

RESEARCH ARTICLE

Innovation and Surgical Care in Nursing

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Abstract

Innovation makes contributions to the patient care process, work order, and the speedup of development. Innovative products consist of technological tools for preventing illnesses, reducing the time of hospitalization, increasing patient comfort, and making the care professional. Florence Nightingale emphasized the need for using innovative products saying "We should change life instead of complying with it" and gave place to important transformations in health. While determining the technology they will use in the care of surgical patients, nurses should actualize the care practices paying attention to these practices being applicable, employable, and creditable and their legal and ethical aspects. Innovative technology is used in many areas of surgery, and this fact propounds the importance of innovation in surgical care. Studies in which innovative practices are applied in nursing are insufficient in our country. For this reason, it is thought that innovative practices in nursing need to be developed. In this review, it is aimed to draw attention to the necessity and importance of innovation in nursing.

Keywords: Innovation, Nursing care, Surgical innovation, Technology

Introduction

Lexically, innovation is derived from the Latin word "innovatus," which means "making something new and different" (Özbey & Başdaş, 2018). The importance of innovative knowledge is gradually increasing, and it rapidly changes the health care practices (Ayvaz et al., 2019).

Innovation contributes to the work order and the development's speedup beside the current approaches (Özbey & Başdaş, 2018). Innovative products are the tools that prevent diseases, shorten the hospitalization time, provide patient comfort, and reduce the pain levels of the patients, and they are tools used in making care management professionals (Weng et al., 2016).

The innovation aims to enable nurses to think multi-dimensionally in patient care, to increase their decision-making skills, and to increase satisfaction in care results. The advancement of technology enables patients to change their perception of care and increase their satisfaction toward care positively (White et al., 2016).

The Center for Nursing Innovation (FoNS), serving in England, develops methods for patient needs and nurses serving in the fields of health and social care. To support innovative developments, FoNS provides nurses and other health care professionals with information, resources, and communication with other institutions through the "Virtual Nursing Innovation Center" (Aksoy, 2016; Kara, 2016; Kartal & Kantek, 2018).

In Turkey, the Innovative Nursing Association was established in 2016 to develop innovation in nursing. The association was established to guide and direct nurses who are interested in innovation studies in the field of nursing (İnovatif Hemşirelik Derneği, 2016).

The Place and Importance of Innovation in Surgical Care

Innovative developments have led to important transformations in health, changing the way of presentation of diagnosis/treatment methods (Kara, 2016). Laser technology, bloodless surgical methods, robotic surgery, and many other treatment methods that are products of innovative technology increase the quality of patient care (Kartal & Kantek, 2018).

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While determining the technology they will use, nurses actualize the care practices paying attention to them being applicable, employable, and credible; their level of effectiveness and cost; and their social, legal, and ethic aspects (Aksoy, 2016).

Current technologies, information technology systems, telemedicine, telehealth services, programmed infusion systems, and current approaches in surgical techniques are among the aspects of the care of surgery patients. Innovative technology is used in many areas of surgery, and this fact propounds the importance of innovation in surgical care (Sarioğlu, 2014).

Nursing profession, which plays a role at all levels in meeting basic human needs such as health promotion, protection, treatment, care, and rehabilitation, has to renew itself in order to survive, increase the quality of care, improve patient outcomes, and provide cost-effective care (Kartal & Kantek, 2018). For example, a decrease in the postoperative pain levels of patients after the operations made with trans-luminal endoscopic surgery as a minimally invasive surgery technique decreases the use of analgesics and provides a cosmetically good look (Kara, 2016).

The first studies on innovation in nursing in Turkey were made by one of our nursing leaders, Perihan Velioğlu. These studies have made important innovations in nursing, such as the use of green operating room textiles, the need for higher education, and the emphasis on teamwork in nursing (Özbey & Başdaş, 2018).

Maintaining health and meeting health care needs satisfaction is one of the basic human rights. Nurses, who play important roles in the protection and development of health, also need to renew themselves in parallel with innovations and developments. The development of technology, the change and increase in the types of diseases, the change in the demands of health care services, and the increase in the expectation of the society necessitate changes and innovations in nursing. It is reported that it will bring positive results such as the identification and prevention of diseases, reduction of return to hospital, and improvement of patient outcomes (Gibson & Kelly, 2010; Özbey & Başdaş, 2018)

Main Points

- Robotic surgery or robot-assisted surgery is the surgical intervention actualized in a patient by a robot.
- Electrosurgical instruments provide important benefits such as faster completion of the surgical process and more precise surgical incisions.
- Silver-containing hydrofiber dressing materials are the most preferred dressing materials during postsurgical wound care.
- PCA devices are devices that can be used after surgery that allow the patient to self-administer analgesics, increase patient satisfaction, and minimize drug-related side effects.
- AI technology can enable preoperative and intraoperative planning, imaging, and surgical interventions to be continued more successfully.
- VR and AR applications are a technology that allows nurses to combine their learning environments with the real world they live in and to seamlessly apply the learned knowledge and skills.

Innovative Approaches in Surgical Care

Robotic Surgery

Robotic surgery or robot-assisted surgery is the surgical intervention on a patient by a robot (Alcan et al., 2019). Robotic technology was practiced in 1985 in brain and nerve surgery for the first time, and it was practiced in urological and orthopedical surgeries later (Dede et al., 2013). The dimensions of the robots got smaller, their functions increased, and operations were started to be made with robots that gave three-dimensional images with the advance in technology.

In Turkey, the first robotic surgery was practiced in 2004 at a private hospital and in 2008, it was started in the hospitals of the Turkish Ministry of Health. Twelve robotic surgeries were practiced in 2010. Robotic surgery has advantages such as smaller incisions, a decrease in the number of people in the team, fewer postoperative surgical complications, an increase in early mobilization, and early discharge status (Irmak, 2016).

The usage areas and numbers of robotic surgeries have increased in recent years. Despite the decrease in the number of people in the team during robotic surgery interventions, the need for nurses, who are important members of the operating room team, continues. It is reported that interventions performed with robotic surgery provide significant comfort and increase patient satisfaction in the preoperative, intraoperative, and postoperative periods (Şengün, 2016). As important members of the surgical team, nurses should be aware of their duties and responsibilities to adapt to this constantly developing technology (Irmak, 2016).

In a study, 90.6% of the nurses stated that they had heard the term robotic surgery before, 34.6% had sufficient knowledge about robotic surgery, and 68.9% reported that they would prefer robotic surgery if they needed surgery in the future (Alcan et al., 2019). It has been reported that robotic surgery has clinical and cost-effective advantages over standard laparoscopic or open surgeries, but research is needed to develop procedures (Diana & Marescaux, 2015).

Electrosurgery

Electrosurgery tools are among the most frequently used tools by surgeons (Peprah & Spry, 2019). These devices provide important benefits such as less postoperative pain, less intraoperative bleeding, faster completion of the surgical process, and more precise surgical incisions (Lane et al., 2016).

Electrosurgical devices are frequently used during endoscopic applications such as polyps removal, bleeding arrest, and tissue resection during surgical interventions performed in operating rooms and outpatient settings (Meeuwse et al., 2017). It is also known that many of these devices and instruments produce foul-smelling and toxic smoke in the operating room that can pose a health risk to both health care workers and patients (European Operating Room Nurses Association [EORNA], 2018; Occupational Safety and Health

Administration [OSHA], 2021; Aydın et al., 2021). This smoke has various names such as “surgical smoke, cautery smoke, diathermy smoke, smoke cloud, smoke, steam, aerosol, bioaerosol, and air pollutants” (Usta et al., 2019; Yavuz Van Giersbergen et al., 2019).

In electrosurgery, at 70°C, the proteins lose their original structure and solidify, which phenomenon is called coagulation. When the temperature of the tissue is suddenly increased from 37°C to 100°C, the cell fluid evaporates, the cell bursts, and an incision occurs. This process causes the formation of surgical smoke and the dispersion of fine particles into the atmosphere (Işık & Abbasoğlu, 2020). Particles of different sizes are produced using different surgical instruments. Particles of 0.–0.8 micrometer (μm) are produced by electrocautery, and 0.35–6.5 μm particles are produced by laser processes and ultrasonic scalpels. The smaller the particles, the better they can enter the body and cause more cellular damage (Mowbray et al., 2013).

In a study, it was stated that the particle size was important, particles smaller than 100 μm remained in the air, particles of 5 μm or larger can be accumulated in the upper respiratory tract, and particles smaller than 2 μm easily accumulated in the alveoli (Bratu et al., 2015).

Surgeons and nurses are generally exposed to more surgical fumes than other surgical team members because they are in the operating room for longer periods (Steege et al., 2016).

In a study conducted with operating room nurses, it was determined that 73.2% of the nurses had at least one symptom related to exposure to surgical smoke. It was determined that 57.3% of them experienced acute and chronic inflammatory respiratory changes, 51.2% of them experienced headaches, 39.1% of them experienced nausea and vomiting, and 34.1% of them experienced hypoxia and dizziness (Yavuz Van Giersbergen et al., 2019).

In another study, it was determined that 87.3% of the nurses experienced a symptom related to surgical smoke, 71.8% complained of headache, 64.3% of them complained of nausea, and 57.7% of them complained of cough (Okgün Alcan et al., 2017).

In a study conducted in Northern Cyprus, it was found that 82.1% of health workers were exposed to surgical smoke and 47.8% had a headache, 35.8% had nausea, and 31.3% had a cough and burning in the throat. It was reported that 29.9% had eye irritation and tearing and 22.4% had respiratory problems (Aydın et al., 2021).

Wound Care

Nurses are primary health professionals who play an active role in wound care and provide care (Rızalar et al., 2019). The primary target in the wound care process is provide to provide a minimum complication rate and rapid recovery using up-to-date methods and care products. For nurses to maintain wound care effectively, they should evaluate the wound

and have sufficient knowledge about the wound healing process.

The primary purpose of healing the wound is that it is the preparation of the necessary environment for recovery. For this purpose, the wound care material should provide bleeding control, remove dead tissue and pus, protect the wound from trauma, reduce the level of pain, drain the excess fluid in the environment, provide an ideal moist environment, and reduce the rate of infection (Welsh, 2018).

Many biological and synthetic dressing materials have been developed for postsurgical wound care. Nurses should pay attention to the practical use of the dressing material, its low cost, high absorption, and nonadherence to the wound. Silver-containing hydrofiber dressing materials are among the most frequently preferred dressing materials today (Vural & Savcı, 2017).

In a study, it was reported that only 3.3% of nurses used this method during wound care. This rate indicates the fact that the knowledge gap of nurses about current wound care materials should be closed (Rızalar et al., 2019).

Another method in wound care is the use of honey. It is reported that honey is effective against antibiotic-resistant bacteria (Methicillin-Resistant *Staphylococcus Aureus*, MRSA; Vancomycin-Resistant *Enterococci*, VRE; and *Pseudomonas* Family) found in infected wounds, but its cost is quite high. According to the results of a systematic review, it is stated that honey accelerates healing in all wounds, and it is reported that there is evidence showing its antibacterial effect in burn wounds (Vural & Savcı, 2017).

Patient-Controlled Analgesia

Postoperative pain is a negative experience experienced primarily by the patient, nurses, physicians, anesthetists, and other health care professionals. Postoperative pain that is not well-managed, which can lead to a decrease in the vital capacity of the patient, disruption of sleep patterns, decreased comfort, and delayed wound healing (Şenaylı et al., 2019). The application of analgesics by different routes (oral, epidural, intravenous [IV], and transdermal) allows the use of nonpharmacological analgesic techniques and the highest level of pain control with patient-controlled analgesia (PCA) (Morlion et al., 2018).

PCA allows the patient to self-administer analgesics. This method is aimed to increase patient satisfaction and minimize drug-related side effects. PCA is an application that gains importance in the “personalization of treatments” approach of modern medicine (Polanco-García et al., 2017). The effective use of the PCA method provides the desired results with the cooperation of patients, nurses, and other health professionals. The surgical nurse plays important roles such as how to use this device, patient education about the use of the device, follow-up of the patient, and evaluation of the treatment effectiveness (Çilingir & Şahin, 2016).

According to the results of the research, it was found that the use of PCA after abdominal surgery is effective in reducing pain intensity, increasing patient satisfaction, and reducing the number of analgesics used (Shariati et al., 2014).

Artificial Intelligence

Artificial intelligence (AI) in health care is predicted to have a significant and positive impact on clinical workflows, patient outcomes, and accurate image interpretation (Korndorffer et al., 2020). It has been reported that AI in surgery has gained significant popularity as a tool for analyzing surgical videos and has begun to be used effectively in surgical sciences (Maier-Hein et al., 2017).

With AI, surgical interventions are more successful with early detection techniques provided in both preoperative and intraoperative planning, imaging, and navigation, and AI technology underlies this success. The use of AI technology in the health sector is still limited today (Etienne et al., 2020). AI is used in many areas in nursing, from preparing treatment plans to facilitating repetitive tasks and creating medicines (Çetin & Eroğlu, 2020; Pepito & Locsin, 2019). AI in nursing can improve the organization of routine practices and treatment plans in the clinic. In addition, it can provide all the necessary information for nurses to make the right decisions (Bini, 2018). AI systems have advantages that can reduce the treatment and diagnostic errors that are inevitable in human clinical applications, and it is thought that programming a humanmade robot with AI that can make clinical decisions may pose a risk for the nursing profession (Şendir et al., 2019). It should not be forgotten that ethical concerns and the safety of individuals should be considered during the use of artificial intelligence technology (Tanioka et al., 2017).

Virtual Reality and Augmented Reality Applications

Advances in Virtual Reality (VR), stereoscopic 3D cameras, and augmented reality (AR) cameras are some of the areas of innovation in the coming years. The first application of VR in health care was implemented in the early 1990s to visualize complex medical data during surgery and to plan surgical procedures preoperatively (Khor et al., 2016). AR is another innovative technology. AR, which has been shaped in different dimensions with the spread of mobile devices and the diversification of wearable technologies, has caused learning environments to change (Altınpulluk, 2019). AR is a technology that allows nurses to seamlessly apply the learned knowledge and skills by combining their learning environments with the real world they live in (Kamphuis et al., 2014).

It is seen that VR applications are a frequently used method in nursing education. In a study in which a VR simulation system designed by nursing students for indwelling urinary catheter application skill training was used, it was reported that VR simulation group students learned the urinary catheter application skill steps more easily and that it could be used as a support system in indwelling urinary catheter application skill training (Smith & Hamilton, 2015). In a study conducted by İsmailoğlu (2015) in Turkey, it was

determined that the IV vascular access skill scores and the satisfaction scores of the students in the intervention group, who were trained with the virtual simulation system IV virtually of nursing students, were significantly higher.

Over the years, depending on the advancing technology, it has improved technically, visually, and functionally and its nearness to reality features is increased. Therefore, it is thought that the fact that simulation systems are more developed by being influenced by today's technology has positive effects on the skills training of VR and simulation systems used in the nursing education process.

Innovation will have positive and negative effects on the nursing profession in the future. The benefits of innovation to the health sector will not change the fact that the nursing profession will become a more respected and indispensable part of the health sector in the future. Innovation in surgical care is advancing for three main purposes: (1) fewer surgical complications, (2) early mobilization, and (3) early discharge. These aims have been developed to increase the satisfaction of patients with care and to increase the job satisfaction of health professionals. In this context, soon, nurses will be able to transfer routine clinical tasks to robot technology, reducing their workload and enabling more complex nursing care to be maintained at the desired level.

The nursing profession has to adapt to change and development to meet the health needs of the near future. In this sense, nurses should take an active role in nursing care by using technology at the highest level. In the light of technological developments, necessary changes in nursing education and curricula will be inevitable. It is thought that basic topics such as artificial intelligence, innovation in nursing, robot nurses, and the use of robot nurses will be included in the nursing education curriculum.

In conclusion, in the light of technological developments, it is expected that nurse educators and administrators, nurse educators and managers, nurse candidates, and graduate nurses will make the necessary effort to benefit from technology to present quality nursing care.

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