follows a predetermined pattern (see Column 2 of Table II). The process is governed by three questions serving as what other observers (Lipshitz, Ron, & Popper, 2002, p. 6) have described as a "debriefing mantra": "What happened? Why did it happen? What can we learn from this so as to do it better next time?" With the mission's primary goals up on the board in front of the team members, the data from each flight crew's aircraft are played back. Although the pilot or navigator is expected to explain key actions that are apparent from the recorded data, any team member can reexamine these data and question the reason for a particular action or the basis for a particular statement. The debriefing process thus elevates the group beyond a single-loop learning process in which they simply would reflect upon their actions in light of a set of unquestioned assumptions.

Our own observations of the debriefing process indicate that participants typically engaged in a deeper, sense-making mode of analysis (Weick, 1995); one governed by a focus on process and the questioning of the basic assumptions underlying mission objectives and the means by which these objectives were to be met. Moreover, team members were constantly encouraged to consider the implications of the issues raised with regard to their future actions. For example, in response to a question raised by a team member in one of the debriefings that we observed, the mission leader responded: "Yes, here's where I screwed up. I made a mistake thinking 'x' when I should have been focusing on 'y' instead. And here's what we should all learn from this for the future . . ."

This statement also illustrates the norm of transparency governing the debriefing session. Regardless of rank, team members are expected to identify problems, ask questions, and offer feedback and advice. As the base commander told us:

It's kind of like a game. It's a thrill for junior flight crew to identify an error committed by one of his higher-ranking, veteran teammates. If the junior team member is correct in his/her assessment, the senior member admits his/her mistake and the junior member is thanked and congratulated for making the observation.

In sum, the IAF debriefings that we observed had the following four elements in common:

- A discussion that was in no way influenced by the participants' organizational status (i.e., rank). The highest-ranking officer was just as likely to be critiqued as the most junior member of the team. Moreover, critiques of high-status team members were no different in tone from those directed at low-status members. For example, the following critique of a senior officer was voiced by a recent recruit: "You could have kept flying a bit more in order to get a better angle for shooting at the target."

- A primary focus on error detection and analysis, but with a distinct effort to acknowledge both exceptional performance and performance meeting the standard mission criteria (e.g., safety). For example, one pilot complimented another and said "the way in which you explicitly pointed out the special features of the target, and not only gave its location, was very helpful in terms of our ability to locate it." As this example suggests, in those cases in which successful performance was noted, emphasis was placed on the conditions contributing to the success and how these conditions might be replicated in the future.
- A discussion that, while open, pleasant, and democratic, had an undertone of constructive competition. Specifically, as noted above, team members appeared to be almost competing with one another as to who could make the most significant and memorable contribution to the debriefing.
- The briefing-debriefing process is grounded on the notion of double-loop learning. For example, after a near accident in a training mission of one of the squadrons, the IAF stopped all training flights the next day, and there were debriefing sessions in all bases, reexamining basic assumptions and rules of operations.

Given these characteristics, the IAF briefing-debriefing technology appears to closely correspond with the team reflexivity concept described by Swift and West (1998), in that the briefing-debriefing technology requires flight teams to engage in all three of the processes identified by these researchers—namely, reflection, planning, and adaptation.

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identify discrepancies between actual and desired performance in the context of the goal review conducted in the briefing and the analysis of goal-oriented behaviors and related constraints in the debriefing. Planning is the key element of the third part of the debriefing (see Table I), in which team members discuss how the lessons they have learned can be applied in the future. Finally, adaptation occurs as team members apply the lessons learned in previous debriefings and examine across debriefings their individual and team-based progress from one mission to next.

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Implications of the System for the IAF

Archival as well as interview data suggest that the briefing-debriefing mechanism has had a dramatic impact on the performance of flight crews, particularly on operational safety. For example, whereas the years leading up to the introduction of the briefing-debriefing technology in the IAF saw an average and largely stable loss of over 20 planes per year due to training accidents, the introduction of the more sophisticated, structured, and recorded briefing-debriefing technology led to an immediate and steep

decline of only one to two planes per year, where it has remained stable for over a decade. The IAF has taken note of the success of the briefing-debriefing sessions and expanded them in the past few years to include not only flight crew members (pilots and navigators), but also the formation's mission-critical ground crew. In addition, the norms underlying the team learning model—transparency, issue orientation, and accountability—have begun to spill over into other IAF domains, with flight crews and other IAF personnel frequently conducting briefing-debriefing sessions on other, non-flight-related activities such as conferences, maintenance operations, and even field trips.

Transferring the Team Briefing-Debriefing Technology to Hospitals

Fighter Crews in the Operating Room? The Surgical Team Work Context

Although, on the surface, it appears illogical to compare surgery to aircraft combat, the research literature suggests that, in a number of ways, their respective work contexts are remarkably similar. For example, in a study comparing cockpit crew to members of hospital surgical and ICU teams, Sexton, Thomas, and Helmreich (2000) note that in both contexts, a high degree of stress is generated by the fact that lives are at stake, and that operational performance is contingent on close and continuous attention to detail. Stress is further generated by the need to be prepared for the unexpected. Surgeons must be prepared for an unusual patient response to anesthesia or for unexpected fluctuations in blood pressure in the same way that pilots must be prepared for a sudden change in the weather. In addition, in both the cockpit and surgery, team members confront highly complex and interdependent work processes (D. W. Johnson & Johnson, 1989; Wageman, 1995), often driven by the operation of multiple, highly sophisticated, and costly apparatuses. While Sexton et al. did not refer specifically to crews of *fighter* aircraft, the constraints they address are among those also typically faced by fighter crews.

Sundstrom et al. (1990, p. 121), in proposing their concept of "action teams," point out further contextual similarities. On numerous occasions, these researchers name flight crews and surgical teams as examples of action teams in that both are "highly skilled specialist teams cooperating in brief performance events which require improvisation in unpredictable circumstances." Indeed, surgical teams, like fighter crews, are composed of individuals drawn from a common, unitwide pool of human resources (in this case, surgeons, anesthesiologists, and nurses), where the composition of any given team depends on a range of factors and exigencies, and where teams are disbanded at the conclusion of the specific action (in this case, the surgery).

Finally, based on our own preliminary field research, we identified a third important similarity—namely, that both fighter crews and surgical teams are typically composed of individuals having diverse functional specializations. Fighter crews include pilots, navigators, and, in some cases, a ground-based virtual crew member. Surgical teams include, at the very least, one or two surgeons, one or two nurses, and an anesthesiologist. As others (e.g., Williams & O'Reilly, 1998) have noted, such functional heterogeneity can introduce further ambiguity into a context already high in uncertainty, as each function typically has its own interests, jargon, and approach to interpreting and responding to significant operational events.

However, our field data also suggest some important differences between flight crews and surgical teams, differences having potentially important implications for tailoring the briefing-debriefing technology to the operating room. First, our data suggest that these systems are more likely to be adopted and effectively applied in units characterized by a strong sense of team identity and having leaders that are open to critique and self-criticism (see Factor 1 in Table I). Despite intrateam heterogeneity, a strong sense of team identity combined with a deeply entrenched organizational tendency to place in leadership positions only those with a documented ability to seek and learn from the criticism of others (including those of lower rank) facilitated self-criticism in most of the air force teams. In contrast, in the surgical context, inter- and intraoccupational status differences (for a discussion, see Tanner & Timmons, 2000) tended to encourage largely hierarchy-based exchanges between the team leader (i.e., head surgeon) and other team members even upon the conclusion of operational activities, thus limiting the emergence of any sense of collective team identity or openness to self-criticism. Specifically, when asked to name the members of their team, surgeons consistently named only the other surgeons, acknowledging the nurses and anesthesiologist only when explicitly asked about the inclusion of other medical professionals. One surgeon, responding to a question about the possible ad-

vantages of a team reflexivity system, remarked, "There is no need for any such system. We [i.e., the surgeon and the surgical resident] talk between ourselves during the surgery and learn immediately." For this senior surgeon, the surgeons *are* the surgical "team," with all others (nurses, anesthesiologists, technicians, etc.), at best, serving as support staff. This perspective also was evident from the hierarchy-based temporal norms followed by most of the surgical teams. Specifically, all members of the surgical team unquestioningly accepted the assumption that regardless of its impact on the work of other team members or other hospital systems, the flow of the surgery (including start times and interruptions) needed to be structured such that, to the greatest extent possible, the particular scheduling needs of the head surgeon could be met.

As implied by the surgeon's above statement, a second key difference concerns the nature of intrateam communication and, specifically, the relative lack of two-way communication in surgical teams (see Factor 2 in Table I). Whereas mission crew dialogue freely among themselves and without regard to military rank both during the mission and in premission briefings and debriefings, our field data indicate that the nature and direction of intrateam communication flow in surgical teams was largely status-derived, with residents and nurses speaking to attending physicians only when spoken to.

This information often was communicated from senior to junior team members in a demeaning way. In many of the observed surgeries, it was possible to infer implicit communication norms mandating that no information be communicated upward unless required by protocol or specifically requested by those with greater status. Nurses viewed this communication pattern as indicative of how nurses are "unappreciated,"

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“taken for granted,” and “mistreated” by surgeons; the surgeons, for their part, described nurses as “simply not caring” and “more interested in leaving at the end of their shift than seeing the operation through.” A number of surgical residents as well as nurses complained about the tone of voice used by their superiors. Indeed, on a number of occasions, our observers noted that the tone used by a senior surgeon in addressing a resident during surgery was more imperative (and at times, even abusive) than instructive or interrogative.

Most recently, Edmondson (2003) reported that the failure of nurses and anesthesiologists to express their opinions or concerns in the operating theater can be directly attributed to power-based communication norms

To a large extent, our observations are consistent with those appearing in much of the research literature on surgical teams. For example, Helmreich and Schaefer (1994) suggest that limited operating efficiencies and preventable adverse events in surgery may be attributed to just such status-based communication barriers. Similarly, Sexton et al. (2000) surveyed surgical teams in five different countries and found that poor teamwork and communication were among the most widely reported problems.

Noting the status-driven nature of information flow in these teams, they found that higher-ranking team members (i.e., senior surgeons) were highly supportive of team-based communication norms that condone the questioning of more senior team members by those lower in status (e.g., nurses), while the latter found such communication patterns to be highly problematic. Most recently, Edmondson (2003) reported that the failure of nurses and anesthesiologists to express their opinions or concerns in the operating theater can be directly attributed to power-based communication norms such as those described above. And unfortunately, as demonstrated by Weick (1993), such barriers to intrateam communication can result in catastrophic consequences for teams performing complex and high-risk tasks requiring a high degree of coordination.

A third important difference between these contexts is apparent with regard to Factor 3 in Table I—namely, the reliance upon standard operating procedures. Whereas in the IAF on a normal day-to-day basis, missions are geared toward training and are therefore highly structured and standardized, the surgical context is often characterized by a high degree of uncertainty, which, in turn, severely limits the application of standard operating procedures. Indeed, while surgeons remarked that they typically follow standard surgical protocols, patient-specific issues can and often do arise that force the surgical team to deviate from these standardized protocols. In this sense, surgical task processes may actually be somewhat more favorable to the adoption of the briefing-debriefing technology than those characterizing the IAF. Nevertheless, because the work of surgical teams remains largely grounded on prespecified work processes, it may be difficult to institutionalize a technology having the potential to call into question the efficacy of such taken-for-granted processes, no less the assumptions upon which they are based.

Two additional factors potentially posing obstacles to the transferability of the briefing-debriefing technology were identified in the context of our field research. First, while the IAF briefing-debriefing technology requires a meeting of all team members prior to the initiation of any action, our data suggest that such preaction gatherings may be difficult to arrange in the surgical context, since the head of the surgical team is rarely present at the beginning or end of the surgery (Factor 4 in Table I). As explained to us by the head of one of the surgical departments:

I’m rarely involved when the surgery begins. I leave it to the resident and other staff to prepare the patient and even to do the preliminary surgical work such as removing the veins from the leg that I will then use later on in the operation. I can use this time more efficiently dealing with other issues that I need to address in the department. Only when this preliminary

work is done do I arrive. I do my work and then leave before the operation is done, leaving the sewing up to the residents and other staff.

In this context, a direct application of the IAF briefing-debriefing technology would require senior surgeons to alter what they view as a highly efficient work process, one that allows them to perform multiple surgeries and still take care of pre- and post-operative concerns in their department.

Finally, a second obstacle (Factor 5 in Table I) suggested by our field data had to do with the systemwide concern with medical liability. As one hospital administrator told us:

Forget about videotaping the operations for postoperative analysis. The lawyers would immediately ask for any such video to be subpoenaed. But I'm even concerned about the debriefing sessions. Can you imagine what the lawyers would do to us if they could get their hands on the protocols from these sessions?

Consequently, one of the critical issues that had to be addressed was how to develop a briefing-debriefing technology in which the learning-related benefits of transparency could not be turned into, as one surgeon noted, "a nightmare of malpractice litigation."

The threat of medical liability serves as a constraint to the transparency of information in the hospitals, unlike the case of IAF, where each training or operation mission is also being videotaped, so that the information is transparent to all the crew members.

Although this limited discussion of the surgical team context in no way does justice to the extensive literature on surgical teams (Carthey, 2003; Savage, 2000), it does provide some important insights into the particular civilian environment within which we attempted to apply the military-based briefing-debriefing technology. On the one hand, the discussion suggests that application of any team-based learning framework to surgical teams was likely to face considerable obsta-

cles, not least because it is not clear to the members of these "teams" where the team's boundaries lie (i.e., are nurses and anesthesiologists to be included?). On the other hand, we felt that, as in the IAF of the early 1980s, there potentially is much to be gained by implementing such a model among surgical teams, particularly given an objective of enhanced patient safety and a reduced incidence of preventable adverse events. Indeed, consistent with the observations of Helmreich (2000), who notes that many of aviation's strategies for enhancing teamwork and safety may be applied to medicine, our observations of reflexivity in the IAF led us to conclude that such structured reflexivity sessions might be ideally suited to address the status-based barriers to intrateam communication apparent in many of the surgical teams that we observed. However, before developing this template, we went back to our field data to gain a better understanding of how the IAF model would need to be modified for application in the civilian, surgical context.

Addressing These Potential Barriers to Adoption

Underlying our efforts to address these potential obstacles was the assumption that once the key actors—namely, the surgical department heads, surgical residents, nurses, and anesthesiologists—understood the potential benefits of the system and became committed to its introduction, we could then turn to them to come up with solutions to these problems. Consequently, our initial step in introducing the briefing-debriefing system was to gain the commitment of those involved. To do this, we took advantage of the nearly mythical status of the IAF in Israeli society and in the medical community in particular. IAF pilots are viewed as the elite of the Israeli

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military, having survived a highly rigorous selection and training process. Moreover, in Israel, the IAF is recognized not only as the driving force behind much of Israel's high-technology industry, but also as the epitome of effective technology management.

With the encouragement of the hospital's top administration, we asked selected surgical department heads, as well as the heads of the various support units (e.g., surgical nursing, anesthesiology) to meet with the commander of one of Israel's air force bases and several of his senior assistants. At

this meeting, the IAF staff explained the logic and potential benefits of the briefing-debriefing technology, and the medical participants agreed to look into the possible adoption of a similar model in their units.

Following this meeting, surgical staff members were invited to visit an IAF base and observe the briefing-debriefing process. Two separate visits were held. Between these two visits, the IAF base commander and several flight crews were invited to observe an operation. Presented in Table III, these phased interactions were designed to facilitate the transfer of knowledge from the military to the civilian organization, and to sequentially increase the surgical team's commitment to the introduction of a learning-based model.

As also shown in Table III, commitment to a pilot project was achieved only after the second visit to the IAF base. Our field notes indicate that the critical step in winning the participants' commitment came during the discussion that followed the flight crew's debriefing session. At this meeting, the base commander and his staff were asked to present their observations of the operational issues in surgery that could potentially be addressed by the briefing-debriefing technology. The issues raised included:

1. Failure of operations to begin at the scheduled time, and potential cost impli-

cations from the ineffective use of valuable resources such as operating rooms and surgical teams. The model could be used to identify the source of such delays and how they might be prevented in the future.

2. Failure of team members to repeat and confirm communications as orders are given, despite protocols requiring that they do so.
3. Periodic entry of unsterilized staff and materials (e.g., surgeon's cellular telephone).
4. Failure of the head surgeon to offer individual or team feedback before leaving the surgery.

Highly impressed by the base commander's remarks (the head of surgery responded that he couldn't have made more precise observations himself), the participants began a lively debate as to whether the briefing-debriefing technology might work in the surgical context. Senior surgical staff took the position that such a model was not even needed, as informal debriefings among surgeons occur on a regular basis regardless. For example, a very senior surgeon said, "There is no reason to wait till the end of the surgery; during the surgery I discuss with the resident what he is doing wrong." This point was immediately refuted by two former pilots currently completing their surgical residencies in the hospital, as well as the head of the surgical nursing unit, who noted that the little communication that takes place is strictly "top down" and structured in such a way to prevent the questioning of underlying assumptions. These participants gave examples of how learning, to the extent that it occurs in the hospital's surgeries, is largely single-loop in nature. In addition, consistent with conclusions reached by West (1996) regarding the potential role of team reflexivity in enhancing members' sense of team identity and internalization of team objectives, these same participants noted that with the adoption of such a model, all those involved in a procedure might be expected to take on a greater sense of responsibility and accountability, identifying and seeking to correct

Our field notes indicate that the critical step in winning the participants' commitment came during the discussion that followed the flight crew's debriefing session.

TABLE III Objectives, Means, and Outcomes of the Commitment-Building Process

PHASE	Participants	Objective	Means	Outcomes
1. First visit to IAF base	All surgeons from one ward, plus all of the nurses and anesthesiologists working with them	Gain knowledge of the briefing-debriefing process	Observation of briefing session, meal with the flight crew, observe planes taking off/landing, observe debriefing	Participants begin to talk about possible advantages of adopting this model to their surgical unit, as well as barriers to adoption.
2. IAF visit to hospital	Base commander and two pilots (of varying rank and seniority)	Have IAF staff be able to identify operational/safety issues and problems in surgeries potentially addressed by briefing-debriefing model.	IAF staff, dressed in surgical "scrubs," observed all phases of an operation	IAF staff takes extensive notes and identify more issues potentially addressed by a briefing-debriefing model than ever imagined by the researchers.
3. Second visit to IAF base	Same as Phase 1 + hospital's head of all surgical units, two IAF (reserve) pilots now completing surgical residencies in the hospital, heads of several other surgical departments	Gain commitment of all parties to implement and evaluate pilot briefing-debriefing model; have parties address obstacles to implementation and develop solutions	Same as Phase 1	IAF staff share their observations with the surgical staff and comment on critical points that should be raised in the briefing-debriefing process. Surgical residents and nurses voice strong support for model. Although senior surgical staff remains skeptical, they agree to adoption of pilot study and begin to discuss solutions to problems identified.
4. Joint meeting of IAF and surgical staff representatives	Two surgical doctors, two IAF officers, two surgeons who are also pilots, researchers, and project coordinators	To create a form and define the structure and process of the briefing-debriefing, such as who should participate, when should each phase be conducted, and where should the briefing-debriefings take place	Think tank	Guidelines for the briefing-debriefing process and forms to be filled out by the surgical teams

problems that could potentially result in adverse events or heighten patient risk.

Impressed by these remarks, the heads of the surgical units consented to proceed with a pilot project, and the group began to address several highly significant practical concerns, including issues relating to liability, boundaries, and timing.

With regard to liability concerns, while most participants agreed that an analysis of video footage of the actual surgery would be beneficial in any debriefing, it was widely recognized that this would be a highly impractical measure due to the risks of litigation. Ultimately, the group found a number of practical solutions to this problem—for instance, not referring to any patient by name in a debriefing protocol and writing the conclusions without referring to any specific team member (see Column 6, Factor 5 in Table III). The group also concluded that while the briefing-debriefing technology posed little risk to the application of standard medical protocols during actual surgeries, there was much to be gained by reviewing the applicability of such protocols under particular patient and surgical conditions both prior and subsequent to the actual surgery (see Column 6, Factor 3).

Regarding the leadership-related, timing issue, it was agreed that, at least for the pilot project, senior surgeons would assist in preliminary operative activities as well as in the stitching up. Senior surgeons acknowledged that, in addition to facilitating preoperative briefings and postoperative debriefings, this would allow for shorter surgeries and for more efficient use of system resources overall (Column 6, Factor 1 in Table III).

Finally, the task of creating the actual briefing-debriefing protocol to be used by the surgical teams participating in the pilot project was assigned to a joint hospital-IAF task force. The task force was charged with ensuring that all briefing-debriefing sessions would be used to constructively identify critical incidents requiring further

analysis, and that all participants would be encouraged to openly express their opinions and concerns (Column 6, Factors 1 and 2 in Table III).

Structured Team Reflexivity and Quality-Related Surgical Outcomes: Initial Insights

The pilot project involved six surgical units and was conducted over a period of three months. The pilot was structured around a model largely based on the IAF template, but it was “tweaked” by the surgical staff, with the assistance of the IAF, in terms of the protocol to be followed, the data to be analyzed, and the nature of the documentation to be retained by the participating surgical teams in order to take into account issues specific to the surgical context.

We followed the implementation of this pilot project as action researchers, using the same qualitative methodologies noted earlier (i.e., observations of briefings, debriefings, and surgeries; pre- and postsurgery interviews with surgical team members) with an interest in learning more about how (if at all) such a structured reflexivity technology might enhance surgical teams’ quality-related outcomes. Our analyses of these qualitative data suggest a grounded model (presented in Figure 1) of how such a military-based team reflexivity technology may drive enhanced quality-related outcomes in hospital surgical teams.

As can be seen in Figure 1, our data suggest that embedded in the briefing-debriefing technology are two team learning processes, the first embodying the characteristics of single-loop learning and the second the characteristics of double-loop learning. Evidence of the two types of learning mechanisms is apparent in the briefing-debriefing protocol adopted by the surgical teams. Specifically, as illustrated in Figure 1, the protocol adopted aimed at encouraging both episode-specific error detection and correction (i.e., single-loop learning), as well as the episode-specific and cross-episodic examination of the embedded systems and assumptions potentially underlying such episode-specific errors (i.e., double-loop learning).

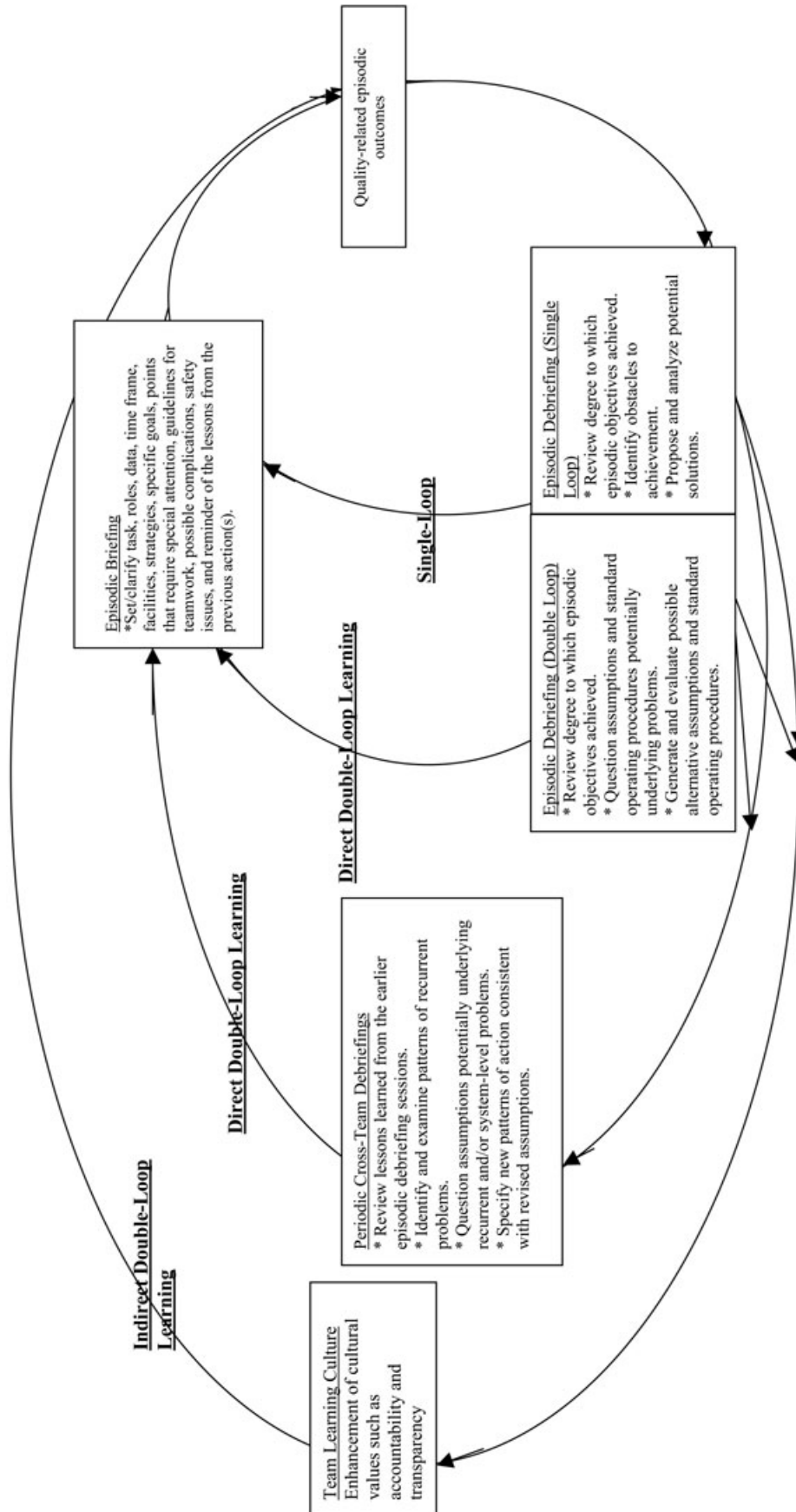


FIGURE 1. A Model of Briefing-Debriefing Incorporating Single- and Double-Loop Learning

For example, the protocol called for a briefing-debriefing cycle in which the team: (a) sets or clarifies objectives, roles, strategies, and guidelines; (b) performs the task, and as a result, the quality of the outcomes is apparent; and (c) reviews the extent to which objectives were met, why they were or were not met, and what can be learned from the experience.

...our data suggest that with the implementation of the adopted briefing-debriefing protocol, surgical teams became engaged in a continuous process of self-reflection, with the results of episode-specific reviews providing a basis for the specification of objectives for subsequent surgeries...

Our data suggest that such protocol-specified identification of key issues and setting of episode-specific objectives indeed had a direct impact on quality-related team outcomes. For example, a debriefing discussion regarding the problems associated with the failure to properly regulate patient temperature highlighted the lack of clear measurement criteria. Concluding that the most accurate temperature for the particular type of surgery in question is that taken in the bladder, bladder-based determination of patient heating requirements was specified in the briefings for subsequent surgeries as a means by which to avoid the problems associated with the failure to properly regulate patient temperature. This example also illustrates how, as illustrated in Figure 1, issues raised in an earlier briefing session were typically reviewed in the subsequent debriefing with the recommendations emerging from this debriefing often serving as inputs for the next briefing. Indeed, as illustrated by the following quote from a surgeon leading a presurgical team briefing, briefings often began where earlier

debriefings left off: "In yesterday's debriefing it was noted that it would be helpful that when the surgery is on one hand, the other be held down by constraints. I suggest we implement this today."

Taken as a whole, our data suggest that with the implementation of the adopted

briefing-debriefing protocol, surgical teams became engaged in a continuous process of self-reflection, with the results of episode-specific reviews providing a basis for the specification of objectives for subsequent surgeries; a process very much consistent with notions of single-loop learning as described by Argyris and Schon (1978). This process is illustrated in terms of the innermost loop shown in Figure 1, and led us to suggest the following proposition:

Proposition 1 (single-loop learning): The enhancement of surgical teams' quality-related outcomes from one surgery to the next will be greater to the extent that problems identified in the context of a debriefing for a surgery conducted at time T_1 are translated into improvements in planned actions included in the preoperative briefing for surgeries to be conducted at time T_2 .

Additionally, our data indicate that, consistent with Argyris and Schon's (1978) notion of double-loop learning, those participating in episode-specific debriefings often engaged in the questioning of taken-for-granted procedures and their underlying assumptions. For example, although it became "common practice" for debriefings to be held at the end of each surgery, in the debriefing following one particularly long operation, participants questioned the timing and nature of the debriefing itself, noting that important information was being missed due to the absence of the initial nursing and anesthesiology staff (who were relieved during a regular shift change). Upset that critical information may have been lost, the team members explored ways of conducting debriefings in a manner more suitable for such long operations. From this example and others like it, we therefore generated the first of two grounded propositions regarding direct double-loop learning:

Proposition 2a: The enhancement of surgical teams' quality-related outcomes from one surgery to the next will be associated with the degree to which episode-specific debrief-

ing participants: (a) engage in the questioning of taken-for-granted procedures and the assumptions underlying them and (b) are able to translate the results of such questioning into the respecification of planned actions for subsequent surgical procedures.

In addition to such episode-specific debriefings, the protocol also called for weekly cross-team departmental meetings designed to review key issues raised in the previous week's debriefings in an effort to identify patterns suggestive of more deep-seated problems requiring system-level changes. To enhance the quality of the double-loop learning at the core of these cross-team meetings, the protocol also required that all of the surgeons from the specific ward, as well as at least one representative of each of the other occupations serving on the ward's surgical teams (i.e., nurses, anesthesiologists, and technical staff) attend these weekly meetings.

Our data suggest that these weekly meetings further stimulated double-loop learning, as is apparent in the following example from the hospitals' coronary surgery unit. The weekly debriefing sessions of the surgical teams from this unit typically involved all of those participating in such surgeries—namely, surgeons, nurses, anesthesiologists, and heart-lung machine technicians. In one of these weekly meetings, the focus was on an issue consistently raised in recent episodic debriefings—namely, the difficulty that the technicians had in hearing the instructions given to them by the surgeons (an issue raised by technicians) and the fact that surgeons do not always know if their instructions have been carried out by the technicians (raised by the surgeons). The conclusion reached in each of the early debriefing sessions (for each individual team) was that the surgeons would speak up and the technicians would vocally confirm performing procedures (an example of single-loop learning). However, when this issue was brought up in the context of the weekly cross-team meetings, it was apparent that this issue was not unique to a particular surgery but rather reoccur-

ring. Participants exploring the root of the problem found that it lay in the physical layout of the operating room (i.e., the fact that, due to machine interference with line of sight, surgeons and technicians rarely have any eye contact).

Viewing this problem as systemwide, the technicians and surgeons worked with one another to draw from the lessons learned in earlier, episodic debriefings. They redesigned the physical layout of the hospital's heart surgery rooms in order to allow for line of sight. This change allowed surgeons to see, on the basis of body gestures, that technicians received and carried out the surgeon's instructions. Indeed, our qualitative data suggest that with this change in place, the proportion of cases in which surgeons had to repeat their instructions over and over again fell dramatically. This example suggests that in accordance with the essence of double-loop learning, the reflexivity technology drove team members as well as department members to test taken-for-granted assumptions (i.e., suitability of room layout) potentially accounting for performance-related problems across episodes (failure to carry out or misinterpretation of surgeons' instructions), identify the systemic root of the recurrent problem (lack of line of sight), be open to a fundamental rethinking of the way in which they approach and do their work (change in physical layout of operating room), and make appropriate changes. Subsequently, we propose that:

Proposition 2b: The enhancement of surgical teams' quality-related outcomes from one surgery to the next will be associated with the degree to which participants in periodic, cross-team debriefings: (a) search for the

...the reflexivity technology drove team members as well as department members to test taken-for-granted assumptions (i.e., suitability of room layout) potentially accounting for performance-related problems across episodes (failure to carry out or misinterpretation of surgeons' instructions)...

common, system-level roots of recurring problems and (b) are able to translate the results of such system-level analyses into the respecification of systems and frameworks and the surgical goals and practices shaped by them.

Finally, beyond the direct effects of double-loop learning on the quality of surgical team outcomes, our data suggest that structured team reflexivity also shapes the very nature of team norms and member interactions. As reflected by the outer loop in Figure 1, we found evidence that debriefing sessions had an impact on teams' shared understandings regarding the importance of inquiry, accountability, and transparency—unit-level characteristics that others (e.g., Ellis, Caridi, Lipshitz, & Popper, 1999; Popper & Lipshitz, 1998) suggest are indicative of a team learning culture. Our interview data suggest that teams whose members have participated in briefing/debriefing episodes manifest team processes more favorable to open self-reflection than teams whose members have never participated in a briefing-debriefing exercise. For example, team members who regularly engaged in briefing-debriefing sessions voiced a far greater willingness to hold themselves and their actions open to the inspection of their fellow team members, regardless of the latter's respective rank or discipline. For example, a nurse who had participated with members of her surgical team noted:

In contrast to our pre-briefing-debriefing tendency to each run off after a surgery to the next item on our respective daily agenda and never look back, since we have been doing briefings and debriefings, I find that we (the members of the team) are constantly looking for the opportunity to review and discuss certain elements of the op-

eration we were involved with earlier, no matter how routine.

Moreover, on a number of occasions we observed open manifestations of such transparency in team member interactions. Whereas in teams not participating in briefings-debriefings, we never observed members of one discipline openly expressing their dissatisfaction with the behavior or performance of a team member associated with another discipline, among members of teams actively engaging in briefings and debriefings, we observed numerous routine and highly constructive cross-disciplinary confrontations suggestive of well-developed team transparency norms. For example, we observed one interaction in which the senior operating room nurse told the senior surgeon that in the future she should be told who would be on the team ahead of time as different team members tend to require different things that need to be prepared in advance. The head surgeon accepted the remark, then discussed with his colleagues ways in which to let the nurses know ahead of time when there is a change in the roster. In another team, we heard the head surgeon complain to one of the anesthesiologists that they (i.e., the anesthesiologists) "talk too much among themselves during the surgery, and that this is disruptive." The anesthesiologists apologized and promised to try to limit their communications in the future.

Team members participating in briefing-debriefing sessions also tended to hold themselves responsible for their own actions and consequences, tending less to blame outcomes on the nature of the patient and/or situation (i.e., stronger accountability norms). For example, in explaining why a particular surgery didn't start on time, an anesthesiologist regularly participating in briefing-debriefing sessions readily placed the blame on himself, noting that because he had been occupied with other patients during the night, the current surgical patient's anesthetization got delayed. Similarly, a junior surgeon admitted to his colleagues that he found the technical aspects of a particular surgery hard to master.

Based on these and similar observations and reflective of the outer loop presented in Figure 3, we posit that:

Proposition 3 (indirect long-term double-loop learning): The effect of structured team reflexivity on quality-related surgical team outcomes will be mediated by the degree to which surgical team members share a common sense of the importance of inquiry, transparency, and accountability in their day-to-day team-based interactions.

In sum, based on our preliminary observations of the way in which this military-based learning was operationalized in a hospital context, we were able to identify three complementary paths by which structured team reflexivity may enhance team outcomes:

1. By means of problem identification and solution (a path suggested by single-loop learning);
2. By questioning taken-for-granted procedures (as well as the assumptions underlying them) potentially underlying an episode-specific problem, or examining system-level processes and structures potentially underlying a recurrent problem across teams and surgeries (a path suggested by direct, double-loop learning); and
3. By generating and entrenching a team learning culture characterized by shared team member understandings regarding the value of inquiry, transparency, and accountability (a path indicative of an indirect, double-loop learning).

Summary, Limitations, Implications, and Conclusion

The current study attempts to document how a structured team reflexivity model developed in a military organization might be useful in addressing one of the primary challenges faced by hospitals around the world—namely, how to reduce the incidence of preventable adverse events. The briefing-debriefing technology adopted by

the IAF incorporates elements that enable more effective single- and double-loop learning processes, such as those highlighted by Senge (1990) and Argyris and Schon (1978). Moreover, this model may be highly appropriate in those team contexts in which human resource deployments are relatively short-term (resulting in short team life cycles); team missions are highly complex, dynamic, and consequential; and team member interactions are complicated by diversity in functional backgrounds and strict status hierarchies.

Our description of the briefing-debriefing technology as implemented in the IAF and the challenges faced by those trying to adapt this model for application in surgical contexts highlights some of the difficulties potentially involved in transferring military-based administrative technologies to the civilian sector. Foremost among these challenges is the fact that while the IAF leadership, upon deciding to implement such a model, essentially had only to give the order, hospital administrators operate within a loosely coupled systems context (Weick & Roberts, 1993) in which such orders are subject to the micropolitics of the multiple units and interests comprising the hospital. We considered this key constraint in designing the implementation processes, and our initial qualitative data derived from the pilot implementation suggest that our efforts were largely successful in the short term. Nevertheless, until more extensive postintervention data are collected, it will be difficult to determine the extent to which the briefing-debriefing technology was truly adopted and institutionalized.

An additional limitation of this research has to do with the generalizability of our findings to hospitals outside of Israel. Although our qualitative data allowed us to generate a grounded model of the way in which a military-based structured team reflexivity inter-

...until more extensive postintervention data are collected, it will be difficult to determine the extent to which the briefing-debriefing technology was truly adopted and institutionalized.

vention may influence quality-related surgical team outputs, it is entirely possible that this model may not be applicable outside of the Israeli context in which it was derived. While nearly all of the major general hospitals in Israel essentially are public (i.e., state- or municipally owned or financed) institutions, this clearly is not the case in many other countries. Consequently, many of the status- and hierarchy-related obstacles discussed as salient in the current case may be less salient in the case of smaller, private institutions in other countries, potentially facilitating the technology transfer process.

Turning to HR managers and practitioners, our findings suggest that it may be helpful to consider three principles when transferring managerial practices from military to civilian sectors.

As such, the degree to which the briefing-debriefing technology may be transferable to other medical institutions, not to mention the degree to which it may yield the benefits suggested by our preliminary, qualitative data, may be contingent upon the nature (i.e., structure, culture, etc.) of the adopting organization and the cultural context within which it operates. Additionally, the mythical status of the IAF in Israeli society may not be generalizable to other countries. Consequently, using a model based on the air force may not have the same impact elsewhere. Moreover, lacking the interest and cooperation of key stakeholders in the military, such transfers may not be easily replica-

ble. Still, we believe that once successfully adopted by a central and highly visible civilian institution, the diffusion of such a military-based organizational technology is likely to occur even without the direct involvement of stakeholders in the military (Rogers, 1962). Regardless, we encourage research aimed at examining such potential contingencies.

In the meantime, we believe that our documentation and analysis of the adoption process makes several significant contributions to the research and practitioner literature. For researchers, the current study identifies some of the key issues constraining the proactive promotion of double-loop reflexivity in action teams, and presents

one means by which such reflexivity may, nevertheless, be introduced. In particular, the military briefing-debriefing technology is proposed as a mechanism by which double-loop learning may be promoted in an organizational context dominated by short-term action teams and characterized by a strong emphasis on rank and status.

More generally, our study also begins to address a dilemma examined by both organizational learning scholars and researchers interested in autonomous and semiautonomous workgroups—namely, how it may be possible to enhance workgroup self-regulation without requiring managers to cede administrative control. Our observations suggest that team briefing-debriefing sessions encouraging single- as well as double-loop learning may provide precisely such a means, allowing for more efficient and effective modes of performance management, particularly in high-accountability work contexts such as hospitals.

Turning to HR managers and practitioners, our findings suggest that it may be helpful to consider three principles when transferring managerial practices from military to civilian sectors. First, practitioners from both sectors should be involved in the process of knowledge transfer. Second, learning through modeling and observation is highly effective for knowledge transfer, both for increasing commitment and for improving the understanding of the transferred methodology. Third, to ensure that the transferred knowledge meets the contextual constraints of the acquiring organization, there is potentially much to be gained by including members of both organizations in the design teams charged with the necessary “tweaking” of intervention technologies.

In addition, our findings suggest a number of ways in which team reflexivity may enhance the operational effectiveness of short-tenure, “action teams,” as well as the challenges that practitioners are likely to have to overcome in adopting such reflexive technologies in their own organizations. From a training and development standpoint, team reflexivity offers a simple and promising new means by which to enhance the autonomy of even short-tenure

teams without the loss of operational control on the part of team managers. However, a substantial challenge exists for HR practitioners because the primary, double-loop learning benefits of reflexivity only can be derived after team members internalize the pro-learning norms underlying this technology. Where these norms are inconsistent with those of the broader organization, implementation is likely to be more problematic. Consequently, our findings suggest that a variety of HR systems and subsystems, from staffing and development to performance evaluation and compensation (Bamberger & Meshoulam, 2000), may need to be restructured in order to enable action teams to most effectively engage in and derive the benefits from team reflexivity.

Finally, our study suggests that despite significant structural and process differences between military and health care organizations,

similarities regarding the need for continuous error detection and reduction, a reliance upon action teams, and a strong status-based work culture may provide a strong incentive for hospitals to look to the military as a possible source of administrative mechanisms that might prove useful in helping to reduce the incidence of preventable adverse events.

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DANA R. VASHDI is a doctorate student of organizational psychology in the Faculty of Industrial Engineering & Management at the Israel Institute of Technology (Technion), Israel. Her research focuses on team learning processes, peer relations in the workplace, and employee well-being. Vashdi's dissertation research won the 2005 Dissertation Grant Award of the Human Resource Management Division of the Academy of Management and SHRM Foundation.

PETER A. BAMBERGER is associate dean at the Faculty of Industrial Engineering & Management at Technion and senior research scholar at the School of Industrial and Labor Relations, Cornell University. Current research interests include peer relations and helping processes in the workplace, and employee emotional well-being. He is the coauthor of *Human Resource Strategy* (with Ilan Meshulam; Sage, 2000) and *Mutual Aid and Union Renewal* (with Samuel Bacharach and William Sonnenstuhl; Cornell University Press, 2001). Bamberger has published over 50 refereed journal articles in such journals as *Administrative Science Quarterly*, the *Academy of Management Journal*, *Academy of Management Review*, and *Industrial and Labor Relations Review*. He received his PhD in organizational behavior from Cornell University in 1990.

MIRIAM EREZ is a chaired professor of organizational psychology in the Faculty of Industrial Engineering & Management at Technion. Her research focuses on work motivation; team, organizational, and national cultures; and innovation. She is the coauthor of numerous books and journal papers. Erez is the former editor of *Applied Psychology: An International Review* and the past president of the Division of Organizational Psychology in the International Association of Applied Psychology (IAAP). Erez is a fellow of the American Psychological Association, the Society for Industrial and Organizational Psychology, the Academy of Management, and the IAAP. In 2002, she received the Distinguished Scientific Contributions Award of the IAAP, and in 2005, Erez received the Israel Prize in Management Sciences.

Dr. **AHUVA WEISS-MEILIK** is the head of the Clinical & Economic Performance unit in Sheba Medical Center. She received her PhD in performance and outcome analysis in health care from Technion. She holds a BS in biochemistry from Tel Aviv University and an MS in physiology and pharmacology from Ben-Gurion University.

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