CHAPTER 2

Robotic Surgery Nursing

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Introduction

Robotic surgery, which has a fairly new history, is a type of surgical practice in which robotic systems are used to perform surgical procedures. It has various advantages and disadvantages for the patient compared to classical surgical methods. Robotic surgery, which offers various advantages for the surgeon as well as the patient, stands out with its benefits in general, although it creates various risks. For this reason, while robotic surgery technology continues to develop, its prevalence and preference are also increasing. Undoubtedly, this situation changes the practice processes of physicians and nurses and creates different responsibilities.

The popularity of robotic surgery continues to grow worldwide. In this process, a new definition for operating room nurses comes to the fore, robotic surgery nursing. A robotic surgery nurse is a specialist operating room nurse who works with the surgeon in the use of robotic systems in surgical operations. While the responsibilities of the operating room nurse in robotic surgery are still being defined, robotic surgery nursing is becoming an indispensable field of expertise in health sciences and for society. In this section of the book, robotic surgery is explained in basic terms, and robotic surgery nursing is examined for the entire perioperative process. Additionally, the relationship between robotic surgery and nursing education and the perspectives of surgical nurses on robotic surgery are also discussed. Robotic surgery is a team effort, just like traditional surgery. For this reason, discussing the role, responsibilities, and position of surgical nurses, who are part of the team, in robotic surgery will create a perspective for the future of surgical nursing as well as robotic surgery.

Definition, History, and Present of Robotic Surgery

Robotic surgery is a type of surgical practice in which robotic systems are used to perform surgical procedures. These systems usually include a set of robot arms specifically designed to control surgical instruments (Kantarcioglu vd., 2022). The surgeon performs surgical procedures through robot arms, which are usually controlled remotely with the help of a console. Robotic surgery can offer notable advantages, such as being less invasive, less blood loss, faster recovery times, and less tissue damage with smaller incisions (Bastug vd., 2023).

The historical development of robotic surgery started in the middle of the 20th century and progressed its process with the development of technology. The first surgical robots began to be used in the 1980s, but the wider acceptance and use of robotic surgery in the medical field dates to the early 2000s. In 2000, the robotic surgery system called "da Vinci Surgical System" received FDA approval in the United States, and this was a period when robotic surgery began to be used more widely (Karabiyik & Macit Aydin, 2018).

Today, robotic surgery is used in many surgical fields around the world. These systems are used for genitourinary surgery, cardiac surgery, gastrointestinal surgery, orthopedic surgery, and many other fields. There are many commercial robotic surgery systems, such as the Da Vinci Surgical System. These robotic surgical systems allow surgeons to move more precisely, provide better visual control with 3D imaging, and often work through smaller incisions (Akbulut & Calik, 2019).

Robotic surgery is developing in parallel with the developments in technology and medicine and finds more use in surgical applications. However, it cannot be used in a wide range due to some disadvantages such as its cost and training process.

Robotic Surgery Technology in Operating Rooms

Robotic surgery systems used in operating rooms usually include a set of robotic arms designed to control and manage surgical instruments. These systems allow the surgeon to manage the surgery remotely from a console and are often used by a surgical team. The most used da Vinci Surgical System robotic surgery system is shown in Figure 1.

Figure 1.
da Vinci Surgical System (Reference: www.intuitive.com)



The da Vinci Surgical System, developed by the Intuitive Surgical company in the USA, is used in many surgical applications. This system consists of arms that allow surgeons to control surgical instruments, a surgeon's console, and a control panel on the operating table. The surgeon sits at the surgical console of the system and directs the robot arms to the surgical instruments with the help of the control panel next to the operating table. The robotic arms mimic the hand movements of the surgeon with high precision. The robotic arms, in which a camera system is integrated, display the surgical site on a three-dimensional magnified screen. Robotic surgery technology is designed to enable surgeons to work with more precision and controllability. However, this technology may not be suitable for every patient's surgical situation. In addition, special training is required to use this technology effectively and efficiently.

The advantages, disadvantages, and usage areas of robotic surgery are listed below (Isik vd., 2022; Long & Kew, 2018; Martins vd., 2019).

Advantages:

- Less Invasive: Robotic surgery can often be performed with smaller incisions and less tissue damage, allowing patients to recover faster. In addition, less blood loss occurs in surgical procedures.
- Three-Dimensional Imaging: Robotic surgical systems allow the surgeon to see the surgical field in three dimensions, which allows them to work more precisely and in detail.
- Optical Lens: Especially with optical lenses, the image of the surgical area is enlarged, allowing more comfortable operations to be performed on sensitive areas.
- Better Mobility: Robot arms can mimic the surgeon's hand movements more precisely. This, in turn, helps the surgeon to perform more challenging and complex procedures.
- Remote Control: The surgeon can control the robot arms from a console next to the operating table, which provides the surgeon with a more comfortable and ergonomic working position.
- Patient Comfort: The patient gains more satisfaction with the result of robotic surgeries.

Disadvantages:

- Cost: The high cost of robotic surgical systems requires a significant investment in infrastructure for hospitals and health institutions.
- Training Requirement: To use robotic surgery systems effectively, surgeons need to receive special training from specialized institutions. This situation requires additional time and effort on the part of surgeons.
- Shortage of Financial Resources: Financial resource shortages in robotic surgery cause surgeons to not receive the necessary training and experience to specialize.
- Technical Problems: Several technical problems may occur in robotic surgery systems. Due to system failures that may occur during surgery, there may be a risk of causing serious problems in operations.

Uses:

- Genitourinary Surgery: It is used in genitourinary surgical operations such as prostate cancer and kidney cancer.
- Cardiac Surgery: It can be used in cardiac surgery procedures such as heart valve replacement, and coronary artery bypass graft (CABG).
- Gastrointestinal Surgery: It is used in gastrointestinal surgery applications such as gastrointestinal surgery and gallbladder operations.
- Orthopedic Surgery: It can also be used in orthopedic applications such as joint surgery and spine surgery.
- Head and Neck Surgery: It can also be used in head and neck surgery such as thyroid surgeries and tongue root cancer surgeries.

Civil Liability

Civil liability can often vary depending on the specific circumstances of the case. The surgical team should inform the patients as well as the technical team and act by ethical standards. The determination of any civil liability usually requires the assessment of a legal professional (Parlak Boru, 2019).

The legal responsibilities arising from robotic surgical interventions may vary depending on many factors. The surgical team that will use robotic surgery systems must have received the necessary training and gained competence. This is important in minimizing possible errors and complications. In case of lack of training, the

responsibility of the surgical team may increase. This situation should not be ignored to avoid legal problems. The patient should be informed about all risks and possible complications before the operation is performed with robotic surgery. The patient should be informed about all the risks of the intervention to be applied and should consider the recommendations. Technical problems or malfunctions may occur in robotic surgery systems. The competence of the surgical team in dealing with such situations can determine the technical responsibility (Parlak Boru, 2019). It is necessary to have the ability and competence to intervene in these malfunctions on-site and quickly.

Robotic surgery should be by standard surgical practices performed in the field of medicine. If established protocols and standards regarding the use of the robotic surgery system are violated, civil liability may arise. Therefore, there should be protocols in which the rules are fully laid out. In any surgical intervention, possible complications should be considered, and the causes of these complications should be examined. If an error or omission is detected, civil liability may arise. In such cases, commissions should be established equitably and equitably, and decisive steps should be taken to resolve the incident. Since robotic surgery procedures are usually performed within a healthcare facility, the organization has responsibility for patient safety and compliance with standards. The surgical team and the healthcare provider must have appropriate insurance and legal protections. This can protect the company financially in case of possible civil liability.

Informatics Competence of Healthcare Personnel

The informatics competence of healthcare personnel in robotic surgery is critical for safe and effective surgical applications. The effective use of technology by healthcare personnel enables them to solve problems that occur and provide quality service in patient care (Merih vd., 2019).

Since robotic surgery is a surgical application that requires the effective use of advanced technology, the informatics competence of healthcare personnel is of great importance. Healthcare personnel, especially surgeons, should have the competence to use robotic surgery systems effectively. Their understanding of the controls and other features of robotic surgery systems greatly helps them to increase their usage skills (Borycki & Foster, 2014).

In cases where technical problems occur in robotic surgery systems, healthcare personnel should have the competence to identify and solve these problems. Imaging systems used during robotic surgery are usually high-resolution and three-dimensional. Healthcare personnel should be able to monitor and analyze the surgical process by using these imaging systems effectively. Robotic surgery often generates large amounts of digital data. Medical personnel must be able to effectively analyze and interpret this data correctly. The security of the data used in robotic surgery systems is of great importance. Healthcare professionals should be conscious about protecting the patient's privacy and ensuring the security of the data.

Healthcare personnel should follow the developments in the field of robotic surgery and continue to receive regular training. This will help them adopt new technologies and methods. Robotic surgery often requires multidisciplinary teamwork. Healthcare personnel should have effective communication and collaboration skills in harmony. In the process of patient care and recovery after robotic surgery, healthcare personnel should be able to effectively educate patients on robotic surgery results, care processes, and monitoring processes (Borycki & Foster, 2014).

Overview of Robotic Surgery Nursing

A qualitative descriptive research article published by Kang and colleagues in the journal Computer Informatics Nursing in 2016 examining nurses' experiences of working in robotic surgery identified major themes in the field of robotic surgical nursing that we

discuss today and are still trying to shape. Patient safety in robotic surgery, control of robot functions, errors and malfunctions caused by the robotic system, feeling of burden on the robotic surgery team, and finally the need and desire for more information and training. Just by taking these themes as a reference, the burden and roles arising from robotic surgery for surgical nurses are understood (Kang vd., 2016).

Surgical treatment offers faster and more radical solutions than medical treatment for various health problems. On the other hand, more complex and complex units, more technical equipment, and technological applications are required. Today, many surgical procedures require the use of high-precision devices and materials. All professional healthcare professionals involved in surgical treatment and care must have the skills to use devices and materials related to their field of responsibility and must be able to understand and manage the technological impact. This is possible if each member of the team gains qualifications in technological devices and applications. Just as a chain is only as strong as its weakest link, in surgical units, which are considered a high-risk environment, the success of the patient's treatment and care depends on the quality of each member of the healthcare team. Surgical nurses undertake various duties at multiple points during the treatment and care process. The surgical patient experiences a three-phase experience called the perioperative period. The first phase of the process is the preoperative period when the decision for surgery is made and the necessary procedures for the surgery are performed. This is followed by the intraoperative period, which takes place in the operating room, and finally, the postoperative period, which begins with the end of the surgery. The intraoperative period takes place in the operating room, in an isolated environment. The roles of scrub and circulation nurses working in this phase are quite different from surgical nurses working in the perioperative and postoperative phases. Only operating room nurses work during the intraoperative period of the surgical process. Although surgical nurses have very different duties and responsibilities in each phase of perioperative care, the main goal of surgical nurses is to provide and continue patient-centered care without interruption.

From the past to the present, operating room nursing, which covers the intraoperative period, has been accepted as the most technical part of surgical nursing. However, today, with the development and increasing use of technological equipment and applications in surgical treatment and care, the entire surgical process has turned into a more technical experience. The perioperative process carried out in line with all the technical and technological developments that will be explained in this section does not change the focus of surgical nursing. The focus is on people. Surgical treatment and care, which takes place within a complex network of machines, puts the responsibility on nurses to complete the surgical process safely for the patient. While all the technical equipment and devices used make more sensitive and critical surgical interventions possible, they also create various risks. For this reason, the roles played by surgical nurses are extremely important and vital in robotic surgery Redondo-Sáenz vd., 2023; Uslu vd., 2019).

Perioperative Care in Robotic Surgery

Developments in robotic surgical technology and its widespread use are changing the operating room environment and affecting the way nurses provide care to patients. The nursing discipline is in the process of producing immature scientific knowledge about care and other nursing roles in robotic surgery. The main reason for this is that robotic surgery is at the beginning of its development and widespread use. Current publications cover the preoperative, intraoperative, and postoperative care and roles of the nurse. The references used in this section specifically focus on informing and supporting the patient about the robotic surgery process, giving the patient an appropriate surgical position for robotic surgery, and drawing attention to the risks and complications associated with this position and the prolongation of the surgery time. In general, it has been emphasized that, in addition to the reported advantages of robotic surgery, it also poses risks in terms

of patient safety and that the nurse has an important role in ensuring patient safety. Additionally, attention is drawn to the responsibility of the operating room nurse in preparing the robotic surgical system for surgery (Martins vd., 2019).

Preoperative Period

Preoperative preparation is important as it positively affects the success of the surgery. Preoperative care in robotic surgery is like that in laparoscopic surgery. Completing physiological, psychological, and legal preparations, and informing and educating patients and their relatives are the issues of preoperative care. Patients and their relatives should be provided with adequate information about the robotic surgery procedure, questions about robotic surgery should be answered, and the patient's fears and concerns about the surgery should be eliminated. It is part of the nurse's professional responsibility to provide information and support to the patient when necessary. While the surgical treatment process is relatively more complicated than other options, robotic surgery can increase the level of unknowns and anxiety for the patient. For this reason, the clinical nurse should perform the function of informing and providing support to the patient by eliminating their own knowledge and training deficiencies and strengthening their skills based on robotic surgery. To provide qualified perioperative care in robotic surgery; i.) nurses should receive training on robotic surgery and patient care undergoing robotic surgery, ii.) professional and institutional standards should be developed in robotic surgery practices to ensure a quality environment that will ensure the safety of surgical patients, iii.) the knowledge required by robotic surgery in the patient's preparation for surgery, It is important to develop the materials required for training and support initiatives with a technological approach. All of these are beyond standard surgical nursing roles and require special effort to translate into practice (Martins vd., 2019; Francis, 2006; Lichosik, 2014).

Intraoperative Period

The scrub and circulation nursing roles for the operating room also apply to robotic surgery. The main division of labor should be in line with the principle of working within the limits of surgical asepsis. The nurse is responsible for directing the robotic device under the guidance of the surgeon during the intraoperative period. Unlike classical surgery, the preparation and calibration of the robot for surgery, the functions of sterile parts, and connector connections are within the responsibility of the nurse (Martins vd., 2019; Dusik-Fenton & Peabody, 2011). Table 1 shows the additional responsibilities of the operating room nurse arising from robotic surgery.

In robotic surgery, the operating time may be longer. Additionally, this form of surgery may require the patient to be placed in a position where the robotic arms will work most efficiently. This position can be challenging for the patient and sometimes even cause positional damage. Prolonging the duration of surgery and keeping the patient in the same position for a long time increases intraoperative risks and complications. To avoid these risks and complications, ensure patient safety, and minimize errors, it is important to use a standardized checklist specific to robotic surgery. Existing checklists may be insufficient in the transition from classical surgery to robotic surgery. For safe and successful surgical operations, current practices should be evaluated, evidence-based current checklists should be developed and standardization in this field is needed. Responsibility and space conflict in the operating room environment may be another risk for robotic surgery. Considering the importance of the operating room nurse in coordination, it can be said that they should also take responsibility for reducing this risk (Martins vd., 2019; Hortman & Chung, 2015).

Table 1.
Additional Responsibilities of the Operating Room Nurse in Robotic Surgery

• Providing and checking cable and connector connections of robotic equipment
• Checking robotic equipment and tools and making them ready for use
• Preventing contamination of tools and robotic equipment in the sterile field during surgery and protecting the sterile environment
• Detecting systemic and technical problems, and damaged equipment and reporting them to the relevant unit to resolve the problem.
• Implementation of emergency procedures in case of a malfunction/problem with the robotic system during surgery; Completion of appropriate surgical preparation for the procedure before surgery
• Making the necessary preparations in case of switching to laparoscopic or open surgery.
• Positioning the patient appropriately for the surgery and supporting pressure points
• Evaluating the patient's condition throughout the surgery and protecting it from possible injuries and risks
• Supporting the coordination between the operating room team, especially the surgeon, and the robotic system

Postoperative Period

Postoperative patient care in robotic surgery is in line with standard care principles. Due to the advantages of robotic surgery, the patient's hospital stay is generally shorter. Pain control is better, mobilization is faster, and the risk of infection is lower. Patients can return to daily life in a shorter time. This shortens the nurse's intervention time in postoperative evaluation and especially discharge education. It may be necessary to change the content and method of postoperative patient education. In addition to face-to-face education and information, the training content can be given to the patient in writing. Moreover, information-education resources should be recommended for patients and their relatives through web applications, mobile applications, and other digital media channels. The patient's questions regarding postoperative care should be answered, and the communication channel should be kept open for post-discharge information and training needs (Francis & Winfield, 2006).

Nurses' Perception and Approach Towards Robotic Surgery

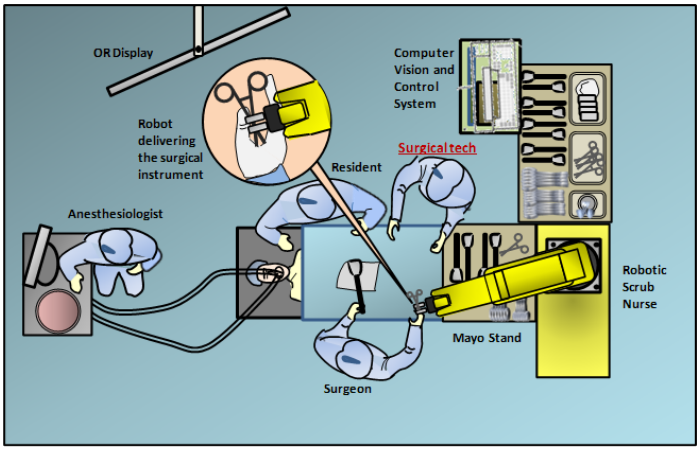
The care service provided in the preoperative and postoperative periods makes the nurse one of the healthcare professionals who have the most communication and interaction with the patient. In the intraoperative period, in addition to patient care, he was responsible for the preparation and coordination of the robotic surgical system and operating room. In robotic surgery, the nurse is always with and at the service of the patient throughout the perioperative process. These factors make nurses' perceptions and opinions about robotic surgery important for the future of robotic surgery. Nurses' perceptions and opinions regarding robotic surgery are also necessary to plan and update nursing education.

The literature examining nurses' views on robotic surgery is just beginning to emerge. According to the current literature, nurses' opinions and approaches to robotic surgery are generally positive. A significant portion of nurses consider robotic surgery preferable for both their patients and themselves. Although it is anticipated that the surgery will take longer and there will be an increase in risks due to the patient remaining in the same position for a long time, the advantages provided by robotic surgery are positively reflected in nursing care. The surgery can be completed with less invasive procedures, delicate interventions are possible with less incision and blood loss, and the level of success in difficult procedures increases; It positively affects the success

of the treatment and the healing process. Thus, it is easier for the patient to recover and mobilize in the postoperative period. Early mobilization and recovery support the patient's independence and return to daily living activities. All of these are among the surgical nurse's care goals. The widespread use of robotic surgery offers a new area of expertise for nurses. The surgical nurse can be a bridge between the patient and other members of the team for robotic surgery. Although nurses' perceptions and opinions about robotic surgery are positive, some of them are experiential and the other important part is internet-based. To improve nurses' perceptions of robotic surgery based on scientific knowledge, the educational content and the curriculum in general need to be updated. Although nurses' perceptions and attitudes are positive, the lack of scientific knowledge also brings anxiety and reservations. Changes in nursing roles, patient and team expectations from the nurse, performance adequacy, standardization of authority and responsibilities, and the complexity of technology are among the main sources of concern. Eliminating these concerns and eliminating reservations will undoubtedly be possible through education. Failure to provide this adequately may result in nurses' resistance to technological change, alienation from their jobs, and a decrease in the quality of care (Alcan vd., 2019; Moloney vd., 2023; Uslu vd., 2019).

While technology transforms and optimizes some business processes in the healthcare industry, it can also cause changes in some professional groups. This chapter of the book you have in your hand covers the change that robotic surgery has created in the nursing process. Similar transformations and changes also apply to surgeons. The question arises whether the technological transformation and change provided by robotic surgery should cause professional concern for surgeons and nurses. Could Gestonurse, which produces an alternative to the surgeon-scrub nurse collaboration, be a symbol of an embodied source of professional anxiety? Gestonurse is a robotic system that acts like a scrub nurse in delivering surgical instruments to the surgeon, promising speed, and fewer errors. It is argued that Gestonurse, a robotic surgical nurse, can prevent assisting errors, especially those caused by communication gaps (Jacop vd., 2012). Despite such alternatives, technology continues to be used to support healthcare professionals and improve business processes. The human touch, empathy, and personal experience remain as important for the surgeon as for the patient. The human factor within the framework of professional healthcare professionals plays an indispensable role in the healthcare sector and will probably continue to do so.

Figure 2.
Scrup Nurse Gestonurse (Reference: https://web.ics.purdue.edu/~jpwachs/gestonurse/)



Increasing the knowledge level of surgical nurses about robotic surgery through various means, such as in-service training, reduces their anxiety and supports the increase in the quality of care. The training supports nurses to play a more active role in robotic surgical care. For this reason, it will be useful to update knowledge through regular and continuous in-service training (Ergin vd., 2023).

Nursing Training for Robotic Surgery

In this section of the book, as explained in 3 subheadings, perioperative nursing care shows similarities and differences in robotic surgery. Robotic surgery procedures differ from current practice, especially in the intraoperative period. However, there are also significant changes in preoperative and postoperative procedures. In addition to providing complete care in robotic surgery, the necessary training for the team to work in harmony should be added to the formal curriculum. Training programs for nurses for patient care in robotic surgery will enable them to gain professional competence and confidence. However, with updated training in this field, risks for patients can be reduced and positive results in nursing care can be contributed. Nurses who are members of the robotic surgery team should improve themselves in robotic surgery and increase their knowledge by participating in in-service training, congresses, conferences, and training and courses organized by companies that install robotic surgery systems. Well-trained personnel are as important as technological equipment and tools for the success and development of robotic surgery. Nurses who are professional in this field; should also undertake tasks such as guiding and supporting inexperienced people in the field, strengthening their competence, and contributing to the development of standards (Francis, 2006; Sarmanian, 2015).

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