การดูแลผู้ป่วยที่ได้รับการผ่าตัดเปลี่ยนลิ้นหัวใจเอออร์ติกชนิดที่ไม่ใช้ไหมเย็บแบบเปิดแผลเล็กในระยะผ่าตัด : กรณีศึกษา

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บทคัดย่อขยาย :

การผ่าตัดเปลี่ยนลิ้นหัวใจเอออร์ติกชนิดไม่ใช้ไหมเย็บแบบเปิดแผลเล็ก หรือ right mini-thoracotomy sutureless aortic valve replacement (RMT-SLAVR) เป็นเทคนิคใหม่ด้านศัลยกรรมหัวใจที่รวมข้อดีของการผ่าตัดแบบแผลเล็ก และการใช้ลิ้นหัวใจเทียมชนิดไม่ต้องเย็บ เพื่อเพิ่มประสิทธิภาพของการรักษา ลดระยะเวลาการใช้เครื่องหัวใจและปอดเทียม ลดเวลาการหนีบ (clamp) หลอดเลือดแดงใหญ่ และลดความเสี่ยงของภาวะแทรกซ้อนในผู้ป่วย โดยเฉพาะกลุ่มผู้สูงอายุและผู้ที่มีภาวะเสี่ยงสูงต่อการผ่าตัดแบบเปิดอก บทความนี้มีวัตถุประสงค์เพื่อเสนอแนวทางการพยาบาลในระยะผ่าตัดของผู้ป่วยที่เข้ารับการผ่าตัด RMT-SLAVR โดยใช้กรณีศึกษาของผู้ป่วยหญิงไทยอายุ 64 ปี ซึ่งได้รับการวินิจฉัยว่ามีภาวะลิ้นหัวใจเอออร์ติกตีบและลิ้นรั่วร่วมด้วย และได้รับการผ่าตัดแบบ RMT-SLAVR เป็นข้อมูลหลักในการประมวลแนวคิดทางการพยาบาล การดูแลผู้ป่วยรายนี้ใช้กรอบแนวคิดจากชุดข้อมูลการพยาบาลระยะผ่าตัด (Perioperative Nursing Data Set: PNDS) ของสมาคมพยาบาลวิชาชีพห้องผ่าตัดแห่งสหรัฐอเมริกา ซึ่งเน้นการวินิจฉัยทางการพยาบาล การปฏิบัติการพยาบาล และผลลัพธ์ที่คาดหวัง แนวทางการพยาบาลที่นำมาใช้ในกรณีศึกษานี้ให้ความสำคัญกับการดูแลแบบองค์รวม โดยแบ่งข้อวินิจฉัยทางการพยาบาลหลักออกเป็น 5 ข้อ ได้แก่ 1) ผู้ป่วยมีความรู้ไม่เพียงพอเกี่ยวกับการผ่าตัดที่ได้รับ 2) ผู้ป่วยมีความวิตกกังวลต่อการผ่าตัดและผลลัพธ์ของการรักษา 3) ผู้ป่วยมีความเสี่ยงต่อการเกิดสิ่งของตกค้างภายในแผลผ่าตัด 4) ผู้ป่วยมีความเสี่ยงต่อการบาดเจ็บจากอุปกรณ์และสภาพแวดล้อมในห้องผ่าตัด และ 5) ผู้ป่วยมีความเสี่ยงต่อการบกพร่องของเนื้อเยื่อหัวใจ สมอง และหลอดเลือดจากการใช้เครื่องหัวใจและปอดเทียม

พยาบาลมีบทบาทสำคัญในการประเมินปัจจัยเสี่ยงต่าง ๆ ทั้งทางกายภาพและจิตสังคม โดยเฉพาะในผู้สูงอายุที่มักมีโรคร่วม เช่น เบาหวาน ความดันโลหิตสูง หรือภาวะสมองเสื่อม การเตรียมผู้ป่วยก่อนผ่าตัดอย่างเหมาะสม เช่น การให้ข้อมูลด้วยภาพ การพูดคุยที่เปิดโอกาสให้ผู้ป่วยตั้งคำถาม และการส่งเสริมให้ครอบครัวมีส่วนร่วม ช่วยลดความวิตกกังวลได้อย่างมี

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ประสิทธิภาพ ในระหว่างผ่าตัด พยาบาลห้องผ่าตัดต้องมีทักษะเฉพาะในการเตรียมเครื่องมือพิเศษ เช่น กล้องวิดีทัศน์ อุปกรณ์ถ่างขยายแบบยาว รวมถึงการควบคุมการนับเครื่องมือที่เป็นระบบเพื่อป้องกันการลืมวัตถุภายในร่างกายผู้ป่วยหลังผ่าตัด การพยาบาลในกรณีนี้ยังครอบคลุมถึงการจัดท่าผ่าตัด การควบคุมอุณหภูมิร่างกาย การเตรียมระบบฉุกเฉิน เช่น เครื่องกระตุกหัวใจไฟฟ้า (defibrillator) และการประสานงานกับทีมศัลยแพทย์ วิสัญญีแพทย์ และเทคโนโลยีหัวใจและทรวงอกอย่างมีประสิทธิภาพ เมื่อการผ่าตัดเสร็จสิ้น พยาบาลยังต้องมีความพร้อมในการประเมินผลลัพธ์ เช่น สัญญาณชีพ การไหลเวียนเลือด และความรู้สึกตัวของผู้ป่วยก่อนเคลื่อนย้ายออกจากห้องผ่าตัด

บทเรียนที่ได้จากกรณีศึกษานี้สะท้อนให้เห็นว่าการพยาบาลระยะผ่าตัดในผู้ป่วยที่ได้รับการผ่าตัด RMT–SLAVR จำเป็นต้องอาศัยความรู้และทักษะเฉพาะทาง รวมถึงความสามารถในการประสานงานแบบสหวิชาชีพอย่างเป็นระบบ การใช้กรอบแนวคิดจากชุดข้อมูลการพยาบาลระยะผ่าตัดช่วยให้พยาบาลสามารถวางแผนการดูแลได้อย่างครอบคลุม ทั้งด้านร่างกายและจิตใจของผู้ป่วย โดยมีเป้าหมายสูงสุดคือความปลอดภัย ความสบาย และผลลัพธ์ทางการรักษาที่ดีที่สุด ในอนาคตควรมีการต่อยอดแนวทางการดูแลนี้ไปสู่ผู้ป่วยกลุ่มอื่นที่ได้รับการผ่าตัดหัวใจแบบแผลเล็ก เช่น การผ่าตัดลิ้นหัวใจไมตรัล การผ่าตัดบายพาสแบบแผลเล็ก หรือแม้แต่การผ่าตัดแบบผสมผสานเทคนิค (hybrid) เพื่อเพิ่มคุณภาพการดูแลและลดภาระของระบบสาธารณสุข การเผยแพร่ความรู้จากกรณีศึกษาเช่นนี้ จึงมีคุณค่าทั้งในด้านการปฏิบัติจริง และการพัฒนาองค์ความรู้ของพยาบาลเฉพาะทางด้านศัลยกรรมหัวใจ

คำสำคัญ : ลิ้นหัวใจเอออร์ติก กรณีศึกษา การผ่าตัดแบบแผลเล็ก การพยาบาลระยะผ่าตัด ชุดข้อมูลการพยาบาลระยะผ่าตัด ไม่ใช้ไหมเย็บ

Perioperative Care for Patients Undergoing Right Mini-Thoracotomy Sutureless Aortic Valve Replacement: A Case-Based Approach

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Extended Abstract:

Right mini-thoracotomy sutureless aortic valve replacement (RMT-SLAVR) is a novel cardiac surgical technique that combines the advantages of minimally invasive surgery and sutureless valve implantation. This approach enhances surgical efficiency, reduces cardiopulmonary bypass (CPB) time and aortic cross-clamp time, and lowers the risk of complications, particularly in older or high-risk patients for conventional open-heart surgery. This article aims to present perioperative nursing care plans based on a case study of a 64-year-old Thai female diagnosed with aortic valve stenosis and regurgitation who underwent RMT-SLAVR. Nursing care was structured using the Perioperative Nursing Data Set (PNDS) developed by the Association of Perioperative Registered Nurses (AORN), which consists of nursing diagnoses, interventions, and expected outcomes. The care plan emphasized a holistic approach, identifying five primary nursing diagnoses: 1) Knowledge deficit related to the surgical procedure; 2) Anxiety about the surgery and outcomes; 3) Risk of retained surgical items; 4) Risk of injury from operating room instruments and environment; and 5) Risk of impaired cardiac, cerebral, or vascular tissue integrity due to CPB.

Nurses play a crucial role in assessing both physical and psychosocial risk factors, especially in older patients with comorbidities such as diabetes, hypertension, or cognitive impairment. Preoperative preparation includes providing visual materials, encouraging patient questions, and involving family members to reduce anxiety. Intraoperatively, nurses required specialized skills to prepare and handle devices such as video-assisted equipment and extended retractors, as well as to ensure accurate instrument counts to prevent the retention of items. Nursing care also included proper patient positioning, temperature regulation, emergency readiness (e.g., defibrillator setup), and collaboration with the multidisciplinary team, including surgeons, anesthesiologists, and perfusion technologists. Postoperatively, nurses were responsible for assessing vital signs, circulation, and level of consciousness prior to transferring patients from the operating room.

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This case study highlights the need for specialized knowledge and skills in perioperative nursing care for RMT-SLAVR patients, as well as systematic interdisciplinary collaboration. The PNDS framework supports comprehensive planning to address both physical and psychological aspects of care, aiming for optimal safety, comfort, and outcomes. Future applications of this nursing approach could extend to other minimally invasive cardiac surgeries, such as mitral valve repair, minimally invasive coronary artery bypass, or hybrid procedures. The dissemination of such case-based knowledge is valuable for both clinical practice and professional development in cardiac surgical nursing.

Keywords : Aortic valve, Case study, Minimally invasive surgery, Perioperative nursing, Perioperative Nursing Data Set (PNDS), Sutureless

Author contribution:

SC: Conceptualization, method and design, writing, revising, and editing the manuscript

PND: Conceptualization, method and design, writing, revising, and editing the manuscript, and corresponding with the editor-in-chief

Introduction

Aortic stenosis is the most common heart valve disease and results in 30-50% of deaths per year.[1] Currently, the most common treatment for severe aortic valve disease is aortic valve replacement (AVR) surgery by median sternotomy (a surgical opening in the middle of the chest at the sternum). Although complications and mortality rates have declined in recent years, the incidence is increasing in older patients with coronary artery disease and diabetes who have more plaque in the heart valves. Therefore, minimally invasive sutureless aortic valve replacement was developed to facilitate and shorten surgical time[2]. The procedure involves making an incision in the right anterior thoracic, which is termed right mini-thoracotomy sutureless aortic valve replacement (RMT-SLAVR).[2] Sutureless aortic valve replacement (SLAVR) is an alternative treatment to aortic stenosis evasive placement of sutures. The sutureless aortic valve bioprosthetic represents an innovative design that aims to maintain the natural structure of the aortic root, aortic sinuses, and sinotubular junction[1,3]. The sutureless aortic valve bioprosthetic is a self-expanding valve and has the potential to shorten the implantation time, reduce cross-clamp time, and cardiopulmonary bypass (CPB) duration, thereby improving surgical outcomes by facilitating a minimally invasive AVR suitable for higher risk patients.[1 3] SLAVR is becoming an alternative to other sutured aortic valve bioprosthetic for aortic stenosis with non-inferiority outcomes. [4-8] The implantation is a safe, simple, and reproducible procedure. It facilitates minimally invasive AVR and concomitant procedures.[6-8] There are specific technical considerations for implantation such as preoperative evaluation of aortic valve morphology and aortic root geometry, aortotomy, annular decalcification, valve sizing, deployment, intra-operative inspection of valve seating, and immediate postoperative echo imaging, all of which are emphasized to obtain excellent hemodynamic results, less paravalvular leakage, pacemaker rate, and high postoperative gradient.[4, 5, 9]

In Thailand, a statistical report of the Society of Thoracic Surgeons of Thailand[10] found that more than 4,400 patients underwent heart valve surgery per year in 2017-2019. The statistics on heart valve surgery at the Cardiothoracic Surgery Unit, Ramathibodi Hospital,[11] from 2017-2019 report 138, 157 and 152 cases, respectively. Ramathibodi Hospital has been performing RMT-SLAVR from 2010 to the present (April 2021) with a total of 28 cases. RMT-SLAVR is a complex procedure that is different from open heart surgery. As it is a minimally invasive aortic valve surgery combined with the use of a sutureless aortic valve, equipment, tools, and surgical techniques are used for minimally invasive cardiac surgery and placement of a sutureless aortic valve. Moreover, this type of surgery requires a surgeon with advanced surgical skills and expertise.

Cardiovascular and thoracic perioperative nurses play a crucial role in caring for patients undergoing RMT-SLAVR. Therefore, they need to learn these new innovations and technologies knowledge that can be correctly applied to care patients undergoing RMT-SLAVR for all dimensions. This article aims to care plans for perioperative nurses

in caring patients undergoing RMT-SLAVR in all stages of surgery.

Types of Sutureless Aortic Valve Replacement (SLAVR)

Currently, there are several bioprosthetic available for aortic valve replacement. Bioprosthetic valves can either be made from animal (e.g, porcine, bovine or equine) (heterograft or xenograft) or human (homograft or allograft) tissue mounted onto a metal or polymer supporting structure with three pillars and a trileaflet configuration that resembles the geometry of a native valve.[12] The Perceval valve is the only sutureless (SL) bioprosthetic valve available.[4, 5]It is made of bovine pericardium leaflets and has a self-anchoring and self-expanding nitinol alloy stent covered by a thin carbon film coating. The Perceval has a special and unique design that is a combination of bioprosthetic and transcatheter aortic valve implantation (TAVI) technology.[6, 7]The Perceval sutureless aortic valve prosthesis structure consists of straight commissural struts (a), a double-sheet valve design (b), eyelets (c), an inflow ring; (d), sinusoidal struts (e) and an outflow ring (f) (Figure 1).

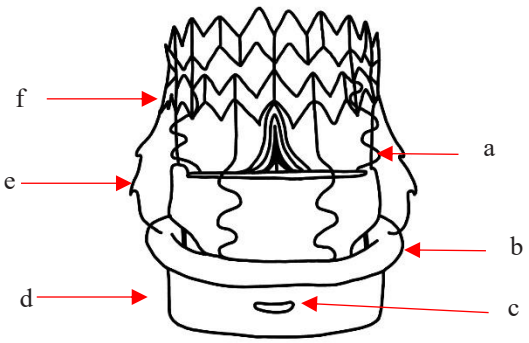

Image courtesy of Pitchaya Hankunakorn

Figure 1 Perceval sutureless aortic valve prosthesis structure.

The valve comprises a biological component of the treated bovine pericardium to reduce the risk of calcification, and a self-expanding, elastic nitinol alloy stent covered by a thin coating of carbonium to improve biocompatibility.[4, 6, 7] The valve is collapsed with an atraumatic device and deployed in the correct position while collapsed under direct visualization of the native annulus.[4, 6, 8] The manufacturer recommends ballooning to optimize adherence to the native aortic wall.[4, 5]

Criteria for Selecting SLAVR

There are four sizes of prosthesis (S, M, L, XL) ranging from 19 to 27 mm.[4-6] Sizing is crucial for long-term valve function and durability. Overly small sizes will cause para valvular leakage (PVL) and overly large sizes will cause valve malfunction and stenosis.[4-6] The inclusion and exclusion criteria are similar to those of other bioprosthetic. With the preoperative echocardiographic measurements of the annulus, sino tubular (ST) diameter, and aortic root

geometry, the data are important and applied for patient selection.[4, 5, 7, 8]

Right Mini-thoracotomy Sutureless Aortic Valve Replacement (RMT-SLAVR)

Full sternotomy aortic valve replacement is a standard procedure with excellent results. RMT is evolving and becoming an excellent alternative approach with good results and cosmetic satisfaction for the patients. Similarly, several surgeons have reported non-inferior results in the RMT operative group regarding mortality, morbidities, and significant adverse cerebrospinal cardiovascular events (MACCE) with less bleeding, fewer blood transfusions, and comparable survival probability at 5 and 10 years. [13] In one study of 92 AVR patients with severe aortic stenosis (AS), an RMT approach was used for over ten years at Ramathibodi Hospital.[13] The study recruited 70 sutured and 22 sutureless patients in the selected group, demonstrating that the procedure was safe, effective, and feasible with excellent early and long-term results. Sutureless prosthesis yielded non-inferiority in early and long-term outcomes for sutured prosthesis with less CCT and better hemodynamic performance, particularly in patients with small annulus sizes of 19-21 mm. A sutureless valve is used, unless the valve is bicuspid, or the patient is under 60. If the patient is not a candidate for sutureless, a sutured bioprosthetic is used. If the patient's age is less than 50, a mechanical valve is considered. [13]

The RMT-SLAVR procedure starts with patients selected based on preoperative CT chest criteria; a 4 cm incision is performed in the right anterior chest wall, and the third intercostal space is entered with cardiopulmonary bypass via the femoral artery and vein. A soft tissue retractor and small rib spreader are applied. A carbondioxide (CO_2) insufflation line (a) and left ventricular vent (b) should be set in place. The cannulation site for the cardioplegic line (c) should be high enough for the aortic cross-clamp (d) and aortotomy (e). The incision for the aortotomy should be 3.5 cm above the annulus of the aortic valve (f) to allow for a subsequently safe aortotomy closure and proper valve seating. Decalcification is necessary in the area of the annulus and at 6-8 mm below the annulus to allow the even, smooth surface of the inflow portion to fully expand.[4, 5, 7, 8] Three guiding sutures are temporarily used to facilitate valve implantation and subsequently removed. Deployment is performed with direct visualization on horizontal and vertical planes. Valve inspections above and below the annulus are usually done to ensure proper seating. Opening and closure of three leaflets are also checked before aortotomy closure.[4, 5, 8]

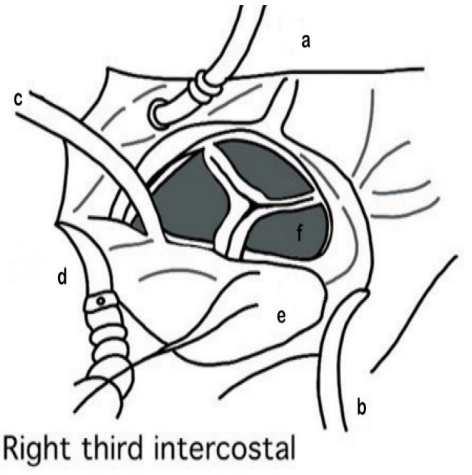

Image courtesy of Pitchaya Hankunakorn

Figure 2 The positioning of various devices and surgical sites related to RMT-SLAVR procedure (a), a carbondioxide (CO_2) insufflation line (b), a left ventricular vent (c), a cardioplegic line (d), an aortic cross-clamp (e), aortotomy site (f), aortic valve

Perioperative Nursing Care in Patients Undergoing Right Mini-thoracotomy Sutureless Aortic Valve Replacement (RMT-SLAVR)

Nursing care in at all stages of patients undergoing RMT-SLAVR involves holistic physical, psychosocial, and spiritual care providing standardized quality services[14-16] to ensure patient safety and protect complications.[17, 18] The perioperative nurses require knowledge in caring for patients. Therefore, this article presents an example of a case study and specific nursing care plan for patients undergoing RMT-SLAVR at all stages (preoperative, intraoperative and postoperative). Using the Perioperative Nursing Data Set (PNDS) of the Association of Perioperative Registered Nurses (AORN) as template care plan following: 1) perioperative nursing diagnosis; 2) perioperative interventions; 3) patient outcomes. Relying on accurate perioperative nursing diagnosis to prevent complications and promote patient safety, which is divided into 2 parts: 1) psychological nursing, which includes knowledge deficit and anxiety and 2) potential risks in RMT-SLAVR, which include retained surgical items, physical hazards and impaired myocardial, peripheral, and cerebral tissue integrity.

Case Study

A case study was conducted on a patient with the following characteristics:

Present Illness

Thai female patient, age 64 years, Thai nationality, height 158 centimeters, weight 61 kilograms. Known case of aortic valve stenosis with hypertension and hyperlipidaemia.

Echocardiogram (Echo): normal LVEF; moderate to severe AS with moderate AR

Coronary Angiogram (CAG): Co-dominant system; LM/LAD/RCA: No significant stenosis

Left Circumflex artery (LCx): No significant stenosis. The doctor made an appointment for the right mini thoracotomy sutureless aortic valve replacement surgery.

Assessment of the patient's condition: Temperature = 36.5°C; pulse = 85; respiratory rate = 20 breaths/min; BP 150/73 mmHg; neck stiffness; fatigue.

Laboratory results: Hemoglobin (HG) = 11.70 g/dl; Hematocrit (HCT) = 36.60%; Platelets (PLT) = 190x10^3/ cumm; Hepatitis B surface Antigen (HbsAg): Negative; Glucose = 115 mg/dl; Creatinine = 1.01 mg/dl.

In the conversation during the preoperative visit, it was found that the patient had an anxious expression. The patient said that she had never had surgery before, so she felt very anxious. The patient was briefly informed that she would need to undergo special heart valve replacement surgery, which would involve a small incision and would take several hours. If the small incision was not possible, there might be an open incision at the middle of her chest. She was also informed that the surgery involved many risks since it was heart surgery, so she accepted the risks. The patient was informed that, after the surgery, she would be in the Intensive Care Unit for about 3 days, if there were no complications, and she would then be transferred to the ordinary ward. When she left the operating room, an incubation tube would be inserted. If she woke up well, the incubation tube would be removed, and there would also be a tube to drain the blood.

In the case study, a patient assessment was performed to develop a care plan for the patient undergoing RMT-SLAVR. Such assessments should reflect a holistic view of the patient, facilitate the use of nursing diagnoses, and incorporate accepted standards of practice. The PNDS can be used in the patient care process as described below. Specifically, diagnosis is important in RMT-SLAVR surgery, and each nursing diagnosis consists of common related factors, common expected outcomes, nursing intervention and rationale. In this case, the nursing care the author chose was considered important:1) psychological nursing, which included knowledge deficit and anxiety; 2) potential risks in RMT-SLAVR, which included retained surgical items, physical hazards and impaired myocardial, peripheral, and cerebral tissue integrity.

1. **Nursing Diagnosis**: Knowledge deficit related to lack of experience with surgery, anxiety and fear of the unknown, complexity of the cardiac condition and surgical intervention.

Common Related Factors:

- First-time surgical experience
- Complex terminology related to cardiac and surgical care
- Limited understanding of postoperative care (e.g., ICU stay, tubes, recovery timeline)
- Pre-existing anxiety about surgery outcomes

Expected Common Outcomes

- Patient demonstrates improved understanding of her cardiac condition and surgical intervention
- Patient can verbalize key aspects of the RMT-SLAVR procedure and postoperative expectations
- Patient expresses reduced anxiety through engagement and questions
- Patient prepares appropriately for ICU and ward care postoperatively

Nursing Intervention and Rationale

Interventions	Rationales
1.1 Provide preoperative education using clear, simple language, visual aids (e.g., anatomical diagrams), or models to explain the RMT-SLAVR procedure.	1.1 Helps address fear of the unknown and increases patient's sense of control over their care.
1.2 Explain the benefits of minimally invasive surgery (RMT): smaller scar, quicker recovery, less pain.	1.2 Reinforces a positive perspective and helps the patient understand why this approach is chosen
1.3 Clarify the nature of sutureless valve (shorter surgery time, less time on heart-lung machine) and its safety record.	1.3 Reduces fear and promotes trust in modern medical techniques
1.4 Review what to expect postoperatively: ICU stay, ventilator tube, chest drains, monitoring.	1.4 Prepares the patient mentally and reduces shock/distress post-op
1.5 Encourage the patient to ask questions and involve family members in education sessions.	1.5 Promotes understanding and support, and helps patients make informed decisions.
1.6 Collaborate with the interdisciplinary team (surgeon, anesthetist, ICU nurse) to reinforce consistent, accurate messaging.	1.6 Provides cohesive support and builds trust.

2. **Nursing Diagnosis:** Anxiety related to apprehension about the surgery and/or perioperative events.

Common Related Factors:

- Changes in health status (cardiac disease requiring heart surgery)
- Stress from the perioperative environment (ICU, tubes, pain, outcomes)
- Situational crisis: surgery (first-time surgery; unknowns surrounding the procedure and recovery, major life events triggering psychological distress)

Expected Common Outcomes

- Patient uses effective coping mechanisms and describes a reduction in the level of anxiety experienced
- Patient verbalizes decreased anxiety
- Patient demonstrates a more relaxed demeanor (e.g., normal vital signs, improved effect)
- Patient participates actively in preoperative education and preparation

Nursing Intervention and Rationale

Interventions	**Rationales**
2.1 Assess the patient's level of anxiety using open-ended questions and observation of non-verbal cues.	2.1 Helps identify the severity of anxiety and tailor interventions accordingly.
2.2 Acknowledge the patient's feelings and validate her fears without minimizing them.	2.2 Builds trust and helps the patient feel understood and supported.
2.3 Provide clear, consistent, and information about the procedure, expected outcomes, and postoperative care.	2.3 Reduces fear of the unknown and provides a sense of control.
2.4 Explain all equipment and tubes the patient may see or experience postoperatively (e.g., ventilator, chest tubes)	2.4 Prepares the patient mentally and reduces post-op distress
2.5 Use calm, reassuring tone; encourage slow, deep breathing during moments of visible anxiety.	2.5 Activates the parasympathetic nervous system, helping calm physiological signs of anxiety.
2.6 Encourage the use of relaxation techniques such as guided imagery, prayer, meditation, or listening to calming music.	2.6 Promotes emotional stability and physiological relaxation.
2.7 Involve the family or significant others in educational sessions.	2.7 Provides emotional support and helps with retention of information.
2.8 Offer to consult a spiritual advisor, psychologist, or pre-op counselor if anxiety is severe.	2.8 Addresses deep-rooted fears and ensures holistic support.
2.9 If anxiety is escalating and unrelieved by non-pharmacologic means, notify the physician to consider short-acting anxiolytics preoperatively.	2.9 Pharmacologic support may be needed to stabilize the patient before anesthesia or surgery.

3. Nursing Diagnosis: High risk for injury related to retained surgical items.

Common Related Factors:

- RMT-SLAVR is performed in a deep, narrow cavity where visibility is limited. Small and delicate instruments are used, increasing the risk of items being overlooked.
- Potential issues in multidisciplinary team communication and operating room workflow (e.g., handoff errors, high-pressure environment). [19-23]

Expected Common Outcomes

- Patient remains free from injury related to retained surgical items, as evidenced by **correct and reconciled surgical counts** and **unremarkable intraoperative imaging** when indicated.

Nursing Intervention and Rationale

Interventions	Rationales
3.1 Perform standardized surgical item counts at key procedural stages: [14, 24] - Before the procedure begins - Before closure of the cavity (pericardium/thorax) - Before closure of the muscle layer - At final skin closure - At any change of scrub or circulating personnel	3.1 Establishes a reliable baseline and ensures consistency throughout the surgery. Reduces the risk of retained items by providing structured checkpoints to verify item integrity and accountability.
3.2 Minimize distractions and unnecessary conversation during surgical counts. All OR personnel should be aware that surgical count is in progress.[25]	3.2 A distraction-free environment supports concentration, accuracy, and team communication. Distractions increase the likelihood of miscounts and errors.
3.3 Document all packing materials used inside the surgical cavity, especially if radiopaque sponges or gauze are left temporarily to control bleeding.	3.3 Provides a reliable record and enables verification during final counts or imaging. Prevents materials from being unintentionally retained inside the body.
3.4 Immediately notify the surgeon and surgical team if a discrepancy in the count is identified. Initiate a standardized protocol for locating the missing item. [25]	3.4 Prompt action enables the surgical team to perform a systematic search, reducing delays and enhancing patient safety. Communication must be clear and acknowledged by the entire team.
3.5 If the missing item cannot be found, initiate intraoperative imaging (e.g., mobile fluoroscopy) prior to final wound closure.	3.5 Intraoperative imaging is critical for locating retained foreign objects. This step ensures the surgical site is clear before completing the procedure.
3.6 Ensure that the nurse documents all count, discrepancies, findings, actions taken, and team responses accurately in the surgical record. [26]	3.6 Complete and accurate documentation supports patient safety, legal accountability, and continuity of care.

4. Nursing Diagnosis: High risk for injury related to physical hazards.

Common Related Factors:

- Use of complex surgical and imaging equipment (e.g., radiologic surveillance, perfusion system, defibrillator, ECMO) in a low-light environment.

- Risk of conversion to median sternotomy due to uncontrollable intraoperative bleeding.

- High-risk cardiovascular setting requiring constant vigilance and emergency preparedness.

- Potential for miscommunication and equipment malfunction due to multitasking and advanced technology.

Expected Common Outcomes:

- The patient remains free from intraoperative injury caused by physical hazards, as evidenced by:

• The availability and functioning of necessary surgical and emergency equipment.

• No intraoperative incidents related to equipment failure or delay in critical interventions.

Nursing Intervention and Rationale

Interventions	Rationales
4.1 Inspect all surgical instruments prior to the procedure, including vascular clamps, needle holders, forceps, and other critical tools, for damage, malalignment, missing teeth, or malfunction. Replace defective items immediately. [27]	4.1. Ensures that all instruments are functioning correctly, reducing the risk of procedural delays and patient injury.
4.2 Moisten the surgeon's or assistant's gloves before handling fine sutures and ensure the full suture is visible before passing. Discard any suture with preformed knots.[28]	4.2 Prevents suture breakage or tissue trauma caused by drag or improper handling. Enhance surgical precision and safety
4.3 Confirm availability and functionality of emergency equipment: defibrillator, pacemaker, suction system, fluid warmers, and crash cart. Place defibrillation patches on the patient before incision. [29]	4.3 RMT-SLAVR involves cardiac manipulation that may lead to arrhythmias or cardiac arrest. Immediate access to resuscitative equipment is essential for patient survival.
4.4 Prepare backup surgical instruments and equipment for immediate use in case of conversion to median sternotomy due to bleeding or surgical complications. [14, 30]	4.4 Pre-emptive preparation allows timely conversion to open-heart surgery, reducing the delay in hemorrhage control and improving patient outcomes
4.5 Continuously assess and monitor the progress of the surgical procedure. Anticipate the surgeon's needs and prepare equipment such as cannulation sets, additional sutures, and extracorporeal membrane oxygenation (ECMO) as needed.[28]	4.5 Proactive intraoperative nursing management ensures rapid response in case of hemodynamic instability or failure to respond to pharmacological interventions.
4.6 Maintain effective communication within the surgical team using standardized communication tools such as checklists and time-outs. [28,31]	4.6 Reduces the risk of miscommunication during critical events. Supports patient safety by ensuring coordinated, timely responses.

5. Nursing Diagnosis: High risk for impaired myocardial, peripheral, and cerebral tissue integrity related to surgery, hypothermia, cardiopulmonary bypass, and/or surgical particulate or air emboli.

Common Related Factors:

- Cardiopulmonary bypasses and risk of embolization
- Hypothermia during cardiac surgery
- Increased myocardial oxygen demand
- Presence of air in arterial lines, kinks in bypass tubing
- Improper positioning with femoral catheters (e.g., IABP)

Expected Common Outcomes:

- The patient's myocardial, peripheral, and cerebral tissue integrity is adequate or improved as evidenced by the absence of new electrocardiographic manifestation of infraction and by the presence of palpable peripheral pulses and a clear or improving postoperative sensorium.

Nursing Intervention and Rationale

Interventions	Rationales
5.1 Inspect and clean all surgical instruments of blood, bone, fat, suture debris, or excess bone wax. Remove visible particulate matter from the surgical field. Notify the surgeon if significant debris is present.	5.1 Particulate matter such as fat, bone, or suture can become emboli, potentially leading to stroke, myocardial infarction, or peripheral ischemia.
5.2 Inspect cardiopulmonary bypass (CPB) tubing for air bubbles, kinks, or unsecured connections before and during use. Notify the perfusionist/surgeon if abnormalities are present.[28, 30]	5.2 Air embolism is a life-threatening risk in cardiac surgery. Secure and intact CPB tubing prevents air entry and maintains proper blood flow.
5.3 Verify functionality of vent and discard suction at the valve excision site. Suction should effectively remove debris rather than infuse fluids.	5.3 Prevents debris from re-entering systemic circulation, which may cause neurological damage or organ infarction.
5.4 Avoid bending the patient's legs when an intra-aortic balloon pump (IABP) is in place in the femoral artery. Reassess positioning frequently. [27,29]	5.4 Bending the legs can kink the catheter or damage the vessel wall, leading to compromised perfusion or vascular injury.
5.5 Monitor ECG continuously and watch for new-onset ST changes or arrhythmias. Notify anesthesia or surgeon of any deviation from baseline.	5.5 Early detection of myocardial ischemia or infarction allows for rapid intervention.
5.6 Conduct neurologic assessments postoperatively (GCS, pupil size, orientation) to detect early signs of cerebral embolism or hypoperfusion.[28]	5.6 Timely identification of neurologic deficits (e.g., stroke) improves outcomes with early management.
5.7 Maintain normothermia using warming devices and fluid warmers during surgery to prevent vasoconstriction and promote perfusion.	5.7 Hypothermia during surgery is associated with impaired tissue perfusion and coagulopathy.

Conclusion

Perioperative nurses play a vital role across all phases of the surgical process preoperative, intraoperative, and postoperative. Their responsibilities are essential for ensuring patient safety, achieving favorable surgical outcomes, and delivering holistic care. RMT-SLAVR is a complex surgical procedure, with potential complications that may arise at any stage. Based on the case study, the application of the Perioperative Nursing Data Set (PNDS) guidelines enables perioperative nurses to provide structured and effective care for patients undergoing RMT-SLAVR. The identification and implementation of appropriate nursing diagnoses are particularly critical for maintaining patient safety and promoting optimal surgical efficiency.

Recommendations

Effective nursing care for patients undergoing RMT-SLAVR requires a collaborative, multidisciplinary

approach that encompasses comprehensive interventions throughout the preoperative, intraoperative, and postoperative phases. This case study underscores the importance of evidence-based nursing practice in enhancing surgical outcomes and ensuring comprehensive, patient-centered care. For patients undergoing other complex surgical procedures, the integration of evidence-based perioperative nursing care is crucial to optimizing safety, preventing complications, accelerating recovery, and improving overall surgical results. Nurses should continuously incorporate the latest research findings into their practice to deliver standardized, high-quality care throughout the surgical continuum.

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