

# Circulating nurse's non-technical skills: a literature review

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## Research article

**Keywords:** Circulating nurse, non-technical skills, behaviors, surgery, operating room.

**Posted Date:** April 21st, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-23634/v1>

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# Abstract

**Background:** Circulating nurses are key members of the surgical team and play an essential role in ensuring patient safety in the operating room. They need to use non-technical skills to provide safe and efficient patient care. This study was conducted to identify the behaviors related to the circulating nurse's nontechnical skills from the existing literature.

**Methods:** A search of the literature between 1990 and 2020 was conducted using online sources, including Web of Science, MEDLINE, CINAHL, Scopus, OVID, and Cochran library. Furthermore, the publications of the Association of peri-operative registered nurses (AORN) and the National Association of Theater Nurses (NATH) were consulted. Then the skills were grouped into known categories of non-technical skills.

**Results:** Behaviors related to circulating nurse's non-technical skills were extracted from the existing literature. Then they were grouped into seven domains, including communication, leadership, coping, teamwork, situational awareness, task management, and decision-making and problem-solving. Furthermore, several improper behaviors were extracted.

**Conclusion:** Circulating nurses need to use non-technical skills from the beginning until the end of surgery to perform efficiently. There is still a need for future work to identifying circulating nurses' non-technical skills using other types of studies to develop an assessment tool.

## Background

For more than one century, surgery has been a significant element of public health (1). More than 234 million major surgeries are undertaken every year worldwide. Regarding high rates of death and complications in major surgical procedures, surgical safety should be considered as a public health concern (2). In the operating room, interdisciplinary teams of healthcare professionals with different skills work together to deliver quality patient care (3). The operating room is high risk (4) and a very complex environment (5), in which occur approximately 50% of adverse events within a hospital (6). The analysis of the adverse events has shown that the causes of these events are defects in non-technical aspects of performance, rather than failures in technical expertise (7). In other words, these cognitive and social skills are being increasingly known as the leading cause of surgical errors (8). Non-technical skills help to reduce surgical errors, effective response to face problems during surgery (9), contribute to safe task performance, and complement technical skills (10).

Circulating nurses are key members of the surgical team and play an important role in ensuring patient safety in the operating room (11). They control the events that happen outside the sterile area and provide team members (12). Circulating nurses remain outside the sterile field and keep the contacts with out of the operating room (13). They are responsible for the patient's final check before surgery (14), and they support the activities of other team members and the patient (15). Circulating nurses control the traffic of the operating room and observe aseptic principles to prevent infections (16). Circulating nurse's

work relies on deployment of non-technical skills (11). They should follow the process of surgery and anticipate the needs of scrub nurses (17). The circulating nurses must remain focused, confident, calm, and in control during operation (18). They should observe the surrounding area to identify possible problems (19) and maintain patient safety (20). Therefore, their non-technical skills are crucial in safe and successful surgery.

The number of studies on operating room nurse's nontechnical skills is lower than other surgical team members (11). Yet, the scrub nurse's non-technical skills have been studied in past years, and a behavioral marker system was developed (3, 21, 22). The circulating nurse's non-technical skills were not considered widely before. Only in one ethnographic study, Redaelli listed the main categories of circulating nurse's non-technical skills, without reporting key behaviors (11). The survey on circulating nurse's non-technical skills is under-developed, while their skills are very important. In a former study, Circulating nurses were the team members with most numbers concerning communication patterns (12). In a previous research, it was revealed that 77% of the errors during the surgery were intercepted by circulating nurses (19). Identifying the circulating nurse's non-technical skills can be helpful in the development of a behavioral marker system, the assessment of their behaviors, and educating them to improve their skills. In this study, we aim to identify the behaviors related to circulating nurse's nontechnical skills from the existing literature.

## Methods

This review was conducted based on the instruction of the Cochran handbook (23). The search terms were selected based on non-technical skills previous researches. Communication, teamwork, leadership, situational awareness, monitoring, coping strategies, problem-solving, decision making, and task management are the non-technical skills that are indicated in previous researches on healthcare staff. The circulating nurses may be called as scout nurse, circulating practitioner, circulating technician, and operating room nurses; so all the terms were put in keywords.

A search of the literature between 1990 and 2020 was conducted using online sources including Web of Science, MEDLINE, CINAHL, Scopus, OVID, and Cochran library. Furthermore, the publications of the association of peri-operative registered nurses (AORN) and the National Association of Theater Nurses (NATH) were consulted. The searched terms were a combination of MeSH terms and keywords. "Non-technical skills", "Task management", "Teamwork", "Communication", "Situational awareness", "Leadership", "Decision making", "coping", "monitoring", "problem-solving", "circulating nurse/practitioner/technician", "scout nurse", "intra-operative nurse" and "Operating room/Operating theatre" were included. Various combinations of the keywords were used.

Original articles, clinical trials, case reports, reviews, systematic reviews, and meta-analysis were included. The list of references for each review article was crosschecked for additional studies. The articles which were published in a language other than English and those that were not published in peer-reviewed journals were excluded from this study. Two authors screened the studies by title and abstract

independently to consider potential eligibility. Then, they reviewed full texts to extract relevant studies. Disagreements between the authors were discussed, and after rechecking, they achieved complete agreement. The included studies were deeply analyzed to extract behaviors that are linked to circulating nurse's non-technical skills. The behaviors were grouped based on the definition of known non-technical skills. Figure one shows the PRISMA diagram of the search results.

## Results

The formerly developed behavioral marker systems to assess surgical team's non-technical skills include some exemplar behaviors that are related to nursing sub-team and circulating nurse's non-technical skills (24-30). Only one ethnographic study (11) has been conducted to extract the circulating nurse's non-technical skills; however, the study not reported exemplar behaviors, so we studied the references that are related to nursing and operating room to extract more behaviors. After reviewing the related studies and textbooks, we extracted the circulating nurse's nontechnical skills' behaviors. We used the definition "social, cognitive, and personal recourse skills that contribute to safe task performance and complement technical expertise (10)" and known non-technical skills to categorize these skills.

### Communication

Communication is the exchange of information among surgical team members (22). This category is a very important element in nursing jobs. The circulating nurse should communicate appropriately with the patient, surgical team members, and others in the surgical ward. They can talk to the patient to decrease his/her fear and stress before the start of surgery (31-33). Circulating nurses should use a proper tone of voice as they stand foots away from the surgical bed (34) and talk about only relevant issues to the surgery (12). They give necessary information to the team members during the surgery and hand-offs (35). Table one shows the circulating nurse's communicational skills.

### Leadership

Regarding circulating nurse's duties, his/her leadership is not defined as "the capability to lead the surgical team"; instead, it's better to describe it as "heading the surgical team members occasionally by guiding them toward corrective actions when they have deviated" (11). Circulating nurses have a crucial leadership role (36), as they are known as "in charge of the operating room" (37). They control the operating room traffic (31, 38) and do not let unnecessary entrances. They lead the time out process (39, 40) and orchestrate the surgery process within the operating room (31). Table 2 shows the circulating nurse's leadership behaviors.

### Coping skills

Operating room nurses are subject to stress, as there are several stressors in the operating room (41). Circulating nurses should be able to cope with stressful situations (11), as they are the most stressed team member in the peri-operative phase of surgery (42). They should adopt quickly to changes (23)

because their reaction against stressful situations can affect other team members and the process of surgery. In such cases, they might reposition instruments smoothly (11). Staying calm and dominant facing emergency situations and complications, being able to adapt with unpredicted and new conditions, Concentrating on the task that should be done at that moment, and a problem-solving based approach in stressful circumstances are the behaviors that were mentioned in the literature.

## **Teamwork**

Circulating nurses should be able to work within the surgical team, cooperate with others, and stay coordinated with them. They function as an extra pair of hands and legs for surgical team, (43) and they help to prepare the operating room before start the surgery (44). Circulating nurses help other team members; for example, they help anesthesiology technicians during changes in patient status (15), induction, and intubation(45) and supporting sterile team members by providing their needs (45, 46). They could do it actively by walking around the operating room and helping team members (47). Circulating nurses also play an important role in coordinating activities in the operating room. They coordinate sterile team members with anesthesiologists (46), coordinate whole team activities (23) and needs (48) with out of the operating room. Table 3 shows the circulating nurse's extracted teamwork skills.

## **Situational awareness**

Situational awareness refers to the perception of elements in an environment within the volume of space and time, understanding and comprehension of their meaning, and projecting their status in the near future (49). People, tools, patient, and instruments are considered as the elements of the operating room. A circulating nurse attends to the patient and reminds behind him/her during the induction of anesthesia. During the surgery, they watch and seek surgical procedure and monitor the sterile team's needs (45). They should be able to anticipate the process of surgery and adjust his/her roles to meet the needs (17). Circulating nurses should ensure the patient's safety and comfort (31) and should gather information about the patient-related issues (16). They should check the presence (50) and the correct function of the devices (16, 45) in the operating room before the start of surgery. Table 4 shows the behaviors related to the circulating nurse's situational awareness.

## **Task management**

Task management refers to the capacity of organizing resources to achieve the surgical team's goals (22) and also maintain operating room standards. Circulating nurses should remain in the operating room until the end of surgery, like other team members (51, 52). They need to manage and prioritize their tasks to do efficiently (53) and do housekeeping of the operating room (54). Circulating nurses should do their duties with precision, for example, in opening the sterile packs (55). They should manage the specimens properly and pay attention to counting protocols such as recording count results immediately and correctly (45). Circulating nurses review and prepare patient's documents (56) and know their roles and act toward them (57). Table 5 shows the circulating nurses' skills in managing their tasks.

## **Decision-making and problem-solving**

Circulating nurses can help in decision-making and problem-solving when the team faces problems. Behaviors like “participating in decisions by raising their opinion”, “offering alternatives when necessary, using analytical decision making regarding the events”, and “trying to identify and solve problems” were indicated in the literature.

## **Improper behaviors**

Through reviewing the literature, we found some inappropriate behaviors that are against the circulating nurse’s non-technical skills and could endanger patient safety by deviating the surgery process. Table 6 shows these behaviors.

## **Discussion**

This review was conducted to extract the circulating nurse’s non-technical skills from the existing literature. The skills categorized into seven domains, including communication, leadership, coping, teamwork, situational awareness, task management, and decision-making and problem-solving. They use these skills from the beginning until the end of surgery. Furthermore, we founded some improper behaviors regarding these skills from the literature.

The result of the review showed that circulating nurses need to have more communication, teamwork, situational awareness, and task management skills than leadership and decision making. This result can be due to the roles in the operating room; surgeons, as the surgical team’s formal leader, have more authority to make decisions and lead the team. On the other way, circulating nurses do the majority of their work with coordinating and management of the operating room. They could only be asked to give their opinion based on their expertise in problem-solving and decision-making, or they help indirectly with acting promptly and providing team members what they need. They manage and control the operating room to provide a comfortable environment for the patient and team members.

Circulating nurses play a vital role in the operating rooms, and their efficient performance extremely is related to deploying non-technical skills. Circulating nurses perceive the operating room as a complex environment that needs high activity and teamwork (58), as technological advances increase their workload and stress (59). They may be impacted by technological and technical factors more than any other member of the surgical team (60). The use of non-technical skills in the operating room can help circulating nurses to do their tasks better in such situations and ensure patient safety. They play a vital role in error recovery and ensuring patient safety (19) by maintain high vigilance and observing other team members from a better point of view; this way, they can protect the sterile field. If a circulating nurse is absent during the surgery process, the communicative bridge between the operating room and hospital will be disconnected, and it could cause delays in the process of surgery and failures.

Individual assessment of circulating nurse's non-technical skills has not been conducted before. Only in studies using behavioral marker systems such as the observational teamwork assessment for surgery (OTAS) (24) and Oxford non-technical skills system (NOTCHES II) (27) the nursing sub-team, including scrub and the circulating nurse is assessed. As being the team member who has the most interactions with materials, equipment, and technologies (61), and regarding the importance of circulating nurse's non-technical skills in safe surgery and patient safety (20), the study of their behaviors is important. This study can be a starting point to develop a tool for the assessment of circulating nurse's non-technical skills and find their strengths and weaknesses in applying these skills. Maybe an interview study could complement our results to develop a tool for assessment of circulating nurse's non-technical skills.

## **Conclusion**

The circulating nurse's non-technical skills have not been studied widely. Circulating nurses need to use non-technical skills to work efficiently and ensuring safe surgery. They have more skills in managing tasks, communication, teamwork, and situational awareness than other leadership and decision-making. There is still a need for investigation on the circulating nurse's non-technical skills.

## **Abbreviations**

AORN: Association of peri-Operative Registered Nurses

NATH: National Association of Theater Nurses

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

OTAS: Observational Teamwork Assessment for Surgery

NOTCHES II: Oxford non-technical skills system II

## **Declarations**

### **Ethics approval and consent to participate**

This study was approved by the ethics committee of Shiraz University of Medical Sciences.

### **Consent for publication**

Not applicable.

### **Availability of data and materials**

All data generated or analyzed during this study are included in this published article.

### **Competing interests**

The authors declare that they have no competing interests.

## Funding

This study was financially supported by Shiraz University of Medical Sciences as a part of a Ph.D. thesis.

## Author Contribution

RK, MH, and ZZ designed and conceived the study. JJ and AF analyzed the data. MH, RK, and SG performed the literature search. HN prepared data analysis. All authors edited, reviewed, and approved the manuscript.

## Acknowledgment

Not applicable.

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## Tables

Table 1: Circulating nurse's communicational skills

- Provides proper feedbacks and acknowledgment
- Informs other team members about his/her actions
- Does not distract other team members
- Gives and asks full information during hand-offs
- If he/she is worried about something, informs other team members
- Raises his/her requests clearly, is audible
- Talks kindly to the patient, informs him/her and calms him/her down
- Respects the patient and other team members
- Knows when should stay quiet and when to talk
- Reminds the forgotten issues to the team members
- Uses proper tone of voice when talking
- Does not talk about irrelevant topics in the OR
- Avoids struggles with other team members
- Participates in the team conversations
- Warns other team members when the sterility is threatened
- Shares necessary information with other team members
- Makes the team members aware of the problems with their performance and instruments
- Has a friendly relationship with other team members and uses sense of humor properly
- Asks for information and updates
- Talks about the plan and the next activities
- Uses the planned communication ways
- Uses keywords for getting the attention of others when faces a problem
- Uses the names when interacts with other team members
- Asks question if feels ambiguous
- Uses non-verbal communication and eye contact

Table 2: Circulating nurse's leadership behaviors

- Reacts when sees a defect in other team member's performance
- Controls the distractors and noises of the operating room environment and makes it quiet
- Directs surgical team members and trainees
- Manages the OR events under challenging situations
- Shows enough assertiveness especially regarding aseptic technique (for example in correct gloving and gowning)
- Observes the performance of other team members
- Participate in planning for future acts
- Encourages other team members to be involved and seek surgery process
- Motivates others team members and tries to increase morale

Table 3: Circulating nurse's teamwork behaviors

- Supports and helps surgical team members
- Offers help to the other team members
- Participates in patient transfer from and to the surgical bed
- Is coordinated with other team members in patients' positioning
- Conducts shaving and prepping after coordination with the surgeon
- Sets the tourniquet after the coordination with surgeon
- Is coordinated with the scrub nurse in counting
- Coordinates his/her tasks with other team members
- Coordinates the patient's particular needs with the surgeon
- Coordinates the presence of other team members before surgery
- Cooperates with every last minute request of the surgical team
- Checks important issues with other team members
- Helps the scrub nurse in cleaning the room
- Asks help from other personnel when necessary
- Does not compete with other team members

Table 4: Circulating nurse's situational awareness behaviors

- Predicts the needs of the sterile team
- Always is ready to meet other team members' requests
- Listens actively to the warnings, orders, and conversations.
- Seeks the surgery process preciously
- Looks at the monitor of vital signs to be aware of the patient status
- Stays in a proper place to dominate all events
- Observes the patient's positioning on the bed
- Observes the other team members' acts
- Monitors the safety of the patient
- Pays attention and follows the other team members' concerns
- Checks the site of operation before the start of surgery
- Reviews the patient's documents before the start of surgery
- Checks the availability of blood products
- Makes sure about the availability of needed instruments before the start of surgery
- Is aware of the resources and uses them properly
- Checks the presence of things required before the start of surgery
- Pays attention to patients conform
- Makes sure that the patient's documents are brought to recovery
- Rechecks the requirements during surgery

Table 5: circulating nurse's task management behaviors

- Observes labeling and transfer of the specimens
- Is aware of the roles and capabilities of other team members
- Helps in the fluent process of surgery.
- Reacts promptly against the events
- Disagrees with the orders that are against standards.
- Insists on correct action and maintaining operating room standards
- Conducts his/her tasks quickly
- Is punctual
- Is aware of the protocols and standards
- Records the events of surgery precisely in a proper time
- Prepares the patient's documents before the start of surgery
- Prevents the unnecessary entrances to the OR
- Prepares the operating room entirely before the start of surgery
- Keeps the trolley in a good order
- Stays at the operating room until the end of surgery
- Brings all necessary instruments and needed items before the start of surgery
- Priorities his/her tasks
- Understands his roles clearly
- Provides the required things in a proper time
- Does his/her duties accurately
- Does not open unnecessary surgical sets
- Bring more instruments and surgical sets before the start of surgery
- Manages his/her tasks so that could concentrate on counting perfectly
- Arranges the instruments properly in the OR
- Records the count results on the board
- Keeps the operating room ordered
- Does his/her tasks in a proper time
- When is under-loaded, does other necessary tasks
- Concentrates on his/her tasks
- Divides his/her workload during the surgery
- Does accurately while doing several tasks at a time

Table 6: Circulating nurse's improper behaviors regarding non-technical skills

- Talks unnecessarily when the surgeon is concentrated on the operation and distracts him/her
- Causes delays in the surgery process
- Uses mobile phone in the operating room
- Fails in coordination with anesthesiologist technician (for example in drugs, positioning)
- Could be distracted easily from surgery procedure
- Exits from operating room
- Counts carelessly
- Opens unnecessary sets
- Is careless in transferring instruments
- Talks about issues unrelated to the surgical process
- Ignores the distractors
- Brings needed instruments mistakenly
- Does not check necessary items before surgery (patient, operation site, instruments, etc.)
- If there is a need for exiting, does not put another nurse in his/her place
- Pays no attention to regularizing operating room
- Does not inform others about conducting his/her tasks
- Ignores sterility
- Cannot be adapted with work pressure
- Does not bring all necessary instruments before the start of surgery
- Does not prepare required tools before the start of surgery
- Does not listen to others and provides no feedback
- Is not present to transfer required instruments to the surgical team
- Responses and reacts late
- Concentrates excessively on documenting and ignores the surgery process
- Does not documenting in a proper time
- Struggles with other team members
- Ignores necessary activities in the work process
- Pays no attention to fill necessary forms and checklists
- Shows weakness and fatigue in his/her tasks
- Does not know roles
- Does not provide required tools in a proper time
- Cannot find essential instrument when needed
- Ignores team member's requests
- Uses improper tone of voice
- Does not respect to other team members
- Ignores the operating room protocols and standards

- Does not share important information with team members
- Is inattentive to patient safety
- Cannot predict patient's and surgical process' future status
- Does not support other team members
- Blames other team members

## Figures

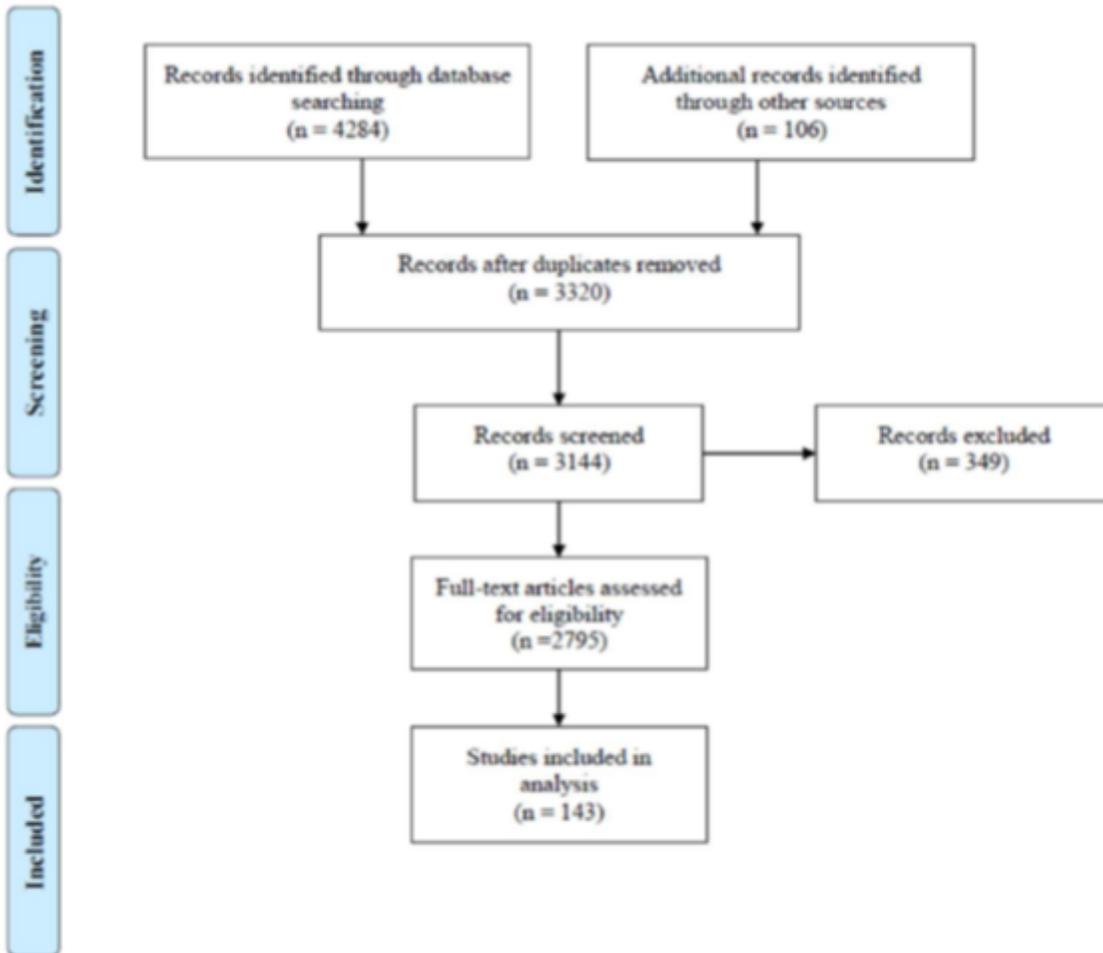


Figure 1

PRISMA diagram