



DUTIES OF NURSES IN THE FIELD OF ROBOTIC SURGERY. ADVANTAGES AND PERSPECTIVES

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ABSTRACT:

Background: The integration of robotic surgery into modern medical practices has transformed operative methodologies, necessitating an evolution in the roles of operating room nurses.

Methods: The method of literature review through deductive content analysis was used for the study. Three databases were selected according to criteria scale and possibility of free access – Science Direct, PubMed (Medline), Scopus. Keywords/phrases corresponding to MeSH terminology (Medical Subject Headings) have been defined - ‘robot surgery’, ‘nurses’, ‘robot assisted surgery’, ‘nursing care’, ‘laparoscopic surgery’, ‘nurse’s role’

Results: The literature review yielded 10 selected publications for analysis. These publications covered diverse topics such as nurses’ experiences in robotic-assisted surgery, perioperative nursing roles, and evaluations of nursing interventions in robotic procedures.

Conclusion: Nurses play main roles in robotic surgery across preoperative, intraoperative and postoperative phases. As technology advances, nurses need continuous training and updated protocols to meet the specific demands of robotic procedures. The study emphasizes the wide-ranging responsibilities of nurses and calls for ongoing research to enhance their contribution to the evolving field of robotic surgery.

Keywords: nurses, robotic surgery, advantages, perspectives,

INTRODUCTION

Robotic surgery is already a part of current surgery and is actively present in the up-to-date equipped operating rooms of modern medical facilities. Its origin and development are closely related to the evolution of laparoscopic surgery and its achievements. Despite its high-tech working methods, including the use of robotic equipment, human resources remain indispensable, including operating room nurses. Their roles and duties change and develop in parallel with the development of the operative methodology itself and the functions of the operators while providing opportunities and perspectives for professional development and implementation of innovative nursing practices.

The first robotic teams used in the surgical field were developed [1] in the nineties of the 20th century, but a robotic arm (PUMA 560) for taking a biopsy in the field of neurosurgery [2] already found application in 1985. Precursors of the current Da Vinci® surgical robot are AESOP®, MONA® and ZEUS® [3]. The surgical robot Da Vinci® (Da Vinci Surgical System) is a robotic surgical system produced by Intuitive Surgical (USA), which was initially used for the purposes of the American army, and later entered the field of civil medicine, mainly for urological and gynecological interventions [4, 5].

The nurse’s role and place during robotic surgery are aimed at several functions - assisting, teaching and research. AORN (Association of Perioperative Registered Nurses) and its European equivalent - EORNA, updated their four-dimensional model called Patient Focused Model, for whose four dimensions (safety, physiological response, behavioral response and health system) the nurse is responsible [6].

The purpose of the present study is to determine the nurse’s responsibilities in the robotic surgery work team and the latest updates of nurses’ functions that provide advantages and perspectives for professional performance.

METHODS

The method of literature review through deductive content analysis was used for the study. Three databases were selected according to criteria scale and possibility of free access - ScienceDirect, PubMed (Medline), Scopus. Keywords/phrases corresponding to MeSH terminology (Medical Subject Headings) have been defined - ‘robot

surgery”, “nurses”, “robot assisted surgery”, “nursing care”, “laparoscopic surgery”, “nurses role”. Their inclusion in formulas via boolean was opted as follows:

Formula 1 (F1)- “robot surgery” AND “nurses”

Formula 2 (F2)- “robot asisted surgery” AND “nursing care”

Formula 3 (F3)- “laparoscopic surgery” AND “nurse’s role”.

The following criteria (descriptors) were submitted: publication period 2019-2024; publication type - review; language of publications - English and Spanish; text - full/free access. Exclusion criteria were: publications before 2019, languages other than those mentioned above, another type of publications.

Each of the formulas was applied in the search for publication information in the three databases, and corresponding results were recorded (Table 1).

Table 1. Data search steps.

Databases	First step: Formula application	Second step: applica-tion of time interval 2019-2024	Third step: inclusion of reviews only	Fourth step: language of papers – English/ Spanish	Fifth step: full text/open access	Sixth step: papes to review
ScienceDirect	Formula 1- 4967 papers	2023 papers	387 papers	386 papers	100 papers	2
	Formula 2- 2268 papers	983 papers	186 papers	186 papers	50 papers	0
	Formula 3- 5662 papers	1426 papers	310 papers	310 papers	53 papers	0
PubMed	Formula 1- 165 papers	88 papers	9 papers	5 papers	5 papers	4
	Formula 2- 294 papers	186 papers	22 papers	22 papers	22 papers	2
	Formula 3- 55 papers	8 papers	0 papers	0 papers	0 papers	0
Scopus	Formula 1- 105 papers	67 papers	7 papers	7 papers	3 papers	1
	Formula 2- 62 papers	50 papers	5 papers	5 papers	2 papers	1
	Formula 3- 9 papers	2 papers	0 papers	0 papers	0 papers	0
Total	N= 13587					N= 10

RESULTS

After applying the formulas in ScienceDirect, the obtained results are as follows: for formula 1- 100 for formula 2- 50 and for formula 3- 53 results. In the PubMed database, 5 results were found for the first formula, 22 for the second, and none for the third. After entering the criteria of the respective formulas in Scopus, the following results were obtained: for formula 1- 3 publications for formula 2- 2 and for formula 3- 0. After using formula 1 in ScienceDirect, other exclusion criteria were applied, after which 86 articles dropped by title and abstract, and 2 were not related to robotic surgery but to other technologies applicable in nursing practice. Only 2 papers left to analyze. From the results of the second formula, 50 articles remained, of which one was duplicated, 46 dropped out by title and abstract, and 7 related to other technolo-

gies. 53 were the results of the third formula, but 46 did not affect nursing practice, 2 were duplicated, and 5 were related to other technologies. Applying formula 1 to the PubMed database and the corresponding exclusion criteria, 5 publications remain for consideration, only one of which dropped by title. After the application of formula 2 in the same database, 16 publications dropped out by title and abstract, and 4 were duplicated, i.e. only 2 posts left to review. Finally, in Scopus, formula 1 resulted in finding three publications, one of which dropped out by title, and another did not address robotic surgery, i.e. one post left to review. With formula 2, of two publications - one was duplicated, and the other remained for consideration. The final number of analyzed articles was 10. Information about the selected publications is shown in the following table.

Table 2. Description of the chosen publications

Database	Formula	Title of Publication	Year of Publication	Source of Publication
ScienceDirect	1	From fast-track to enhanced recovery after surgery in radical cystectomy pathways: A nursing perspective [13]	2022	Asia-Pacific Journal of Oncology Nursing
		Perioperative psychological issues and nursing care among patients undergoing minimally invasive surgeries [15]	2022	Laparoscopic, Endoscopic and Robotic Surgery
PubMed	1	Experiences of perioperative nurses with robotic-assisted surgery a systematic review of qualitative studies [11]	2022	Journal of Robotic surgery
		Perioperative Nursing Role in Robotic Surgery: An Integrative Review [8]	2023	Journal of Peri Anesthesia Nursing
		Nurses' perceptions and experiences of robotic assisted surgery (RAS): An integrative review [10] Nursing performance in robotic surgeries: integrative review [7]	2023 2019	Nurse Education in Practice Revista Brasileira de Enfermagem
	2	Evaluation of the Postoperative Nursing Effect of Thoracic Surgery Assisted by Artificial Intelligence Robot [14]	2021	Contrast media & Molecular imaging
		Anesthesia Professionals' Perspectives of Teamwork During Robotic-Assisted Surgery [12]	2020	AORN Journal
Scopus	1	Unpacking the Broad Landscape of Intraoperative Stressors for Clinical Personnel: A Mixed-Methods Systematic Review. [16]	2023	Journal of Multidisciplinary Healthcare
	2	Surgical Nursing Intervention Protocol in Robotic Surgery [9]	2019	Index de Enfermeria

DISCUSSION

The duties of nurses in surgery related to robotic systems can be classified according to different criteria. One of them is the time frame that accompanies conventional surgical interventions as well. The periods for the application of health care and specifically nursing care are three - preoperative, intraoperative and postoperative. Before the operation itself, the role of the nurse is mainly centered in two directions - the patient and the operating room. Training programs are needed to acquire knowledge and skills, standardize processes, reduce patient risk, and support good outcomes in nursing practice [7]. The dimensions imposed as leading also play a role in the selection of nursing activities in the preoperative period - regarding the health system, the nurse must fit into a functioning multidisciplinary team and participate in preoperative programs [8]. The other dimension, referring to the safety of the patient, requires the necessary correct positioning of the same [7, 8, 9] and continuous communication in the work team. The measurement of behavioral responses obligates the nurse to take actions and measures to reduce fear and anxiety in the patient [8]. More educational pro-

grams and protocols need to be put in place for the smooth running of perioperative nursing in general, as noted in the systematic review by Moloney et al. from 2023 [10]. Other studies have also identified the experiences and perceptions of nurses working in robotic operating theaters and report a need for increased training and more research [11]. The prospects of the highly specialized nurse are directly proportional to the levels of training. Regarding the preparation of the operating room, it is important to emphasize the requirement for implementing standards, protocols, and algorithms in the preparation of the Da Vinci® surgical system. The correct distribution of the system elements (console, operating table, video panel) is essential for safe operation [9]. Plugging in and out securing and disinfecting the various hardware and power cables are also the nurse's responsibility [7, 9], as well as donning and positioning the robotic arms [9].

The second time period is intraoperative, and it coincides with the course of the surgical intervention itself. Emphasis is placed here on the fourth dimension of the Patient Focused Model, which includes caring for the physiological response. The nurse monitors the risk of bleeding,

water-electrolyte and alkali-acid imbalance, intestinal motility, incontinence, pain and others [8]. The medical team must be in protocol readiness to transform a minimally invasive intervention into conventional (open) surgery at any moment [7]. After docking (first incision and insertion of trocars), the nurse takes care of placing, connecting and checking the functionality of the optical system, the insufflator, the cables for mono- and bipolar coagulation [9]. The Instrumenting nurse is responsible for maintaining the sterility of the operative field, and the circulating nurse - for non-sterile areas, as in conventional surgery. The role of a nurse anesthetist participating in robot-assisted operations is completely different. There is little research on her place in the team and the qualities and skills she should possess [12]. Research in anesthesiology during robotic-assisted surgery may identify areas for improving quality of care and patient safety [12].

Finally, we consider the postoperative period, in which the nursing care continues and illustrates its specificities. Despite the well-established lower perioperative risk due to the minimally invasive nature of robotic surgery, patient care is an essential part of all four dimensions of the Patient Focused Model. Already in the operating room, the nurse is the one who prepares the patient's placement in the ICU or another department [9], having the responsibility to know the operation performed and the possible complications resulting from it [7]. It is essential to actively communicate with patients in order to provide information (within the limits of nursing competence) regarding postoperative care, nutrition, exercise, hygiene regime and others. Studies have been made that aim to summarize the postoperative period and related care from the perspective of specific surgical interventions. A Danish study, for example, emphasized learning pathways to improved recovery with an emphasis on radical cystectomy after robot-assisted surgery and the search for quality rather than speed in recovery [13]. Another study, which focused on thoracic surgery, followed the functions of the nurse throughout the perioperative period by measuring job satisfaction after the interventions [14]. An important phenomenon of the activity of medical specialists is the care for the psycho-emotional state of patients as part of modern integrative and holistic approaches. The good psychological tone of the patient and the absence of stress factors is one of the

prerequisites for the absence of complications. A 2022 Chinese study examined various perioperative psychological conditions in patients undergoing robotic surgery and the nurse's role in their management [15].

Last but not least, dealing with the stressors of the work environment can be seen as a function of each member of the multidisciplinary team. The narrow specialization and high responsibility associated with the activity of a nurse working in an operating room, conventional or robotic, are associated with higher levels of stress at work. An international study indicates that technical factors are most often studied as stress-provoking and that nurses are rarely included in this type of research [16].

CONCLUSION

Based on the bibliographic review, we can conclude about the responsibility and role of the nurses, as well as their duties as members of the multidisciplinary team handling robotic equipment. The period chosen for the time frame from 2019 to 2024 is the closest chronologically to our modern times, with the aim of eliminating deactualizations, summing up the latest discoveries and achievements and avoiding duplication. Undoubtedly, the duties of the operating room nurse have evolved in parallel with the evolution of robotic surgical teams such as the Da Vinci®. The nurse actively participates, depending on her function and role, in the preoperative preparation of the patient, the room and the robot. In the same way, the nurse takes a place in the team during the intervention - they have a position of instrumenting, circulating or anesthesiological. Their duties are very specific, requiring a wide range of knowledge and manipulative capabilities. Algorithmization for working with the Da Vinci® robot is the subject of activity of AORN and many other international and local nursing organizations. There is a need for constant updating of training programs and standardization of existing protocols. The field of the nurse's performance in robotic surgery is wide in view of the constantly developing medical technology. The nurse has the opportunity for professional expression through training, research and health awareness activities regarding minimally invasive interventions. There is a need for new research on various areas of nursing practice, the results of which will increase the benefits and support the prospects of nurses in the field of robotic surgery.

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