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Trauma Team Discord and the Role of Briefing

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Abstract

Background—Briefing of the trauma team prior to patient arrival is unstructured in many centers. We surveyed trauma teams regarding agreement on patient care priorities, and evaluated the impact of a structured, physician-led briefing on concordance during simulated resuscitations.

Methods—Trauma nurses at our Level II center were surveyed, and participated in four resuscitation scenarios, randomized to “Briefed” or “Non-briefed.” For Non-briefed scenarios, nurses independently reviewed triage sheets with written information. Briefed scenarios had a structured, four-minute physician-led briefing reviewing triage sheets identical to Non-briefed scenarios. Teams included 3–4 nurses (subjects) and 2–4 confederates (physicians, respiratory therapists). Each team served as their own control group. Confederates were blinded to nurses’ Briefed or Non-briefed status. Immediately before, and at the midpoint of each scenario, nurses estimated patient morbidity and mortality and ranked the top 3 of 16 designated immediate care priorities. Briefed and Non-briefed groups’ responses were compared for: (1) Agreement using intraclass correlation coefficient (ICC), (2) Concordance with physicians’ responses using Fisher’s exact test, (3) Teamwork via T-NOTECHS ratings by nurses and physicians using t-test, (4) Time to complete clinical tasks using t-test.

Results—38 nurses participated. 97% “agreed/strongly agreed” briefing is important, but only 46% agreed briefing was done well. Comparing Briefed versus Non-briefed scenarios, nurses’ estimation of morbidity and mortality in Briefed scenarios showed significantly greater agreement

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with each other and with physicians' answers ($p<0.01$). Rank lists also better agreed with each other (ICC 0.64 vs 0.59) and with physicians' answers in Briefed scenarios. T-NOTECHS Leadership ratings were significantly higher in Briefed scenarios (3.70 versus 3.39, $p<.01$). Time to completion of key clinical tasks was significantly faster for one of the Briefed scenarios.

Conclusions—Discordant perceptions of patient care goals was frequently observed. Structured, physician-led briefing appeared to improve interprofessional team concordance, leadership and task completion in simulated trauma resuscitations.

Level of Evidence—Level 3, Therapeutic / Care management

Background

Effective interdisciplinary teamwork is crucial to trauma patient resuscitation. This requires team members' knowledge of roles, tasks, and shared goals for patient care.(1· 2) However, the context of traumatic injury is frequently complex: patients with multiple (possibly undiagnosed) medical conditions, advanced age, intoxication, or psychosocial issues. Furthermore, trauma team members have varying backgrounds, training and experience. The team frequently has the dual obligation of patient care and trainee education, and may have to care for multiple patients simultaneously. All of these factors may exacerbate stress and confusion regarding team members' roles and goals of care.

Briefing of a team prior to a task can provide a valuable forum for sharing knowledge, reducing confusion about roles and can help create a shared mental model for patient care goals. Standard pre-operative briefing (the "time-out") is a requirement of The Joint Commission and has been shown to reduce errors. (3) The value of crew resource management techniques, including briefing, for trauma resuscitation has been described. (4· 5) Despite these findings, many trauma centers have no structured briefing requirement for the trauma resuscitation team prior to patient arrival, and there are no guidelines for this in the Advanced Trauma Life Support (ATLS) curriculum. (6)

We hypothesized that trauma team members may differ in their medical and psychosocial assessment of the patient, and may thus have disparate goals and priorities during trauma resuscitation. We proposed that a structured, physician-led briefing may improve trauma team concordance regarding perceived patient morbidity, mortality and priorities of resuscitation. We further hypothesized that this improved concordance would be evident by improved nontechnical skills (teamwork) and task efficiency in simulated trauma resuscitations.

Methods

Subjects

All nurses who participate in emergency department trauma resuscitations at our Level II trauma center were invited to join the study, which was held in conjunction with a trauma nurse refresher course. Participation was voluntary, professional educational leave time was provided by our institution, and informed consent was obtained. In the months prior to the simulation event, nurses received a one hour didactic session covering principles of

teamwork in trauma resuscitation and reviewed team member roles and tasks as defined at our institution. Participants were surveyed regarding their background and training including: years of clinical trauma experience, years on our institution's trauma team, and prior formal team training. Nurses were asked to indicate (on a 5-point Likert-type scale) their agreement with the following statements: (1) Trauma team "briefing," i.e. information communication, discussion and planning before the arrival of the patient, is important for optimal trauma patient care (2) Trauma "briefing" at our hospital is performed well, and is helpful. Participants subsequently completed three hours of simulation-based trauma team training at the University of Hawaii John A. Burns School of Medicine, SimTiki Simulation Center.

Simulations

Four scenarios were developed collaboratively by our trauma / critical care physicians, trauma / critical care nurses and simulation specialists. They were designed to run for ten minutes each. The patient was depicted by either a simulated patient (actor) or high technology human patient simulator (SimMan®, Laerdal Medical, Wappingers Falls, NY). Scenarios were designed to depict trauma cases with complex psychosocial and clinical issues. Three key clinical tasks for each scenario were identified to serve as observable behavioral anchors to evaluate team functioning. (Table 1) Key clinical tasks were selected to represent management elements deemed essential to good team performance, and that were performed early and reliably in scenario beta testing. In addition to a common goal of patient survival (when possible) with limited functional morbidity, we developed a list of 16 trauma team priorities potentially applicable to all the scenarios, using a modified Delphi process (Table 2). Two trauma / critical care physicians (S.S. and B.B., "MDs") reviewed each scenario design and independently predicted (a) 30-day survival and (b) full functional recovery for the patient ("low" <20%, "medium" 20–90%, or "high" >90%). They also ranked what they perceived to be the top three (of 16) immediate care priorities.

Participants were grouped into teams reflecting our actual trauma resuscitation teams, containing 3–4 nurses (subjects) and 2–4 confederates (physicians, including S.S., A.B., G.S, and respiratory therapists). Team composition was based on participant availability. Scenario sequence was first randomized by clinical problem, then each scenario was randomized to be briefed (B) or non-briefed (NB) according to one of two sequences. To account for expected improvement in team performance from the first to last scenario, the sequence of scenarios was structured so that the first and last scenarios were similarly B or NB, i.e. B-NB-NB-B or NB-B-B-NB. When applicable, each team served as their own control group to examine the impact of briefing.

In NB (control) scenarios, nurses had four minutes to independently review information transmitted by pre-hospital medics. This was provided as handwritten data on our standard emergency department physician trauma triage sheet including mechanism, injury, symptoms and treatment (MIST) information. (6) In B scenarios, a structured, physician-led (B.B.) briefing was performed. The format for B included a review of pre-hospital data on the triage sheet as well as verbal review of the TeamSTEPPS® Brief Checklist (Table 3). (7) After B or NB, nurses were asked to independently estimate the expected 30-day survival

and functional recovery for the patient. They then ranked what they perceived to be the top three of 16 designated immediate care priorities. After completing the rank list, nurses were paged to join assembled trauma team confederates, bedside in a simulated trauma bay, to care for a patient who had “just arrived” in the emergency department. Confederates were blinded to team B or NB status. At a standardized pre-determined midpoint of each scenario, clinical action was paused for no more than 3 minutes, and nurses again rated the patient’s expected survival and disability and ranked the top 3 (of 16) immediate care priorities. Scenario participation was then resumed, and completed at a predetermined clinically defined end point or after a total scenario time of 10 minutes. At the conclusion of each scenario, nurses performed an independent self-assessment of nontechnical (teamwork) skills using the T-NOTECHS 5-item rating scale.(8) They then participated in a 30-minute structured, facilitated video debriefing which emphasized nontechnical skills objectives. Clinical points or priorities were not systematically debriefed but were integrated as they supported teamwork debriefing objectives. Teamwork was independently assessed in real-time during the scenarios by two physician confederates (A.B. and G.S.) experienced in using T-NOTECHS. T-NOTECHS ratings were completed by the confederate experts immediately following each scenario, without video review. T-NOTECHS is derived from a non-technical skills (NOTECHS) scale developed for aviation, and is based upon five behavioral domains: Leadership, Cooperation and Resource Management, Communication and Interaction, Assessment and Decision Making, and Situation Awareness/Coping with Stress, each rated on a scale of 1–5, where 5 = flawless demonstration of the skill and 1 = the team did not demonstrate the teamwork behavior. After all training sessions were concluded, videotapes of the scenarios were reviewed by three trauma team confederate physicians (S.S., A.B., G.S.), establishing consensus on time to completion of the three key clinical tasks. Raters were blinded regarding whether the scenario was B or NB.

Analysis

Level of agreement among nurses was determined using Intraclass Correlation Coefficient (ICC). Estimations of patient survival (mortality) and functional recovery (morbidity) were elicited and analyzed as trinary response: “low” <20%, “medium” 20–90%, or “high” >90%. ICC of responses regarding priorities in resuscitation considered both the presence and absolute ranking of each priority.

To compare B versus NB versus MDs resuscitation priorities, we determined the percentage of time each of the 16 priorities were “ranked” (in the top 3) or “not ranked” by nurses in each of the four scenarios. When a significant difference was observed between N and NB groups, the nurses’ rank lists were compared to the MDs rank list to determine which group demonstrated greater concordance with MDs perceptions.

Teamwork scores (T-NOTECHS) and time to completion of key clinical tasks for B versus NB scenarios were compared by t-test. Mixed effects models were also conducted to compare B and NB, controlling for scenario type, group, and repeated values by each subject. Significance was determined at $p<0.05$.

Results

38 trauma nurses participated. This included all ten of our critical care certified (CCRN) “crisis” nurses and approximately 60% of our regular emergency department nurse workforce. 63% were male, 31% were Caucasian, with a median of four years’ experience on our trauma team; 35% had undergone prior formal team training at our institution. 97% “agreed” or “strongly agreed” that briefing is important, but only 46% agreed or strongly agreed that briefing was performed well.

Nurses’ estimated patient morbidity and mortality showed good concordance overall, however there was better agreement for the B scenarios versus the NB scenarios (Table 4). B and NB groups’ estimates differed significantly only in the Ped versus MV scenario. In this scenario, 21% of nurses in NB groups estimated the injury was survivable (>20% chance of 30-day survival) and recoverable to baseline functional status (>20% chance of no-long term disability), versus 4% of B groups and none of MDs ($p<0.05$ for both mortality and morbidity). There was no significant difference in morbidity and mortality estimates between nurses with or without prior formal teamwork training. Similarly, more clinically experienced nurses (>4 years on our trauma team or >7 years total) did not differ significantly from the less experienced.

Nurses’ priority rank lists at the midpoint of each scenario differed from their pre-scenario rankings in only 1 out of 128 points of analysis ($128 = 16 \text{ priority items} \times 4 \text{ scenarios} \times 2 \text{ time points}$). Therefore, those results are reported together. When comparing B versus NB scenarios, nurses exhibited slightly higher concordance among themselves in the B scenarios versus NB scenarios ($\text{ICC} = 0.64$ versus 0.59 , $p = \text{NS}$). Rank lists of B versus NB scenarios differed significantly for ten priorities across the four scenarios (Table 5). For these priorities, B rank lists more closely approximated MDs rank lists 80% of the time. We examined the possible effect of prior teamwork training and/or years of clinical experience on nurses’ rank lists. When analyzed as independent variables, nurses without prior teamwork training and/or less clinical experience more closely agreed with MDs on three priorities in two scenarios. However, when controlling for the effects of briefing, teamwork training and clinical experience, only the effect of briefing remained as a statistically significant variable.

Real time teamwork ratings (T-NOTECHS) by nurses and physician teamwork experts were available for only 32 scenarios, due to data loss on one day (8 scenarios). Although overall T-NOTECHS scores were not significantly different, the B group performed better in the domain of Leadership than the NB groups. This was indicated via independent scores from nurses (3.64 ± 1.04 vs 3.35 ± 0.94 , $p<0.05$) as well as physician teamwork experts (3.70 ± 0.83 vs 3.39 ± 1.01 , $p<0.01$). Mixed effects models revealed comparable results.

Efficiency in performance of clinical tasks was significantly different between B and NB groups in only one (Football) scenario (Table 1). There was a non-significant trend in completion of clinical tasks, better in the B groups, with fewer tasks omitted (8 versus 11).

Discussion

Simulation-based training has been shown to have a positive impact upon trauma teamwork and clinical processes. (9–12) Simulation also holds value as a method to assess team members' cognitive and non-technical skills. (13, 14) Prior work from our institution described role confusion among physicians and nurses in interprofessional trauma teams. (15) This project explored the use of simulation to uncover discordant perceptions of goals and priorities in high-acuity trauma patient resuscitation. Our data indicates that trauma teams in complex cases frequently lack a “shared mental model” as demonstrated by a mediocre level of agreement among nurses regarding priorities (ICC = 0.62 overall).

In surveys of operating room and intensive care unit teams, surgeons have a much more positive perception of teamwork and communication than do their nurse and anesthesiologist colleagues. (16, 17) Similar to those venues, lapses in communication are common during trauma resuscitation and thus a good target for interventions to achieve a common mindset. (18, 19) Communication during resuscitation, such as sharing information and “thinking out loud,” is one way to facilitate a shared mental model. Our scenario scripts included these communication techniques, however team communication during the scenario did not appear to have a major impact upon team concordance. This is evident by the facts that nurses never significantly changed their estimation of patient morbidity and mortality from the pre-scenario to mid-scenario time points, and that rank list priorities changed significantly only 8% of the time. This may illustrate the common pitfall of “premature closure,” and the difficulty in altering the initial presumptive diagnosis of experienced clinicians. (20)

Briefing is another attractive method to attain improved teamwork and a shared mental model. (21) Our data illustrated an improvement in agreement (ICC) in nurses' expectation for patient morbidity and mortality for teams that had a structured physician-led briefing, versus teams who received the information without a briefing. Overall, the effect was statistically significant but perhaps not clinically relevant, as NB groups also demonstrated high concordance (ICC 0.89). However, one particular scenario (Ped vs MV) revealed potentially clinically relevant discord in the NB groups. Almost half of the nurses in the NB groups indicated that the patient had a >20% chance of survival. This is in stark contrast to MDs assessment and published data regarding the low survivability of patients undergoing cardiopulmonary resuscitation for blunt trauma. This discordance could have implications regarding individual team members' goals of care, task performance (i.e. futile care) and psychological stress regarding patient outcome.

Similarly, we demonstrated significant differences between B and NB group members' perceptions of priorities during resuscitations. The B groups better agreed with MDs in a significantly greater number of priorities across all scenarios.

The influence of briefing on teamwork and clinical task completion was not as dramatic as might be expected. Our teams were comprised of experienced clinicians, each team included a critical care “crisis” nurse who acts as the first responder to critical patient incidents in our hospital. It may be difficult to significantly improve upon these teams' high baseline performance level, and may limit the generalizability of our study. When analyzing for the

potential confounding effects of more clinical experience (>4 years on our trauma team or >7 years total) or prior formal teamwork training, we noted no significant influence. Our last broad interprofessional team training program had been conducted more than two years prior, so decay of skills may have contributed to the absence of a demonstrable effect. (22) Additional limitations were posed by our research methodology, which was of circumspect and conservative design in an effort to reduce the influence of confounding factors. For example, the impact of briefing was likely mitigated by the fact that, to reduce bias, the physician briefer was not involved in the resuscitation. In trauma resuscitation, analogous to operating room briefings, it would be expected and optimal for the briefing to be led by the trauma team leader, including all members of the resuscitation team, including physicians, residents, and respiratory therapists. (23) Differences in team function during our simulated resuscitations were also likely impacted by the use of confederates who were required to play scripted, relatively static roles. Evaluation of non-technical (teamwork) skills by T-NOTECHS is designed to examine performance of the team as a whole, rather than individual members. (24) Improved performance among the variable members of the team (the nurses) may not have been of adequate magnitude to overcome static performance of the constant members (confederates). Thus, we did not demonstrate a significant improvement in overall task completion, despite faster performance in one scenario and a trend toward better task completion in the B groups. Similarly, T-NOTECHS scores improved significantly only in the domain of Leadership. This may reflect the improved concordance between nurses and physicians in the B groups, illustrating the concept of “followership” as an important component of effective Leadership. (25)

The quality and effort devoted to the briefing may be impacted by many factors, including a paucity of available time. Trauma centers, like ours, that receive patients from a large catchment area with a robust pre-hospital communication network would be best able to incorporate a structured briefing paradigm. Briefing would also be feasible for interfacility transfer of critically injured patients. Centers may need to adopt protocols for earlier activation of trauma teams to accommodate briefing. Urban trauma centers with very short transport times or frequent unanticipated arrivals would have more difficulty incorporating a structured briefing process.

Incorporating a structured briefing may require physician education on how to conduct a timely and effective briefing. Experience with the pre-operative “time out” would suggest that this process is feasible, particularly when facilitated by a checklist. (26) For our study, the TeamSTEPPS checklist was chosen due to its familiarity, but a trauma-specific checklist may have a greater impact. Refinement of a trauma-specific checklist may allow adequate briefing in a shorter time frame.

The results of this study should serve to heighten awareness of interprofessional trauma team discord. We believe ATLS and trauma team training programs should focus more attention toward ensuring a “shared mental model” of team roles, patient priorities, and situational awareness early in resuscitation, if possible, prior to arrival of the patient in the emergency department. Refinement and implementation of a physician-led, trauma-specific briefing checklist may be one way to facilitate this. We propose a structured, 4-minute briefing be considered for inclusion in future team training programs. Our experience in the

simulated setting should inform the design of additional research needed to evaluate the optimal method and clinical impact of briefing.

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Authorship

All authors were involved in drafting and critical revision of the manuscript. Additional roles as follows:

Design: SS, GS, EL, BB

Data acquisition: SS, GS, AB, AW, NH, GK, BB

Analysis and interpretation of data: SS, AW, NH, GK, EL, BB

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TABLE 1
Comparison of Briefed versus Non-briefed groups in time to completion of key clinical tasks in each scenario

SCENARIO NAME	CONTENT	KEY CLINICAL TASKS	BRIEFED	NOT BRIEFED	p
			Mean time (secs) ± SD		
Ped vs MV	Pregnant female pedestrian (SimMan) struck by an auto, cardiopulmonary resuscitation (CPR) at scene	1. Member of trauma team takes over chest compressions from resident	34.8 ± 10.0	66.8 ± 36.6	0.14
		2. Call out “no pulse”	107.8 ± 53.7	144.5 ± 36.1	0.44
		3. Call out “non-perfusing / agonal / no” rhythm on monitor	148.8 ± 21.2	176.7 ± 33.6	0.19
Driver MVC	Local celebrity (Actor) driver in multiple motor vehicle collision (MVC) with death at scene, belligerent with odor of alcohol, facial trauma	1. Call out blood pressure (BP) 116/70	125.5 ± 17.7	81.7 ± 27.6	0.09
		2. Call to clear non-essential personnel from the room	178.5 ± 55.3	151.2 ± 38.0	0.48
		3. Nurse request for sedation prior to CT	178.7 ± 69.5	158.4 ± 105.6	0.78
Burn	Elderly male (SimMan) with extensive burns and smoke inhalation	1. Call out BP 100/60	111.8 ± 29.2	224 ± NA	NA
		2. Call out oxygen saturation 92%	142.0 ± 55.2	201.0 ± 43.8	0.24
		3. Nurse request for analgesia	161.5 ± 19.1	146.0 ± 22.1	0.40
Football	15 year old (SimMan) in hemorrhagic shock, parents refuse blood transfusion	1. Call out BP 84/50	96.3 ± 39.7	109.7 ± 32.4	0.57
		2. Second intravenous (i.v.) line started	64.3 ± 24.7	118.2 ± 37.6	0.04
		3. Call for Trauma Blood	68.7 ± 15.5	138.0 ± 30.0	0.02

TABLE 2

List of options for priorities in each resuscitation scenario

In addition to reducing risk of death and disability, what are the top THREE priorities in this resuscitation?	
Analgesia	
Reduce patient's psychological stress	
Patient confidentiality	
Provide support to family members	
Vulnerable patient protection / forensics	
Determine advance directives	
Safety of healthcare providers	
Cost containment	
Triage and resource allocation	
Documentation	
Medicolegal liability	
Avoid cosmetic morbidity	
Limit radiation exposure	
Limit blood transfusion	
Resident / Nurse education and training	
Organ preservation (for donation)	

TABLE 3**TeamSTEPPS® Brief Checklist ***

During the brief, the team should address the following questions:
Who is on the team?
All members understand and agree upon goals?
Roles and responsibilities are understood?
What is our plan of care?
Staff and provider's availability throughout the shift?
Workload among team members?
Availability of resources?

* The TeamSTEPPS® Brief Checklist⁷ is reprinted with permission of the Agency for Healthcare Research and Policy.

TABLE 4

Level of agreement of nurses in Briefed versus Non-briefed scenarios on expected patient morbidity and mortality

Estimation of	Intraclass Correlation Coefficient (95% CI)	
	Briefed	Not Briefed
Mortality (<30 days)	0.95 (0.93–0.96)	0.91 [*] (0.88–0.93)
Morbidity (long-term functional disability)	0.93 (0.91–0.95)	0.89 [*] (0.85–0.91)

^{*}
p < 0.01 vs Briefed groups

TABLE 5

Differences in rank list of priorities between Briefed (B) and Non-briefed (NB) scenarios. Shaded areas indicate closer agreement with physician-ranked priorities

Scenario Priority	MDs ranked	B	NB	p for B vs NB
		% of time ranked		
Ped vs MV				
Determine advance directives	No	19	40	.05
Driver MVC				
Triage and resource allocation	Yes	43	17	.01
Burn				
Triage and resource allocation	No	9	32	.01
Avoid cosmetic morbidity	No	4	23	.01
Organ preservation (for donation)	No	24	0	.02
Determine advance directives	Yes	81	36	<.001
Vulnerable patient protection	No	0	14	.01
Football				
Limit blood transfusion	Yes	25	64	<.001
Provide support to family members	Yes	56	30	.03
Medicolegal liability	Yes	50	16	.001