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Mudança de Paradigma: Trabalho de Equipa para além de Excelência Individual

A Paradigm Change: Choosing Teamwork over Individual Excellence

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A Paradigm Change: choosing teamwork over individual excellence
Mudança de Paradigma: trabalho de equipa, para além de excelência individual

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NTS – Non-technical skills

TPOT – Trauma Team Performance Observation Tool

T-TAQ – Team STEPPS Teamwork Attitudes Questionnaire

TEC – Trauma, Emergency, and Catastrophe Elective

FMUC – Faculty of Medicine of the University of Coimbra

TL – Team Leader

A – “Airway” Doctor

B – “Breathing” Doctor

C – “Circulation” Doctor

BT – Before training

ET – End of the semester

LT – Late training

AT - MIST handover – Age, Time, Mechanism of injury, Injuries, Signs, Treatment

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Resumo

Introdução e objetivos

Nos últimos anos, a simulação como meio de ensino tem ganho destaque em Medicina. Contudo, o ensino médico tem privilegiado a aquisição de conhecimentos e competências individuais, desvalorizando o desenvolvimento de competências para trabalho em equipa. Sendo a maioria dos erros cometidos em Medicina devido ao fator humano, ou seja, às competências não técnicas, pretendemos estudar o impacto que o treino em ambiente de simulação dessas competências tem no trabalho de equipa, em contexto pré-graduado. Concretamente, pretendeu-se avaliar se alunos de Medicina conseguem adquirir e reter competências de trabalho de equipa na avaliação e reanimação inicial em ambiente simulado de vítimas de trauma grave.

Metodologia

População de estudo composta por 23 participantes, alunos pré-graduados do 5º ano de Medicina, divididos em equipas de quatro elementos. Foram simulados e registados em vídeo vinte momentos de trabalho de equipa de avaliação e reanimação inicial de doentes traumatizados graves, em vários momentos de aprendizagem (antes de treino prático, no final do semestre e 6 meses após o último treino prático). Foi realizada uma avaliação, duplamente cega, por dois observadores independentes, aplicando-se a *Trauma Team Performance Observation Tool* (TPOT).

Adicionalmente, aplicou-se o questionário Team STEPPS (*Teamwork Attitudes Questionnaire* - T-TAQ), que permite avaliar as atitudes individuais relativamente às competências não técnicas, e perceber se o treino dessas competências resultou numa mudança de atitudes.

Resultados

As vinte gravações foram avaliadas por dois observadores independentes, com um nível de concordância moderado entre as suas avaliações (Kappa = 0.52, $p < 0.001$).

Foi verificada uma melhoria estatisticamente significativa na abordagem geral da equipa, comprovada pelos scores do TPOT ($p < 0.005$). Nos T-TAQ obtivemos melhoria estatisticamente significativa no grupo de competências não técnicas “Mutual Support” ($p < 0.05$).

Conclusões

Neste estudo provou-se que incorporar a educação e treino de competências não técnicas no ensino pré-graduado médico levou a uma melhoria mantida da performance da equipa, na abordagem ao doente de trauma. Deve ser dada consideração à

introdução do treino de competências não técnicas e do trabalho de equipa no contexto de emergência nos planos curriculares pré-graduados.

Palavras-chave: Competências Não Técnicas; Simulação Biomédica; Ensino pré-graduado; Trauma; Trabalho de Equipa

Abstract

Introduction

In recent years, simulation as an educational method has gained increasing importance in Medicine. However, medical education has privileged the acquisition of individual knowledge and skills, devaluing the development of teamwork skills. Since most of the errors in clinical practice are due to the human factor, i.e., non-technical skills, we intend to study the impact that training in a simulation environment has on teamwork in a pre-graduation setting. Specifically, we aimed to assess whether medical students could acquire and retain teamwork skills in resuscitation in a simulated environment of severe trauma patients.

Methods

The study population was composed of 23 participants, all 5th-year medical undergraduate students, who were divided into teams of four elements. Twenty simulated scenarios of teamwork in the initial assessment and resuscitation of critically ill trauma patients were recorded. The recordings were made at various learning moments (before training, at the end of the semester, and 6 months after the last training), and a double-blind evaluation was performed by two independent observers, applying the Trauma Team Performance Observation Tool (TPOT).

In addition, the Team STEPPS Teamwork Attitudes Questionnaire (T-TAQ) was applied to the study population to assess individual attitudes towards non-technical skills, and to understand whether training these skills resulted in a change in attitudes.

Results

The twenty recordings were evaluated by observers, who obtained a moderate level of agreement between their evaluations (Kappa = 0.52, $p < 0.001$).

There was a statistically significant improvement in the team's overall approach, evidenced by the TPOT scores ($p < 0.005$). In the T-TAQ statistically significant improvement was present in a group of non-technical skills, "Mutual Support" ($p < 0.05$).

Conclusion

In this study, it was proven that incorporating non-technical skills education and training in undergraduate medical education led to a sustained improvement in team performance in the approach to the trauma patient. Consideration should be given to introducing non-technical skills training and teamwork in the emergency setting into undergraduate curricula.

Keywords

Non-Technical Skills; Biomedical Simulation; Pre-graduate education; Trauma; Teamwork

Introduction

The approach to polytrauma patients is a challenge for all professionals (doctors, nurses, and allied health professionals). Trauma patients often present in extreme situations, under intense time pressure and great uncertainty about the patient's condition and injuries. In addition, team members will be from various healthcare professional groups and specialties, with different levels of training and who often do not work together on a day-to-day basis. The success of this team is based on the interdependence of the members, each with their role in treating the patient.

All these constraints can culminate in what is referred to as a "perfect storm of errors and poor outcomes". [1] If we analyze in detail the causes of poor outcomes, we will find that most adverse events (up to 70%) in medicine were due to human factor errors, that is, failures related to non-technical skills. [2] As expected, adverse events are more likely to happen at times of increased pressure and time-sensitive emergencies, such as in the trauma setting.

Clarke *et al* argue that errors at the time of polytrauma care can occur in up to 100% of all trauma resuscitations. [3] Digressing on the nature of these errors, Hicks concluded that they ranged from difficulties in decision making, obtaining information, loss of situational awareness, and, above all, poor communication, and leadership. [4]

Non-technical skills are defined as social, cognitive, and individual skills that interfere with technical skills and the execution of tasks and procedures. [5] Multiple studies have shown that non-technical skills training can improve patient care, patient safety, operating room efficiency, and patient outcome. [6,7]

Currently, team training in postgraduate education is widespread in most developed countries, including Portugal, to improve health care and professionals' skills. [8–11] Simulation as an adjunctive learning method has gained prominence in medicine, as well as in other professions. [12,13] This method allows skills to be practiced in a protected and deliberate way, allowing for repetition and reflection, providing standardized experiences for all participants, and obviating some inherent flaws in traditional medical education. [14]

During simulation, participants can explore their decision-making, problem-solving, clinical reasoning, and communication skills during simulated scenarios. They are also given the option to discuss their actions with colleagues afterward in a debriefing session, which allows them to reflect upon their performance as well as improve upon it (for example, decisions made leading up to the situation). [15]

Undergraduate medical education curricula have emphasized the acquisition of individual knowledge and skills, often in a competitive spirit. The clinical reality, however,

is not like this, and the patient benefits when physicians work collaboratively. [16] Still, the reality of undergraduate medical education has failed to promote teamwork skills. [17] The impact of such training using simulation on medical students, particularly in the trauma and emergency context, is still largely unknown.

Thus, this study aims to assess if medical students can apprehend and retain teamwork skills in managing simulated trauma patients. Specifically, we aimed to study if there were statistically significant differences in the assessments made before and after the training in non-technical skills and if those skills were embedded at 6 months after the last training session.

Methods

This observational and descriptive double-blind study is based on the elective "Trauma, Emergency and Catastrophe" (Coordinator: Professor Henrique Alexandrino) at the Faculty of Medicine of the University of Coimbra (FMUC) in its inaugural academic year 2020/2021.

The study population consisted of 23 5th-year medical students (11 from the first semester, and 12 from the second) who gave their informed consent for this study, and who had no previous training in simulation environments or trauma situations. The study was approved by the institutional review board (Comissão de Ética da FMUC, CE-095/2021) and all participants gave their informed consent in writing.

During the elective, participants shared common lectures and case discussions, presented by faculty with experience both in the clinical management of trauma patients and teaching experience in postgraduate simulation courses, namely Advanced Trauma Life Support, European Trauma Course, and Definitive Surgical and Anesthetic Trauma Care Courses.

The 23 candidates were randomly divided into teams of four. In each team, one candidate was the Team Leader (TL), one the "Airway" doctor (A), one the "Breathing" doctor (B), and one the "Circulation" doctor (C). The scenarios were prepared by the faculty and consisted of a simulated trauma patient with one life-threatening injury. After a pre-hospital report in a standardized approach, using the AT-MIST handover (Age, Time, Mechanism of injury, Injuries, Signs, Treatment), the TL would brief the team, allocate roles, and mobilize resources. The simulated patient would then be brought into the simulated emergency room and the horizontal assessment and resuscitation would start. Communication, decision-making, and teamwork would be required by all team members, with the TL also displaying leadership skills. The scenario would end when the life-threatening condition was managed and there was a decision for patient transfer,

either for imaging or for damage control surgery. After each simulation, there was a structured debriefing, facilitated by the most experienced instructor.

The first scenario was performed after lectures on trauma management, non-technical skills, and team training, several hands-on skills sessions on technical skills, and an initial assessment and management demonstration of the team approach to a trauma patient led by an instructor.

Recordings of clinical case simulations were made at various learning moments, for a total of 20 videos, allowing for an observational study with descriptive analysis based on the double-blind assessment of two independent observers, using the Trauma Team Performance Observation Tool (TPOT) scoring system, designed to assess a team's performance. [18] The TPOT scores from the three different learning moments were obtained and compared at three time points: before practical training (BT) – eight videos -; end of semester training (ET) – nine videos - and six months after the last training simulation, which will correspond to the late training (LT) – three videos. In this way, we aimed to evaluate not only the evolution but also the retention of skills.

The two observers, Dr. Maria João Koch and Dr. Filipa Madeira, surgeon and anesthesiologist, respectively, are two clinicians with vast experience in trauma management and are trained European Trauma Course instructors. They are also unaffiliated with FMUC and did not know the participants. They independently reviewed the videos in random order, without comparing notes with each other, and thus were blinded to the time-point status, BT, ET, or LT of the participants. Based on the consensus of the study authors, questions 14 from Situation Monitoring ("Applies the STEP process when monitoring the situation") and 19 from Mutual Support ("Uses the two-challenge rule, CUS, and DESC script to resolve conflict") were excluded from the TPOT tool (Appendices 1), as they did not apply to our predesigned simulated scenario. Each item is rated using a five-point Likert scale, ranging from 1 (very poor) up to 5 (excellent).

In addition, the Team STEPPS Teamwork Attitudes Questionnaire (T-TAQ) (Appendices 2), developed by the US Agency for Healthcare Research and Quality, was applied to assess individual attitudes toward non-technical skills and to understand whether training in these skills results in a change in attitudes. [19]

The questionnaire consists of 30 questions, regarding 5 different non-technical skills, which are rated using a five-point Likert scale ranging from 1 (strongly disagree) up to 5 (strongly agree). The T-TAQ was completed at the beginning of the optional subject, before any theoretical or practical teaching, and at the end of the semester, allowing the comparison of the results.

The IBM Statistical Package for the Social Sciences (SPSS®) version 27 was used for statistical analysis, with a significance level of 0.05 set. The normality of the distributions was analyzed using the Kolmogorov-Smirnov test.

For each question in the TPOT and T-TAQ scoring systems, we compared the different stages of scores using non-parametric tests. We also compared the overall scores. Two TPOT questions were excluded because they were not applicable, leaving 23 questions on a five-point scale, meaning that the TPOT scores could range from 23 to 115. We assessed agreement between reviewers using Cohen's kappa for each test. The values considered were ≥0.61 to indicate a substantial level of agreement, 0.41-0.60 to indicate moderate agreement, 0.21 - 0.40 to indicate fair agreement, 0-0.20 to indicate slight agreement, and <0 to indicate no agreement. P-values <0.05 were considered to indicate statistical significance. The comparison of skill evolution and retention was performed by applying Friedman's Test, which allowed us to compare the three evaluation moments. The Wilcoxon test was used for analysis and comparison of the results obtained in the T-TAQ questionnaires.

Results

The twenty recorded simulated team resuscitations were assessed with moderate agreement observed in the TPOT Score ratings between independent observers (Kappa= 0.52, $p < 0.001$).

Analyzing and comparing the videos at the three different assessment times, the TPOT results were very good. The students, after only the lectures and demonstrations on non-technical skills, without any previous training, obtained high values in the first training, with a median of 4.25, on a scale of 1 to 5. Moreover, they also improved in a statistically significant way and, more importantly, maintained this improvement, increasing and maintaining a median of 4.5 ($p < 0.005$).

Using descriptive analysis, we can get a more intuitive sense of the results (Fig 1).

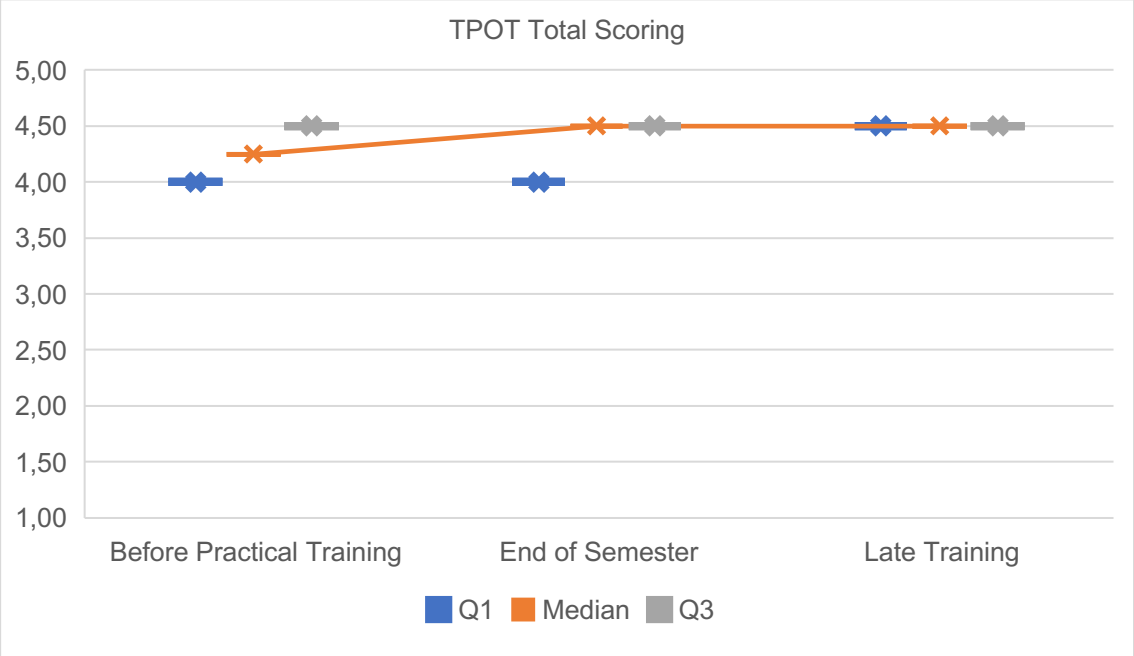

Fig 1. Evaluation and evolution of team performance through median and interquartile ranges, using the Trauma Team Performance Observation Tool scale, in the three different moments of evaluation ($p < 0.005$).

Analyzing the final scores of each skill group assessed in the TPOT score, as well as question by question, and comparing between the different simulation moments, no statistically significant differences were found in each individual non-technical skill.

Regarding T-TAQ analysis, all candidates completed the questionnaires (100% response rate).

When studying the total responses for each skill group, we found statistically significant differences in one group of non-technical skills (Mutual Support) between the pre- and post-education questionnaire ($p < 0.05$) (Table I, Fig 2).

Table I. Team STEPPS Teamwork Attitudes Questionnaire groups of non-technical skills results, presented as medians and interquartile ranges in parentheses.

	Pre-education	Post-education	P-value
Team Structure	5 (4.5, 5)	5 (4.5, 5)	> 0.05
Leadership	5 (4, 5)	5 (5, 5)	> 0.05
Situation Monitoring	5 (4, 5)	5 (5, 5)	> 0.05
Mutual Support	**2.5 (2.5, 3)**	**3 (3, 4)**	**< 0.05**
Communication	5 (4, 5)	4.5 (4, 5)	> 0.05

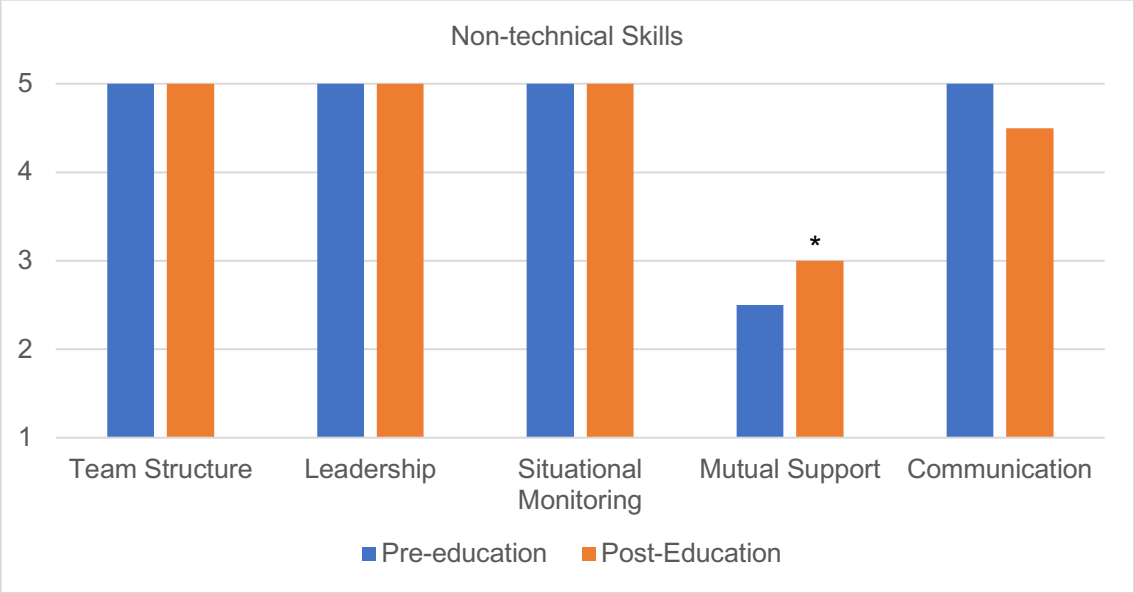

Fig 2. Self-assessment of the participants NTS (N = 23 participants), before and after the TEC elective, using the Team STEPPS Teamwork Attitudes Questionnaire.

* - p <0.05

Discussion

From the first moment, medical students are expected to work and study hard, with the aim of achieving individual excellence. Although this is obviously mandatory in a profession such as Medicine, this individualistic approach underestimates the role of teamwork and mutual collaboration. Furthermore, this system creates a distancing and isolation of the students, who will prioritize the acquisition of individual technical skills and theoretical knowledge, while belittling the importance of developing NTS, such as communication skills, which are mandatory when these future doctors later integrate clinical teams. For this reason, the training of non-technical skills in undergraduate education and its incorporation into the medical education curriculum is paramount, as it will allow the change from a competitive environment to a collaborative one. [20,21] It is particularly in cases of trauma and emergency, where most medical errors are due to poor communication, that we realize that individual excellence at the technical and scientific level may not be enough for one to be a good team member or team leader.

Our study proved that teaching non-technical skills can improve medical students' team performance in different scenarios. This is highly relevant, since about 1450 medical students start their training every year in Portugal. [22] In our study, despite the teams' initial results being very good, when we assessed the evolution of the teams' performance in the three different moments of evaluation, we found not only the acquisition of NTS and subsequent improvement in the team's overall performance, but

also the retention of those same skills, 6 months after the last training in the simulated scenario.

It can be argued that the students' initial results were very good, probably because the first teamwork assessment was made after exposure to a lecture and a demonstration of non-technical skills. A better demonstration of the acquisition of teamwork skills by the students would be performed by exposing them to the scenarios without this previous preparation. However, in the authors' opinion, this would be unethical since the results would be very likely poor and could induce feelings of frustration and demotivation. Also, the use of a control population of students unexposed to these initial lectures and demonstrations, could also be considered unjustifiable.

We were also able to demonstrate that the training of these skills, with the respective debriefing, led to a constant improvement of skills. The simulation-based training allowed for the development of these skills in a safe environment and allowed for repetition, to consolidate the NTS. [23,24] Furthermore, after 6 months, the students were invited to run a new simulated scenario and the results proved the retention of the previously acquired NTS. We must, of course, consider that students may have developed an awareness of the importance of teamwork in trauma management over the course of the semester and continued their studies after the end of the elective. However, this alone may not justify the excellent teamwork that was observed after a 6-month break.

Regarding the results obtained after evaluating the T-TAQ questionnaires at the two different times, we obtained a statistically significant difference in one skill group, the "Mutual Support". Although the T-TAQ is a questionnaire filled out by the participants, and therefore a subjective study method, its main purpose is to see if there have been changes in behavior between two different points in time. With this result, we conclude that students significantly changed their non-technical skills of mutual support, eventually privileging teamwork.

This study has several limitations. First, considering that it was the first year of this TEC elective, the study population is small, both in the number of participants in the case of the questionnaires, and in the number of videos in the case of the evaluation of the simulations. Secondly, this study occurred in a simulated setting. Further work is required to validate these findings in a clinical context. Moreover, obtaining data via filming the simulations may have had an effect at a psychological level on the participants, thus creating a bias. It should also be noted that the TPOT was used as the scale for evaluating team performance, but there are many other scoring systems available. Finally, the T-TAQ is a self-completed questionnaire, making the results subjective. In addition, it is not known how consistent this self-reported change in behavior is, particularly when the participants start their clinical practice. Furthermore, although the

T-TAQ has been used in several studies and its reliability has been verified, it has not been approved specifically for the Portuguese population.
Nonetheless, we believe that team training and the development of NTS can be easily achieved with simulation training in the undergraduate setting, as it leads to a durable change in behavior, as shown in this study. We highlight that this behavior change is not acquired just by training these NTS on a one-time basis, but by continuously training and perfecting them.

Conclusion

In conclusion, NTS training improves team performance in undergraduate education. Thus, it is paramount that medical schools recognize its importance, to change the students' mindset from a competitive to a collaborative one. This new approach would change the paradigm from a team of excellent individuals to an excellent team, allowing the reduction of human errors and improving performance, ultimately resulting in better patient outcomes, particularly in the trauma and emergency settings.

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Appendices 1: Team Performance Observational Tool (TPOT) scoring system adapted according to the TEC objectives. Rating Scale used: 1 – Very Poor; 2 – Poor; 3 – Acceptable; 4 – Good; 5 – Excellent.

1. Team Structure	Rating
Assembles a team	
Establishes a leader	
Identifies team goals and vision	
Assings roles and responsabilities	
Holds team members accountable	
Actively shares information among team members	
Comments: Overall Rating – Team Structure	
2. Leadership	Rating
Utilizes resources efficently to maximize team performance	
Balances workload within the team	
Delegates tasks or assignments, as appropriate	
Conducts briefs, huddles, and debriefs	
Empowers team members to speak freely and ask questions	
Comments: Overall Rating - Leadership	
3. Situation Monitoring	Rating
Includes patient/family in communication	
Cross monitors fellow team members	
Fosters communication to ensure team members have a shared mental model	
Comments: Overall Rating – Situation Monitoring	
4. Mutual Support	Rating
Provides task-related support	
Provides timely and constructive feedback to team members	
Effectively advocates for the patient	
Collaborates with team members	
Comments: Overall Rating – Mutual Support	
5. Communication	Rating
Coaching feedback routinely provided to team members, when appropriate	
Provides brief, clear, specific and timely information to team members	
Seeks information from all available sources	
Verifies information that is communicated	
Uses SBAR, call-outs, check-backs and handoff techniques to communicate effectively with team members	
Overall Rating - Communication	
TEAM PERFORMANCE RATING	

Appendices 2: Team STEPPS Teamwork Attitudes Questionnaire (T-TAQ).

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Team Structure						
1.	It is important to ask patients and their families for feedback regarding patient care.					
2.	Patients are a critical component of the care team.					
3.	This facility's administration influences the success of direct care teams.					
4.	A team's mission is of greater value than the goals of individual team members.					
5.	Effective team members can anticipate the needs of other team members.					
6.	High performing teams in health care share common characteristics with high performing teams in other industries.					
Leadership						
7.	It is important for leaders to share information with team members.					
8.	Leaders should create informal opportunities for team members to share information.					
9.	Effective leaders view honest mistakes as meaningful learning opportunities.					
10.	It is a leader's responsibility to model appropriate team behavior.					
11.	It is important for leaders to take time to discuss with their team members plans for each patient.					
12.	Team leaders should ensure that team members help each other out when necessary.					

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Situation Monitoring						
13.	Individuals can be taught how to scan the environment for important situational cues.					
14.	Monitoring patients provides an important contribution to effective team performance.					
15.	Even individuals who are not part of the direct care team should be encouraged to scan for and report changes in patient status.					
16.	It is important to monitor the emotional and physical status of other team members.					
17.	It is appropriate for one team member to offer assistance to another who may be too tired or stressed to perform a task.					
18.	Team members who monitor their emotional and physical status on the job are more effective.					
Mutual Support						
19.	To be effective, team members should understand the work of their fellow team members.					
20.	Asking for assistance from a team member is a sign that an individual does not know how to do his/her job effectively.					
21.	Providing assistance to team members is a sign that an individual does not have enough work to do.					
22.	Offering to help a fellow team member with his/her individual work tasks is an effective tool for improving team performance.					
23.	It is appropriate to continue to assert a patient safety concern until you are certain that it has been heard.					
24.	Personal conflicts between team members do not affect patient safety.					

Communication						
25.	Teams that do not communicate effectively significantly increase their risk of committing errors.					
26.	Poor communication is the most common cause of reported errors.					
27.	Adverse events may be reduced by maintaining an information exchange with patients and their families.					
28.	I prefer to work with team members who ask questions about information I provide.					
29.	It is important to have a standardized method for sharing information when handing off patients.					
30.	It is nearly impossible to train individuals how to be better communicators.					