

CASE REPORT

Mitral valve-in-valve implantation: A case report

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Received 8 April 2021; accepted 2 July 2021



KEYWORDS

Critical care nursing;
Mitral valve
regurgitation;
Heart valve
prosthesis
implantation;
Cardiovascular
nursing

Abstract

Introduction: Mitral valve-in-valve implantation is a new therapeutic tool in the field of structural interventional cardiology for patients with bioprosthetic dysfunction due to severe mitral valve regurgitation and high surgical risk. The objective was to develop an individualised nursing care plan for a patient undergoing this procedure; the first case in our centre.

Case description: A 75-year-old woman, independent for activities of daily living, with a history of chronic renal failure and biological mitral valve replacement due to rheumatic valve disease. She was admitted to the acute cardiac care unit for severe symptomatic mitral valve regurgitations secondary to mitral bioprosthesis dysfunction. Heart surgery was ruled out due to comorbidities and high surgical risk, and the patient underwent percutaneous mitral valve-in-valve implantation. The implantation was successful.

Assessment: The nursing assessment followed Marjory Gordon's conceptual model identifying the following impaired patterns: pattern 2: bilateral malleolar oedema without pitting; pattern 3: urinary catheter and intravenous diuretic use; pattern 4: dyspnoea on moderate exertion, dry nocturnal cough, orthopnoea and respiratory disturbances, and activity intolerance; pattern 5: need for pharmacological assistance for a good night's rest.

Diagnoses: The following nursing diagnoses were established using the NANDA taxonomy: *Excess fluid volume*; *ineffective breathing pattern*; *Activity intolerance* and problem collaborating: *Hypotension and anaemia secondary to deep thigh haematoma*.

Planning: The following objectives were set based on the NOC taxonomy: *Fluid balance*; *Respiratory status: ventilation*; *Cardiopulmonary status* and the following NIC interventions: *Hypervolaemia management*; *Respiratory monitoring and oxygen therapy*; *Vital sign monitoring and heart care*.

Discussion: Nursing interventions aimed at monitoring haemodynamic status, fluid restriction together with the efficacy of diuretic treatment achieved a negative water balance which contributed to fluid depletion improving respiratory symptoms, enabling implantation under better conditions.

DOI of original article: <https://doi.org/10.1016/j.enfi.2021.07.002>

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PALABRAS CLAVE

Enfermería de cuidados críticos; Insuficiencia de la válvula mitral; Implantación de prótesis de válvulas cardíacas; Enfermería cardiovascular

Conclusions: Technological progress in the health sciences, and in the field of acute cardiology in particular, directly calls for training, revision and updating of critical care nursing. Given this dynamic and continually evolving process, the specialist intensive care nurse, the inclusion of the cardiovascular nurse specialist in multidisciplinary teams such as the heart team, and expanding the consultation of the haemodynamic nurse are urgently required to ensure optimal nursing care, safety, and care quality.

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Valve in valve mitral: a propósito de un caso

Resumen

Introducción: El implante valve in valve mitral es una nueva herramienta terapéutica que ha surgido recientemente en el campo del intervencionismo estructural en cardiología para aquellos pacientes con disfunción bioprotésica por insuficiencia mitral severa y alto riesgo quirúrgico.

El objetivo es elaborar un plan de cuidados enfermero individualizado, destinado a una paciente que se somete a este procedimiento, siendo el primer caso en nuestro centro.

Descripción del caso: Mujer de 75 años, independiente para las actividades de la vida diaria, con antecedentes de insuficiencia renal crónica y recambio valvular mitral biológico por valvulopatía reumática. Ingresada en la unidad de cuidados cardiológicos agudos por insuficiencia mitral severa sintomática secundaria a disfunción de la bioprótesis mitral. Descartada para cirugía cardíaca por comorbilidades y alto riesgo quirúrgico se procedió al valve in valve mitral percutáneo, siendo exitoso su implante.

Valoración: La valoración enfermera se realizó siguiendo el modelo conceptual de Marjory Gordon donde se identificaron los siguientes patrones alterados: patrón 2: edemas maleolares bilaterales sin fovea; patrón 3: sondaje vesical y uso de diurético endovenoso; patrón 4: disnea a moderados esfuerzos, tos seca nocturna, ortopnea y alteraciones respiratorias e intolerancia a la actividad; patrón 5: necesidad de ayuda farmacológica para el buen descanso nocturno.

Diagnósticos: Mediante la taxonomía NANDA se establecieron los diagnósticos enfermeros: *Exceso de volumen de líquidos*; *Patrón respiratorio ineficaz*; *Intolerancia a la actividad* y el problema de colaboración: *Hipotensión y anemia secundaria al hematoma profundo en muslo*.

Planificación: Basándonos en la taxonomía NOC se determinaron los objetivos: *Equilibrio hídrico*; *Estado respiratorio: ventilación*; *Estado cardiopulmonar* y las siguientes intervenciones NIC: *Manejo de la hipervolemia*; *Monitorización respiratoria y Oxigenoterapia*; *Monitorización de los signos vitales y Cuidados cardíacos*.

Discusión: Intervenciones enfermeras dirigidas hacia la monitorización del estado hemodinámico, la restricción de líquidos juntamente con la eficacia del tratamiento diurético consiguió un balance hídrico negativo que contribuyó a la depleción mejorando los síntomas respiratorios y permitiendo llegar al implante en mejores condiciones.

Conclusiones: El progreso tecnológico en las ciencias de la salud y concretamente en el ámbito de la cardiología aguda conlleva directamente la necesidad de capacitación, revisión y actualización de los cuidados críticos enfermeros. Ante este proceso dinámico y en continua evolución, la figura de la enfermera especialista en intensivos, así como la inclusión de la enfermera experta en cuidados cardiovasculares en equipos multidisciplinares como el Heart team y la expansión de la consulta enfermera en hemodinámica se hacen imperiosamente necesarias para garantizar unos cuidados enfermeros óptimos, de seguridad y de calidad asistencial.

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Introduction

The recommendations of the European Society of Cardiology in the management of valvular heart disease emphasise that the choice between valve replacement with mechanical or biological prostheses should be multifactorial. The main advantage of bioprostheses is that they make anticoagulation unnecessary and thus avoid the risk of bleeding and stroke. On the other hand, over the years they are more susceptible to structural failure and lead to valvular insufficiency and/or stenosis. Dysfunction of surgical bioprostheses occurs in older patients with associated comorbidities, which implies a high risk for new cardiac surgery.¹

After an individualised assessment of the case by a team of specialists in the field of cardiovascular medicine (Heart team), the best therapeutic option is agreed upon from a multidisciplinary approach, with the patient being the central axis and the one who must make the decision once he/she has been offered adequate information free of bias on all the therapeutic possibilities.²

Transcatheter mitral valve implantation within the dysfunctional bioprosthesis, a procedure known as mitral valve-in-valve, has been developed within the framework of structural interventionism in cardiology as a new therapeutic tool for this type of situation, demonstrating its effectiveness and clinical impact.³

Access for the procedure includes the transapical, transseptal and transatrial approaches, the latter of which is used infrequently. The transseptal approach is performed completely percutaneously through the femoral vein and approaches the left atrium by puncturing the interatrial septum, guided by transesophageal echocardiography and with temporary electrocatheter support throughout the procedure. It is a less invasive approach, with no need for thoracotomy or direct injury to the left ventricle.⁴

The most relevant complications described related to the implant itself are: malposition of the prosthesis, obstruction of the left ventricular outflow tract, high post-procedural transmitral gradient and residual mitral regurgitation. Clinical complications include bleeding, stroke, renal failure and those related to vascular access. Clinical guidelines recommend anticoagulation therapy for the first three months after implantation.⁴

The clinical case describes the admission of a patient to the acute cardiac care unit, where, once clinically stabilised and treatment optimised, percutaneous mitral valve implantation is performed as a therapeutic alternative due to severe symptomatic mitral bioprosthetic mitral regurgitation and high surgical risk.

The objective is to draw up an individualised nursing care plan for a patient who undergoes this structural procedure, the first case in our centre.

Case description

Seventy-five-year-old woman, independent for activities of daily living, with a history of hypothyroidism, arterial hypertension, stage III chronic renal failure, who underwent biological mitral valve replacement surgery for rheumatic valvular heart disease in 2016.

She was admitted to the acute cardiology care unit from the cardiology outpatient clinic for clinical manifestations of dyspnoea on moderate exertion of 20 days of evolution accompanied by dry cough predominantly at night, orthopnoea and bimalleolar oedema. She did not report chest pain or fever, and cardiopulmonary auscultation detected predominantly right-sided bibasal crackles and a panfocal systolic murmur. Echocardiographic studies showed massive mitral insufficiency due to mitral bioprosthesis dysfunction, with preserved ejection fraction. As she was not a candidate for cardiac surgery due to the high surgical risk, mitral valve in valve implantation was performed transseptally, with a good final result, with no periprosthetic leaks or obstruction of the left ventricular outflow tract. Post-procedure, she presented arterial hypotension accompanied by a decrease in haemoglobin levels. Suspicion of a possible internal haemorrhage led to a thoracoabdominal CT scan, which showed a deep haematoma in the right thigh, with no signs of active bleeding; 2 red blood cell concentrates were transfused, thus resolving the acute symptoms. At the same time, she showed progressive deterioration of renal function due to multifactorial causes, maintaining a good diuretic index and without the need for continuous renal replacement therapy. Once anticoagulant treatment was started, and given her clinical stability, the patient was transferred to the cardiology ward, where she remained in good general condition, and was discharged home with subsequent check-ups with the haemodynamics and cardiology nurses.

Informed consent was requested from the patient to disclose the case, maintaining anonymity throughout the process.

Evaluation

The nursing assessment was carried out according to Marjory Gordon's conceptual model of functional patterns. Data collection was carried out by direct observation, patient interview and computerised clinical history.

The result of the assessment was:

- **Pattern 1 Perception - Health management.** No known drug allergies or toxic habits. Perception of good health until the onset of symptomatology, adherent to pharmacological treatment and healthy lifestyles.
- **Pattern 2 Nutritional - Metabolic** Weight: 56 kg. Height: 1,57 m. BMI 22,7 kg/m². Normal weight. No digestive problems. Eating a balanced diet. Intact and hydrated skin with presence of bimalleolar oedema without fovea. Axillary temperature: 36,5 °C.
- **Pattern 3 Elimination. Urinary and faecal continent.** Daily bowel habit. Bladder catheterisation for strict and rigorous control of diuresis; use of intravenous diuretic (furosemide, 20 mg every 8 h).
- **Pattern 4 Activity - Exercise.** Heart rate: 89/min in sinus rhythm. Blood pressure: 126/59 mmHg. Respiratory rate: 23/min. Basal oxygen saturation: 93%. Tachypnoea, need for oxygen therapy by nasal cannula at 2 l/min. Presence of dyspnoea on moderate exertion, dry nocturnal cough and orthopnoea. Regular moderate physical activity (swimming). Assessment of functional capacity by means of Barthel test: score 100 (independent). Currently intolerant.

erance to activity: bedridden in absolute rest and in Fowler's position to promote ventilation. Assessment of the risk of pressure ulcers using the Braden test: score 15 (low risk).

- *Pattern 5 Sleep and rest.* Restful sleep at home, but during hospitalisation requires pharmacological support (lorazepam 1 mg) for a good night's rest.
- *Pattern 6 Cognitive - Perceptual.* Bilateral hypoacusis corrected with hearing aids. No cognitive alterations or presence of pain or physical discomfort.
- *Pattern 7 Self-perception - Self-concept.* Good self-concept and self-image.
- *Pattern 8 Role - Relationships.* Lived with her sister, who passed away in 2018; currently lives alone, independent for daily life activities. No direct family but has a strong social network of friends.
- *Pattern 9 Sexuality and reproduction.* No children, no pregnancies or abortions.
- *Pattern 10 Adaptation - Stress tolerance.* Verbalises being calm. Has reading books to help distract her.
- *Pattern 11 Values and beliefs.* She expresses a desire to recover and continue her life in the best health conditions.

After the nursing assessment, the following altered patterns were identified:

- *Pattern 2.* Presence of bilateral malleolar oedema without fovea.
- *Pattern 3.* Bladder catheter and use of intravenous diuretic.
- *Pattern 4.* Presence of dyspnoea on moderate exertion, dry nocturnal cough, orthopnoea and respiratory alterations. Intolerance to activity, absolute rest and Fowler's position.
- *Pattern 5.* Need for pharmacological help for a good night's rest.

Diagnosics

Following the NANDA⁵ taxonomy, the following nursing diagnoses were identified, classified in order of priority and collaborative problems.

Nursing diagnoses

- 00026 Excess fluid volume related to compromised regulatory mechanisms and manifested by dyspnoea, crepitant, orthopnoea and oedema.
- 00032 Ineffective breathing pattern related to hyperventilation and manifested by tachypnoea, dyspnoea and orthopnoea.
- 00092 Intolerance to physical activity related to an imbalance between oxygen supply and demand and manifested by exertional dyspnoea.
- 00198 Sleep pattern disorder related to environmental factors and disruptions (nursing care of the critically ill patient) and manifested by dissatisfaction with sleep.
- 00004 Risk of infection related to invasive procedures (bladder catheterisation and peripheral access central venous catheter).

Collaboration problems

- Hypotension and anaemia secondary to deep haematoma on the right thigh.
- Acute chronic renal failure secondary to multifactorial causes (acute anaemia, renal hypoperfusion, use of contrast during the procedure and nephrotoxic drugs).

Care planning

For the development of the individualised nursing care plan, the NOC⁶ taxonomy was followed, identifying the expected outcomes with their indicators and selecting NIC⁷ interventions with specific intensive care nursing activities. These refer to the comprehensive approach to the critically ill patient through surveillance and early detection of possible complications, management and resolution of acute critical situations and prevention of associated risks.

To evaluate the results, assessment items were incorporated at the beginning of the process and at discharge from the unit, using a 5-point Likert-type scale, with 1 being the least desirable value and 5 the most desirable.

Table 1 shows the care plan in its entirety, and Table 2 shows the collaboration problems.

Discussion

Mitral valve-in-valve implantation has emerged as a therapeutic alternative to cardiac valve reintervention. Structural interventionism in cardiology with this type of procedure has demonstrated its effectiveness and clinical impact in complex, frail, elderly patients with severe symptomatic mitral regurgitation and high surgical risk.³

In the clinical case described, nursing interventions aimed at monitoring haemodynamic status, fluid restriction, together with the efficacy of diuretic treatment, achieved a negative water balance that contributed to depletion, improving respiratory symptoms and allowing the implant to be reached in better conditions.

We have scientific evidence in nursing care^{8,9} for patients undergoing implantation of other types of cardiac devices, such as the MitraClip®, used for native mitral valve regurgitation, and percutaneous aortic valve implantation (TAVI) for severe aortic valve stenosis, but not specifically for mitral valve replacement. They have in common the percutaneous approach and are less invasive, which favours the patient's recovery and also the possible clinical and implant-related complications. For this reason, once the procedure is completed, transfer to the acute cardiac care unit is necessary for close monitoring and control of potential alterations. In this case, the monitoring of vital signs (before and after the procedure), as well as the control and follow-up of analytical and clinical data, favoured the early detection of the collaboration problems that arose and their early resolution.

With mitral valve-in-valve implantation, the diagnosis of activity intolerance was successfully addressed and the exertional dyspnoea and congestive symptoms were resolved, and she was able to gradually increase her activity in a supervised manner and become increasingly independent in self-care.

Table 1 Care planning.

NANDA 00026 Excess fluid volume related to compromised regulatory mechanisms and manifested by dyspnoea, crepitant, orthopnoea and oedema

NOC results	0601 Water balance	
Indicators	Initial Likert score	Likert score on discharge
060107 Balanced daily inflows and outflows	3A	5A
060108 Pathological breathing sounds	3B	5B
060112 Peripheral oedema	2B	5B
NIC interventions	4170 Hypervolaemia management	

- Monitor haemodynamic status, including CVP, MAP, PAP and PECP, as available.
- Observe respiratory pattern for symptoms of pulmonary oedema
- Monitor for the presence of adventitial lung sounds
- Elevate the head of the bed to improve ventilation
- Administer prescribed medications to reduce preload
- Monitor inflow and outflow
- Restrict free water intake
- Monitor peripheral oedema (location and extent)
- Observe skin integrity in immobile patients with oedema in declined areas

Likert Scale Score A: 1 Severely Compromised, 2 Substantially Compromised, 3 Moderately Compromised, 4 Slightly Compromised, 5 Not Compromised

Likert Scale B score: 1 Severely, 2 Substantially, 3 Moderately, 4 Slightly, 5 Not at all

NANDA 00032 Ineffective breathing pattern related to hyperventilation and manifested by tachypnoea, dyspnoea and orthopnoea

NOC results	0403 respiratory status: ventilation	
Indicators	Initial Likert score	Likert score on discharge
040301 Respiratory Frequency	3C	5C
040302 Respiratory rate	3C	5C
040314 Dyspnoea on exertion	3B	5B
040315 Orthopnoea	2B	5B
NIC interventions	3350 Respiratory monitoring	

- Monitor rate, rhythm, depth and effort of breaths
- Apply continuous non-invasive oxygen sensors with appropriate alarm systems in at-risk patients according to facility guidelines and as indicated
- Assess chest movement, noting symmetry, accessory muscle utilisation and intercostal and supraclavicular muscle retractions
- Monitor for the presence of crepitus, if applicable

3320 Oxygen therapy

- Administer supplemental oxygen as ordered
- Monitor the efficacy of oxygen therapy
- Observe for skin lesions caused by friction of the oxygen device

Likert scale score B: 1 Serious; 2 Substantial; 3 Moderate; 4 Slight; 5 None

Likert scale score C: 1 Severe deviation from the normal range; 2 Substantial deviation from the normal range; 3 Moderate deviation from the normal range; 4 Slight deviation from the normal range; 5 No deviation from the normal range

NANDA 00092 Activity intolerance related to an imbalance between oxygen supply and demand and manifested by exertional dyspnoea

NOC results	0005 Tolerance to activity	
Indicators	Initial Likert score	Likert score on discharge

Table 1 (Continued)

NANDA 00026 Excess fluid volume related to compromised regulatory mechanisms and manifested by dyspnoea, crepitant, orthopnoea and oedema

000518 Ease in carrying out activities of daily living	2A	5A
NOC results	0414 Cardiopulmonar status	
Indicators	Initial Likert score	Likert score on discharge
041401 Systolic blood pressure	5C	5C
041402 Diastolic blood pressure	5C	5C
041404 Apical heart rate	5C	5C
041405 Heart rate	5C	5C
041406 Respiratory rate	3C	5C
041407 Respiratory rhythm	3C	5C
041410 Urinary elimination	3C	4C
041412 Oxygen saturation	3C	5C
041414 Intolerance to activity	2A	5A
041416 Paleness	4B	4B
041422 Peripheral oedema	2B	5B
041425 Dyspnoea on slight exertion	3B	5B

NIC interventions

1800 Help with self-care

- Provide a therapeutic environment ensuring a warm, relaxing, private and personalised experience.
- Provide support until the patient is fully capable of assuming self-care
- Help the patient to accept dependency needs
- Encourage independence, but intervening if the patient is unable to perform the given action

4040 Heart care

- Encourage a gradual increase in activity when the condition is stabilised.
- Ensure a level of activity that does not compromise cardiac output and does not provoke cardiac crises.

- Monitor the patient's tolerance to activity

- Monitor water balance (input/output and daily weight)

- Monitor the onset of dyspnoea, fatigue, tachypnoea and orthopnoea

- Establish a support relationship with the patient and their family

6680 Monitoring of vital signs

- Monitor blood pressure, pulse, temperature and respiratory status, as appropriate

- Monitor pulse oximetry

- Monitor if there is central and peripheral cyanosis

- Identify the possible causes of changes in vital signs

Likert scale score B: 1 Serious; 2 Substantial; 3 Moderate; 4 Slight; 5 None

Likert scale score C: 1 Severe deviation from the normal range, 2 Substantial deviation from the normal range, 3 Moderate deviation from the normal range, 4 Slight deviation from the normal range, 5 No deviation from the normal range

Likert scale score A: 1 Severely compromised, 2 Substantially compromised, 3 Moderately compromised, 4 Slightly compromised, 5 Uncompromised

NANDA 00198 Sleep pattern disturbance related to environmental factors and disruptions (nursing care of the critically ill patient) and manifested by sleep dissatisfaction

NOC results	0004 Sleep	
Indicators	Initial Likert score	Likert score on discharge
000421 Difficulty in getting to sleep	2B	5B
000406 Interrupted sleep	3B	5B

Table 1 (Continued)

NANDA 00026 Excess fluid volume related to compromised regulatory mechanisms and manifested by dyspnoea, crepitant, orthopnoea and oedema

000404 Sleep quality NIC interventions	3A 1850 Improve sleep • Adjust the environment (light, noise, temperature, mattress and bed) to encourage sleep • Group care activities to minimise the number of awakenings • Adjust the medication schedule to support the patient's sleep/wake cycle • Observe/record the pattern and number of hours of sleep of the patient 2304 Administration of medication: oral • Inform the patient of the expected actions and possible adverse effects of medicines • Assist the patient with the ingestion of medicines, if needed • Record the drugs administered and the patient's response, according to the centre's protocol.	5A
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Likert scale score B: Serious, 2 Substantial, 3 Moderate, 4 Slight, 5 None

Likert scale score A: 1 Severely compromised, 2 Substantially compromised, 3

Moderately compromised, 4 Slightly compromised, 5 Uncommitted

NANDA 00004 Risk of infection related to invasive procedures (bladder catheterisation and peripheral access central venous catheter).

NOC results Indicators	1924 Risk control: infectious process Initial Likert score	Likert score on discharge
192401 Recognises personal risk factors for infection	2D	5D
192402 Recognises the consequences associated with infection	3D	5D
192405 Identifies signs and symptoms of infection	2D	4D
192411 Maintains a clean environment	4D	5D
192415 Practises hand hygiene	4D	5D
NIC interventions	6540 Infection control • Implement universal precautions • Teach the patient and family how to avoid infections • Use antimicrobial soap for handwashing when appropriate • Clean the patient's skin with an appropriate antibacterial agent • Shave and cleanse the area as indicated in preparation for invasive procedures and/or surgery. 4220 Care of peripherally inserted central catheter (PICC) • Insert the catheter using sterile technique according to the manufacturer's instructions and the facility's protocol • Fix the catheter and apply a sterile transparent dressing, according to the centre's protocol. • Observe whether there are signs of phlebitis • Use sterile technique to change the dressing at the insertion site, according to the centre's protocol • Record the date and time on the dressing • Irrigate the line after each use with an appropriate solution, according to the centre's protocol • Maintain universal precautions 1876 Urinary catheter care • Maintain hand hygiene before, during and after catheter insertion or manipulation.	

Table 1 (Continued)

NANDA 00026 Excess fluid volume related to compromised regulatory mechanisms and manifested by dyspnoea, crepitant, orthopnoea and oedema

- Maintain a closed, sterile and unobstructed urinary drainage system.
- Ensure that the drainage bag is below the level of the bladder
- Maintain patency of the urinary catheter system
- Routine care of the urethral meatus with soap and water during daily bathing
- Observe the characteristics of the draining fluid

Likert scale score D: 1 Never proven, 2 Rarely proven, 3 Sometimes proven, 4 Often proven, 5 Always proven

NANDA 00047 Risk of deterioration of skin integrity related to physical immobility (post-procedural care).

NOC results	0407 Tissue perfusion: peripheral	
Indicators	Initial Likert score	Likert score on discharge
040716 Capillary toe filling	5C	5C
040710 Warm extremity temperature	5C	5C
040738 Pedial pulse strength (right)	5C	5C
040739 Pedial pulse strength (left)	5C	5C
NOC results	1101 Tissue integrity: skin and mucous membranes	
Indicators	Initial Likert score	Likert score on discharge
110101 Skin temperature	5A	5A
110102 Sensitivity	5A	5A
110104 Hydration	5A	5A
110113 Skin integrity	5A	5A
NIC interventions	3590 Skin surveillance	
	<ul style="list-style-type: none"> • Use an assessment tool to identify patients at risk of loss of skin integrity (e.g. Braden scale). • Observe colour, warmth, swelling, pulses, texture, and for oedema and ulceration of the extremities. • Observe for areas of discolouration, bruising and loss of integrity of skin and mucous membranes • Observe for pressure and friction zones • Document skin and mucosal changes • Implement measures to prevent further deterioration (e.g. anti-decubitus mattress, schedule of postural changes). 	

Likert scale score C: 1 Severe deviation from the normal range, 2 Substantial deviation from the normal range, 3 Moderate deviation from the normal range, 4 Slight deviation from the normal range, 5 No deviation from normal range

Likert scale score A: 1 Severely compromised, 2 Substantially compromised, 3 Moderately compromised, 4 Slightly compromised, 5 Uncommitted

The quality of sleep during periods of hospitalisation, and specifically in intensive care units, is altered due to environmental conditions (noise, ambient luminosity, need for nursing care) and emotional factors such as fear, concern for their illness or for their family. Prevalence rates of between 22% and 61% have been reported and it is known that sleep pattern disorders have detrimental effects on both physical and psychological health, affect the recovery process and increase morbidity and mortality.¹⁰ The nursing approach to this problem was multifactorial, favouring a relaxed envi-

ronment, free from direct light and external noise, grouping care to minimise interruptions and, on the other hand, with the administration of sleep inducers, monitoring their effectiveness.

The clinical case described highlights the technological advances in structural interventional cardiology and provides an individualised nursing care plan for a patient undergoing mitral valve in valve implantation, providing a frame of reference for other similar cases that may occur during the practice of care.

Table 2 Problems of collaboration.

Hypotension and anaemisation secondary to deep haematoma of the right thigh.

NOC results	NIC interventions
0413 Severity of blood loss	4020 Reduction of the haemorrhage
	<ul style="list-style-type: none"> • Identify the cause of the haemorrhage • Exhaustively monitor the patient in search of a haemorrhage • Monitor blood pressure and haemodynamic parameters, if available • Monitor the neurological function • Record the level of haemoglobin/haematocrit before and after blood loss • Monitor coagulation, including prothrombin time (PT), partial thromboplastin time (PTT), fibrinogen, fibrin degradation/cleavage products and platelet count, as appropriate • Organise the availability of blood products for transfusion, if necessary. • Maintain permeable IV access • Administer blood products (platelets and fresh frozen plasma), if indicated

Acute chronic renal failure secondary to multifactorial cause (renal hypoperfusion, contrast use, acute anaemia, nephrotoxic drugs).

NOC results	NIC interventions
0504 Renal function 0602 Hydration	4180 Management of hypovolaemia
	<ul style="list-style-type: none"> • Monitor for the presence of laboratory and clinical signs of impending acute renal failure (e.g. increased BUN and creatinine, decreased GFR, myoglobinuria and oliguria). • Monitor haemodynamic status, including heart rate, BP, MAP, PAP, CVP, PAP, PECP, CO and CI, as available. • Monitor inputs and outputs • Administer prescribed isotonic i.v. solutions (e.g., physiological saline or lactated Ringer's solution) for extracellular rehydration at an appropriate flow rate, as appropriate • Use an i.v. pump to maintain a constant flow of intravenous infusion. • Monitor for hypervolaemia and pulmonary oedema during i.v. rehydration.

Conclusions

Technological progress in the health sciences, and specifically in the field of acute cardiology, directly leads to the need for training, revision and updating of critical care nursing. In the face of this dynamic and continuously evolving process, the figure of the specialist intensive care nurse, as well as the inclusion of the expert cardiovascular care nurse in multidisciplinary teams such as the Heart team and the expansion of the haemodynamic nurse consultation, are imperatively necessary to guarantee optimal nursing care, safety and quality of care.

Financing

We received no funding or grant of any kind.

Conflict of interests

None.

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