EDITORS

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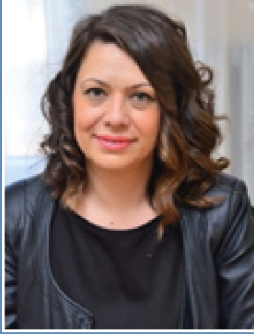# NURSING IN ALL AREAS: CARE, EDUCATION AND INNOVATION

BZT TURAN

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Asisst Prof. Dr. Dilek ÇEÇEN ÇAMLI

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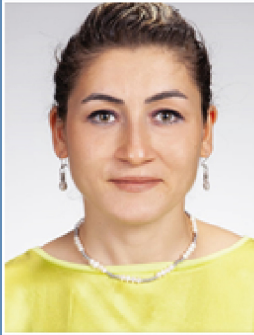
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PREFACE

Nursing, which has developed over time, is a branch of science and art that deals with the health of the individual, family and society. It is a profession with a wide application area where activities are carried out to protect, maintain and improve the health of the individual. Nurses undertake the task of helping people not only when they have health problems, but also in every process and in every field from birth to the end of life. This volume has been created to present the development of a wide range of nursing care under the influence of current and technological changes.

Nursing, an applied profession in which theoretical knowledge is combined with practical skills, continues to develop continuously under the influence of social, scientific and technological changes. Today, rapidly developing health services and the reflections of new technologies on care lead to changes in the traditional roles and functions of the workforce nurse and the consideration of patient-centered care models. This book is both a guide and a source of inspiration for professionals who want to fulfill the current roles and practices of nurses with creative, up-to-date and evidence-based strategies.

The chapters in these pages highlight a wide range of topics, including the reflections of innovation on care processes in various areas of nursing and innovative educational approaches that prepare the next generation of nurses.

Each contribution offers valuable insights, practical perspectives and real-world applications that reflect the dynamic nature of modern health systems. As you study this book, we encourage you to embrace the nature of the nursing profession and the need for nursing care for people in all circumstances and at all ages. We hope that this book will inspire you to contribute to a professional health care environment that embraces technology and innovation and is able to step outside its traditional roles. We are grateful to the authors and contributors who have enriched this book with their expertise and vision.

Asist. Prof. Dr.Dilek ÇEÇEN ÇAMLI

Asist. Prof. Dr.Çiğdem Gamze ÖZKAN

CONTENTS

COMMON PROBLEMS AND MANAGEMENT IN THE ELDERLY CANCER PATIENT

Esin SEVGI DOGAN[1]

1. INTRODUCTION

Cancer is a fatal disease that can spread by uncontrolled proliferation of abnormal cells in tissues/organ. According to the data of the World Health Organization (WHO), cancer ranks second among the diseases that cause death worldwide (WHO, 2024A). 9.743.832 cancer-related deaths occurred worldwide in 2022 (WHO, 2024B) When the cause of death data of the 'Turkish Statistical Institute (TSI)' for 2022 were examined; it was reported that 12.6% of the deaths occurred were due to tumours (benign/malignant) cancer (TSI, 2024). In the literature, it is reported that the incidence of cancer increases with age (WHO, 2024A). Age is an important risk factor for cancer disease. The elderly account for 71.3% of all cancer-related deaths (Li, Shan, Zhang and Ma, 2024). According to the 2018 statistical data of the 'Ministry of Health, Public Health Institution of Turkey, Department of Cancer (MHPHITDC)', the most common types of cancer in elderly individuals are lung cancer in men and breast cancer in women (MHPHITDC, 2018).

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1.1. Cancer Physiology in Elderly Cancer Patients

Cancer, which is a disease with a high mortality rate, has become one of the most important health problems that should be emphasised with the increasing world population and the number of elderly people (Li et al., 2024). Some molecular and cellular changes that occur especially in advanced ages increase the risk of cancer in the elderly. Age-related telomerase instability, prolonged exposure to carcinogenic agents, accumulation of cells belonging to carcinogenesis in the tissues, decreased regenerative capacity of deoxyribonucleic acids (DNA), immune and endocrine system changes, impaired apoptosis repair or regeneration ability of cells, oncogene activation, weakening of immunity and loss of tumour suppressor genes are physiological mechanisms that may lead to cancer development in elderly individuals (Boccardi and Marano, 2024; Montégut, López-Otín and Kroemer, 2024).

Oxidative mitchocondrial DNA damage: The increase in oxidative stress associated with ageing leads to accumulation of oxidised proteins and increases in membrane lipid peroxidation. At the same time, with aging, mitochondrial oxidation renders cells more prone to apoptosis (Zhou et al., 2024). It has been reported that oxidative DNA damage can cause malignancy (Hayes, Dinkova-Kostova and Tew, 2020).

Teiomer shortage: Telomeres shorten continuously throughout life (Shay, 2016). Therefore, telomere length determines the lifespan of cells. When telomeres shorten to a critical length, the senescence programme is activated. After that, cell division stops. However, they continue to live and function (Bilici, 2020). In advanced malignancies, telomerase is reactivated and telomere length is stabilised. Also, there is the ability of continuous cell division (Shay, 2016).

Immunity: A good functional immune system is most important for the prevention of malignancy. However, aging leads to defiency of immune functions. Due to this deficiency, an effective immune response against a malignency fail (Fulop et al., 2018; Müller, Di Benedetto and Pawelec, 2019).

Comorbidity conditions: It is known that comorbidities, which are more likely to be seen in old age, also increase the incidence of cancer (Williams et al., 2016).

Carcinogenic agents: Exposure to carcinogenic agents for a long time, oncogenic activation, anti-oncogene defects, decreased immunity and increased DNA damage are factors that increase the rate of cancer in elderly

individuals. In addition, the rate of DNA mutation due to shortening of telomeres increases with aging, and the risk of cancer increases even more as a result of impaired DNA repair mechanisms and decreased immune functions (Wolf, 2021).

1.2. Common Problems And Nursing Care in Gertiatric Cancer Patient

1.2.1. Anemia and Fague in Elderly Cancer Patients

Anemia is one of the problems that occur in the majority of cancer patients. In elderly individuals who do not have cancer, anaemia occurs due to factors such as iron deficiency, crobic kidney disease, chronic inflammation, folate and vitamin B12 deficiency (Ludwig, Wedding, and van Belle, 2012). In addition to these factors, anaemia can be seen in cancer patients with the addition of tumour-related bleeding, tumour invasion to the bone marrow, chemical factors produced by the tumour and cancer treatment-related causes (Escobar Álvarez et al., 2021).

Although the problems associated with anaemia vary biologically, symptoms such as fatigue, pale skin, cold extremities, rapid or irregular heartbeat, shortness of breath, chest pain, headache, dizziness, syncope and hypotension occur as a result of decreased oxygen supply to tissues and organs (Gadó, Khodier, Virág, Domján and Dörnyei, 2022). Fatigue is the most common symptom related to anaemia in cancer patients. In elderly cancer patients, impaired mental capacity, confusion, depression, nausea, loss of appetite, shortness of breath, syncope and falls may occur.mIn addition, it causes a decrease in the physical capacity and muscle strength of the elderly and decreases mobility and quality of life (Gómez Ramírez, Remacha Sevilla and Muñoz Gómez, 2017).

The American Society of Clinical Oncology and the American Society of Haematology state that chemotherapy-related anaemia should be treated (Ludwig et al., 2012). The goal in the management of cancer-related anaemia is to reduce the patient's need for blood transfusion, improve fatigue and quality of life, respond well to antineoplastic therapy and increase survival (Balducci, Falandry and List, 2022). Treatment methods of cancer-related anaemia are erythropoiesis-stimulating agents, erythropoietin, erythrocyte transfusion or iron replacement therapies (Madeddu et al.,2018). With the mediation of this treatment, patients' haemoglobin levels are tried to be kept at an average of 12 g/dl (Balducci et al., 2022).

Fatigue is the most common symptom related to anaemia in cancer patients (Gómez Ramírez et al., 2017). For the management of fatigue in cancer patients, the patient and his/her relatives should be educated, a patient-specific nutrition and exercise plan should be created, cognitive and behavioural therapies should be used, appropriate complementary and alternative treatment and pharmacological treatment approaches should be used (Karabulutlu, Akbaba and Güneş, 2023). In this context, for the management of fatigue;

- Before and during active treatment, cancer patients and their relatives should be informed about the possible causes of fatigue, the severity of fatigue, how long it will last and options for managing it (National Comprahensive Cancer Network (NCCN), 2025),

- In the information; cancer patients who will undergo radiotherapy, chemotherapy and biotherapy should be told that the level of fatigue will be moderate or severe during this period (NCCN, 2025),

- It should be explained that fatigue may be related to the disease or treatment (NCCN, 2025),

- It should be explained that experiencing fatigue does not indicate the effectiveness of the treatment (NCCN, 2025),

- In the training and information to be provided, approaches such as mutual discussion, goal setting, coaching and receiving feedback from the patient should be used to help patients cope with fatigue (NCCN, 2025),

- The exercise programme of cancer patients should be designed according to the patient's age, gender, cancer type and physical fitness level (NCCN, 2025),

- A comprehensive geriatric evaluation of the patients should be performed before the exercise plan of elderly cancer patients is developed, and the comorbid conditions of the patients should be taken into consideration (Soones, Ombres and Escalante, 2022)

- The nutritional plan for elderly cancer patients should be based not only on caloric status, but also on the patient's physical and cognitive capacity, such as chewing capacity, dentures, ability to go to the supermarket or grocery store to buy food products, and ability to cook and heat food (Soones et al., 2022).

1.2.2. Nötropenia and Risk of Infection in Elderly Cancer Patients

Chemotherapy is the main treatment approach used in cancer patients. One of the most common complications of this treatment approach is neutropenia (Bahar, Ovayolu and Ovayolu, 2019). Neutropenia is an important risk factor for the development of infection. (Atay, 2015). Pharmacological and nonpharmacological approaches are used in the effective management of neutropenia. For the risk of infection in patients with neutropenia;

- Alcohol-based antiseptics or soap and water should be used for hand hygiene in health institutions (Center of Disease Control and Prevention (CDS), 2023),

- Hands should be washed when visible contamination occurs, before and after each contact with the patient, after contact with the patient's body fluids and wastes, after contact with the patient's immediate environment, before putting on gloves and after removing gloves (CDS, 2023),

- To prevent oral infections, oral mucosa in elderly cancer patients should be regularly evaluated with scales with proven validity and reliability (Fong, 2019),

- Individual oral care protocols established with a multidisciplinary team should be used to ensure oral hygiene (Chaveli-López and Bagán-Sebastián, 2016; Yayla, 2017),

- A soft toothbrush should be used for brushing teeth (Al Jaouni et al., 2017),

- In the diet of the patient, foods such as raw or undercooked eggs, meat, fish, seafood and unpasteurised milk should be avoided, uncooked vegetables should not be consumed, fruit that is not sure to be sterilised should not be eaten, water should not be drunk (Garofolo, 2013),

- Food should be prepared daily, stored under appropriate temperature conditions and foods not consumed daily should be destroyed (Garofolo, 2013),

- Patient rooms should be ventilated with positive pressure ventilation systems (Bass et al., 2023),

- Health professionals who will care for patients should protect the patient by using masks, aprons, gloves immediately before entering the patient room (Bass et al., 2023),

- Live or dried plants and pets should not be kept in the patient room (Bass et al., 2023),

- The devices in the patient room must be cleaned daily (Bass et al., 2023).

1.2.3. Trombositopenia and Risk of Bleeding in Elderly Cancer Patients

The most common cause of thrombocytopenia in cancer patients is impaired platelet production. This condition is caused by the use of immunosuppressive and chemotherapeutic drugs or bone marrow suppression due to radiation therapy (Mones and Soff, 2019). While patients may experience ecchymosis and petechiae in the early stages, sometimes epistaxis, hemoptysis, hematemesis, melena, vaginal bleeding, and bleeding around wounds or at vascular access sites may also occur. Bleeding can lead to conditions such as hypovolemia and death in the patient, depending on factors such as the amount, duration and severity of bleeding (Mones and Soff ,2019; Shaw, Nielson, Park, Marongiu and Soff, 2021). For the management of thrombocytopenia and bleeding;

- Medical treatment should be applied according to the physician's order (Çömlekçi, 2020).

- The patient and family should be educated about bleeding risk factors, symptoms and bleeding prevention practices (Escobar et al., 2022).

- The patient's skin integrity should be protected. For this: skin hygiene should be provided, softening lotion should be used on dry skin (Çömlekçi, 2020).

- Invasive intervention should not be applied to the patient unless necessary (Çömlekçi, 2020).

- Oral care should be performed on sensitive gums, taking into account the patient's thrombolytic value: moisturizer should be applied to dry lips, a soft-tipped toothbrush should be used, alcohol-free products should be used in oral care, the mucosa should be evaluated for dryness in patients receiving oxygen support with materials such as nasal cannula and the moistness of the mucosa should be ensured (Çömlekçi, 2020; Rapone et al., 2017).

- Since coughing and sneezing can cause bleeding, appropriate medical treatment and precautions should be taken according to the physician's order (Çömlekçi, 2020).

- Constipation and straining can cause bleeding. Therefore, patients should be advised to eat high-fiber foods, consume plenty of fluids, massage the abdomen, and exercise (Wickham, 2017).

- Environmental safety measures should be taken to protect patients from trauma. The patient and their family should be educated about removing objects that may cause falls and collisions, not keeping sharp objects in the environment, and the patient should definitely wear slippers or shoes while walking (Clemson, Stark, Pighills, Torgerson, Sherrington and Lamb, 2019).

- Patients should be advised to use an electric shaver while shaving (Inbaraj et al., 2024).

- Patients should not have procedures such as pedicures and should not cut their nails deeply (Çömlekçi, 2020).

- Patients are advised not to wear tight and tight clothing (Çömlekçi, 2020).

1.2.4. Fever in Elderly Cancer Patients

Although fever, which is one of the body's defence mechanisms, is usually associated with inflammation and infection, it may occur due to causes such as medications, radiotherapy and tumour. Therefore, the underlying cause of fever should be determined by performing a comprehensive evaluation in elderly oncology patients with fever (Loizidou, Aoun and Klastersky, 2016). Pharmacological and non-pharmacological treatment methods are used for the effective management of fever in cancer patients (Dam, McCarthy and Ramsbotham, 2015). To manage fever in cancer patients;

- Patients should receive appropriate antibiotic treatment for fever caused by bacterial infections according to the physician's order, appropriate antiviral treatment for fever caused by viral infections according to the physician's order, and appropriate antifungal treatment for infections caused by fungal infections according to the physician's order (Kapucu and Akdemir, 2010),

- Whether the cause of fever is known or not, broad-spectrum intravenous antimicrobials should be started in all febrile neutropenic patients according to the physician's order for the risk of infection and fever (Çalışkan Yılmaz, 2007; Dam et al., 2015; Krzyzanowska et al., 2016),

- In patients with neutropenic fever, prophylaxis with granulocyte colony stimulating factor should be administered to improve the body's defence capabilities (Çalışkan Yılmaz, 2007; Dam et al., 2015),

- The patient and family should be informed about the risk of neutropenia and the precautions that can be taken (Çalışkan Yılmaz, 2007; Güleser et al., 2015),

- Appropriate hand hygiene should be ensured, protective isolation measures should be taken, skin integrity should be ensured and maintained, appropriate masks should be used, chlorhexidine baths should be taken, food should be prepared under appropriate conditions, appropriate nutrition programme should be established and catheter care should be provided (Çalışkan Yılmaz, 2007; Güleser et al., 2015),

- External cold application methods should not be used until antipyretic drugs begin to reduce the rising fever (Dam et al., 2015).

1.2.5. Dyspnoea in Elderly Cancer Patients

Dyspnoea is a symptom that is frequently encountered, especially in lung cancer, causes pain, gradually intensifies, and may be more difficult to manage than others (Crombeen and Lilly, 2020). This symptom may occur due to cancer, lung and treatment-related complications, tumour spread and irritation in the airways, pulmonary toxicity associated with immunotherapy, other existing diseases, and, although not common, side effects of radiation therapy (American Cancer Society, 2014; Hahn, Gill, Agarwal and Maughan, 2017; NCCN, 2022).

The care of patients with dyspnoea typically requires a multidisciplinary approach. The main goals of treatment and management of dyspnoea are to correctly identify and appropriately treat the underlying disease process, optimise recovery and improve dyspnoea symptoms (Budhwar, 2020). Management of dyspnoea includes both pharmacological and non-pharmacological interventions (Chin and Booth, 2016). To effectively manage dyspnoea;

- Opioids should be used as the first option in the treatment of cancer-related dyspnoea according to the physician's order (Duysinx et al., 2021),

- Corticosteroids should be used according to the physician's order, especially in terminal cancer patients and palliative care patients (Corcoran, 2013),

- Benzodiazepines should be used according to the physician's order in alleviating anxiety related to dyspnoea in cancer patients (Levy et al., 2009),

- Palliative oxygen therapy should be used in non-h poxemic patients (SaO2 ≥92%) with dyspnoea due to cancer and advanced cardiopulmonary disease (Hardinge et al., 2015),

- Nurses should evaluate hypoxia and hypoxaemia, apply patient-specific oxygen therapy and follow-up (Ernstmeyer and Christman, 2021),

- Small lip and diaphragmatic breathing techniques should be used to reduce respiratory distress in patients (Beasley, Stanton, and Aldridge, 2015),

- Nurses should correctly apply bronchodilators, corticosteroids, psychotherapies and opioids used in the management of dipsnea, and inform the patient about the indications, doses, usage and side effects of the drugs (Ernstmeyer and Christman, 2021),

- In addition to pharmacological treatment, appropriate nursing interventions for secretion clearance strategies, invasive and noninvasive ventilation modalities, energy conservation techniques, relaxation techniques, nutrition strategies and respiratory techniques should also be applied (Ernstmeyer and Christman, 2021).

1.2.6. Mucositis in Elderly Cancer Patients

Mucositis is the development of damage to the oral mucosa when chemotherapy, radiotherapy or chemoradiotherapy treatment stimulates the inflammatory process (Shetty et al., 2022). Mucositis, which is an important oral health problem, is one of the most common toxicities in the elderly receiving anticancer treatment (Suto, Inui and Okamura, 2022). In mild mucositis, only symptoms such as taste change and aversion to food are present, whereas in moderate to severe mucositis, important clinical findings such as mucosal oedema, redness, ulceration, bleeding and increased salivation are observed. Ulcerations in the oral mucosa predispose to the development of infection and sepsis. Patients complain of burning/pain in the oral cavity/throat, speech, eating, swallowing and drinking problems. Pharmacological and non-pharmacological treatments are used in the management of mucositis (Kamińska, Juszkiewicz, Tymicka, Bronikowska and Kolak, 2016). To manage mucositis;

- Sodium Bicarbonate can be used to maintain oral cleanliness (Hong et al., 2019).

- Chlorhexidine, its use in cancer patients has no beneficial effect on mucositis. Its use is not recommended (Hong et al., 2019).

- Benzydamine mouthwash can be used in patients with head and neck cancer receiving radiotherapy and chemoradiotherapy (Hong et al., 2019).

- Oral cryotherapy is recommended for the prevention of mucositis in autologous haematopoietic stem cell transplant patients receiving high dose melphalan or in patients receiving bolus 5 fluorouracil (Correa et al., 2020).

- Honey should be used as combined topical and systemic application for the prevention of mucositis in patients with head and neck cancer receiving radiotherapy and chemoradiotherapy (Yarom et al., 2020).

- Nurses should know the risk factors for the development of mucositis (oral health status before treatment, oral hygiene routine, presence of prosthetic teeth, etc.), perform daily intraoral examination of patients, monitor their physiological status (iron, folic acid and vitamin B12 levels, etc.) (Schub and Kornusky, 2017).

- Nurses should educate patients and family members about mucositis risk factors, prevention strategies and possible complications (Schub and Kornusky, 2017).

- In order to maintain the patient's hydration, nurses should monitor the fluid intake and output, encourage fluid intake of 8 glasses or more per day, and administer intravenous fluid therapy to the patient according to the physician's order (Schub and Kornusky, 2017).

- In order to support the patient's nutrition, nurses should monitor the patient's weight, provide the patient with a diet consisting of soft and light foods, and administer tube or parenteral nutrition when necessary according to the physician's order (Schub and Kornusky, 2017).

- Nurses should apply topical/systemic analgesics according to the physician's order to relieve the patient's pain due to mucositis (Schub and Kornusky, 2017).

1.2.7. Nausea and Vomiting in Elderly Cancer Patients

Nausea and vomiting are the two most feared side effects in patients receiving cancer treatment (Saito et al. 2013). Nausea and vomiting in cancer patients are usually related to radiotherapy and chemotherapy (Buluş, 2020; Roila et al., 2006).The risk of developing nausea and vomiting in elderly

individuals is lower than in younger individuals (Hu et al., 2014). On the other hand, since nausea and vomiting may cause serious problems such as dehydration and electrolyte deficiencies, appropriate management of nausea and vomiting in the elderly is very important (Herrstedt, Lindberg and Petersen, 2022). Both pharmacological and non-pharmacological approaches are used in the management of nausea and vomiting in the elderly (Doğan, 2023). In this context, for the management of nausea and vomiting;

- According to the physician's order; pharmacological treatment recommended by the physician for nausea should be applied (Doğan, 2023).

- The patient should be informed about self-care measures that can be used in the management of nausea and vomiting (Buluş, 2020).

- To minimise nausea, the patient should be advised to eat smaller, more frequent meals, reduce food flavours and other stimuli containing strong odours, avoid spicy, fatty and highly salty foods, and take antacids before meals (Tipton et al., 2007)

- Behavioural interventions can play an important role in the management of anticipatory symptoms (Dupuis et al., 2014). Behavioural therapies, especially progressive muscle relaxation training, systematic desensitisation and hypnosis, can be used to treat anticipatory nausea and vomiting (Hu et al., 2014).

- Complementary and alternative treatment methods can be utilised (Doğan, 2023).

1.2.8. Diarrhea in Elderly Cancer Patients

Intestinal symptoms experienced by geriatric oncology patients may occur as a result of the tumour itself or surgery, radiotherapy, chemotherapy, immunotherapy and other pharmacological treatments (Andreyev et al., 2018; Bossi et al.,2018). Chemotherapy-induced diarrhoea in geriatric oncology patients causes complications such as weight loss, fatigue, renal failure, haemorrhoids, perianal skin irritation, malnutrition and dehydration (Shafi and Bresalier, 2010). For the management of diarrhoea;

- In order to identify the patient's diarrhoea, stool frequency, how long the symptoms have been present should be investigated and other accompanying findings should be detected (Saygılı et al., 2017).

- Normal bowel and defecation habits of patients should be learnt before starting chemotherapy and radiotherapy (Andreyev et al., 2018).

- The foods the patient eats/drinks and the risk of being in contact with an infected person should be questioned. In addition, the patient should be evaluated before and after the use of proton pump inhibitors, non-steroidal anti-inflammatory drugs, laxatives and antibiotics (Andreyev et al., 2018; Bossi et al., 2018).

- The patient's vital signs should be monitored (Andreyev et al., 2018; Bossi et al., 2018).

- Skin turgour and mucous membranes should be evaluated to determine the volume status of the patient (Saygılı et al., 2017).

- The patient's serum creatinine and urea values and fluid and electrolyte values should be monitored (Saygılı et al., 2017).

- Fluid monitoring of the patient should be performed (Corinaldesi, Stanghellini, Barbara, Tomassetti and De Giorgio, 2012).

- The use of probiotics before or during chemotherapy can be used to prevent diarrhoea in oncology patients (Lu et al., 2019).

- Patients should be trained before chemotherapy and radio therapy for diarrhoea symptoms that may develop due to oncology treatment (Andreyev et al., 2018).

- Coffee, alcohol and fibre intake should be reduced (Bossi et al., 2018).

1.2.9. Constipation in Elderly Cancer Patients

One of the frequently encountered symptoms in elderly cancer patients is constipation (Van Lancker et al., 2014). Factors such as aging process, cancer treatments and other comorbidities may cause constipation (Dzierżanowski and Mercadante, 2022).Currently, pharmacological and non-pharmacological treatment methods are used in the management of constipation in geriatric oncology patients. Pharmacological treatments include laxatives, prokinetic agents and peripheral opioid antagonists, while non-pharmacological treatments include fibre supplements, exercise, acupuncture and biofeedback therapy. Specific treatments for the management of opioid-induced constipation are also discussed (Dzierżanowski and Mercadante, 2022; Van Lancker et al., 2014). For the management of constipation;

- Patients with advanced cancer should be regularly evaluated for constipation (Davies et al., 2020).

- Patients with persistent constipation should be referred to a specialist for further investigation/management (Davies et al., 2020).

- The patient's medication list should be reviewed to assess medications that may cause constipation (Saçar, 2020).

- Patients should be encouraged to defecate immediately after waking up in the morning or 30 minutes after meals to benefit from gastrocolic reflex. Defecation should not be forced for more than five minutes (Saçar, 2020; Uzun and Coşar, 2019).

- Dietary fibre intake should be increased to 25-30 grams Daily (Saçar, 2020; Uzun and Coşar, 2019).

- The individual should be encouraged to engage in physical activity to improve bowel regularity (Saçar, 2020; Uzun and Coşar, 2019).

- Patients should be provided with adequate privacy and appropriate equipment (e.g. commode, footstool) to encourage defecation. (Saçar, 2020; Uzun and Coşar, 2019).

- Patients should be encouraged to drink 5-8 glasses of water a day, to have breakfast with a hot drink to help gastro-olic reflex and to go to the toilet when the urge to defecate occurs (Olgun, 2016; Uzun and Coşar, 2019).

- Patients should be taught pelvic floor manoeuvres and abdominal massage to stimulate bowel movements is recommended (Olgun, 2016).

1.2.10. Alopecia in Elderly Cancer Patients

Physiological changes in the hair, skin and hair follicles with aging may cause alopecia to be ignored in elderly cancer patients. However, physiological and systemic changes observed as a result of aging may make the prognosis of alopecia worse in the elderly (Hamid et al., 2022; Rugo and Hurk, 2023). Cancer-related alopecia may occur due to cancer chemotherapy treatment or malnutrition due to symptoms such as loss of appetite, nausea and vomiting (Quesada, Guichard and Fiteni, 2021; Rugo and Hurk, 2023). In particular, nutritional and absorption disorders in the elderly cause loss of vitamins that nourish the skin (Hamid et al., 2022; Rugo and Hurk, 2023). In addition to pharmacological treatment, approaches such as tourniquet application and cold application can be used for the management of alopecia. However, research on these is ongoing. In leukemias and other cancers involving stem cells, the use of approaches such as tourniquet application and cold application is recommended (Yangın, 2020).

For the management of alopecia; the hair should be treated gently, a soft-bristled hairbrush or a wide-toothed comb should be used, and products such

as hair dryers, irons, or gels or clips that may damage the scalp should not be used. In addition, the hair should be washed less frequently and with a light shampoo and dried very gently with a soft towel (National Cancer Institute, 2023). However, it is necessary to prevent the alopecia experience, which complicates the process for elderly cancer patients, before it occurs (Quesada et al., 2021). Therefore, patients should be supported psychosocially (Yangın, 2020).

1.2.11. Sarcopenia in Elderly Cancer Patients

Sarcopenia is quite common in elderly cancer patients. Chemoradiotherapy, surgery, inflammation, anorexia, decreased physical activity and tumour-induced catabolic factors contribute to sarcopenia (Eriksson et al., 2017; Williams, Dunne, Giri, Shachar and Caan, 2021). In addition, there is a greater loss of muscle mass due to impaired nutrition, especially due to side effects of chemotherapeutic agents such as nausea, vomiting, anorexia and loss of taste (Williams et al., 2021). To manage sarcopenia in elderly cancer patients;

- The patient should be provided with a balanced diet (Baz and Ardahan 2016; Hassan et al. 2016).

- The patient and his/her family should be educated about maintaining physical activity and exercising as much as he/she can (Baz and Ardahan 2016; Hassan et al. 2016).

- The recommendations to be given to the patient in the trainings should be organised individually according to the general condition of the patient, nutritional habits, current activity level and preferences of the individual (Baz and Ardahan 2016; Hassan et al. 2016).

- In order to prevent a decrease in physical movement that may cause sarcopenia, elderly individuals should perform moderate physical activity for at least 30 minutes every day and 2-3 times a week (Baz and Ardahan 2016; Hassan et al. 2016).

- When physical activity is recommended, it should be planned individually according to the general condition, habits, disability and competences of individuals (Baz and Ardahan 2016; Hassan et al. 2016).

- In patients with known sarcopenia, individual-specific exercise should be planned in cooperation with the physiotherapist and muscle strength should be increased (Alan, Gürsel, Ünsal, Altın, and Kılçıksız, 2013).

- onsidering the deficiencies and general health status of the patient, patient-specific diet and vitamin D support should be provided in co-operation with the physician and dietician (Alan et al., 2013).

1.2.12. Pain in Elderly Cancer Patients

Cancer pain is a chronic pain. Cancer pain in elderly cancer patients is often difficult to manage because the patient perceives the pain as a natural part of ageing (Brant, 2018). In addition, impairments in the cognitive functions of elderly cancer patients, comorbid conditions and nutritional disorders make the management of pain more difficult (Hachem et al., 2019). In addition, communication disorders due to hearing problems of elderly cancer patients negatively affect the assessment of pain. Both pharmacological and non-pharmacological aging approaches are used in the management of cancer pain (Brant, 2018; Hachem et al., 2019). To manage cancer pain;

- Data should be collected to assess pain (Campbell, 2011).

- As the ageing process may lead to a higher incidence of opioid-related side effects, these should be initiated at the lowest possible dose and increased based on tolerability and efficacy (Gress, Charipova, Kaye, Viswanath and Urits, 2020; Hachem et al., 2019).

- The patient and family should be educated about the possible side effects of opiods (Dowell, 2022).

- The use of acupuncture may be recommended for pain management (Chiu, Hsieh and Tsai, 2017).

- Massage may be recommended to reduce the severity of pain (Crawford et al., 2016).

- Since relaxation techniques reduce muscle tension and anxiety, they may be recommended to reduce pain (Vambheim, Kyllo, Hegland and Bystad, 2021).

- Imagination technique can be used to prevent the patient from feeling the intensity of pain (Gustavsson and von Koch, 2006).

- Hypnosis, which is effective in reducing the intensity of pain with its muscle relaxant effect, may be recommended (Satija and Bhatnagar, 2017).

- The patient and his/her family should be educated about pain, diagnosis of pain, drugs used in pain management and other treatment methods (Goswami, Ghosh, Nandi, Mukherjee and Sarkar, 2022).

1.2.13. Insomnia in Elderly Cancer Patients

In cancer patients, environmental factors, disease process, treatment-related symptoms, type of treatment administered and psychological status of the patient may cause insomnia (Yavuzşen, Alacacıoğlu, Çeltik and Yılmaz, 2014). Both pharmacological and non-pharmacological treatment methods are used in the management of insomnia. Although pharmacological treatment is widely used for the management of insomnia, its use is controversial due to side effects of drugs related to physiological deterioration with aging (Savard, Ivers, Villa, Caplette-Gingras and Morin, 2011). For the management of insomnia in cancer patients;

- The patient's sleep hygiene should be ensured. For this; the patient should not sleep during the day, should not eat or drink anything shortly before going to bed, should avoid activities that will increase the stress level (news/discussion programme etc.), should avoid caffeine, should not drink plenty of water, the room where the patient sleeps should be dark, quiet and the room temperature should be 18-20 degrees, and should be as active as possible during the day (Pandey, Littlewood, Cooper, Hernandez and Day, 2018).

- Cognitive behavioural therapies should be used (Savard, Simard, Ivers and Morin, 2005).

- Mind, body applications (music, art therapy, progressive transition techniques) should be utilised (Bradt, Dileo, Magill and Teague, 2016; Ennis, Kirshbaum and Waheed, 2018; Khakha, Satapathy, Dey, 2015).

- Manipulative approaches (yoga, massage, reflexology, hot foot bath) should be utilised (Hachul, Oliveira, Bittencourt, Andersen and Tufik, 2014; Özdelikara and Tan, 2017; Valizadeh, Seyyedrasooli, Zamanazadeh and Nasiri, 2015).

1.2.14. Distres in Elderly Cancer Patients

Distress is a physically, socially and psychologically perceived experience that affects patients' thoughts, feelings or behaviour (NCCN, 2024). In other words, distress means distress, difficulty, danger (Tıbbi Terimler Sözlüğü, 2024). Elderly cancer patients may experience certain levels of distress at every stage of the diagnosis and treatment process of their cancer (Dauphin et al., 2019; Holland et al., 2013; Leung, Shokoohi, Bates and Ho, 2021). Symptoms of distress may include sadness related to loss of health, fear, anxiety, helplessness, anger, depression, anxiety, panic, lack of appetite, poor physical function, loss of independence, decreased sleep quality, thoughts of

death, side effects of the disease or treatment, and anxiety about social roles and may persist for a long time (Dotan et al., 2021; NCCN, 2024; Riba et al., 2019)

Distress can interfere with the ability of the elderly cancer patient to cope effectively with the process and can negatively affect the person physically, psychologically and socially (Dekker, Graves, Badger and Diefenbach, 2020; Holland et al., 2013; Leung et al., 2021). Therefore, early diagnosis, evaluation and treatment of distress in elderly cancer patients is very important (Fu et al., 2021; Kim, 2019). To manage distress;

- Cognitive behavioural therapy and problem solving therapies can be used (Apostolo, Queiros, Rodrigues, Castro and Cardoso, 2015)

- Face-to-face mindfulness trainings can be conducted (Compen et al., 2018).

- Supportive-expressive psychotherapy (Rodin et al., 2018).

- Early diagnosis and psychosocial care should be provided for cancer patients who experience stress (Dekker et al., 2020).

- Mindfulness-based stress reduction programme can be used (Carlson et al., 2016; Goyal et al., 2014; Rush and Sharma, 2017).

- Yoga may be recommended (Taso et al., 2014)

- Breathing and muscle relaxation exercises may be recommended (Greenlee et al., 2017).

- Internet-based problem solving programmes and telehealth applications can be used (Compen et al., 2018).

1.2.15. Delirium in Elderly Cancer Patients

Delirium is frequently seen due to aging and psychopathological process of cancer and cancer treatment methods. Delirium is seen more frequently especially in patients with brain tumours. The fact that the cancer patient is elderly and has a history of dementia or stroke increases the risk of developing delirium10. Psychological problems experienced by patients may negatively affect their quality of life and compliance with treatment (Ülger et al., 2014). Therefore, management of delirium in elderly cancer patients is important;

- Elderly cancer patients should be closely monitored for delirium (Scottish Intercollegiate Guidelines Network, 2019).

- Patient relatives should be educated about interventions to prevent delirium (Iglseder, Frühwald adn Jagsch, 2022).

- Since pain and agitation trigger the development of delirium, the appropriateness of sedation should be assessed continuously (Erbay and Girgin, 2020).

- The fluid-electrolyte balance of patients should be monitored and adequate fluid and electrolyte intake should be ensured (Karadas and Ozdemir, 2019).

- Patients should be provided with regular nutrition, hypo/hyperthermia and constipation should be prevented. (Bush et al 2018; Karadas and Ozdemir 2019).

- Multidrug use should be avoided in patients as it increases the risk of delirium (Bush et al., 2018; Karadas and Ozdemir, 2019).

- Patient's person, place and time orientation should be ensured: Communication with the patient should be maintained continuously, materials reminding the time and day should be in their environment, daily news should be discussed with the patient, the patient should be provided with their belongings at home when necessary, and communication with family members should be maintained (Conley, 2011; Kilic and Kav, 2022).

- In order for the patient to recognise the difference between day and night, a bright light should be used in the morning and a night light in the evening (Kahraman and Calisir, 2020; Karadas and Ozdemir, 2019).

- The catheter and other connections should be arranged to minimise the physical limitation of the patient (Kahraman and Calisir, 2020; Karadas and Ozdemir, 2019).

- Bed edges should be raised to prevent falls and traumas (Kahraman and Calisir, 2020; Karadas and Ozdemir, 2019).

- In-bed range of motion exercises should be performed at a level that the patient can tolerate, and patients should be mobilised early after surgical intervention (Karadas and Ozdemir, 2019).

- Treatments should be performed at the time when patients are awake to ensure adequate sleep (Kahraman and Calisir, 2020; Karadas and Ozdemir, 2019).

2. CONCLUSIONS

Cancer patients experience many problems due to cancer and treatment process. The management of these problems in elderly cancer patients can be difficult due to physiological disorders and other accompanying diseases. Pharmacological and non-pharmacological treatment and care approaches are used in the management of common problems in elderly cancer patients. Research on the management of common problems in elderly cancer patients is ongoing. Therefore, nurses caring for elderly cancer patients need to follow current practices related to the management of this problem.

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CURRENT AND TECHNOLOGICAL REFLECTIONS IN SURGICAL NURSING: FROM PAST TO PRESENT

Asisst Prof. Dr. Dilek ÇEÇEN ÇAMLI[1]

1.INTRODUCTION

The use of digital technologies in healthcare facilitates the remote determination and transmission of physiological parameters, real-time monitoring and control, 24-hour online medical advice for teleconsultative patients, preventive measures, and immediate intervention to basic vital parameters in emergencies. Technologies such as the internet (e-mail, websites), telephone communication, video conferencing and others are being used for these developments that are revolutionizing the health sector (Çoban, Göktaş and Gezginci, 2020).

2.HEALTH TECHNOLOGY

The concept, phrase and qualification that refers to all kinds of health-related philosophies, systems, ideas, methods, practices and similar techniques that are used to produce and supply / provide preventive and therapeutic health services / products, including those applied not only with tools and machines using advanced technologies, but also those applied only by speech or hands without using any tools, and all technological adaptations

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that allow some techniques to be applied with the help of health equipment and medicines (Kaman and Yi Zhao, 2022)

During the production and supply of health services, various techniques and technological equipment (tools, sets, devices, machinery, apparatus and other objects) and medicines are utilized. For many centuries, natural and inexpensive techniques have been used in health services, and in parallel with the developments in science and technology, firstly, simple technological products were started to be used, and then, both the techniques used and the technologies utilized have developed, diversified and become more complex through a rapid and continuous change (Yilmaz and Kaya, 2020).

From the 15th century onwards, developments in anatomy, physiology and pathology within the framework of scientific and technological developments have enabled the etiologic (cause-oriented) identification and treatment development of diseases that were previously attributed to supernatural causes and then treated symptomatically. In the 18th century, Pasteur's discovery of the rabies germ led to a more precise separation between physiological and psychological treatment. The use of the microscope brought bacteriological information, blood, urine and stool tests and biopsy into the field of health. Injection in 1789, the stethoscope in 1816 and X-rays in 1895 were discovered and used for medical purposes. In the 20th century, asepsis-antisepsis, anesthesia and blood transfusion techniques improved surgical practices, while the industrialization of drug production and the discovery of vitamins and antibiotics improved internal medical sciences and practices. In addition to therapeutic health services dealing with the symptom (symptom) or cause (etiology), the understanding of preventive health services gained weight. Body thermometers, ophthalmoscopes, laryngoscopes, cystoscopes, gastroscopes, sphygmomanometers that measure blood pressure in a similar way to today, electrocardiographs and transistors, which came into commercial use in the 1950s, were the first products of technological benefits in the field of health (Parmar and Chan, 2020).

The engineer-doctor collaboration initiated in the 1960s at the National Aeronautics and Space Research Center (NASA) in the United States of America (USA) for the health of astronauts, and with the routineization of special space research with direct medical purposes, health services have become almost dependent on technology since the second half of the 20th century. Developments in the field of biochemistry, which analyzes the structure of body fluids, led to the development of devices such as photoelectric colorimeters, flame photometers, ultraviolet spectrophotometers and chromatographs for quantitative analysis of these fluids. Diagnostic

and therapeutic radiodiagnostic and radiotherapeutic devices, computed tomographs (CT scanners), magnetic resonance (MR, NMR, MRI), scintigraphs, sonographs, pacemakers, renal dialysis/hemodialysis, cobalt therapy, defibrillators, artificial respiration devices, intensive care systems, coronary bypass surgery, organ and tissue transplantation (implants) and the like are techniques and technological applications that have emerged in the last few decades. It can be observed that this development has accelerated and intensified leading to new specializations, health institutions have become places with complex technical equipment, and health services have turned into an industry (Simsir and Mete, 2021).

Current Situation ;

The medical technology sector includes many engineering disciplines. These disciplines include mechanical, electrical-electronic, chemical, metallurgical and computer engineering. Developments and advances in these fields are significantly reflected in medical technology products (Şendir and etc. 2019)

The technologies used in health services are pharmaceuticals and medical equipment. Both of these fields are highly influenced by developments in science and technology and use innovations effectively and intensively. The field of "health services", which produces services using pharmaceuticals and medical equipment, is more susceptible to socio-economic developments and social and political openings. Developments and improvements in the other two fields significantly affect the quality of health services (Thuemmler and Bai 2017).

3. ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN SURGICAL NURSING

The main functions of health institutions and organizations consist of the provision of diagnosis, treatment and rehabilitation services. In this process, it is known that the occupational group with the highest workload is nurses. As a result of increased workload, the quality of nursing services as well as the quality of life of nurses are affected. It is stated that nurses are frequently assigned professional and non-professional tasks (other than nursing practices) (Ronquillo and etc 2021). Unprofessional practices lead to an increase in workload. It is stated that robot technologies and artificial intelligence can support especially non-professional tasks and thus nurses can work effectively by allocating more time and energy for their professional tasks (McGrow, K. 2019).

Surgery is "the creation of voluntary trauma that can change the biological and physiological functions of patients". Surgical nursing is "the branch of nursing in which all physical, biopsychosocial and biopsychosocial needs of a patient undergoing surgery or other invasive intervention before, during and after surgery are determined and met in a planned manner". A surgical nurse professionally plans patient care, performs and evaluates evidence-based practices. In addition, surgical nursing is a field that requires individual skills such as communication, leadership, teamwork and decision-making skills, as well as the use of various equipment and devices and new surgical techniques and methods. Therefore, it is a fact that the rapid reflections of developments in science and technology in the field of health will also affect the duties and responsibilities of surgical nurses (Özkan and Salık Asar, 2022). From this point of view, the use of artificial intelligence technologies will cause some changes in the functions of nurses caring for surgical patients.

'Da Vinci', the first known surgeon-controlled robot, is known to increase the precision and accuracy of surgeons, assist the surgeon, and reduce the responsibility of nurses by minimizing possible errors that may occur in the operating room (Pepito & Locsin, 2019). Then, the robot Cody, developed by Georgia Tech University in the United States of America, designed to be useful in bedridden patients, is effective in providing bed bathing and dressing of patients, as well as helping the rehabilitation of stroke patients (Doğan Merih and Akdoğan, E. 2021). Robot Cody has a laser range finder and a camera inside and can determine which area of the body needs to be cleaned. The robot Robear, which is produced especially for use in areas requiring physical strength, helps the patient to stand up and transfer from one place to another (Doğan Merih and Akdoğan, 2021) While providing care, nurses also perform practices that require physical strength and are especially exposed to musculoskeletal injuries. Reducing the tasks that physically strain nurses and preventing physical injuries can be achieved with robot technologies (Turan and Khorshıd, 2022) These two artificial intelligence-based robots can be used in situations that require physical strength, such as transferring surgical nurses to their beds after surgery. Considering how much physical strength surgical nurses spend every day during the transfer of a large number of patients from the operating room stretcher to their own bed and the associated complaints such as low back pain, the use of such robots is a very advantageous situation (Turan and Khorshıd, 2022). Especially in orthopedic patients, it will be effective in meeting the needs of being tied to the bed for a long time and accordingly moving the patients in bed and bed bathing.

The Pepper Robot, which is effective in providing hospital orientation for patients and detects people's emotions through the camera inside, their gender through their voice, and whether they are children or adults, can speak in 20 different languages (Baloğlu and etc. 2019). In addition, this robot welcomes hospital visitors, takes individuals to the areas they want to go to within the hospital and answers their questions (Baloğlu and etc. 2019). This robot will also be able to detect patients who are hospitalized for surgical intervention and have anxiety due to their surgery by evaluating the tone of voice and the words they use. Thus, even in the first admission, the surgical nurse will be able to determine the anxiety of the patients thanks to this robot and apply the interventions without wasting time.

Robot Nao, which can support the treatment and care processes of children and the elderly in the vulnerable group, is designed to be used in the rehabilitation process of patients and also for motivational purposes (Doğan Merih and Akdoğan, 2021) Robot Nao is a robot that can chat with patients and perceive jokes (Doğan Merih and Akdoğan, 2021) These robots will be especially effective in reducing the anxiety of elderly and pediatric patients before surgical intervention and in providing motivation for the treatment and care process after surgery.

Robots named SAM are robots that can navigate in clinics, enter patient rooms at certain intervals and question the condition of patients (Doğan Merih and Akdoğan, 2021). SAM robots, which are also equipped with training equipment, can also evaluate the patient in terms of fall risk (Doğan Merih and Akdoğan, 2021). IV Robots RIVA, which ensure patient safety, cost-effectiveness in drug use and minimize errors, ensure that intravenous drugs and perfusions are administered at the correct dose (Baloğlu and etc 2019, Doğan Merih and Akdoğan, 2021). Ensuring and protecting patient safety is very important in the surgical process. Thanks to the equipment of these two robots, patients will be monitored frequently in the postoperative period and possible changes will be detected early and quickly thanks to the robot, reducing the workload of the nurse and preventing unwanted situations by recognizing the changes in the patient early and taking precautions. Postoperative IV infusion treatments are an indispensable and important practice for patients. The use of these artificial intelligence-supported robots that minimize the possible errors of the nurse who has to care for a large number of patients will undoubtedly increase patient safety. The use of robot-assisted technologies in healthcare undoubtedly has positive contributions. For example, it is stated that these robots mentioned above can reduce the pain of patients and improve their psychology. Thus, they can support nurses (Pu, Moyle and Jones, 2020).

Robot Sophia, a robot with voice recognition technology that can see thanks to the camera system in its eyes, is used in the provision of health services thanks to its ability to speak in multiple languages and recognize faces (Baloğlu and etc 2019, Doğan Merih and Akdoğan, 2021). In the coronavirus epidemic, which we have encountered in recent years and is a global problem, it is known that healthcare professionals and especially nurses are frequently exposed to the virus due to the high contagiousness (Çoban, Göktaş and Gezginci, 2020). For this reason, the robot Grace, designed by scientists in 2020, can communicate with patients isolated due to coronavirus and take vital signs. Designed to prevent the risk of transmission, this robot will be especially effective in preventing infections after surgery. Evaluating the vital signs of patients who need to be isolated to prevent cross-infections in this way will be a positive approach for both the patient and the nurse. This robot also helps surgical nurses to provide care services by performing speech therapy (Doğan Merih and Akdoğan, 2021). As can be seen from these examples, artificial intelligence and robot technologies can be used in the processes of early diagnosis, diagnosis, decision-making, treatment, research, education, education, health protection and maintenance of surgical nursing as well as in the field of nursing (Thuemmler and Bai, 2017).

Nurses caring for surgical patients will be able to incorporate AI technology into their care in the near future, depending on the economic conditions of the countries. Artificial intelligence technology will serve as important tools to support nurses' contribution to higher-level goals such as developing the nursing profession and improving population and global health (Clancy, 2020). With the inclusion of this technology in the nursing process, it will be able to identify and meet the goals and priorities of patients, provide personalized evidence-based care, and increase the power of nurses to provide multidimensional care by analyzing data from different areas (e.g. environmental, genomic, health data, socio-demographic data) (Uzun, 2020). It is stated that artificial intelligence technology can provide predictions for planning and management, especially in emergency or long-term and bedridden patient care, and this will save time for the evaluation of the patient in nursing services, determination of anxiety, rapid determination of ways of coping, and the creation of training processes that include patient trends. On the other hand, this will offer the opportunity to optimize the delivery of nursing care by alleviating mundane, time-consuming and burdensome tasks that do not require special nursing skills or knowledge (Ronquillo et al., 2021,Uzun 2020). In order to learn the devices that patients need to use after surgery or in the treatment program, artificial intelligence will automatically suggest the most appropriate terms determined by

artificial intelligence, based on the text written by the nurse, and their use and compliance will be ensured. Among other applications, the use of artificial intelligence technology to identify patients with a history of falls, drug and alcohol use disorders, to support care planning and patient risk assessment, and similarly, to predict pain sensation and physical changes for acute critical situations will undoubtedly facilitate the nurse to fulfill both independent and dependent functions, and to fulfill care practices with less time, less energy and with the least possible errors. From this point of view, it can be said that nurses in the health system will contribute to the development and dissemination of artificial intelligence technologies and will perhaps be the health professionals who use this technology the most in the international arena (Erikson and Salzmann-Erikson 2016, Saadatzi et al. 2020). However, contrary to this view, there are scientists who think that robots that mimic human movements programmed with artificial intelligence may pose a risk to the nursing profession (Erikson and Salzmann-Erikson, 2016, Saadatzi et al. 2020). In this dilemma, it is very important to analyze these risks well in order to prevent ethical violations

As it is known, it is a fact that the number of nurses in the health sector all over the world is not sufficient and that they have the highest workload among these professional groups (Saadatzi et al., 2020).While the increasing workload of nurses and the physical discomfort they are exposed to negatively affect their quality of life, on the other hand, it also affects their quality of care. It is predicted that robot technologies and artificial intelligence will contribute to the care tasks of the nurse and thus nurses can use their energy and time more in their professional duties (McGrow, 2019). With the use of artificial intelligence and robotics, it is thought that costs in the health sector will decrease and the quality of service will increase as a result of the integration of nurses' professional experience, knowledge and critical thinking skills with technologies (McGrow 2019, Saadatzi et al. 2020, Uzun 2020).

4.TELE-HEALTH APPLICATIONS IN SURGICAL NURSING

In the world, the insufficient number of health institutions and personnel working in these institutions and technological developments in the field of communication have led to the importance of remote treatment and care applications (Ersoy and etc 2015, Ertek 2011). Telehealth is the provision of medical interviews between healthcare personnel and the patient through telecommunication tools. Telehealth includes preventive, curative and

rehabilitative health care services (Çam and Kaçmaz, 2018). Telehealth services are carried out with communication technologies such as telephone, video conferencing and interactive television (Kaman and Yi Zhao 2022). Communication tools used in the field of health can provide access to information of patients at a distance, manage electronic health record systems, and provide remote treatment and care to patients (Keskin and Özhelvacı 2022). Difficulties in receiving health services due to geographical distance, prolongation of life expectancy, increase in the number of patients requiring continuous follow-up and orientation towards individual-oriented health services have enabled the concept of telemedicine to enter our lives (Simsir and Mete, 2021)

4.1.Telemedicine

Telemedicine is defined as the diagnosis of a patient's medical condition, ensuring treatment and monitoring after treatment using various electronic information tools. For example; In France, patients are provided with a remote doctor to be examined in a compartment called 'remote health cabin' and their post-treatment check-ups can be done in this way. During the Ebola outbreak; doctors at the University of Virginia examined patients in some parts of Africa using remote medical technology and provided treatment for the patients (Çam and Kaçmaz, 2018). Patient examinations can take place in real time or within a specified time frame (Yilmaz and Kaya 2020). Although telemedicine applications are used in many branches in the world for the diagnosis, treatment and monitoring of patients, it is a developing field in our country. When telemedicine applications are compared with traditional health applications; there are studies showing that telemedicine is beneficial in terms of time, labor and cost (Çam and Kaçmaz, 2018). The concepts of telemedicine and telehealth are often confused with each other (Ertek, 2011). While telehealth includes preventive, therapeutic and rehabilitative health services, telemedicine only includes health services such as diagnosis, treatment and post-treatment follow-up (Çam and Kaçmaz, 2018; Ertek 2011).

4.2.Tele Surgery

Tele surgery is the adaptation of the field of telemedicine to the field of surgery. Due to reasons such as inadequate operating room conditions, low number of personnel and geographical distances, the number of telesurgery applications is increasing day by day. Tele surgery is the process of reaching the operating room from a very distant location using mobile network

technologies without establishing a physical connection with the patient and performing surgery. The surgeon evaluates the images transferred to him with a very short delay time with 5G mobile network technologies and performs the surgery using end effectors placed on the patient (Çoban, Göktaş and Gezginci, 2020). For example; a neurosurgeon working in Beijing manipulated the surgical instruments of a patient on the operating table in the city of Sanya from Beijing and the successful operation was recorded in the literature as telesurgery (Yun, Zhaoyi, and Qingqing, 2019). Although it has the advantages of the surgeon performing the operation from a sitting position, the instruments used have the ability to move in all directions, and the surgeon does not need an assistant since all the instruments are used by the surgeon, the emergence of auditory, visual, and tactile undesirable situations during the operation causes the operation to be prolonged and the possibility of making errors to increase (Leshera and Shahb 2018). In the future; it is thought that telesurgery will provide great benefits with mobile network technologies and developments in the field of medicine.

4.3.Tele Nursing

Technological developments in the field of health have also affected the field of nursing. Nurses should know the developing information technologies and use these technologies in practice to increase the quality of care provided remotely (Çam and Kaçmaz, 2018).Tele nursing is the integration of the telecommunication network into the field of nursing (Kaman Fan and Zhao 2022). The inadequacy in the number of nurses prevents the provision of individual-centered patient care and reduces the rate of utilization of health services. n telenursing; communication between the patient and the nurse is provided by using telephone, computer and interactive television (Leshera and Shahb 2018). Many interventions can be provided by telenursing, from a simple telephone conversation to medical video conference meetings, from the nurse being able to access the patient's monitor information from home via the internet and from the patient-nurse-doctor visits (Leshera and Shahb 2018). In a study where patients diagnosed with chronic heart failure were monitored with the remote nursing care method; patients were able to reach the nurse by phone 24 hours a day and the patient's ECG information could be recorded via a cable connected to the telephone line (Keskin and Özhelvacı, 2022).

Computers and the internet are widely used in fulfilling the education role, which is one of the most important roles of nurses in providing quality care. Patient education is one of the frequently used and successful roles in tele-nursing practices (Yun G and etc.2019). A study conducted in England

stated that patient education has an important place in remote care (Şendir and etc. 2019). In a randomized controlled study, it was found that patients who received daily education with smartphones and tablets after total knee replacement had less pain during rest than patients who did not receive education (Ozkan and Salik Asar 2022). In surgical units, nurses play a major role in maintaining the regular treatment and care of patients. Due to the insufficient number of surgical nurses who are with the patient 24 hours a day and closely monitor the patient, there are disruptions in the treatment and care of patients, the length of hospital stay is extended and the quality of life decreases. Due to such reasons, remote surgical care initiatives have begun to be implemented (Ozkan and Salik Asar 2022). Telesurgical nursing is the provision of pre- and post-operative surgical preparation and care of surgical patients via telecommunication tools (Leshera and Shahb 2018).The telesurgical nurse has responsibilities such as gathering information about the patient, following the patient's findings, being able to critically evaluate the patient's condition with the information at hand, making recommendations for treatment and care by contacting the doctor if necessary, and informing the patient of new arrangements (Ozkan and Salik Asar 2022). Remote surgical care is defined as nursing interventions planned to monitor patients before and after surgery, monitor existing chronic diseases, and reduce emergency room visits. In a study conducted with patients undergoing lung transplantation, remote nursing interventions were implemented in accordance with nursing diagnoses such as activity intolerance, limb muscle dysfunction, immobility, nutritional deficiency, and decreased quality of life, and complications that may develop in the patient were prevented (Parmar and Chan 2020). In a study conducted by Culligan et al. on thoracic surgery, it was emphasized that remote surgical care was very important in the one-month period following the patient's discharge and stated that remote surgical care had positive effects on the patient (Culligan et al. 2019)

Surgical site infection, one of the most important complications after surgery, can be detected with a mobile phone application, which provides great benefits in surgical care during this process (Ozkan and Salik Asar 2022). In the study conducted by sandberg et al. in 2015, the surgical incision area was observed with a mobile phone after the patient was discharged, and it was concluded that observation with a mobile phone was effective in diagnosing surgical site infection (Sandberg and etc 2019In a study conducted by Shahrokhi et al. in 2018, it was determined that the time it took for head trauma patients who received tele-nursing care to apply to the hospital after discharge was shorter than that of patients who did not receive tele-nursing care (Shahrokhi and etc. 2018).

In telesurgical nursing, remote surgical care provided using telecommunication tools and wearable technological products has been brought to patients' homes and has provided patients with more self-management of their own health (Ozkan and Salik Asar 2022). In a study conducted in the United States in 2018, Leshera and Shah concluded that telecommunication services were used more in the preoperative process; thus, patients' food, transportation, and hotel expenses were reduced. Research results have determined that remote surgical care provided in the preoperative process has positive effects on patients living in rural areas. It has been suggested that early applied telesurgical nursing care reduces perioperative mortality and morbidity rates (Culligan M.and etc 2019). It has been determined that remote surgical care applications are widely used in the world, but there is a lack of formal training regarding the application (Çam and Kaçmaz, 2018). In order to perform telesurgical nursing, surgical nurses must receive training and document the training they receive Ozkan and Salik Asar 2022). Surgical nurses working without a license may encounter ethical problems during remote surgical care. In order to avoid these problems, job descriptions should be created for telesurgical nurses, administrative support should be provided, and national policies and laws should be developed. In this way, possible ethical problems will be prevented (Keskin and Özhelvacı, 2022). In our country; it has been determined that research on remote surgical care applications is not sufficient (Çam and Kaçmaz, 2018). Problems are experienced in telesurgical nursing applications due to the fact that patients live in rural areas, care is provided to elderly patients, and patients' inability to use technological devices.

5.NANOTECHNOLOGY IN SURGICAL NURSING

Nanotechnology is the control of matter at the atomic, molecular and supramolecular level. The oldest and most common definition of nanotechnology, also referred to today as molecular nanotechnology, expresses a specific purpose of controlling atoms and molecules for the manufacture of macroscale products (Del Vecchio and etc 2023). The field of use of nanotechnology in medical science is called nanomedicine. As a subject, nanomedicine includes the use of molecular information and molecular tools in the body for the purpose of diagnosis, treatment, prevention of diseases and traumatic injuries, relief of pain and protection and development of human health. It is a field in which many multidisciplinary scientists such as molecular biologists, physicists, mathematicians, medical professionals, computer engineers and other engineers need to work together, and the first nanobiotechnology laboratory was established at Cornell University in 2000

(Del Vecchio and etc 2023). Today, surgical clinics use orthopedic prostheses (hip prostheses), cardiovascular implants (heart valves, etc.), neural implants, plastic and reconstructive implants, dental implants, ophthalmic systems, catheters, drug delivery systems such as insulin pumps, and general surgical systems such as sutures, adhesives, and blood substitute fluids produced with nanotechnology (Li, S 2022).

Nanotechnology is expected to have a very important place in the future as it produces materials, devices and systems with new features that are more functional, faster, take up less space and consume less energy. In addition, while talking about the benefits of nanotechnology for human health and medical applications, it has recently been emphasized that it can cause toxic, mutagenic systemic effects in individuals. It is stated that nanotechnological products entering medical applications can cause possible toxic effects on nerves, respiration, digestion and blood, and it is thought that skin disorders may also occur due to their molecular properties (Del Vecchio and etc 2023). Nanomedicine is a branch of nanotechnology and refers to molecular scale and highly specific medical interventions for treating diseases, repairing damaged tissues such as bones, muscles, nerves or damaged tissues. Today, the treatment of many diseases takes a lot of time and cost. Faster and much cheaper treatments can be developed using nanotechnology. Maximum therapeutic effect can be achieved with minimal side effects with materials and devices designed for target cell and tissue-specific clinical applications (Maheshwari PV, Gupta NV. 2012). With nanotechnology; materials and devices that can interact with the body at the molecular level are designed using high-specificity scales. These materials and devices are designed to achieve minimal side effects and maximal therapeutic effect in the targeted cell and tissue-specific area in some potential and specific clinical applications (Li, S 2022).

5.1. Nanotechnology in Clinical Microbiology

It is planned to solve identification problems with microchip technology, detect antibiotic and antiviral resistance genes, shorten diagnosis time, eliminate identification problems in microbiological emergencies and clinically valuable samples, and new methods and results are published in this field every day. Nano-sized sensors are configured for DNA/RNA analysis in the detection of pathogenic microorganisms (Li, S 2022).

5.2.Nanotechnology in Orthopedic Treatment

Nanotechnology in orthopedic treatment is a field used in the interaction of bone cells, vaccination, bone correction and prostheses. It provides movement at the micro level in prostheses. Thanks to the new molecules obtained using this technology, very durable and light artificial bone is created. Nano hydroxyapatite crystals are obtained by restructuring the hydroxyapatite (HA) crystals that form the bone. Thanks to this new bone obtained, it is possible to treat various fractures and structural disorders (Li, S 2022).

5.3.Nanotechnology in Pharmacology

Drugs can be placed in nano-sized spheres and capsules and directly delivered to tissues through capillaries in the blood, and the desired effect can reach an effective concentration, thus providing a regional effect instead of a systemic effect. These types of drugs in nano-sized can easily reach the targeted area. In addition, attempts are being made to eliminate traditional side effects of the methods. For example, eye drops applied for glaucoma are irritating and disturb patients. The newly produced nanoparticle eye drops can easily spread to all structures of the eye and do not disturb patients (Li, S 2022).

Nano vaccines that easily pass through the skin also stimulate the lymph nodes. Forms of nano vaccines that are applied through the nose have also been produced. Nano vaccines applied through the nose are easily absorbed through the nasal mucosa, show their effects both in the blood and in the mucosa, and create an immune response. Thus, viruses that can enter the mucosa and replicate themselves, such as HIV, can be prevented from entering the blood (Wang and Fang 2021).

5.4.Tissue Engineering/Nanotechnology in Wound Healing

Tissue engineering deals with tissue repair or production. Its main goal is to create organs or tissues in laboratory conditions for use in cases of tissue damage or loss. In order to achieve these goals, the complex human system needs to be observed, its properties learned and imitated. With the latest developments in nanotechnology, it is possible to observe and characterize biological events in various ways.

Nanotechnological products used in wound healing include carriers, drug-related ones and tissue scaffolds. Ready-to-use artificial dermal layers

are produced in the form of dermal analogs. Although the use of dermal analogs is not always successful, they need to adhere and integrate with the tissue. The high cost of this method is an important factor that prevents its application for surgeons and patients. Electrospun nanofibers are planned to be used in the healing of chronic wounds such as diabetic ulcers or burns ((Wang and Fang 2021).

5.5.Nanotechnology in Cancer

Early diagnosis is important for the success of cancer treatment. Traditional methods may be insufficient. Matter exhibits different properties at the nanoscale. These substances, which can be reduced to this size, can be used for cancer imaging, targeting and treatment, and for destroying cancer cells with hyperthermia. Nanomaterials that are very small in size can enter cancerous tissues and burn cancerous cells using radiation at the appropriate wavelength. It destroys cancerous cells with the cytotoxic effect of high temperature with the hyperthermia method (Li, S 2022).

5.6.Nanotechnology in Dental Health

The effects of nanotechnology are also seen in dental health. For example; nanorobots can be added to the antiseptic liquids we use in oral and dental cleaning; they will eliminate disease-causing bacteria in the mouth and will also prevent the formation of plaque and tartar by detecting them. Researchers from Clarkson University in New York have developed a new method that protects teeth against cavities. With this method, the surface of the tooth is polished very sensitively and flawlessly with silica nanoparticles. With the new method, the polished tooth becomes so "slippery" that the "bad" bacteria that damage tooth enamel cannot adhere to the tooth surface. In this way, the bacteria can be easily cleaned without damaging the tooth.

5.7.Nanotechnology in Diabetes Treatment

Research continues to provide the implantation of fluorine-based nanosensors called "Smart tattoos" that respond to glucose under the skin and can be manipulated from the outside for noninvasive glucose monitoring (Del Vecchio and etc 2023). Nanotechnology has also been placed in remote monitoring devices to monitor diabetic patients. In a preclinical study, researchers monitored the glucose levels of patients using smart nanodevices. In this study, nanoproducts administered to the body via inhalation were distributed into the patient's bloodstream and monitored the patient's blood glucose level. The working mechanism of these miniature nanochips, which

recognize the patient's glucose molecule and measure glucose levels, is based on the mimetic theory of imitating normal pancreas function and thus preventing fluctuations in blood glucose levels. Thus, changing glucose levels can be monitored and long-term side effects associated with diabetes can be prevented (Li, S 2022). Following research, the development of a carrier system such as chitosan, a polymer nanoparticle, enables protein drugs administered orally or nasally to be saved from the effects of gastric enzymes. Chitosan nanoparticles, which have mucoadhesive properties, can deliver the drug to the bloodstream without being broken down (Del Vecchio and etc 2023). Research into permanent treatment of diabetes continues.

5.8.Nanotechnology in Pain Management

In recent years, interest in liposomes has increased in pain management, especially in developing systems that provide free release of anesthetics(Li, S 2022). These developed products can later be used topically and as a single injection during surgery. Local anesthesia can now be performed by topical application of liposomal formulation (lidocaine) added to creams on the skin area where anesthesia is required. Lidocaine-loaded liposomes are widely used in the United States. Liposomes are another pain control method that can be used instead of morphine (Del Vecchio and etc 2023).

5.9.Nanotechnology in the Treatment of Atherosclerosis

Nanotechnological developments offer opportunities to approach cardiovascular diseases at the cellular level. Chemoreceptors placed in the nanotechnological device can recognize plaques in the artery wall by chemical means. This device, made of carbon, withstands high pressures and sucks plaques from the artery wall by creating a vacuum effect. Plaques are scraped off the area using rotating saws driven by a nanomotor (Del Vecchio and etc 2023, Li, S 2022). As can be seen, nanotechnology is used in some way in almost every field of medicine. Therefore, nurses working in the surgical field need to know these new developments and follow the nanotherapy processes applied to their patients.

6. WEARABLE TECHNOLOGIES IN SURGICAL NURSING

The first wearable computer was designed in 1955 by Claude Elwood Shannon and Edward O. Thorp as a four-button computer that could be worn inside a shoe. In 1961, Shannon and Thorp designed this shoe and increased

their chances of winning the game by 4% by determining the performance of roulette wheels in Las Vegas. This design by Shannon and Thorp was not announced until 1966. Steve Mann is known as another important name in this field. In 1998, Steve Mann designed a pair of glasses called EyeTap Digital Eye Glass. Mann's design, with various developments, came to the design of Google Class in 2012. Many wearable technologies such as Xybernaut, designed in the period from Shannon & Thorp to Mann's Eye Class, did not achieve significant commercial success. One important reason for this is that these designs are products of the "wearable computer" paradigm that has not been understood (Godfrey and etc 2019). These designs have been "technology-driven" products. A wearable technological system is a collection of devices that are attached to a person's body and work together seamlessly and always under the user's control to assist the user in their daily tasks (Simsir and Mete, 2021). These devices, both individually and together, have little or no Operational Inertia and are proactive and continuous in their operations. The user observes an increase in the quality of life by using these technologies in a way that he or she is almost unaware of (Godfrey and etc 2019).

Wearable technologies perform the basic functions or unit operations of sensing, processing (analysis), storage, transmission and application (use). The specifics of each function will depend on the application area and the user, and all operations can take place on the individual or in a remote location (Godfrey and etc 2019).

6.1. Meta-wearable Technologies

Computer motherboards provide data paths to which microchips (memory, microprocessor, graphics, etc.) can be attached to meet the performance needs of end-uses such as gaming, image processing, high-performance computing, etc. in the physical information infrastructure. In 1996, Jayaraman et al. developed a fabric-based wearable technology for tracking soldiers (Godfrey and etc 2019). The wearable motherboard, which is in the form of a piece of clothing such as a fabric or an undershirt, provides an information infrastructure to which sensors or devices can be attached to provide the user with the desired functionality. Thus, it would provide both functions: a flexible information infrastructure and a platform for monitoring individuals' vital signs efficiently and cost-effectively through a "universal" clothing interface. Clothing could have a third dimension of "intelligence" embedded within it, enabling the growth of personal networks in which each piece of clothing has its own IN address (individual network), similar to

today's IP (internet protocol) address for computing devices (Godfrey and etc 2019).

Textiles can fulfill all the features of wearable technologies. Textiles are meta-wearable devices. People are used to wearing clothes. Therefore, no special training is required to wear them. Clothing is the most universal area of human-computer interfaces (Godfrey and etc 2019). Universal clothing interfaces can be "personalized" to suit individual preferences, needs and tastes, including body size, budget, environments and moods in which wearable technologies will be used. Textiles are flexible, strong and lightweight and are generally resistant to different types of operational (stress/strain) and harsh environmental conditions (biological hazards and climatic). Textiles are unique in combining strength and flexibility in the same structure and retain their strength while bending into the desired shape. Textiles can be made in different form factors, including desired length, width and thickness dimensions, thus allowing for "variable" surface areas (Oksuz E 2018). Textiles offer the ultimate flexibility in the system thanks to the extremely wide range of fibers, yarns, fabrics and production techniques (such as weaving, knitting, nonwovens and printing). It is possible to produce textiles relatively cheaply compared to traditional printed circuit boards (Oksuz E 2018). Textiles eliminate the problems of confusion and jamming during use because the main data paths or communication paths are an integral part of the fabric. Textiles can easily accommodate "redundancies" in the system by offering multiple communication paths in the network.

The structures of textile products offer easy power distribution from one or more sources through textile yarns integrated into the fabric. Wearable technologies are natural technologies used to focus on the power of people to be successful. Of all technologies, wearables have the closest relationship with people. A wearable technology is worn by people, stays with them for a long time, and provides a very close and effective interface with people. This close relationship and interaction brings wearable technologies to an important position (Godfrey and etc 2019i Oksuz E 2018).

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FLIPPED CLASSROOM MODEL AND PEDAGOGICAL DESIGN FEATURES IN NURSING UNDERGRADUATE EDUCATION

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1. INTRODUCTION

With the continuous development of technology, the emergence of tablets and smartphones, the ability to download digital content faster, and the availability of wireless internet connection throughout the campus allow teachers and students to use technology in all environments, allowing educators to carry out classroom practices more effectively (Dehghanzadeh & Jafaraghaee, 2018; Xu et al., 2019). Since traditional learning methods do not attract the interest of today's student profile and do not meet the needs at the desired level, new methods are gaining popularity. In this context, the use of technological applications in nursing education will contribute to the education process by enabling the student to think critically, to be more interested in the course and to increase participation in the course (Özkan and Demirbağ, 2023). Therefore, educators need to consider the transition from teacher-centred education to student-centred education (Ayoub, El-

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Aziz and Mohammed, 2024). FCM (Bishop & Verleger, 2013), which was created based on the development of technology and the idea of designing developing technologies according to different learning models, has emerged as one of the innovative ways of effective teaching for undergraduate nursing students. FCM is a method that prevents passive learning and uses active learning strategies unlike the traditional learning order. In FCM, students are provided access to videos and audio recordings prepared as course materials via the internet, technological tools such as computers, tablets or smartphones without coming to the classroom in the pre-class period (Tan, Yue and Fu, 2017). Students have the opportunity to learn the subject matter of the course by watching the prepared lecture videos, and then they have the opportunity to practice the course topics through more interactive learning activities such as group discussions, case presentations, and quizzes in the classroom environment (Lo & Hew, 2017). The flipped classroom model, which is a student-centred approach, is an effective and valuable teaching method that produces better learning outcomes, is positively experienced by students, and has the potential to improve engagement and learning outcomes (Morini, Tavares and Dutton, 2024).

2. NURSING EDUCATION AND CHANGE IN TEACHING METHODS

In order to provide safe care to patients with complex health needs, students need to have strong knowledge, critical thinking and clinical reasoning skills, as well as problem-solving and decision-making skills in providing care (Benner, 2017). The methods and strategies used in nursing education are affected by rapidly developing computer and internet technologies. Internet and digital tools have an important place in the lives of the new generation. It is thought that traditional teaching methods are insufficient to respond to differentiated student expectations in the education of the digital generation (Kaya & Dalgıç, 2018; Kızıl & Şendir, 2019). In addition, it can be said that the traditional teaching method of nursing education may prevent the development of some nursing skills. The traditional method is a one-way teaching method in which the content originates from the instructor and is then transferred to the student; it is a method in which there is a pressure to teach the course curriculum in a certain time period and students are expected to take the relevant course at exactly the same time and place (Öz and Abaan, 2021). For this reason, innovative education methods are needed in both theoretical and skills education of nursing (Kaya & Dalgıç, 2018). Therefore, information technologies have made it imperative for nurse educators to design teaching approaches that meet both the needs of

the current health system and the learning needs of students. By using active learning-based approaches in courses and clinical practice settings, nursing educators can support students' professional development, provide deep learning opportunities, and prepare them for professional life (Docherty et. al., 2018).

With the developing technology, the tools used by modern nursing educators to train students in nursing education have changed and the use of innovative practices has become increasingly widespread (Korhan et al., 2018). The use of innovative practices in nursing education increases the attention of students, saves education from monotony, and facilitates the continuation of teaching by ensuring the active participation of the student (Morini, Tavares and Dutton, 2024; Korhan et al.,2018; Lin, Hwang and Hsu,2019). Instructional strategies should encourage student engagement and self-directed learning to increase understanding and retention of complex concepts. New research suggests that more active learning methods that focus on meeting students' needs should be used (Xu et al., 2019;Zuber, 2016). The fact that the learning processes of each individual are different from each other requires the use of different methods and techniques to provide knowledge and skill teaching in all fields. It is stated that traditional teaching methods restrict nurse candidates from gaining sufficient professional knowledge and skills due to reasons such as preventing methods such as question-answer and discussion in crowded classes, insufficient time, reducing opportunities for effective communication, discussion and skill practice, inability to carry out theoretical courses with methods in which students are active, insufficient practice area and lack of instructors (Dehghanzadeh and Jafaraghaee, 2018; Nursing Undergraduate Education Workshop, 2017). Therefore, groundbreaking innovations in nursing teaching strategies are needed to encourage nursing graduates to discover and apply new knowledge and to prepare them for the clinical field and nursing roles (Bristol, 2014; Saunders, Green and Cross, 2017)

The fact that technology has a great impact on nursing care as well as nursing education has revealed the necessity of preparing nursing students for a constantly changing technology-driven healthcare environment. Today, the high number of students and the high demand for nursing education programmes, the insufficient number of faculty members (Nursing Undergraduate Education Workshop, 2017), the increase in the amount of scientific knowledge specific to nursing and the complexity of educational content; once again reveals the importance of technology in nursing education. In addition, the individual differences and abilities of students are becoming increasingly important, and the changing profiles and expectations

of students make it necessary to create and develop new environments where technology is used in nursing education (Hampton, Welsh and Wiggins, 2020; Seemiller and Grace, 2017). In addition, the fact that the majority of nursing students are Generation Z individuals who use the internet from an early age is an important reason for the integration of new technologies into nursing education (Şenyuva, 2019; Hampton, et al., 2020). FCM (Bishop and Verleger, 2013), which was created based on the development of technology and the idea of designing developing technologies according to different learning models, has emerged as one of the innovative ways of effective teaching for undergraduate nursing students. This model is a teaching method that has the potential to change teaching and learning for nursing education (Hessler, 2016).

As a result, in order to reach international standards in nursing education and to ensure that students are active and willing in education by removing vocational education from the obligation, traditional education should be abandoned at all levels of nursing education, a dynamic innovative system should be developed in which the student-centred, instructor is in the position of a guide and the current technology is integrated into education (Nursing Undergraduate Education Workshop, 2017; WHO, 2016; Pulliam, 2018).

3. FLIPPED CLASSROOM MODEL

In contrary with the traditional model where teachers lecture in class and students complete exercises afterwards, in the flipped classroom model, students are presented with the course material before class and class time is allowed to be used for deeper exploration through interactive activities. This reorganisation of in-class and out-of-class time shifts the decision to learn from the teacher to the student. The student, who comes prepared for the lesson topic at home, learns the subject in depth through activities in the classroom (Lambert & Plowman, 2020; Strayer, 2012). From this point of view, FCM sees the technology infrastructure as a tool in education and provides students with the opportunity for active and self-directed learning. FCM can improve the quality of nursing education through inter-student and inter-teacher interactions as well as providing more opportunities for students to practice (Kim et al, 2017). At the same time, this model has the potential to transform nursing education and practice by focusing more on learner motivation and self-directed learning (Betihavas et al., 2016).

3.1.Flipped Classroom Model and Theoretical Framework

FCM is a type of blended learning that meets the needs of students by enabling them to participate in learning and take an active role in the learning process (Stein & Graham, 2020). Blended learning is an instructional design approach based on the integration of face-to-face and online/virtual learning opportunities to enable learners to learn more not only from the teacher but also from their peers outside the classroom and online learning communities by reducing the time the learner is in the classroom (Stein and Graham, 2020;Ateş, 2020). It is the combination of traditional education in the classroom environment with learning activities in which the student can determine his/her own learning speed, place and time in online learning environments outside the classroom (Reidsema, 2017).

Active learning and student-centred teaching are based on the philosophy of constructivism. In FCM, educators leave the position of teaching knowledge and guide the learning process in the student's internalisation of knowledge (Strayer, 2012). In this context, FCM is a teaching method based on 'constructivist learning' with student-centred activities and learning environments where students are active (Kara, 2016). Constructivist approach advocates basing new learning on previous learning and experiences (Özerbaş, 2007). Accordingly, with FCM, students' prior learning is provided by watching the content presented outside the classroom. In the classroom process, students have the opportunity to construct new knowledge on their previous learning. In this teaching strategy, each student learns the concepts at his/her own learning speed, plays and pauses the lecture videos according to personal preferences and watches them as many times as preferred. FCM is a flexible teaching method as it provides the opportunity to learn course materials at the preferred time and place (Sun, 2017). In addition, compared to the traditional classroom, FCM is more effective in improving students' cooperative spirit, practical ability, enjoyment of the lesson, expression and communication, curriculum effects, participation interest, thinking and analysing ability (Xu et. Al., 2019). It also increases flexibility in accessing learning materials and resources and improves efficiency in the use of physical space (Kim and Kim, 2017). Due to these features, the flipped classroom model has attracted the attention of educators and has been widely applied and studied in many disciplines, including nursing.

With FCM, changes in the use of in-class and out-of-class time, activities traditionally accepted as 'homework' in the classroom can be done as in-class work. In addition, active learning, peer learning, in-class activities

emphasising problem solving, pre-class and post-class activities, and technological products such as videos can be used (Stein and Graham, 2020). With more practice in the group learning space in the classroom, teachers/trainers can make more efficient use of class time, correct students' misunderstandings, and provide feedback during the teaching of nursing practices; students can then apply their newly acquired knowledge (Lin et. al., 2019).

Instructors can add surprise questions or mini-exams to the video materials that students study before the lesson (Özkan and Demirbağ, 2023). The aim here is to encourage students to participate and study outside the classroom. In this way, students can evaluate themselves about how much they have learnt the lesson (Joseph et al., 2021;Long , Cummins and Waugh, 2017). This model provides the opportunity to do more practice and activities during the lesson. The main point of FCM is that the lesson time in the classroom is allocated to the learning process in which the student is more active (Evans et al., 2019; Long, Cummins and Waugh, 2017).

Although both lecturing and the use of technology-supported programmes during the lesson ensure that the lesson passes efficiently, it may cause problems in terms of time. With FCM, the time problem is eliminated and the students who come prepared for the lesson can easily ask their questions about the points and questions that are not understood in the video lessons they have watched. In FCM, teachers assume the role of facilitator and spend their time in the classroom interacting with students individually (Long, Cummins and Waugh, 2017). The focus of the lesson is on the student instead of the subject matter and student-centred learning takes place in contrast to teacher-centred teaching (Stein and Graham, 2020). Student-centred learning makes students feel important and think that their ideas are important (Evans et al., 2019). Thus, this teaching method motivates students and enables them to achieve their learning goals (Turan and Göktaş, 2016; Long, Cummins, and Waugh, 2017). It is also stated in the model that learning flexibility is one of the strengths of the method and that the role of the educator in this environment changes from 'expert teacher' to a person who guides and facilitates (Sun, 2017). While the student is responsible for grasping the theory presented in the lecture, the instructor is responsible for creating the action-oriented experiences that take place in the classroom. It has been found that students watching videotaped lectures more frequently leads to higher grades and better learning outcomes at the end of the semester (Evans et al., 2019; Heijstra and Sigurðardóttir, 2018). Nwosis, Ferreira, Rosenberg, and Walsh observed that the number of students who dropped the course and received low course grades (D or F) decreased in the study

conducted partially with FCM in their courses, and found that students preferred this method and helped them succeed in the course (Nwosisi etal., 2016). The FCM method was found to make students more satisfied with the lessons conducted according to FCM, to make more effort to study, and to increase their participation in the course. Chen and his colleagues think that this teaching method is a method that should be used in higher education to provide the self-discipline that students need (Chen et al., 2018).

3.2.Flipped Classroom Model and Active Learning

In the nursing education process, it is emphasised that active learning methods should be preferred in the classroom that increase students' participation in the course in order to conduct the course and ensure learning (Evans et al., 2019; Hampton et al., 2020; Nursing Undergraduate Education Workshop, 2017). Bonwell and Eison defined active learning as 'an action that involves reading, writing, discussing and engaging at the levels of analysis, synthesis and evaluation while the student continues to solve problems' (Bonwell and Eison, 1991). Active learning techniques help students develop self-directed learning techniques to enable them to become more autonomous learners (Atkins, 2018).

Taking an active role in learning enables the student to better understand the material and increase its retention, enabling the student to use the material outside the classroom (Lin et al., 2019). For students to be actively engaged in learning, the teacher should create an environment that encourages students to participate in the lesson (Hampton et al., 2020). Such an environment is not possible in a traditional classroom setting (Lin et al., 2019). It is stated that in order to create an active classroom, teachers should abandon traditional lecturing methods. The traditional lecture process is considered a passive learning environment because it does not create an environment that encourages students to think critically (Atkins, 2018). In such classroom environments, students sit and listen to the lecture rather than being active participants and they are required to take notes while the teacher is lecturing. In a meta-analysis study, it was stated that traditional courses reduce success rates, while active learning methods help to achieve better grades (Freeman et al., 2014).

Active learning strategies require a more student-centred pedagogy. There are many advantages of learning in a classroom where the student is active. By using active learning strategies where the student is at the centre, students are more interested in their own learning, targeted results are achieved in student knowledge and skills, and student confidence, collaboration and

critical thinking skills are increased (Billings, 2016). Despite evidence that active learning strategies improve student outcomes, passive pedagogy continues to dominate nursing education. While the lessons taught in this way appeal to a specific group of students, they do not meet the different needs of other students in the class. In active learning, more emphasis is placed on developing practical skills and exploring attitudes and values rather than transferring knowledge to students. Students who participate in activities by being involved in the teaching environment in the classroom are more active, their motivation increases, they are more involved in high-level thinking activities, and they are more interested in the subject by using the course materials better (Kim et al., 2016).

The purpose of the active learning method is to understand the students and make adjustments according to their needs. FCM using active learning strategies provides such an opportunity for both the student and the instructor. FCM is only successful when active learning strategies are used correctly. In FCM, outside the classroom, the lesson is watched by students in video conferencing format, and inside the classroom, students continue the lesson as 100% participants with collaborative active learning exercises (Lo and Hew, 2017). Active learning exercises include case studies, concept maps, interactive games or student response systems (such as Kahoot), discussion, think-pair-share case discussions, collaborative activities that nursing professionals use to provide the necessary active learning component in the classroom (Ugwuanyi et al., 2020). When exploring the definitions of FCM and active learning concepts, it is seen that all classroom experiences take place around active learning experiences and active learning is a supportive structure for the flipped classroom. These activities have been found to be some of the best practices supported by research as active learning methods that produce positive outcomes such as student satisfaction, critical thinking, student engagement and improved academic performance (Ugwuanyi et al., 2020; Halterman, Broxton and Joshua, 2024).

3.3. Components of the Flipped Classroom Model

An experienced team of educators of the flipped learning team, together with Pearson (2013), defined the four basic components of FCM as F-L-I-P, which constitute the theoretical framework of FCM, based on the literature and the results of their survey. These F-L-I-P components used in FCM are Flexible Environments, Learning Culture, Intentional Content and Professional Educator (Yarbro et al., 2014; FLN, 2014). Teachers need to add these four components of F-L-I-P to their teaching processes to facilitate learning (Yarbro et al., 2014). When these components are not used while

applying FCM, it is thought that it cannot go beyond a teaching method in which only home and school are replaced and videos are given to students as homework (Demir, 2018).

3.3.1 Flexible Learning Environment

FCM often allows educators to physically reorganise learning spaces to accommodate group work, independent study, research, performance and learner assessment, and to fit the lesson. It creates flexible environments where students choose when and where to learn (Bergmann and Sams, 2012; Tétreault, 2013). The space needs to be flexible so that an educator can create a small practice environment and individual work spaces. Rather than creating a classroom environment such as fixed desks or rows of student chairs, flexible working environments should be created for both the instructor and the student, where the working/lesson environment can be organised as desired and appropriate to the course (Schlairet, Green and Benton, 2014). Internet access provided in the flexible learning environment should allow students to easily access course materials from their mobile devices (Schlairet et al., 2014).

Educators recognise that classroom time can be chaotic and noisy in contrast to the usual quiet classroom. In the flexible learning environment that educators provide to students before the lesson, they ensure that students have access to educational materials that allow them to learn when and where they want. In a flexible learning environment prepared in this way, students do not feel the tension that occurs when trying to understand the lesson in a cramped lesson, and the educator gains more time to carry out practical activities in which students are active (FLN, 2014; Demirel, 2016)

3.3.2. Learning Culture

In traditional education, the teacher is in the role of instructor. In FCM, instruction consciously shifts to a student-centred approach as classroom time is focused on enabling students to explore the subject matter in greater depth and creating rich learning opportunities. As a result, students move to the learning centre where they are actively involved in knowledge construction as they personally participate in the learning process and evaluate their learning in a personally meaningful way (Özdamli and Asiksoy, 2016). Students theoretically decide their own learning pace by reviewing the course content. Instructors can maximise the use of face-to-face classroom interactions to assess students' comprehension and synthesis of course material.

3.3.3. Deliberate Content

The third component, deliberate/purposeful content, shows that the educator identifies which topic/lesson or practice he/she needs to teach directly and makes an effective decision about how best to explain/introduce these practices in the video lessons he/she will prepare. It knows which topics are important within the scope of the course and why, and how the content it determines is related to the learning objectives of the course and the student (Tetrault, 2013). In addition, it plans learning activities by creating purposeful content and materials that will facilitate student learning in the course. Although viewing course content materials is not sufficient for most students to analyse information (Hamdan et al., 2013), in-class activities that ask students to apply and synthesise information can provide a basic knowledge base. For this reason, it is necessary to introduce the basic and critical information related to the subject in the videos that the student will study before the lesson in a way to cover the programme in the lesson (Hamdan et al., 2013; Tetrault, 2013). Because the main purpose of FCM is to use technology to support collaborative curriculum with active learning. In this context, it is important that the content to be used in classroom activities during the course is converted into a video lesson, otherwise students may be confused and see videos as a disadvantage.

3.3.4.Professional Educator

FCM requires professional educators who can assist students in making connections between new and prior knowledge by engaging in complex learning activities during the lesson (Lasry, Dugdale and Charles, 2014). This is because it is important for the instructor to observe all students and provide immediate feedback when evaluating their work. One of the criticisms of the TSYM is that the instructional videos used in the model will replace educators. However, the guidance and depth of knowledge of the instructor is critical for the creation of the videos used in this model, the planning and execution of pre-lesson and in-lesson activities (Tetrault, 2013). This is more important and demanding than the process followed in the traditional education model. The trainer has to determine when and how to shift direct instruction from group to individual learning space and how to maximise face-to-face time between teachers and students. During the lesson, educators are constantly observing their students, providing them with feedback about the moment and continuously evaluating their work (Hamdan et al., 2013).

3.4. Advantages and Disadvantages of the Flipped Classroom Model

FCM has advantages in terms of student, instructor and teaching as stated in the literature. FCM provides students with realistic learning experiences, improves the student's interpretation ability and motivation (Altemueller and Lindquist, 2017). With this model, students' individual differences are taken into account (Elian and Hamaidi, 2018), it helps them to comprehend different and complex scenarios correctly, and to improve their decision-making and problem-solving skills (Lee and Park, 2018). From the instructor's point of view, the instructor moves out of the narrator position and finds the opportunity to guide the student, creates an interactive learning environment, and increases the classroom time spent for student-to-instructor and student-to-student interaction (Altemueller and Lindquist, 2017). Instructor and student interaction increases in classroom practice (Turan and Akdag-Cimen, 2020) and the classroom environment can become a clinical learning environment that deepens nursing students' understanding of professional roles (Saunders, Green, and Cross, 2017). It reduces lecture time and repetition, enables more effective use of class time, and enriches classroom time with applications rather than theoretical lectures (Wittich et al., 2018). In this context, time in the classroom can be used to review and discuss topics that are difficult to comprehend and thus less time is spent on answering basic and repetitive questions.

Besides these advantages of FCM, it may also have some limitations and disadvantages. Some students may come to class without watching and studying the videos before class (Xiu, Moore, Thompson, and French, 2019), they may perceive an intense study pace and workload (Betihavas et al., 2016), and it may cause stress (Bouwmeester et al., 2019). In addition, not all students are able to learn all basic and advanced material independently through video tutoring (Presti, 2016). In addition to these, the fact that students have to constantly connect to the internet, the lack of an environment where they can actively talk and evaluate their reactions while studying the lesson in the out-of-class process, the difficulty in interacting with the instructor and friends, and out-of-class study time may cause disconnection in the learning process and decrease in learning effectiveness. Again, the possibilities such as not being able to understand whether the student has learnt the information correctly or not, the difficulty in controlling the students' video viewing, and the possibility of using extra time to re-teach the missing / incorrect information are seen as negative aspects in terms of the applicability of this model (Khaltmatova, 2017). In order to eliminate such negativities, surprise

questions can be added to the lecture videos, the scroll bar of the video can be removed during the first viewing of the video and it can be made compulsory for the student to watch the video. In addition to these, reminders can be sent via text message or e-mail according to the students' follow-up status. By analysing the answers given by the students to the questions, whether they watched the video or not, the date they watched the video for the first time and the number of times they watched each subject, the parts that the students could not learn about the subject can be determined by the instructor and these deficiencies can be corrected at the beginning of the lesson in the classroom. In this way, it can be said that the negative aspects mentioned in terms of the applicability of the model can be eliminated to a great extent. In order to prevent these negativities, online tests can be conducted to identify students' incomplete learning (Holik, 2016), and the time freed up from the process of giving preliminary information in the classroom can be used to eliminate the incomplete learning identified in the new subject and to move the learning to the next cognitive level (Turan, 2016; Özkan and Demirbağ, 2023).

3.5. Learning Process in Flipped Classroom Model

In FCM, there is a sequential connection between out-of-class lecture videos and in-class activities (Reidsema et al., 2017). FCM divides education into two phases. In the first phase, students gain an understanding of the intended concepts and in the second phase, they learn to use and evaluate the learnt concepts in new situations. This student-centred method helps students to use what they have learnt in practice, thus preparing them to respond to the challenges of healthcare settings (Betihavas et al., 2016).

In FCM, students come to class by watching the video of the lesson they will learn. The lesson starts with short questions and answers. If there are unclear points in the lesson, they are explained in a comprehensive way (Ajmal and Hafeez, 2021). In the rest of the time, the teacher conducts group/individual activities in which the students are active and guides the students with one-to-one support. In this type of classroom structure, lessons are always delivered via videos outside of class time (Turan and Akdag-Cimen, 2020), the teacher does not lecture directly in the classroom. The aim of FCM is to give students the opportunity to learn through discussion. In this approach, instead of a teacher-centred classroom, there is a student-centred classroom and the teacher is in the classroom only as a guide. In the traditional approach, lecturing takes a lot of time. In a traditional classroom environment, students have to follow what is said by the teacher. They focus on the teacher's presentation and may miss important points when trying

to write down what the teacher says. In addition, students hesitate to speak in class and do not want to ask questions (Harris et al., 2016). Educators cannot identify students' deficiencies until the assignment is handed in or the assessment is done.

In FCM, time is restructured. According to Bergman and Sams, in the traditional model, students who complete their homework at home come to class with a series of questions in mind. After the warm-up, teachers have to allocate almost 20 minutes for homework questions. At least 30 or 45 minutes are spent to present the new content, leaving only 20 or 35 minutes for guidance and independent practice (Bergmann and Sams, 2012). In TSYM, after a 5-minute warm-up activity, students who watch the relevant video lesson at home ask questions about the new content and the teacher answers them for about 10 minutes. The remaining 75 minutes are reserved for counselling and independent practice or laboratory activity (Table 1). As the table shows, the flipped classroom provides students with more time to practise through extensive, hands-on and problem-solving activities and exercises.

Table 1. Comparison of classroom activity periods of traditional classroom and FCM (from Bergmann and Sams)

Traditional Classroom	Time (Minutes)	Flipped Classroom Model	Time (Minutes)
Warming Up Activity	5	Warming Up Activity	5
Control of homework of the previous lesson	20	Question and answer time about the videos	10
Presenting New Content	30-45	------	
Exercises / Laboratory Practices	20-35	Exercises / Laboratory Practices	75

In an educational environment based on FCM, the course hour can be evaluated in an environment where more practice can be done instead of the lecture/classroom. While the student nurse has the opportunity to do more practice related to the activities carried out, she/he repeats her/his theoretical knowledge at the same time and thus active learning is realised. In this way, while the educator is in the position of guide/monitor/director in the classroom, the student is in the role of active and practitioner.

3.6. The Role of Teacher and Student in the Flipped Classroom Model

In the Flipped Classroom Model approach, the student is transformed from a passive receiver of information to an active supporter of information. In the use of this model, students should take their own learning responsibilities, follow the teaching materials before the lesson and prepare for the lesson. By making the necessary interactions with their teachers and friends, they should give feedback and be active in class discussions (Turan and Akdag-Cimen, 2020; Özkan and Demirbağ, 2023).

The teacher as well as the learner has many roles and responsibilities in TSYM. In a TSYM setting, the teacher prepares a lesson that is recorded by the teacher or obtained from another professional source. The time the teacher spends creating or acquiring this instructional content is 'the least visible but most critical step in the planning process. By uploading the prepared lesson materials to a learning management system, the educator shares the lesson with the students. Before fully implementing this model, the teacher teaches students how to watch the videos, encourages them to pause and replay the video as needed, take notes and write down any questions they have. Sometimes students may be asked to complete online quizzes, worksheets, writing assignments, or any other selected activity worthy of scoring in the student's overall course grade (Turan and Akdag-Cimen, 2020; Özkan and Demirbağ, 2023). When the students come to class on the day of the lesson, the instructor, students' questions, misconceptions and other issues related to the videos review it, then to class, that he created for that day introduces the learning activities. They give the necessary instructions to the students and then the to work on tasks they begin. In this process while providing instructive feedback and guiding students through critical thinking activities helps students.

3.7. Flipped Classroom Model in Nursing Education

Traditional teaching is unable to cope with the needs of nursing education as a result of rapid advancement in healthcare. Blended learning appears to be a new option to address the current situation as Internet technologies continue to develop (Du et al., 2022). In the development of nursing skills, it is important for nurse educators to provide learning guidance in order to increase students' engagement in the course content prepared before the class, their learning performance, and their responsibility for their own learning. In this context, it is recommended that nurse educators design pre-class activities for students to ensure that students are ready for in-class

activities and integrate creative teaching strategies into nursing education (Barbour and Schuessler, 2019). Observations in nursing classrooms show that experienced nurse educators apply old-fashioned teaching strategies that do not appeal to today's students (Berg and Lepp, 2023). However, nursing students in Generation X and Y have never known a world without technology and prefer learning with modern technology and more interaction in the classroom as opposed to classical teaching. In the last decade, the value of student-centered teaching, in which student participation in nursing education in higher education is actively provided and students have their own learning responsibilities, has been emphasized (Xu et al., 2019). In this direction, FCM, which includes the application of active learning strategies and has become increasingly widespread recently, has emerged as an approach that can solve this problem as one of the student-centered teaching methods (Kim et al., 2017). This student-centered teaching model overlaps with the philosophy of nursing education and can increase the professional competence of nursing students (Hu et al., 2018). Therefore, nursing schools should use technological applications in their teaching strategies to attract students' interest and improve learning outcomes.

It shows that the use of FCM in nursing education is an effective teaching approach that will enable students to associate the theories and concepts they have learned with nursing skill practices and to be prepared for nursing experiences (Youngwanichsetha et al., 2020). In addition to presenting information and developing nursing skills, nursing education using the flipped model aims to encourage nursing students to increase their critical thinking and self-efficacy by supporting the strengthening of knowledge that will help students evaluate health and provide appropriate treatment and care in real health situations (Lee and Park 2018). It is stated that nursing students tend to learn by rote memorization and cannot make connections between nursing theory and practice due to superficial memorization (Bressington et al., 2018). In addition, factors such as inadequate practice and lack of familiarity with nursing skills may cause students to feel more anxious and under pressure in the process of evaluating nursing skills. In nursing education, the implementation of FCM can overcome problems such as inadequate student practice and inadequate feedback during the teaching of nursing skills. When this model is adopted in the classroom, students have more time to interact with nurse educators (Özkan and Demirbağ, 2023), and class time is managed properly for review and discussion of targeted nursing practices (Godfrey, 2019). Thus, students can also be responsible for their own learning. In this context, ensuring that students have enough time to practice and providing feedback to them can increase their performance

in learning nursing skills (Kaplan, Özdemir and Kaplan, 2023) and nursing skill levels (Anderson, 2017; Zidan et al., 2020).

Zidan et al. (2020) found that FCM had a positive effect on nursing students' achievement of safe drug administration skills, Borges (2019) found that it had a great positive effect on improving tracheostomy care practices and reducing failure by 60%, improving urinary catheterization knowledge, skills and self-efficacy (Aguilera-Manrique et al., 2022) and physical examination skills (Soltaninejad et al., 2024). In addition to the results of this study, Dindorf-Hogenson et al. stated that students in both FCM and traditional lesson groups showed good psychomotor skill performance in the insulin pen application involving a large number of sequential steps (Dinndorf-Hogenson et al., 2021). In another study conducted by Kaplan et al. it was also stated that although the total mean scores of FCM students in IV catheterization, IV blood collection, blood pressure measurement from the brachial artery, IM injection into the ventrogluteal region and urinary catheterization skills in women were higher than the students in the control group, there was no statistically significant difference between the groups (Kaplan et al., 2023). Flipped learning increased nursing students' knowledge related to the principles of asepsis and enabled them to take responsibility for learning. This model had a positive effect on students' higher order thinking skills such as critical organization and decision making (Acun, 2024). Compared with TLBI, FC may be more beneficial in enhancing community nursing competence and academic performance (Chang and Hsu, 2024). The effect of training videos prepared for CPR, bandaging and IV catheterization applications and return demonstration sessions on the skill performances of nursing students was examined. In the study, the experimental and control group students participated in the theoretical lecture and skills demonstration on the first day. On the second day, the training videos were made available only to the FCM group, and on the third day, the classroom video designed for the same group was shown. On the fourth day, the skill performances of the experimental and control group students were evaluated. It was determined that the students in the FCM group who performed the skill practices according to the checklists were more successful in terms of skill performances.

In the meta-analysis study including 11 randomized controlled studies in which Hu et al. examined the effectiveness of FCM in undergraduate nursing education in China, in 8 studies consisting of 1180 students (590 in the FCM group and 590 in the control group), the theoretical knowledge scores of the students were examined and it was determined that the courses taught with FCM had a positive effect on the level of theoretical knowledge

and increased the success scores compared to the courses taught with the traditional method (Hu et al., 2018). In a study conducted by Greenwood and Mosca (2017) in a surgical nursing course, the traditional method, in which the course is taught by the teacher through presentations, was compared with FCM, in which students study the audio presentations of the course online before each class (Greenwood and Mosca, 2017). According to FCM, students were asked to listen to the course materials before coming to class and to study the presentations before coming to class. In the classroom, the course was completed with case studies and the exam scores of both groups were compared. It was found that the FCM group had a statistically significant increase in exam scores in the first and second semesters compared to the exam scores of the students in the traditional class.

Jan and Kim's meta-analysis study evaluating the cognitive, affective and interpersonal outcomes of flipped classrooms in higher education shows that this method has more significant effects on students' affective and interpersonal outcomes than cognitive outcomes (Jang and Kim, 2020). In Pulliam's study with FCM in the "Health Assessment Course", students stated that this method provided peer collaboration and helped participants learn from each other (Pulliam, 2018). Within the scope of the nursing leadership course, the effects of flipped and in-class teaching methods on student achievement were evaluated and it was found that the achievement scores of FCM students were statistically significantly higher than the achievement scores of students who received in-class teaching. In FCM, more "A" letter grades were obtained compared to the in-class teaching method and no student received an F letter grade. In line with the results of the research, it was stated that the Flipped Classroom teaching method is a method that can be used for students to learn basic concepts (Öz and Abaan, 2021).

One of the main objectives of education is to provide positive behavior to the individual while at the same time ensuring the permanence of this behavior. In this context, the effective use of learning environments and time in teaching nursing practices is an important issue in terms of ensuring the permanence of knowledge and skills (Banks and Kay, 2022). FCM is an effective learning method in which classroom time can be used effectively, the student can find time to repeat the relevant nursing practices and is active/ practitioner, accelerates the learning process, and can ensure the retention of knowledge and skills (Dehghanzadeh and Jafaraghaee, 2018; Lelean and Edwards, 2020). In FCM, the student completes the cognitive part of the subject and comes to the lesson ready and motivated as he/she studies and repeats the subject as much as he/she wants at any time (Pangandaman,

2018; Lambert and Plowman 2020). In addition, with in-group and in-class activities, students become active in the lessons and learning process and focus more and develop both critical thinking skills and learning attitudes (Chen, Lui and Martinelli, 2017), so that they remember what they do for a longer period of time. Based on this information, the student's being active in the FCM implementation process, learning flexibility, giving the student enough time to internalize the information, the student's communication with peers and the nurse instructor can be appropriate factors to ensure the permanence of learning (Dehghanzadeh and Jafaraghaee, 2018).

In addition, understanding the information learned and being aware of how to use it can also make learning more permanent. It is thought that audiovisual tools and animations used in videos, which are teaching materials in FCM, make the lesson more interesting in teaching nursing practices and affect the retention of learning by stimulating more sensory organs. Based on these results, it can be said that FCM, a student-centered teaching method, improves the student's undergraduate basic competencies and academic performance (Ng, 2023), basic nursing skills (Sullivan, 2022), self-efficacy, critical thinking skills, communication skills (Lee and Hwang, 2016), learning motivation and learning satisfaction (Ayoub, El-Aziz and Mohammed, 2024), and has a positive effect on the retention of learning (Lambert and Plowman, 2020).

4. CONCLUSION

The use of innovative teaching methods and technologies in nursing education allows nursing students to practice to improve their abilities and skills by supporting them to feel safe. In order for the nursing profession to maintain its popularity and become a targeted professional group, it is important for nursing schools that provide nursing education to evaluate the expectations and learning needs of the digital generation and develop learning activities that are compatible with their learning styles. In the light of these technological developments, if nursing teaching methods suitable for the new generation are not updated, it may lead to undesirable consequences in terms of patient safety because prospective nurses will not be adequately prepared cognitively and skillfully for the future technological working environment.

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HEALTH CARE-ASSOCIATED INFECTIONS AND NURSING CARE

Besim ÇAM[1]

1. INTRODUCTION

Health care-associated infections(HAI) are infections acquired by patients while receiving health care. These are infections that develop at least 48 hours after hospitalisation or within 10 days after discharge. If there is a surgical procedure, it occurs within 30 days (up to one year if there is an implant) (Haque et al., 2018).

HAI is reported by the Centers for Disease Control and Prevention (CDC) of the United States of America (USA) and the World Health Organisation (WHO) as the most important cause of mortality and morbidity worldwide (Artan et al., 2015; Mankan & Kaşıkçı, 2015). According to WHO data (2020), nosocomial infections are seen in 7% of hospitalised patients in developed countries and 10% in developing countries, and 3-6% of these patients lose their lives (Çelik et al., 2020).

An estimated 1.4 million people worldwide are thought to develop nosocomial infections every day. It is reported that nosocomial infections develop in 5%-10% of hospitalised patients in the USA in a year, this rate is between 6-9% in Europe, and this rate varies between 1-3% and 16% in Turkey (Ağırbaş, 2013; Özden & Özveren, 2016). In a study investigating the prevalence of infection in ICU (Intensive Care Unit) [Extended Prevalence

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of Infection in Intensive Care (EPIC II)], the infection rate was reported to be 51% (Vincent et al., 2009).

Since ICUs are areas where invasive interventions are performed more frequently, patients with more severe clinical course, trauma, metabolic disorders and surgery are monitored, and resistant microorganisms are isolated more frequently compared to the general hospital, the risk of healthcare-associated infection is high (Trubiano & Padiglione, 2015). It has been reported that 53.6% of HAIs seen in ICU resulted in death and considering this rate, prevention and control of HAIs is of great importance (Yüceer & Demir, 2009).

Healthcare-associated infections, which are an important health problem for the world in general and for our country, cause prolonged hospitalisation of patients, increased morbidity, mortality and treatment costs, and loss of workforce for healthcare professionals (Yüceer & Demir, 2009).

In the prevention and management of healthcare-associated infections, a multidisciplinary approach, developing local guidelines, monitoring, supervising and providing feedback on the use of broad-spectrum antibiotics are necessary. At the same time, the use of evidence-based practices to prevent infections will contribute to improved patient outcomes (Haque et al., 2018).

The role of nurses in controlling and preventing infection is very important. Nurses should be knowledgeable about the cause, effect and management of infections to improve the quality of healthcare.

In particular, nurses should be aware of the risk factors for urinary tract infections, ventılator associated pneumoniae, catheter-associated bloodstream infections and surgical site infection, which are common in the hospital, and follow up patients at risk for infection. They should also know the standard prevention strategies in infection control. Take and implement necessary precautions to prevent cross-contamination from infection sources. In addition, in the prevention and management of infections, the nurse should cooperate with all team members working in the ICU and pay attention to aseptic rules. Nurses should be aware of evidence-based guidelines on the prevention of infections for quality care, follow updates continuously and contribute to the establishment of institutional protocols (Yorgancı & Çakmakçı, 1997; Yüceer & Demir, 2009).

2. INFECTIONS PREVENTION, PROTECTION AND NURSING CARE

It is suggested that surveillance and diagnosis are very important in the acceptance of health care-associated infections as a quality indicator (Oğuz et al., 2013). In recent years, events such as the increasing pandemic in the world reveal the importance of surveillance and practices to prevent infections in preventing infections (Önal & Kalaycı, 2021). Prevention of health care-associated infections is a process that starts with the admission of the patient to the unit and requires the employees to work in an interdisciplinary team approach with the Infection Control Committee (ICC). With this cooperation, rapid and accurate diagnosis is made, necessary precautions are taken, isolation rules are followed, investigations are carried out and outbreaks are recognised at an early stage. As nurses are the health professionals who have the most contact with patients, nosocomial infections are a quality indicator that is directly influenced by nursing practice, i.e. a quality indicator that is sensitive to nursing or nursing practices.

Nursing practices have been shown to reduce nosocomial infections by 40-50% in studies (Akbayrak & Bağçivan, 2010; Barrera-Cancedda et al., 2019). In the literature, it is reported that the universal measures determined by the Centre for Disease Control (CDC) are significantly effective in the prevention of nosocomial infections and that nosocomial infections are reduced by 30% with the application of basic infection prevention methods (Akyol et al., 2006; Yüceer & Demir, 2009).

For the prevention of infections;

- Training of health personnel on prevention and infection control,

- Clinical and microbiological surveillance,

- Prevention of microorganism transmission,

- Sterilisation and disinfection procedures must be carried out in accordance with the procedure and with appropriate methods and frequency (Ören, 2010).

3. STANDARD PRECAUTIONS TO BE CONSIDERED IN NURSING CARE TO PREVENT INFECTION

3.1. Hand washing

Hands are the most effective route of transmission for nosocomial infections. However, apart from nosocomial infections, hand washing is extremely important for protecting and improving general public health. Studies have reported a 30-50% reduction in nosocomial infections with hand washing alone (Koşucu et al., 2015). The hands of healthcare workers are responsible for 20-40% of the spread of micro-organisms between patients (Artan et al., 2015). The non-compliance of healthcare workers who undertake the treatment and care of patients with other isolation measures and control methods, especially hand washing, which is the most basic isolation measure, causes the infection to spread more (Ulupınar & Tayran, 2011). Despite this, compliance with handwashing among healthcare workers is low and inadequate. For this reason, WHO has recommended the use of strategies and national campaigns to increase handwashing compliance (Koşucu et al., 2015)

Hand washing is defined as the removal of microorganisms from the hands. Hand washing is one of the most effective standard isolation measures to prevent the spread and occurrence of nosocomial infections. The aim of hand washing is to remove visible soil from the hands, to remove all transient flora and to reduce the permanent flora (Arda et al., 2005). To ensure this effectiveness, hands should be washed for at least 20 seconds. WHO emphasises hand washing after contact with the patient, before aseptic procedures, contact with body fluids, after patient treatment, after contact with anything in the patient's environment (Kaya & Güvenir, 2020).

Picture 1. Hand washing tips (https://aiat.edu.au/covid-19/)

The main reason for low compliance with hand washing is the time it takes. Although it takes only 20 seconds to wash hands, it takes 40-80 seconds to walk to the sink, wash hands, dry hands and return to the patient. This reduces staff compliance in hospitals, especially in intensive care units where workloads are high and hand washing is most needed (Günaydın, 2013).

3.2. Using Gloves

One of the most important and common practices used by nurses and other healthcare workers to prevent cross-infection is the use of gloves. Other goals are to prevent hand contamination and to protect against micro-organisms that can be transmitted through blood (Kaya & Güvenir, 2020). However, although gloves are used to prevent cross-contamination, they also cause direct cross-contamination if not used properly (Ören, 2010).

For the glove to be protective, it must be sized to fit the person's hand. If it is torn, punctured or disintegrates, it should be replaced immediately with a new one and should not be reused. When it is removed, it should be taken out with the clean part facing outwards and disposed of in the appropriate waste bin (Karaahmetoğlu & Softa, 2016). However, some studies have reported incorrect practices. In one study, wearing more than one glove during patient contact, unnecessary use of gloves, failure to wash hands after removing gloves and failure to change gloves appropriately when changing from one patient to another were reported as the most commonly observed poor practices (Arda et al., 2005).

Gloves should be selected and used according to the intervention to be performed, the process to be carried out and the chemical agents to be contacted. In 1987, the Centers for Disease Control and Prevention (CDC) recommended universal precautions, the most important of which is proper hand washing before and after patient contact, after removing gloves (Bulut et al., 2014).

Considering that hands and gloves are the most important means of transporting pathogenic micro-organisms, it should be remembered that gloves should be removed and hands washed when moving from patient to patient or from a soiled area to a clean area on the same patient to avoid cross-contamination (Yüceer & Demir, 2009).

3.3. Isolation Methods

Isolation is one of the most important aspects of infection control. Isolation is a protective measure that prevents the transmission of organisms, including antibiotic-resistant micro-organisms, from infected patients to other patients, visitors and healthcare workers (Sarvan, 2010; Usluer, 2013).

Isolation measures are provided in two ways: standard measures covering all patients in the hospital and measures covering specific patient groups (Usluer, 2013). When considering the standard precautions outlined in the CDC's 2019 updated Isolation Precautions guideline, the most important standard precaution is to wear non-sterile gloves when handling all types of blood, body fluids and secretions other than sweat, and to practice hand hygiene by removing gloves after contact. If there is a possibility of blood and other body fluids coming into contact with the clothing or bare skin of healthcare workers, it is recommended that an apron be used in addition to gloves, and if there is a possibility of blood and other body fluids being splashed into the environment, it is recommended that a surgical mask and goggles or a mask with a visor be used (Sharma et al., 2020; Siegel et al., 2007).

Transmission control measures are measures applied in addition to standard measures to identified or suspected, epidemiologically important, infected or colonised patients. Measures of transmission are analysed in three groups:

- Respiratory measures,
- Droplet measures,
- Contact measures (Usluer, 2013).

Implementation of isolation measures is very important in reducing nosocomial infection rates in the ICU. Therefore, the ICU nurse should post the isolation cards on the door of the patient's room when necessary, inform the ICU team about the isolation measures and ensure that the measures are implemented (Yüceer & Demir, 2009).

3.4. Precautions To Be Taken Due To Invasive Interventions

Invasive procedures, which are an integral part of life support, are an important risk factor for nosocomial infections that may develop in the patient. The most common invasive interventions performed in the hospital are intravenous catheterisation, urinary catheterisation and intubation. First group precautions for invasive procedures include appropriate catheter care, sterilisation and dressing application using aseptic technique.

Studies have shown that catheter-associated urinary tract infections(CA-UTI), ventilator-associated pneumonia(VAP) and central line-associated bloodstream infections(CLA-BSI) are the most common infections in the ICU (Çoksak et al.; Deepashree et al., 2017). It is important to prevent these infections before they occur. Therefore, organisations such as WHO, Centre of Disease Control and Prevention (CDC), Institute for Healthcare Improvement (IHI), Healthcare Infection Control Practices Advisory Committee (HICPAC), National Healthcare Safety Network (NHSN) are contributing to efforts to combat HAIs by publishing many procedures and guidelines, including evidence-based practices for the prevention of HAIs according to international/national standards (Benenson et al., 2020; Gezie et al., 2019; Resar et al., 2012).

Nurses, who are responsible for the treatment and care of patients, are of great importance in the prevention of healthcare-associated infections (Babu, 2020; Resar et al., 2012). Nurses should be aware of the risk factors for CA-UTI, VAP and CLA-BSI that are common in the ICU and follow up patients at risk for infection (Al-Jubouri, 2014; El-Sayed et al., 2015; Resar et al., 2012). They should implement and ensure the implementation of guideline interventions, including prevention and control measures, in accordance with national/international standards (Babu, 2020; Barrera-Cancedda et al., 2019; Yüceer & Demir, 2009).

4. CONCLUSION

Nurse observation forms are a very important source of data for infection prevention and follow-up. These forms must be filled in correctly and completely. It is very important that nurses and other healthcare workers work with the infection control committee and take the necessary precautions to prevent infection. Precautions to be taken specific to the development of infection and care strategy should be determined and implemented carefully. Nurses working in wards play a very important role in the prevention of infections and epidemics. The nurse is the main person in charge of coordinating and exchanging information between the whole team and monitoring the correct implementation of measures (Trubiano & Padiglione, 2015; Yüceer & Demir, 2009).

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NURSING CARE FOR MULTIDRUG RESISTANT BACTERIA

Besim ÇAM[1]

1. INTRODUCTION

Antibiotic resistance occurs when some strains of bacteria are not affected by an antibiotic, or when a strain that is affected by an antibiotic becomes resistant through resistance mechanisms (Töreci, 2003). Multi-drug resistance (MDR) is generally defined as resistance to three or more classes of antimicrobial agents (Magiorakos et al., 2012; Tunay et al., 2012).

Since the discovery of antibiotics, their inappropriate and excessive use has led to the development of side effects and bacterial resistance. This is a serious public health problem that will affect future generations. Particularly in the late 20th century, resistance has developed in many pathogens, and this situation has not been confined to the hospital, but has led to the emergence of new infections in the community and in animals that do not respond to antibiotic treatment, and to increased mortality and morbidity. From a global public health perspective, antimicrobial resistance kills 700,000 people a year. If no action is taken to combat antimicrobial resistance, it is estimated that 10 million people will die from antimicrobial resistance by 2050 (O'Neill, 2014).

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Healthcare-associated infections, a major global and national health problem, lead to prolonged hospital stays, increased morbidity and mortality, and higher treatment costs due to antibiotic resistance (Yılmaz, 2008).

Many factors contribute to the spread of resistant micro-organisms. These include inappropriate or inadequate standard precautions, the use of broad-spectrum antibiotics, and the presence of many invasive procedures. In all these processes, the role of the nurse in antimicrobial resistance is very important as the health worker who spends the most time with the patient (Wentzel et al., 2014).

Nurses are involved in the implementation phase of the antibiotic treatment process and prepare, implement and monitor the outcomes of treatment. When using drugs, the nurse should have sufficient pharmacological knowledge, take the necessary precautions and make decisions about the procedures to be carried out. (Aygin & Cengiz, 2011). Nurses should follow eight key principles for safe medication administration (right drug, right dose, right patient, right time, right route, right form of administration, right record, right response) (Çiftçi & Aksoy, 2017).

A study of the use of antimicrobials in relation to nursing care found that 24.1% of antimicrobials were used inappropriately. An important finding from this study was the use of multiple antimicrobials at the same time, and the problems caused by the lack of information on dosages and dosing intervals in the doctor's medication orders (Aslan et al., 2023).

Controlling multidrug resistance, which has become a global public health problem, is possible with rational use of drugs, accurate diagnosis and treatment methods, coordinated cooperation between health professionals, universal evidence-based practice packages and careful implementation of infection control packages. When nurses are seen as the leaders in this whole process, it should not be forgotten that they have a responsibility that requires great attention and effort in treatment, follow-up and feedback.

2. ANTIMICROBIAL STEWARDSHIP

Antimicrobial stewardship is a multidisciplinary approach to optimising the appropriate use of antimicrobial therapy (Aslan et al., 2014). Antimicrobial stewardship programmes are the most important long-term measures that can be taken against the development of antibiotic resistance. Antimicrobial stewardship programmes should ensure the appropriate use of antibiotics, resistance surveillance, effective infection prevention and control in hospitals. Members of the antimicrobial stewardship programme are infectious

diseases and clinical microbiology specialists, clinical pharmacists, hospital epidemiologists, information systems specialists and clinical microbiology specialists. Effective antimicrobial stewardship programmes require collaboration with healthcare professionals who actively care for patients (Dellit et al., 2007). Although their role in antimicrobial stewardship is not yet fully defined, nurses working on the ward and in intensive care units can make an important contribution.

Nursing roles contributing to antimicrobial stewardship in routine practice;

➢ Patient admission

● Obtaining the patient's history of antibiotic allergy

● Learning the medicines used

➢ Microbiological sampling

● Early and appropriate sampling (before antibiotic administration and under aseptic conditions)

● Collection of samples appropriate to the patient's clinical condition

➢ Antibiotic administration

● Appropriate timing and administration of antibiotics by the appropriate route and proper record keeping

● Providing clinicians with opinions on the usefulness of antibiotics and reminders for rapid transition from intravenous to oral formulations.

● Ensuring compliance with surgical prophylaxis as implemented within hospital policy (reminder site)

● Remind physicians of patient's antimicrobial allergy

➢ Monitoring the daily progress of the patient

● Sharing the daily data of the patient with physicians (day of antibiotic use, sharing the results of the patient's culture and blood values, clinical status of the patient)

➢ Patient safety

● Monitoring adverse and side effects of antimicrobial drugs

● Sharing changes in the patient's condition with the physician

➢ Patient education

- Transferring the basic principles in the use of antimicrobial drugs and antibiotic resistance to the patient

- Informing the patient about situations where antibiotics are unnecessary

- Explaining the antimicrobials to be used appropriately to the discharged patient (Azap & Ergönül, 2017; Dyar & Pulcini, 2017).

The fact that nurses are at the centre of multidisciplinary communication and are constantly monitoring patients is very important in the fight against antimicrobial resistance (Olans et al., 2016).

3. ANTIBIOTIC PRACTICES IN NURSING CARE

The appropriate use of medicines is important for improving the quality of healthcare and the health of patients and society as a whole (Saygılı et al., 2015). Nurses should have practical and theoretical knowledge of many important steps such as storage conditions of antibiotics used in treatment, especially parenteral solutions, preparation process, infusion time, interactions with other drugs (Erdal, 1987). The dose of antibiotics should be enough to treat the infection and cause minimal side effects. Therefore, the nurse should prepare and administer the appropriate dose of treatment according to the doctor's instructions. Drug interactions may occur in the body or in the external environment. Antibiotics may interact with the components of other medicines or infusion fluids (Bakır, 2001). Antibiotics for parenteral use should not be given at the same time as other antibiotics or other medicines (Öztürk, 2008).

The nurse should be informed about the side effects of antibiotics and the patient's antibiotic sensitivity, if any. The success of antibiotic treatment is determined by clinical and laboratory response. In the clinical response, improvement of diarrhoea in the patient with diarrhoea, reduction of fever, disappearance of the complaint of burning during urination can be followed in the clinical response. Leukocyte, C-Reactive Protein (CRP) and sedimentation values reaching normal limits are among the criteria that should be evaluated in laboratory response (Tekeli & Çevik, 2008) . Nurses should monitor the patient's clinical and laboratory findings and communicate with the physician about the patient's response and ensure that the treatment is reorganised. In addition to clinical nurses, infection control nurses play an important role in this process. The infection control nurse should take part in the establishment and implementation of hospital antibiotic resistance prevention policies. The infection control nurse should make observations

in the clinic, identify errors and deficiencies, have information about the distribution of resistance in the hospital, follow current and international publications and put them into practice. At the same time, nurses and other healthcare workers in the clinic should be trained in infection control and antimicrobial resistance at regular intervals (Dyar & Pulcini, 2017).

4. MAJOR MICROORGANISMS SHOWING MULTIPLE ANTIBIOTIC RESISTANCE AS NOSOCOMIAL INFECTION AGENTS

➢ Methicillin-resistant *Staphylococcus aureus* (MRSA)

➢ Vancomycin-resistant Enterococcus spp. (VRE)

➢ Extended-spectrum beta-lactamase (ESBL) producing *Escherichia coli* and *Klebsiella pneumoniae*

➢ Carbapenem and colistin resistant *Pseudomonas aeruginosa*

➢ Carbapenem and colistin resistant *Acinetobacter baumannii* (Andi, 2019).

5. NURSING CARE IN PREVENTION OF HOSPITAL INFECTIONS CAUSED BY MULTIDRUG RESISTANT BACTERIA

➢ To have sufficient pharmacological knowledge in the use of medicines to be able to take the necessary precautions and decisions on the procedures to be carried out,

➢ Have sufficient knowledge of and be able to apply isolation precautions and standard precautions (hand washing, use of gloves, etc.),

➢ Must have a good knowledge of the rules of asepsis and antisepsis and apply these rules in any procedure involving the patient,

➢ Provide education on the use of antibiotics (rational use of medicines) to other healthcare professionals and the public,

➢ Studies of isolation precautions and compliance with standard precautions should be carried out regularly with the infection control committee, the knowledge of all healthcare workers should be assessed, strategies to improve compliance should be developed, training should be provided, repetition of training should be ensured and feedback on the subject should be obtained,

➢ Working with the infection control committee to develop flow charts, assessments, protocols and follow-up in the clinic to prevent nosocomial infections caused by resistant bacteria,

➢ Working with the infection control committee to develop flow charts, assessments, protocols and follow-up in the clinic to prevent nosocomial infections caused by resistant bacteria (İnfal & Şahin, 2018; Karabay et al., 2018; Koşucu et al., 2015; Özden & Özveren, 2016).

6. CONCLUSION

Antimicrobial resistance is not only associated with inappropriate and frequent use, but also with inappropriate use of antibiotics and failure to adhere to the duration of antibiotic treatment. The difficulty of producing new antibiotics and the lack of alternative methods for treating nosocomial infections make it difficult to treat resistant strains. WHO states that this situation will become a serious public health problem in the near future. Therefore, it is recommended that a number of measures be taken to prevent the development of resistance. As nurses are the protagonists in the whole process from drug administration to patient care and follow-up, it is very important to manage this process correctly. Nurses with clinical knowledge, continuous self-education, effective communication, teamwork and process management skills are needed to prevent the development of resistance in the process after the correct selection and use of antibiotic therapy.

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SIMULATION AND MOULAGE APPLICATIONS IN NURSING EDUCATION

Havva KARA[1]

1. INTRODUCTION

Education is the process of bringing about behavioral change in an individual's life in a desired way through experiences. Teaching, on the other hand, is the planned and controlled teaching activities carried out in schools. Education is a dynamic process that provides individuals with attitudes as well as knowledge and skills. In this context, nursing education should cover all learning domains (affective, cognitive and psychomotor domains) since it aims to internalize the knowledge, skills and attitudes of the profession and transform them into behaviors (Duruk & Zencir 2015; Ergöl & Kürtüncü 2013; MacLean et al., 2017; Şen 2012).

The use of audio-visual teaching tools in education is very important in terms of the permanence of learning. The fact that the learning event can be permanent and forgetting can be late depends on the number of sensory organs addressed during the teaching activity. In vocational education such as nursing education, which requires the integration of theoretical and practical education, it is very important that students learn by experiencing and practicing (Neill & Wotton, 2011; Terzioğlu et al., 2013).

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The World Health Organization [WHO] has published some basic standards for nursing education and according to these standards, it recommends the use of simulation and electronic learning techniques for effective learning and teaching in nursing schools (https://www.who.int/hrh/nursing_midwifery/global-strategy-midwifery-2016-2020/en/ Access Date: 18 October 2024).

The main purpose of nursing education is to train nurses who can identify the nursing care needs of healthy or sick individuals in any environment, plan and meet the required nursing care at the level of professional standards, integrate theoretical knowledge and clinical practices, and at the same time gain effective problem-solving skills and think critically (Sarı & Erdem, 2017). However, after graduation, nursing students are also required to solve complex clinical problems in real life in conflicting situations (Sujin et al, 2015). In order to develop all these skills, nurse educators are recommended to provide sufficient clinical experience to student nurses. However, there may be difficulties in developing psychomotor skills in clinical settings due to limited opportunities to develop these skills, the complexity of the health system, patient safety issues, and the high number of students (Durmaz Edeer & Sarıkaya, 2015; Labrague et al., 2019; Yuan et al., 2012). In the studies conducted on the subject, it has been determined that nursing students in our country have problems during clinical practice and the main reason for the problems experienced is that they cannot find the opportunity to apply the theoretical knowledge and therefore feel themselves inadequate in practice (Karadağ et al. 2013; Terzioğlu et al., 2012).

Rapid developments in the field of technology have greatly affected nursing education and the perceptions of students and educators, and the techniques in the field of education are constantly developing and renewing themselves in this context. (Padilha et al., 2018). The innovations provided by technology have popularized the use of current teaching methods and the utilization of technology in the field of education. Disciplines in the field of health are also affected by these developments and innovations and update themselves. For example, in the last two decades, simulation in health education has been rapidly accepted and widely used worldwide (Motola et al. 2013; Sujin et al. 2015).

2. SIMULATION

Simulation is an educational strategy that creates realistic clinical situations for students and facilitates their practice and learning in a safe environment with equal, planned, continuous and different application

methods in line with learning principles (Atakoğlu R. et al., 2020). The use of simulation method, which is also defined as copying real-world scenarios, is becoming increasingly widespread in nursing education (Lavoie et al., 2017; Yuan et al., 2012).

With simulation applications, students receiving nursing education are given the opportunity to practice their clinical skills with realistic experiences in a simulated environment, as well as the feeling of how to become a nurse. Therefore, the importance of simulation-based education that enables students to gain competence and proficiency in patient care and management is increasing day by day (Moule, 2011; NCSBN, 2014; Tüzer et al., 2017). The use of simulation in nursing education has become increasingly widespread due to the impact of developments in the field of technology and the increase in factors that complicate the learning conditions of students in clinical practice areas. Simulation in nursing education is very important both in terms of reducing the problems experienced in clinical practice and the development of professional identity (Berragan, 2011; Sarmasoğlu et al. 2016).

The results of simulation-based education in nursing research have shown that simulation is an important learning tool to strengthen nursing students' theoretical knowledge and psychomotor skills, critical thinking, self-confidence, motivation, clinical reasoning and judgment (Durmaz Edeer & Sarıkaya, 2015; Labrague et al., 2019; Woodruff et al., 2017).

Simulation-based education, allows students to perform practices that are less common in clinical settings in a controlled environment without harming patients or other students. (Mazzo et al., 2017). In addition, even if the student makes a mistake during the simulation, this mistake does not damage the simulator and the simulation environment offers the opportunity to correct this mistake instantly. Thus, the student will experience much less stress and his/her learning will be facilitated because he/she is practicing an application that he/she will do for the first time in an environment where his/her mistake can be tolerated and corrected more quickly, rather than doing it on the patient in a stressful way with the fear of harming him/her. In addition, simulation-based education also enables students to develop communication skills that they will use in communication with both patients and their relatives and other health professionals (MacLean et al., 2017; Mazzo et al., 2017).

In addition to classroom lectures, clinical education constitutes an important and large part of education in nursing, and therefore nurse educators should provide their students with sufficient clinical experience

while providing opportunities for clinical experience with real patients. Since nurse educators cannot prepare their students for every situation they may encounter in clinical practice, it is recommended that they promote competencies such as critical thinking skills and self-confidence through various teaching approaches (Sujin et al., 2015).

Education is the process of bringing about behavioral change in an individual's life in a desired way through experiences. Teaching, on the other hand, is the planned and controlled teaching activities carried out in schools. Education is a dynamic process that provides individuals with attitudes as well as knowledge and skills (Duruk & Zencir 2015; Senemoğlu 2013). In this context, nursing education should cover all learning areas (affective, cognitive and psychomotor areas) since it aims to internalize and transform the knowledge, skills and attitudes of the profession into behavior (Ergöl & Kürtüncü 2013; MacLean et al., 2017).

The use of visual and auditory teaching tools in education is very important in terms of the permanence of learning. The fact that learning is permanent and forgetting is delayed depends on the number of sensory organs addressed during the teaching activity. In vocational education such as nursing education, which requires the integration of theoretical and practical education, it is very important that students learn by experiencing and practicing (Terzioğlu et al., 2013).

The World Health Organization [WHO] has published some basic standards for nursing education and according to these standards, it recommends the use of simulation and electronic learning techniques for effective learning and teaching in nursing schools (https://www.who.int/hrh/nursing_midwifery/global-strategy-midwifery-2016-2020/en/ Access Date: 18 October 2024).

Simulation is a method that develops and supports students' affective, cognitive and psychomotor skills by imitating situations that can be encountered in a realistic and reliable environment (INACSL, 2016; Lavoie et al., 2017). Another technique that supports participants' sensory perceptions and the fidelity of the simulation scenario in nursing education is the use of moulage. Mulage, which is used to simulate injury, disease, aging, and other physical characteristics, can be used alone, or it can be included in the scenario in simulation applications and applied to both the skin of mannequins and standardized patients (Edwards & McCormack, 2018; Smith-Stoner, 2011).

Simulation-based education, which has become the cornerstone of undergraduate nursing education, improves students' competencies in patient care management (Aebersold, 2018). It has recently been reported that human patient simulators allow for more realistic experiences and offer students the opportunity to assess, intervene and evaluate patient outcomes (Sujin et al, 2015).

Simulation-based training has been proven to improve communication skills, the ability to collaborate with other members of the medical team, the ability to manage complex situations, self-efficacy, team effectiveness, and interpersonal relationships (Sujin et al., 2015). Reflective thinking during debriefing steps has been found to effectively support communication skills and trust in nursing and medical education. Through this process, attitudes towards the classroom and learning, class satisfaction increased and improved (Sujin et al., 2015).

2.1. Designing the Simulation

In simulation-based learning, it is recommended to use the best practice standards developed by the International Nursing Association for Clinical Simulation and Learning (INACSL). This is because INACSL is an association that shares best practices developed with simulation educators and aims to improve the science of simulation by creating evidence-based guidelines for educators. The association was established in 2011 and periodically revises its best practice standards to create a common language for simulation education at the international level (INACSL, 2016; Sittner et al. 2015).

In order to achieve the learning objectives and outcomes in a simulation-based learning experience, it is very important to apply this standard correctly. Within the standard, the necessary criteria and what needs to be done to achieve these criteria are discussed in detail. Standards according to the most recent version of the Association published;

- Content experts and simulation experts in the fields of pedagogy and practice should design simulation training together in collaboration.

- A needs analysis should be conducted in a simulation-based learning experience.

- Measurable key objectives should be set.

- The simulation-based learning experience should be aligned with the purpose and objective of the simulation.

- A scenario or case should be designed to provide a simulation-based learning experience.

- In order to create the required perception of realism, a variety of realistic methods should be used.

- Plan a participant-centered facilitation approach that addresses participants' learning objectives, knowledge and experience levels, and expected learning outcomes.

- A pre-briefing plan with preparatory materials and briefing should be created to guide participant success in the simulation-based learning experience.

- Simulation-based learning experiences should be followed by an information or feedback session.

- Develop a plan for the evaluation of the simulation-based learning experience and the participant.

- In a simulation-based learning experience, the scenario should be tested with a pilot test before implementation (INACSL, 2016).

Facilitation

There are different facilitation methods for educators in simulation-based learning experiences. The facilitation method to be used varies depending on the participant's learning needs, cultural characteristics and expected outcomes. Facilitation is the process that leads participants to work harmoniously, grasp the learning objectives and develop a plan to achieve the desired outcomes. In this process, the facilitator is the educator who assumes responsibility and oversight for managing the entire simulation-based experience (INACSL, 2016).

Preliminary Information

It is a process involving preparation and debriefing. Pre-briefing ensures that participants in the simulation-based learning experience are prepared for the educational content and are aware of the ground rules for the simulation-based experience (INACSL, 2016).

Professional Integrity

Professional integrity requires compliance with ethical values, demonstration of professional behavior, keeping up to date with current knowledge, and meeting the educational needs of students through quality simulation experiences in the simulation-based learning experience (INACSL, 2016).

Results and Targets

It ensures the development of measurable simulation objectives to meet expected behaviors and outcomes across the entire simulation-based learning experience (INACSL, 2016).

2.2. Classification of Simulation

Simulation environments and simulators that are designed in accordance with reality and simulate all possible situations are classified as low fidelity, medium fidelity and high fidelity simulation/simulators.

Low Fidelity Simulation (Task Tutorials): It is a simulation environment created by using whole body mannequins with low technological features and part task trainers. Mannequins or models used for learning basic psychomotor skills (blood sampling, venipuncture, urinary catheter, etc.) in nursing skills training are shown as examples of low-fidelity task trainers. These simulation tools can also be used by adding them to high-fidelity simulation applications or standardized patient applications. In addition, their costs are lower than others (Duruk & Zencir 2015; Ulric & Mancini, 2013).

Medium Reality Simulation: This simulation includes a variety of training tools and simulators, ranging from simple multimedia to mannequins demonstrating specialized functions such as bowel sounds, cardiac rhythms and respiratory sounds, where basic physical examinations and skills can be performed. In medium-real simulation, real patient care materials and a patient bed are used to create the environment. Medium-real simulators can be guided by the trainer and can record the results of the application thanks to computer programs. (Ulric & Mancini, 2013).

High Realistic Simulation: This simulation is the simulation that is closest to the clinical environment, reflects the real patient care environment, and uses high-level real equipment. The difference of high-fidelity simulators from other simulators is the ability to show physiological response and standard/simulated patient applications can be used to create a high-fidelity simulation environment. Thus, high-fidelity simulation provides students with an optimum learning environment. In addition, applications such as moulage that increase sensory perception for smell and image can also be used in high-fidelity simulation (Göriş et al., 2014; Morgan 2018; Ulric & Mancini, 2013).

Standardized Patient

The standardized or simulated patient, defined as the portrayal of the patient role by a healthy individual, is considered to be the most realistic simulators.

Standardized patient application was first used by Howard Barrows in Los Angeles, California in the 1960s. Barrows defined a standardized patient as "real patients or volunteers trained to present a clinical situation" (Barrows, 1987; Uslu & Yavuz Van Gıersbergen, 2018).

This practice is frequently used in clinical skills training in medical education to improve students' skills such as anamnesis, communication, physical examination, and clinical decision-making before they encounter real patients in the clinic. Standardized patient practice is frequently used in teaching, developing and evaluating basic communication and history taking skills in nursing education. During the realization of the scenario in thedevelopment of psychomotor skills in nursing education, not only the patient's history, physical examination findings, social and psychological status, body language and personality traits of the patient are effective in creating patient perception (Owens & Gliva-McConvey, 2014).

Advantages of standardized patient practice in clinical skills training:

- The student has a realistic clinical learning experience through standardized patient practice in the classroom environment before going to the clinical environment.

- Students learn with less anxiety/anxiety

- The content of this practice is designed in a standardized way and students perform all the procedures from taking the patient history to the application steps.

- Standardized patient practice offers students the opportunity to repeat some or all of the procedures.

- With standardized patient practice, self-learning is supported and students are given responsibility for learning.

- In this practice, students are given quick feedback on their performance, thus enabling them to improve their development (Uslu & Yavuz Van Giersbergen, 2018).

In the literature, it was reported that students' anxiety levels decreased, their self-confidence increased, and they were better able to integrate theory and practice because learning experiences with standardized patients provided the opportunity to perform skills and practices in a safe and controlled environment. In addition, it was found that the mean scores for planning patient-specific basic nursing care in the student group trained with standardized patient application were statistically significantly higher than

the mean scores of the student group trained with the traditional method (Sarmasoğlu et al., 2016; Yoo et al., 2013).

Simulation is a method that develops and supports students' affective, cognitive and psychomotor skills by imitating situations that can be encountered in a realistic and reliable environment (INACSL, 2016; Lavoie et al., 2017). Another technique that supports participants' sensory perceptions and the fidelity of the simulation scenario in nursing education is the use of moulage. The moulage used to simulate injury, disease, aging, and other physical characteristics can be used alone, or it can be included in the scenario in simulation applications and applied to both the skin of mannequins and standardized patients (Edwards & McCormack, 2018; Smith-Stoner, 2011).

3. MOULAGE

Moulage, which comes from the French word "mouler", means "casting" or "molding" (Ulric & Mancini, 2013). Mulage is defined as a set of makeup techniques in which latex, wax, artificial liquids and makeup products are used to simulate the appearance of skin, wounds and similar sensory and physical changes, physiological and psychological symptoms of disease. The word moulage was first used in Florence in the late 1600s when Leonardo da Vinci's teacher Andrea del Verrocchio, who was studying the ventricles of the brain, encouraged Vinci to use wax to make molds from cadavers. At that time, wax was only used in works of art. However, it started to be used in the creation of the first anatomy models and actually formed the basis of moulage. There are moulage museums in Paris, Athens, Florence, Zurich and Vienna. In the historical process, moulage has been used in many areas of medical education, and for the first time in 1795, it was used as a teaching tool in the training of soldiers for injuries. Today, moulage continues to be used in medical education fields such as dermatology and pathology, especially in the diagnosis of skin diseases , as well as in trauma drill training in military medical and nursing schools. (Hernandez et al. 2013; Ulric & Mancini, 2013). Medical moulage is the art of reproducing a healthy or affected body part as a macroscopic model for the purposes of documentation, training or evaluation. Modern moulage involves a complex combination of silicone molds, temporary tattoos, professional makeup, and other techniques to demonstrate specific disease manifestations in a healthy person or mannequin for simulation-based training. The use of moulage, which plays an important role in high quality simulations, does not only cover applications that provide visual reality. Mulage provides a valuable

opportunity for practical experience that can be perceived by multiple senses such as sight, hearing and touch (Stokes-Parish et al., 2019).

In wound care simulations, the practice can be done on three-dimensional wounds created with moulage. Mulage helps the student to perceive the etiology, physiology and healing process of the wound and can also be used to improve students' wound assessment skills. Studies have shown that when simulation is used for skin lesions and wound care education, students gain confidence through realistic experiences (Edwards & McCormack, 2018; Hernandez et al., 2013; Smith-Stoner, 2011).

3.1. Things to Consider When Creating Moulage

Parts to be considered in moulage application, which is an experiential teaching method;

- In order to be able to perform moulage applications correctly and in accordance with reality, the necessary literature information should be obtained before the procedure, whichever odor, sound or image is desired to be created.

- The materials required for mulching should be provided before application.

- The trainer can perform the moulage applications himself or use ready-made moulage sets.

- If the moulage application is to be performed on living tissue, the trainer should check the expiration dates of the materials to be applied and test the materials to be applied to the skin for allergies.

The shelf life of the materials to be used in mulage applications should be taken into account and the materials should be stored at room temperature (Smith-Stoner, 2011; Ulric & Mancini, 2013).

- During moulage applications in the education of nursing students, sound can be obtained in the simulation environment by using materials such as car horns and monitor alarms, and a simulation environment similar to the real hospital environment can be provided by using plastic makeup products and wax to obtain visuals such as wounds, ecchymoses and burns (Smith-Stoner, 2011; Stokes-Parish et al., 2019; Ulric & Mancini, 2013).

- Developing technologies in nursing education also popularize the use of new learning tools. The use of moulage, which is one of these developments, provides students with the opportunity to learn by expe-

rimentation, thus improving their clinical decision-making skills and increasing their self-confidence. The use of moulage, which positively affects both students' learning and professional skills in nursing education, helps students to increase their clinical competencies in the laboratory before going to the real patient care environment (Göriş et al., 2014; Sujin et al., 2015).

• It has been observed that the results of studies on simulation and moulage applications in our country are limited. In this study, it is aimed to provide nursing students with clinical skills related to wound assessment and wound care with moulage application in the laboratory environment before experiencing them on patients in practice. In terms of focusing on the use of moulage in the wound care education of nursing students, it is thought that the study will shed light on further studies and contribute to reaching new evidence-based data.

4. CONCLUSION

Simulation and moulage applications, which increase nursing students' clinical competence, self-confidence, critical thinking skills, communication skills and knowledge levels, reduce students' anxiety and positively affect the clinical decision-making process, are very important in nursing education. Teaching methods such as simulation and moulage should be integrated into nursing education because they are effective in developing nursing students' psychomotor skills and increase students' self-confidence and satisfaction.

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