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# NON-TECHNICAL SKILLS FOR NURSE-ANESTHETISTS: LEARNING AND EVALUATION.

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## ABSTRACT

Over the past decade there has been a rapid increase in scientific interest regarding patient safety, particularly in incidents that could have been avoided (adverse events). Studies have shown that in addition to the high level of education and specialization, the non-technical skills of an intraprofessional team play an important role in patient safety. By non-technical skills we mean cognitive and interpersonal traits favoring effective teamwork, such as communication, leadership, situational awareness, decision-making and role-sharing skills. The purpose of this review is to investigate the non-technical skills of a nurse-anesthetist and the factors contributing to their development. Anesthesiology departments are high-risk departments and are required to be staffed by nurse-anesthetists with specialized knowledge and non-technical skills in order to ensure the patient's safety and a better surgical outcome. Teaching non-technical skills to nurse-anesthetists is performed through various methods, such as simulation, role play, video projections and case studies. Of course, apart from the basic education, continuous training and assessment with predefined criteria are required, using special tools such as the ANTS-AP.

**KEYWORDS:** Anesthetist nurse, intraprofessional team, non-technical skills, patient safety, teamwork.

## INTRODUCTION

The development of technology, knowledge and research over the last decade has brought enormous impetus to health sciences, particularly in the medical field. A similar development was observed in nursing science and research.[1] Undoubtedly, nursing science is going through its most enlightened period.

The model of the medical-centric approach has fallen. Today the treatment is based on the holistic model, in which all health professionals participate equally in decision-making for the best possible treatment of the patient, giving each one ther scientific perspective towards the disease.[2] Today, the nurses are equal members of the interdisciplinary team, they have an active role in therapeutic care, documented scientific opinion and high technical skills.

Every health professional has adopted a different culture from his education that includes values, beliefs, attitudes, customs, and social class and gender issues as shaped by the historical evolution of their profession.[3] While medical and nursing education is taught in a different educational context, so when they are called as health professionals to work as an interdisciplinary team, they face difficulties in the areas of communication, collaboration, leadership, awareness and decision making, due to the difficulties associated with the human factor.[4] Thus, a new area in the training of health professionals began to develop, the "non-technical skills", in order to overcome the obstacles that arise from the professional culture and human factor.[5]

Non-technical skills are cognitive and interpersonal skills that assist in effective teamwork and include the skills of communication, leadership, teamwork, status awareness, decision-making, and role-sharing skills. The non-technical skills are related to the human factor and modulate the interaction of the members of a team in the day-to-day clinical practice.[6]

Health workers need to have non-technical skills (NTS) to provide safe, effective and patient-centered care.[7] In recent years, there has been an increase in the interest of doctors and nurses, particularly those working in high-risk departments such as surgery (Anesthesiology and Operation Room), Intensive Care Unit (ICU) and Emergency (ER) Department; for training or developing their non-technical skills.[7,8]

Based on the records of anesthesiological events and on-site surgeries, it has been shown that most of the errors

are related to the inadequate development of non-technical skills,[9] and 40% of these incidents could be avoided with appropriate training.[10]

Given that the anesthesiology departments are the world's most high-risk departments, they are required to be staffed by high-level nurses with specialized knowledge in anesthesia.[11] It is imperative to highlight the learning of non-technical skills to nurse-anesthetists; for the safety of the surgical patient and the best outcome of the patient in the critical phase of cardiopulmonary resuscitation (in a number of Greek public hospitals performed by anesthesiology group) or in an emergency.[12]

In an attempt to highlight the problems of communication and collaboration among the members of an interdisciplinary team as a cause of safety and patient outcomes, some scholars have been inspired by accidents in aviation.[13]

There seemed to be a strong correlation between the crew of an aircraft with the interdisciplinary health team because:

- Their members are not stable.
- In a critical event they must work together properly and act immediately.
- They must observe at the same time the indications of electronic devices.

So they adopted the non-technical skills assessment tool that can predict pilot behavior during critical events and apply it to doctors. It is a non-technical skills assessment tool based on predetermined criteria with corresponding desirable and undesirable examples, and has four non-technical skills classes with fifteen individual behavioral indices.[14] {table 1}.

**Table 1: Characteristics of non-technical skills NOTECHS.**

| Individual characteristics | Skills |
|---|---|
| Cooperation | Teamwork<br>Respect the opinion of team members<br>Support for other members<br>Conflict resolution |
| Leadership | Proper use of power and self-confidence<br>Provide and maintain standards<br>Planning and coordination of tasks<br>Managing the workload |
| Situation awareness | Collecting the information<br>Understanding _ Editing<br>Prevision_ Prevention |
| Decision making | Defining the problem<br>Examination _Assessment options<br>Choosing the best solution<br>Evaluation |

Oxford NOTECHS System, 2012

For the same reasons, CRM techniques also apply to medicine.[8,15]

Over the years, new tools have been developed based on the NOTECHS specially for the surgeons (NOTSS).[16] the anesthesiologists (ANTS).[17] The nurse- anesthetists (ANTS-AP).[18] and the operating room nurses (SPLINTS).[19] Anesthesiology is one of the first medical specialties that started to study the causes of human errors in order to analyze them and make the necessary changes to prevent them and improve the safety and outcome of the patient.[5]

This review focuses on the non-technical skills of nurse-anesthetists as they should be included in specialized nursing training.

**Non Technical Skills**

- **Communication**

The ability to communicate properly is undoubtedly the most important skill and is essential in the nursing profession. Proper communication is an integral part of the skills that each health professional should have, and for this reason it is assumed that it exists in every professional and is not mentioned separately in the individual skills of non-technical skills.[8] The basic principles of communication are taught to undergraduates in Nursing, developed with clinical experience and perfected with the personal cultivation of each one. Communication between individuals is a perpetual and dynamic process that takes place on two levels: the relationship between the interlocutors and the content of the messages they exchange.[20] It is very important to recognize and deal with barriers and constraints in communication, for the benefit of the patient first and foremost as well as the smooth cooperation of the team. A program that will teach team collaboration and communication skills is a strategy that can improve communication between members of the multidisciplinary team.[21]

- **Awareness**

The nurse- anesthetist should be in constant alert in the operating environment. They should observe and understand the interactions between the group members and the patient's reactions. It is necessary to be able to process the information received, to recognize the needs that are born and to act in a timely and effective manner by anticipating the requirements of the present time and what follows.[18]

- **Understanding the situation**

It is important the nurse anesthetist to collect information about the condition of the patient, the associates, the technological equipment and consumables of Anesthesia, the procedures of the administration, and to evaluate all these elements in order to anticipate the situations and planning the next step.[18] {table 2}.

**Table 2: Nurse- anesthetist behavioral indicators to alert the operating room environment.**

| Positive Indicators | Negative Indicators |
|---|---|
| Remains with the patient throughout the surgery.<br>Increases the level of observation during periods of risk, such as surgery incision or bleeding or hemodynamic instability. | Does not collect information from their colleagues.<br>Leaves the patient unattended.<br>Not being able to observe the operating environment. |
| Chooses to sit in such a position in the operating room to be able to observe and hear the patient, monitors, ventilator, surgery and their colleagues. | Choose a wrong position with reduced possibility of patient observation and hearing, anesthesia equipment and his colleagues. |
| Ensures proper patient monitoring by hemodynamics and respiratory. | Goes for a break or for supplying material in times of increased risk.<br>Fails to evaluate the critical time. |
| Collects information from the Anesthesiologist for laryngoscopy and prepares for a possible difficult intubation. | Shows a lack of interest.<br>Fails to prepare properly. |
| Monitoring the patient without being distracted from other tasks or non-surgical conversations that are in progress. | Distracted by events not related to this surgery. |
| Collects information from multiple sources, such as monitor, ventilator, patient's diagram, checklists etc. | Fails to evaluate and interpret correctly the clinical signs and symptoms of the patient, to avoid critical events. |

ANTS- AP System, University of Aberdeen, NHS Education for Scotland, 2015.

**• Identifying needs and understanding the information**

The nurse-anesthetist should be able to evaluate and interpret the information they collect with the observation to detect any deviations from the normal and expected. When the nurse-anesthetist does not have the required skills, they may cause the violation of patient safety barriers during critical events.[22] {table3}.

**Table 3: Indicators of behavior of nurse-anesthetists on recognition and understanding.**

| Positive Indicators | Negative Indicators |
|---|---|
| Cross-check unexpected events that trigger the alarm monitor, such as arrhythmia, oximetry waveform, BP. | Putting in silence alarms without cross checking and investigating the cause. |
| Recognizes and interprets the changes in the behavior of team members.<br>Stands by all members. | Fails to evaluate the psychological state of the team members.<br>Make inappropriate questions or behaving inappropriately according to the environmental conditions. |
| Changes the clinical condition of the patient when required, such as increased fluid flow for display. | Fails to recognize and respond in a timely manner to the patient's needs on changes in their condition.<br>Does not recognize the critical events. |
| Knows and understands the surgery and the emergency plan. | Does not know and doesn't ask for clarification from the remaining members for the surgery. |
| Identifies and cross checks the needs of the patient before entering the operating room, such as special equipment for patient with morbid obesity. | Unable to assess the patient and to identify their needs. |

ANTS- AP System, University of Aberdeen, NHS Education for Scotland, 2015.

**• Provision**

It is very important for patient's safety and outcome for the nurse-anesthetist to be able to predict what will happen in the near future and to plan the necessary interventions to prevent it.[13] {table 4}.

**Table 4. Indicators of behavior of the nurse-anesthetist regarding the provision of unexpected events.**

| Positive Indicators | Negative Indicators |
|---|---|
| Inform his colleagues about the unforeseeable event and the desired effect of the intervention implemented. | Unable to respond on time to unforeseen events.<br>Unable to prioritize needs. |
| Prepares the appropriate equipment or medicine to cope with the unpredictable event. | Not being able to prepare properly. |
| Provides the equipment they have prepared in the order required for each process. | Does not recognize the chronological order of the proceedings. |

ANTS- AP System, University of Aberdeen, NHS Education for Scotland, 2015.

**Teamwork and Collaboration**

The nurse-anesthetist has to share information about the patients' health with the other members of the team. The members of the team are all equal and for the smooth and safe outcome of the surgical patient, all members are required to know and understand the therapeutic goals and the surgical plan. Occasionally fatigue is a cause of irritability, agitation and conflict. Thus, health professionals may find it difficult to contain their behavior at the time of a critical event where, in addition to their fatigue, stress is overwhelming.[23]

**• Coordination with the team**

It is necessary for the nurse-anesthetist to work effectively with the rest of the multidisciplinary team, without creating problems for the members' relations. It is equally important to have the courage of their opinion, beyond their high level of specialized knowledge, so that they can introduce new ideas and innovations in their field (24) {table 5}.

**Table 5: Indicators of behavior of the nurse-anesthetist regarding their coordination in the team.**

| Positive Indicators | Negative Indicators |
|---|---|
| Accepts verbal requests from colleagues. | Unable to cope with verbal instructions. |
| Shares information with the group about the plans and the changes in the plan such as patient sensitivity to latex, difficult intubation. | Speaks vaguely to the surgical room without addressing a particular partner.<br>Does not share information about the medical status of the patient. |
| Confirms the understanding of the revised plan that has been modified for the patient's needs. | Cannot cope with emergency situations and projects that deviate from the usual routine. |
| They are able to propose an alternative plan in the event of failure of the original plan. | Fails to propose alternative plans. |
| Collaborates with the group to achieve objectives such as compliance with the timeframe of the operation. | Cannot coordinate with the team.<br>Performs their own work at an inappropriate time. |
| They are not disturbed by any interruptions in their concentration. | Fails to retrieve their concentration quickly. |

ANTS- AP System, University of Aberdeen, NHS Education for Scotland, 2015.

**• Support colleagues**

The operation room is extremely demanding and stressful and the nurses working in it have quite a lot of mental fatigue. Also, anesthesiology departments are highly risky and require specialized training. An anesthesiologist should recognize the moral, emotional or psychological instability of his or her associates in order to be able to provide them with the appropriate help and support they need. Nurses enjoy the care they offer to their patients and it seems that their satisfaction increases as they are socially tied to their colleagues. This is one of the main reasons that remain in the nursing profession even when the administration does not support or encourage them (25). Similarly, they should be able to recognize the symptoms of their own work-related fatigue and develop relaxation strategies to deal with it {table 6}.

**Table 6. Indicators of behavior of the nurse-anesthetist in support of group members.**

| Positive Indicators | Negative Indicators |
|---|---|
| Understands when a partner is tired and offers them help. | Fails to offer help. |
| Asks for assistance from their partners when he / she needs it. | Does not ask for help and acts heroically. |
| Is encouraging and reassuring when needed. | Makes bad and inappropriate comments to their colleagues. |
| Reminds the anesthetist of any processes that may have escaped or have been forgotten. | They are not aware of any omissions.<br>Skips the anesthesiologist's instructions. |
| Working calmly and quietly.<br>Asks other members to be quiet when there is a difficulty that requires | Distracts their colleagues, makes a fuss or displaced discussions. |

| | |
|---|---|
| extra concentration or when one partner is tired. | |
| Helps their colleagues to take a break. | Does not help his colleagues.<br>Lazy at every opportunity. |
| Repeats the options that already exist (to be heard again) to choose the most appropriate one. | |

ANTS- AP System, University of Aberdeen, NHS Education for Scotland, 2015.

**• Confident, support his / her opinion**

A competent nurse-anesthetist is confident about themselves and their knowledge and is not afraid to ask for clarification when they do not understand a process or if this process is not followed according to evidence based medicine. The nurse-anesthetist is dynamic and has the courage to express their documented opinion and propose new possibilities, changes or goals. They participate in the department's targeting and have developed leadership skills[26] {table 7}.

**Table 7: Indicators of behavior of nurse-anesthetist in support of group members.**

| Positive Indicators | Negative Indicators |
|---|---|
| Speaks dynamically to colleagues, regardless of their level of seniority to avoid an error.<br>Not afraid to speak when necessary for patient's safety. | Does not react when a colleague is inappropriate.<br>Agrees with their silence (silent consent).<br>Avoids getting involved, although the patient's safety is at stake. |
| Assumes leadership when needed, such as in an emergency.<br>Asks for support from seniors during a critical incident. | Speaks so loudly that their colleagues feel intimidated.<br>Does not accept help. |
| Asks for clarification as to who is the chief anesthetist when two specialist anesthetists are present in the same incident. | Remains silent when anxious. |
| Is a mediator in resolving disputes.<br>Explains the rational based on an action plan for resolving conflicts. | Does not try to resolve a conflict. |
| Adapts communication style that suits each situation. | Has no adaptability. |
| If necessary, ask for help from third parties to resolve a conflict. | Afraid to ask for help. |
| Uses professional judgment and values to protect the rights and dignity of the patient. | Fails to preserve the dignity of the patient. |

ANTS- AP System, University of Aberdeen, NHS Education for Scotland, 2015.

**Task management, project execution**

The nurse-anesthetist must make good use of available resources in the best possible and most economical way. It needs to be organizational in order to be able to establish the activities required to successfully achieve the goals. Clinical anesthesia can also be applied by specially trained and certified nurse-anesthetists (CRNA) with the same reliability.[27]

**• Design and preparation**

In order to complete perioperative processes without delays or unnecessary interruptions, it is necessary for the nurse-anesthetist to properly design and prepare its equipment and resources and to anticipate the possible organizational requirements that might be needed in a critical phase, with the severity of the surgery or the patient's profile {table 8}.[18]

**Table 8: Indicators of behavior of nurse-anesthetists in the design and preparation of a project.**

| Positive Indicators | Negative Indicators |
|---|---|
| Checks and gathers the necessary equipment and medicine before surgery. | Fails to fully prepare the required equipment and / or drugs. |
| Knows what is needed in the 5', 15' or 50' of anesthesia and prepares them. | Not informed of the plan of operation.<br>Not aware of the process steps. |
| Uses the checklists to avoid errors. | Does not check the checklists. |
| Has a stock of materials and medicines so as not to delay the surgery. | Not having enough stock. |
| Utilizes the time of low anesthetic requirements to prepare the rest of the work. | Not properly utilizing their time. |
| Takes initiatives to prepare predictable work. | Not being prepared and causing delays in the flow of surgery. |

ANTS- AP System, University of Aberdeen, NHS Education for Scotland, 2015.

**• Prioritization and problem solving**

It is important for a nurse-anesthetist to know their duties and responsibilities, to be able to plan and prioritize their work to carry it out on the basis of their priority. Of course, for this to work, there needs to be an inherent critical thought, so one must recognize its weaknesses and constraints and accept that no one is capable of everything, emotional difficulties can also affect critical thinking and the cognitive skills of one person {table 9}.[28]

**Table 9: Indicators of behavior of nurse-anesthetists in prioritization and problem solving.**

| Positive Indicators | Negative Indicators |
|---|---|
| Recognize what is most relevant and what needs more attention.<br>Aware of the demands of the situation. | Performs tasks in a random order, without taking into account the needs of the patient or team.<br>Cannot prioritize priorities. |
| Understands the risks, identifies them and communicates them to the other members.<br>Guiding the team according to the protocols. | Insists on completing unnecessary work even when the patient's condition requires modification of the work plan. |

ANTS- AP System, University of Aberdeen, NHS Education for Scotland, 2015.

**TRAINING NON-TECHNICAL SKILLS**

Non-technical skills can be taught through appropriate training via special programs that develop non-technical skills combined with practical techniques.[29] These programs integrate theoretical courses and simulation scenarios - the so-called training courses.[8]

Initially, trainees should learn the desired ideal reaction when practicing specific clinical practices. In addition to the theoretical lessons, it has been shown that video projections of various scenarios indicate the desirable and undesirable reactions of the members of the group to follow a discussion about the mistakes.[35] The team is then called upon to cope with real-world scenarios based on simulation using medical equipment and human models. Controlled simulation and role plays appear to be an effective teaching method in preventing errors.[31] Especially for nurse-anesthetist, training should be done in a surgical and emergency environment (such as an abortion in the pathological wing).

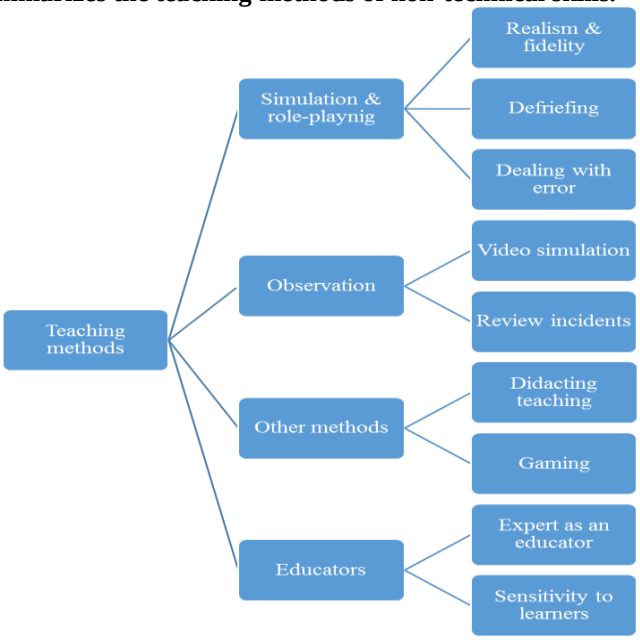
An additional strategy of learning non-technical skills is to discuss and analyze some incidents in order to find mistakes in the execution of the clinical act and how the procedures could have been performed more correctly or to avoid mistakes that have taken place briefing. This method can be done daily at the end of the shift or periodically every week or month by discussing the most important events.[32]

Another method of teaching, with particular emphasis on the patient's safety, is the use of teaching material on the computer at the same time as exercises through computer games.[24] This method is individual and can also be applied from home. But it is not enough on its own, it needs to be combined with other teaching methods at a group level.

As with any type of learning, the success of anesthesia nurse training in non-technical skills is equally dependent on the trainer's transmissibility and trainee receptivity. Finally, because non-technical skills tend to decline over time, it is advisable to repeat their training at intervals (2-4 years).[5]

Using the simulation to teach clinical and non-technical skills, it is easier for health scientists to acquire and apply the knowledge and techniques required to achieve the best results in patient care. Since the primary objective of teaching is to facilitate learning, it is important that the simulation experience is learning-oriented {diagram 1}.[33,34]

**Diagram 1: The diagram summarizes the teaching methods of non-technical skills.**




Gordon, Darbyshire & Baker (2012)

## CONCLUSIONS

From this review, the need to learn non-technical skills in anesthesia nurses emerges and is documented.

Undoubtedly, the scientific background of nurse-anesthetists has increased significantly over the last decade, but since there is no undergraduate or postgraduate nursing specialization in clinical anesthesia or recognized specialization, in Greece, their education is usually done by the senior nurses in Anesthesiology and Anesthesiologists. This practice has a significant disadvantage, it does not adequately prepare anesthesia nurses for both the prevention of errors and omissions and the treatment of emergency situations.

On the contrary, there are researches demonstrating the contribution of non-technical skills training to doctors (surgeons and anesthesiologists) and nurses (anesthesia and surgery) for the patient's safety. Especially for nurse-anesthetists the field of research is limited, but it is clear that their training in non-technical skills significantly improves patient's perioperative safety.

This review could be a guide to assessing anesthesia nurses in non-technical skills with a view to educating them. As well as a method of training anesthesia nurses in non-technical skills through error identification and analysis, action or accident discussion, video projection and observation.

It could also be the occasion for a structured program of learning non-technical skills, either undergraduate or postgraduate, or as a nursing specialty, under the aegis of the nursing school, including seminars, video projections and simulations.

Finally, from this review it seems useful to carry out research studies on the detection of non-technical skills in anesthesia nurses in Greece and the assistance of a training program.

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