



# Management and Nursing Interventions in Testicular Torsion: Early Diagnosis and Timely Surgical Intervention

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## Abstract

**Background:** Testicular torsion is a critical urological emergency characterized by sudden scrotal pain, swelling, and ischemia. It predominantly affects adolescents and requires urgent intervention to preserve testicular function and fertility. Delays in diagnosis or treatment significantly increase the risk of testicular necrosis, necessitating orchiectomy. Timely identification and surgical management are essential for optimal outcomes. **Methods:** A comprehensive review of current diagnostic and therapeutic approaches was conducted, emphasizing the role of Doppler ultrasound, TWIST scoring, and manual detorsion. Nursing interventions were analyzed to highlight their impact on patient outcomes, including pre-operative preparation, pain management, and post-operative care. **Results:** Prompt recognition and surgical intervention within six hours significantly improved testicular salvage rates. Doppler ultrasound emerged as the gold standard for diagnosis, with manual detorsion serving as a temporary measure in inconclusive cases. Nurses played a critical role in triage, stabilization, and

patient education, ensuring rapid surgical preparation and post-operative recovery. Effective nursing care also reduced complications, including infection and psychological distress. **Conclusion:** Early diagnosis, rapid surgical intervention, and comprehensive nursing care are pivotal in managing testicular torsion. Educating patients and healthcare providers on symptom recognition is essential to minimize delays. Advancements in diagnostic and therapeutic techniques, coupled with efficient nursing practices, have greatly improved patient outcomes, emphasizing the need for ongoing awareness and education to ensure timely intervention and optimal recovery.

**Keywords:** Testicular torsion, Nursing Interventions, Diagnosis, Surgical Management, Fertility Preservation

## 1. Introduction

Scrotal complaints are a common concern in emergency medicine, accounting for approximately 0.5% of all visits to the emergency department. Among these, testicular torsion represents a critical urologic emergency, requiring immediate recognition and intervention to prevent testicular loss. Testicular torsion is characterized by the twisting of the spermatic cord, which obstructs blood flow to the testicle, leading to ischemia and, if untreated, necrosis. The condition is most prevalent in adolescents, particularly those aged 12–18 years, though it can occur at any age, including in neonates and older adults. The annual incidence

**Significance** | Timely diagnosis and intervention are critical in preventing testicular loss and preserving fertility, ensuring improved patient outcomes and recovery.

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ranges from 1 in 4,000 to 1 in 25,000 males under 18, making it a leading cause of testicular loss (Barbosa et al., 2021; Elder et al., 2020).

The pathophysiology of testicular torsion involves venous congestion caused by the twisting of the spermatic cord, which restricts venous outflow while also compromising arterial inflow. This results in ischemia, rapid testicular swelling, and tissue and tissue necrosis if not promptly addressed. Factors contributing to testicular torsion include anatomical abnormalities, such as the "bell clapper" deformity, where the testicle is inadequately attached to the scrotum, increasing its mobility and susceptibility to torsion. Neonates may experience extravaginal torsion due to incomplete fixation of the gubernaculum, whereas intravaginal torsion predominates in older children and adults (Hayes & Malone, 2022). Early clinical recognition is paramount, as testicular salvage rates decrease dramatically with delayed treatment. Testicular viability declines significantly beyond six hours of symptom onset, emphasizing the necessity for prompt surgical intervention. Clinically, torsion typically presents as acute onset scrotal pain, swelling, and erythema, often accompanied by systemic symptoms such as nausea and vomiting. Diagnostic evaluation begins with a thorough physical examination, including assessment for the absence of the cremasteric reflex, which is a hallmark feature. Additional diagnostic tools, particularly color Doppler ultrasound, have emerged as the gold standard for assessing blood flow to the affected testicle, with a sensitivity of 93% and specificity approaching 100% (Vega & Castagnetti, 2019).

Management of testicular torsion involves immediate surgical detorsion and orchiopexy, with the contralateral testicle also secured to prevent future torsion. In cases where the affected testicle is nonviable, orchiectomy may be necessary. The timing of surgical intervention is critical; procedures performed within six hours of symptom onset yield the highest rates of testicular salvage, while delays beyond 12 hours significantly increase the likelihood of irreversible damage (Yamamoto et al., 2020).

Testicular torsion represents a surgical emergency with profound implications for fertility and endocrine function. Early recognition, rapid diagnostic evaluation, and timely surgical management are essential for optimal outcomes. Raising awareness of the clinical features and improving access to emergency care can significantly reduce the risk of testicular loss and associated complications.

## 2. Etiology

Testicular torsion is a leading cause of scrotal complaints, often presenting in emergency departments as a urological emergency. It occurs most commonly in patients under 25 years of age and is frequently associated with a congenital abnormality of the processus vaginalis. The condition arises from the twisting of the spermatic cord, which disrupts blood flow to the testicle. Typically,

the tunica vaginalis adheres firmly to the posterolateral aspect of the testicle, limiting the mobility of the spermatic cord. However, in cases where the tunica vaginalis attaches higher than normal, increased testicular mobility can result in intravaginal torsion. This defect, known as the "bell clapper" deformity, is bilateral in about 40% of cases (Velasquez et al., 2023).

Neonatal torsion, in contrast, often involves an extravaginal mechanism, where the tunica vaginalis and spermatic cord twist together due to inadequate attachment to the gubernaculum. This form of torsion can occur in utero or shortly after birth and requires a distinct management approach (Monteilh et al., 2019). While rare, adults may also experience testicular torsion, particularly in association with testicular malignancy, underscoring the importance of comprehensive diagnostic evaluation in atypical cases (Naouar et al., 2017).

## 3. Epidemiology

Testicular torsion primarily affects adolescents, with peak incidence occurring during puberty when rapid testicular growth heightens susceptibility. The most affected age group is between 12 and 18 years, although torsion can occur at any age, from neonates to older adults (Mellick et al., 2019). Neonates and infants with congenital anomalies, such as malformations of the processus vaginalis, are particularly at risk. Similarly, adults with a history of testicular trauma, undescended testicles, or anatomical abnormalities like the bell clapper deformity are predisposed to the condition (Fantasia et al., 2015).

Testicular torsion is relatively rare, with an estimated incidence of 1 in 4,000 to 1 in 25,000 males under the age of 18 (Howe et al., 2017). It remains a leading cause of testicular loss and requires urgent intervention to prevent irreversible damage. The condition's rapid progression underscores its status as a medical emergency; testicular viability is significantly compromised after 6–8 hours of torsion. Studies suggest that left-sided torsion is more common, possibly due to anatomical differences in the left spermatic cord (Bandarkar & Blask, 2018).

## 4. Pathophysiology

The pathophysiology of testicular torsion involves the twisting of the spermatic cord, which obstructs venous outflow while initially sparing arterial inflow as shown in Figure 1. This results in venous congestion and subsequent swelling of the testicle. As the condition progresses, arterial blood flow is also compromised, leading to ischemia and eventual necrosis if left untreated. The degree of twisting can vary, with rotations of 180 to 720 degrees reported in severe cases. The ischemic process rapidly deprives the testicular tissue of oxygen and nutrients, leading to irreversible damage (Mellick et al., 2019).

Prompt surgical intervention, typically detorsion and fixation, is essential for salvaging the affected testicle. The likelihood of testicular survival is highest when detorsion is achieved within 6 hours of symptom onset, with significantly diminished outcomes beyond 24 hours (Osumah et al., 2018).

## 5. History and Physical Examination

Patients with testicular torsion commonly present with sudden-onset, unilateral scrotal pain, which may radiate to the lower abdomen or groin. Accompanying symptoms often include nausea, vomiting, and scrotal swelling (Table 1). In neonates and younger children, symptoms may be more subtle, with irritability or reluctance to move the legs as potential indicators.

On physical examination, key findings include a high-riding testicle with an abnormal transverse lie, scrotal erythema, and edema shown in Table 1. The absence of the cremasteric reflex—a contraction of the scrotum in response to stroking the inner thigh—is considered a hallmark of torsion, although its reliability diminishes in young children and neonates (Mellick et al., 2023).

Differential diagnoses for acute scrotum include epididymitis, orchitis, testicular appendage torsion, inguinal hernia, hydrocele, and trauma. Testicular appendage torsion, in particular, presents with localized tenderness and may display a "blue dot" sign, a cyanotic discoloration over the torsed appendage. This condition, while painful, is self-limiting and does not require surgical intervention (Friedman et al., 2016).

## 6. Management

Early recognition and surgical management are critical for testicular torsion. Immediate scrotal exploration is indicated in cases where torsion is suspected, as delays in treatment significantly increase the risk of testicular loss. Detorsion and bilateral orchiopexy are the standard procedures, with the unaffected testicle fixed to prevent future torsion. In cases where the affected testicle is nonviable, orchiectomy is performed (Tydeman et al., 2010).

Advances in imaging, particularly Doppler ultrasound, have improved diagnostic accuracy, allowing for non-invasive assessment of blood flow. However, reliance on imaging should not delay surgical intervention when clinical suspicion is high. The integration of standardized protocols and enhanced awareness among healthcare providers can improve outcomes by reducing time to treatment (Murár et al., 2008).

In conclusion, testicular torsion is a time-sensitive condition with significant implications for fertility and endocrine health. Early identification and prompt surgical intervention remain the cornerstones of effective management. Increased awareness of the condition's etiology, epidemiology, and clinical presentation can aid in minimizing the risk of irreversible testicular damage and associated complications.

## 6.1 Evaluation and Management of Testicular Torsion

The **TWIST scoring system** is a widely accepted tool for assessing the probability of testicular torsion. This system assigns specific numerical values to key clinical findings: a hard testis (2 points), swelling (2 points), nausea or vomiting (1 point), absent cremasteric reflex (1 point), and a high-riding testis (1 point). The likelihood of testicular torsion increases with higher TWIST scores. For patients with lower scores, ultrasound is typically recommended to confirm the diagnosis. Conversely, patients with high scores can proceed directly to surgical intervention without additional imaging (Mellick et al., 2019).

## 6.2 Ultrasound Imaging

Ultrasound is the diagnostic modality of choice for evaluating testicular torsion, particularly after an initial physical examination. It offers a sensitivity of approximately 93% and a specificity of 100% for testicular torsion, making it highly effective for diagnosis (Bandarkar & Blask, 2018). During the procedure, the patient lies supine with the legs in a frog-legged position, supported by a towel under the scrotum. Adequate ultrasound gel is applied to ensure image clarity. The unaffected testicle is scanned first, followed by examination of the affected side. Both transverse and longitudinal scans are performed to assess testicular size, echotexture, and the presence of fluid collections. Normal testicles measure approximately  $4 \times 3 \times 2.5$  cm, with a homogenous echotexture and smooth borders.

The use of color Doppler imaging is critical for evaluating vascular flow. Reduced or absent blood flow in the affected testicle strongly suggests torsion. Doppler imaging also differentiates between venous and arterial blood flow, enhancing diagnostic accuracy. Despite its effectiveness, ultrasound may not reliably detect torsion in neonates, as up to 40% of cases may show no apparent blood flow on Doppler imaging (Friedman et al., 2016).

## 6.3 Laboratory Testing

Urine analysis is often performed to rule out other conditions such as epididymitis or orchitis. While the presence of pyuria may indicate infection, it does not exclude testicular torsion (Mellick et al., 2023).

## 7. Treatment and Management

Prompt diagnosis and intervention are critical to prevent testicular necrosis and loss. The optimal window for surgical intervention is within six hours of symptom onset. Beyond this timeframe, the risk of irreversible damage increases significantly (Howe et al., 2017). Immediate consultation with a urologist is essential, especially when clinical suspicion remains high despite inconclusive imaging findings.

### 7.1 Manual Detorsion

When surgical intervention is not immediately available, manual detorsion can be attempted. The testicle is rotated medially to

laterally, mimicking the action of "opening a book." Pain relief following this maneuver suggests successful detorsion. If pain persists or worsens, the testicle should be rotated in the opposite direction. Serial ultrasound can be used at the bedside to monitor the return of blood flow, and additional detorsion attempts may be made if necessary (Monteilh et al., 2019).

### 7.2 Surgical Intervention

Definitive management of testicular torsion typically involves surgical exploration. During this procedure, the testicle is untwisted, and its viability is assessed. Non-viable testicles require orchiectomy, followed by the insertion of a testicular prosthesis 4–6 months post-surgery, once inflammation has resolved. Bilateral orchiopexy is often performed to prevent future torsion, even in cases where the affected testicle is salvaged (Naouar et al., 2017).

### 7.3 Differential Diagnosis

A thorough evaluation is necessary to differentiate testicular torsion from other conditions with similar presentations (Table 2). Accurate diagnosis ensures timely and appropriate management, minimizing the risk of complications.

**Testicular Tumors:** These often present as painless masses in the scrotum. Unlike torsion, they do not cause acute pain or swelling and typically involve chronic discomfort.

**Epididymitis:** This infection of the epididymis is characterized by a gradual onset of scrotal pain, erythema, swelling, fever, and dysuria. Doppler ultrasound reveals increased blood flow, distinguishing it from torsion (Osumah et al., 2018).

**Hydrocele:** A fluid collection around the testicle causes painless scrotal swelling, lacking the sudden severe pain associated with torsion.

**Traumatic Hematoma:** This condition results from scrotal trauma and presents with localized swelling and less intense pain than torsion. The patient often provides a clear history of injury.

**Orchitis:** This infection of the testicle presents with fever, swelling, and gradual pain. Doppler imaging typically shows increased blood flow, differentiating it from torsion (Fantasia et al., 2015).

Careful clinical evaluation, including history-taking, physical examination, and appropriate imaging studies, is essential to distinguish testicular torsion from these other conditions. Accurate diagnosis is vital for timely treatment and optimal patient outcomes.

Testicular torsion is a urological emergency that requires rapid evaluation and management to prevent testicular loss. The TWIST scoring system and Doppler ultrasound are valuable diagnostic tools that guide clinical decision-making (Table 2). In cases of high clinical suspicion, immediate surgical consultation is imperative, even if imaging findings are inconclusive. Understanding the differential diagnoses and their distinguishing features is crucial for accurate assessment and management. Prompt intervention within

the critical six-hour window significantly improves the likelihood of testicular salvage and preserves fertility.

## 8. Prognosis

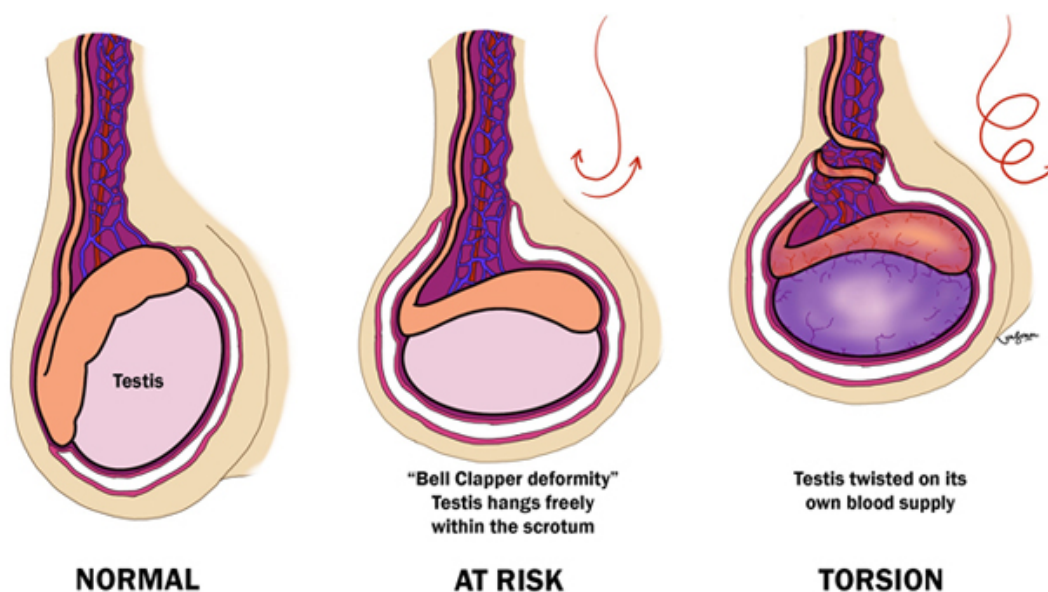
Advancements in medical practices have notably enhanced the ability to preserve testicular function following torsion. Despite these advancements, disparities in outcomes persist, particularly among African American individuals, younger patients, and those without health insurance. Timely surgical intervention remains the most critical factor influencing prognosis, with optimal results achieved when surgery is performed within 8 hours of symptom onset. Delays beyond this window significantly reduce the likelihood of successful testicular salvage (Monteilh et al., 2019). Furthermore, the risk of recurrence remains, even after orchiopexy, a procedure designed to prevent future torsion by securing the testicle in place. Despite improved techniques and early interventions, demographic and systemic factors, as well as delayed presentations, continue to adversely affect prognosis in certain populations.

## 9. Complications

Testicular torsion and its management are associated with several significant complications. The most serious complication is the loss of the affected testicle, particularly when surgical intervention is delayed. Infections at the surgical site can occur, potentially complicating recovery and leading to further health issues (Velasquez et al., 2023). Infertility is another critical concern, especially in cases involving bilateral torsion or when treatment is delayed. Severe cases may result in impaired exocrine and endocrine functions, which are essential for sperm production and hormone regulation. Cosmetic deformities, such as an altered appearance of the scrotum, are also potential outcomes of surgical intervention. These complications highlight the importance of timely diagnosis and effective management to minimize adverse consequences (Osumah et al., 2018).

## 10. Other Issues

Ultrasound, particularly with color flow Doppler imaging, remains a cornerstone in diagnosing testicular torsion. It is highly sensitive and specific, offering critical insights into the severity of the condition by assessing blood flow to the affected testicle. Early and accurate detection through ultrasound significantly influences the treatment approach and improves outcomes (Bandarkar & Blask, 2018) (Table 4). The involvement of a urologist at the earliest opportunity is equally essential to prevent testicular loss. Doppler imaging provides clear evidence of compromised blood flow, enabling clinicians to determine the urgency of surgical intervention (Friedman et al., 2016). This diagnostic tool not only



**Figure 1.** Testicular torsion, is a sudden twisting of the spermatic cord which contains the blood vessels of the testicle. This can lead to blood supply to the testicle being cut off. This condition can lead to permanent damage to the testicle if it is not treated urgently.

**Table 1.** Key Symptoms of Testicular Torsion

Symptom	Description	Importance
<b>Acute scrotal pain</b>	Sudden onset of severe pain in the scrotum	The most common symptom and initial indication of torsion
<b>Swelling</b>	Enlargement of the scrotum, often accompanied by redness	Indicative of inflammation and compromised blood flow
<b>Nausea and vomiting</b>	Often seen due to pain or ischemia affecting the abdominal organs	Common associated symptoms of torsion, particularly in children
<b>Absence of the cremasteric reflex</b>	Loss of the reflex that raises the testicle in response to stroking the inner thigh	A diagnostic sign of testicular torsion
<b>Scrotal discoloration</b>	Darkening of the scrotum, indicating compromised blood supply	Can be a late sign of torsion and impending necrosis

**Table 2.** Diagnostic Methods for Testicular Torsion

Diagnostic Tool	Method	Role in Diagnosis	Limitations
<b>Ultrasound (Color Doppler)</b>	Uses sound waves to visualize blood flow to the testicle	Essential for confirming torsion and assessing blood flow	May be inconclusive in certain cases of partial torsion
<b>TWIST Scoring System</b>	A clinical scoring system based on symptoms like nausea, history of scrotal pain, and abnormal findings	Assesses the likelihood of torsion to guide decision-making	Not definitive; used to prioritize imaging or surgical intervention
<b>Manual Detorsion</b>	A physical manipulation of the testicle to untwist it	Can be performed if ultrasound is inconclusive; offers temporary relief	Should only be attempted under surgical consultation; not a definitive solution
<b>Clinical Examination</b>	Physical inspection and palpation of the scrotum	First step in diagnosis, including checking the cremasteric reflex	Incomplete in diagnosing torsion, requires confirmation through imaging

**Table 3.** Nursing Interventions for Testicular Torsion

Phase	Nursing Action	Purpose	Considerations
<b>Preoperative</b>	Assess for signs and symptoms of torsion (pain, swelling, nausea)	Ensure early identification and prompt medical attention	Rapid assessment and swift notification to the healthcare team
	Provide patient history (previous episodes, trauma, anatomical abnormalities)	Gather relevant information for diagnosis and management	Crucial for understanding the risk of recurrence
	Ensure NPO status and preparation for surgery	Prepare for potential surgical intervention	Prevents aspiration during surgery
<b>Intraoperative</b>	Monitor vital signs and assist in positioning the patient	Maintain patient stability and comfort	Ensure the surgical team has adequate resources and support
	Administer pain management as ordered	Alleviate pain while avoiding masking critical symptoms	Avoid excessive analgesia that may delay diagnosis
<b>Postoperative</b>	Monitor for signs of infection, bleeding, or complications	Early detection of issues to prevent further harm	Frequent assessments to ensure optimal recovery
	Educate patient and family on post-surgical care, including wound care	Facilitate recovery and prevent complications	Address concerns about testicular loss, fertility, and recovery
	Arrange follow-up appointments to assess testicular function and fertility	Ensure long-term success of treatment	Provide psychological support, especially for adolescents

**Table 4.** Surgical and Postoperative Outcomes for Testicular Torsion

Outcome	Factor Influencing Outcome	Impact on Testicular Salvage	Postoperative Considerations
<b>Testicular Salvage Rate</b>	Time to intervention (within 6 hours vs. 12-24 hours)	Higher salvage rates with earlier intervention	Timely follow-up and monitoring for complications
<b>Recurrence of Torsion</b>	Orchiopexy (testicular fixation) and risk factors	Possible, especially without orchiopexy	Regular follow-ups to detect recurrence
<b>Infertility</b>	Bilateral torsion or delayed intervention	Risk of infertility if both testes are affected	Fertility preservation counseling and follow-up
<b>Cosmetic Deformity</b>	Severity of torsion and damage to testicle	Risk of cosmetic changes post-orchietomy	Psychological support for body image concerns
<b>Pain and Recovery</b>	Type of surgical intervention (detorsion vs. orchietomy)	Pain management and recovery time vary	Monitoring for infection and wound healing

confirms the condition but also serves as a guide for immediate surgical planning.

### 11. Enhancing Healthcare Team Outcomes

Effective management of testicular torsion requires a well-coordinated interprofessional healthcare team. The triage nurse plays a pivotal role in recognizing symptoms and ensuring the patient receives immediate attention in the emergency department (ED). Prompt communication between the triage nurse and the ED physician is essential for expedited care. The ED physician collaborates with radiologists to perform imaging and consults with urologists to plan surgical intervention (Murár et al., 2008). Concurrently, nursing staff prepare the patient for surgery, ensuring necessary preoperative steps such as blood work and maintaining NPO status.

Once the diagnosis is confirmed, the urologist performs the required surgical procedure. Nurses must communicate effectively with the patient and their family, educating them about potential complications, such as infertility and the possibility of testicular loss. Additionally, pain management must be carefully balanced to avoid masking critical symptoms that could delay diagnosis. An integrated approach involving open communication, timely decision-making, and coordinated efforts among healthcare professionals is essential to achieving favorable outcomes. This systemic strategy is particularly crucial in ensuring testicular salvage and minimizing long-term complications (Tydeman et al., 2010).

### 12. Outcomes

The prognosis for testicular torsion is closely tied to the timing of diagnosis and treatment. Delays in recognizing and addressing the condition increase the likelihood of testicular atrophy and permanent functional loss (Mellick et al., 2019). Studies indicate that between 20% and 40% of torsion cases result in orchiectomy, with African American patients and younger males facing a disproportionately higher risk of testicular loss. When patients present within 6 hours of symptom onset, the testicular salvage rate approaches 100%. However, delays beyond this critical period dramatically reduce success rates; if treatment is delayed for 12 to 24 hours, the salvage rate drops below 50% (Howe et al., 2017).

Even after successful orchiopexy, there remains a risk of recurrent torsion, which may necessitate additional surgical interventions. This underscores the importance of comprehensive follow-up care and patient education to minimize the risk of recurrence and address any complications promptly (Naouar et al., 2017). While advancements in medical practices have improved overall outcomes, disparities in access to timely care and demographic factors continue to influence prognosis.

Testicular torsion remains a urological emergency requiring prompt and coordinated care. Early diagnosis through the use of ultrasound and timely surgical intervention are paramount in preserving testicular function and preventing complications. Effective management necessitates the collaboration of an interprofessional healthcare team, emphasizing the importance of communication and swift decision-making. Despite medical advancements, challenges persist in addressing disparities in outcomes among specific demographic groups. Continued efforts are needed to improve access to timely care and ensure equitable treatment outcomes for all patients.

### 13. Nursing Interventions for Testicular Torsion

Nursing interventions for testicular torsion focus on early recognition, stabilization, preparation for surgical intervention, and providing supportive care to prevent complications (Table 3). Since testicular torsion is a surgical emergency, timely action is critical to preserve testicular function and fertility. The primary nursing priority involves promptly identifying the condition. Nurses must remain vigilant in assessing patients for the hallmark symptoms of testicular torsion, which include acute scrotal pain, swelling, nausea, and vomiting. Upon the patient's arrival at the emergency department (ED), the triage nurse should quickly evaluate for these symptoms and alert the healthcare team immediately if torsion is suspected.

A detailed patient history is essential to aid diagnosis in Table 3. Nurses should inquire about previous episodes of scrotal pain, any history of trauma, or anatomical abnormalities such as a "bell-clapper" deformity, which increases susceptibility to torsion (Monteilh et al., 2019). By providing an accurate and comprehensive medical history, nurses can support physicians in reaching a timely diagnosis.

Once torsion is suspected, nurses play a pivotal role in facilitating rapid diagnostic testing and preparing the patient for surgery. To ensure the patient is ready for possible surgical intervention, nurses should position the patient comfortably, initiate fasting protocols (NPO), and assist with necessary laboratory tests, such as blood work. Administering pain management as prescribed is crucial; however, caution must be exercised to avoid masking symptoms that could delay diagnosis (Osumah et al., 2018).

If testicular torsion is confirmed, the nurse must ensure immediate consultation with a urologist and assist in preparing the patient for surgery. This preparation includes obtaining consent, ensuring the availability of surgical supplies, and maintaining clear communication with the surgical team. Beyond physical readiness, emotional support is essential. Nurses should address the concerns of patients and their families, particularly about potential outcomes like testicular loss or infertility. Educating families about the

surgical procedure, recovery process, and potential complications is an integral part of comprehensive care.

Postoperatively, nursing care focuses on monitoring for complications such as infection, bleeding, or recurrent scrotal pain. Nurses should educate patients and families about proper wound care, recognizing signs of infection, and the importance of follow-up appointments to monitor testicular function and fertility outcomes. Comprehensive patient education ensures adherence to postoperative care and promotes recovery.

#### 14. Diagnosis and Early Intervention

Testicular torsion is a critical urological emergency most commonly seen in adolescents, although it can occur at any age. Symptoms typically include sudden onset scrotal pain and swelling. Early diagnosis and intervention are paramount, as the viability of the affected testicle declines rapidly after six hours of ischemia (Velasquez et al., 2023). Ultrasound, particularly with color Doppler imaging, is the gold standard for diagnosing torsion, as it effectively evaluates blood flow to the testicle (Bandarkar & Blask, 2018).

The Testicular Workup for Ischemia and Suspected Torsion (TWIST) scoring system is another valuable tool, helping clinicians assess the likelihood of torsion and decide whether imaging or immediate surgical intervention is required (Friedman et al., 2016). In some cases, when ultrasound findings are inconclusive, manual detorsion may be attempted to temporarily relieve torsion and restore blood flow pending surgical consultation.

#### 15. Surgical and Pharmacological Management

The definitive treatment for testicular torsion is surgical intervention, typically involving detorsion and orchiopexy, a procedure to prevent future recurrence (Table 4). In severe cases where the testicle is deemed nonviable, orchiectomy (removal of the testicle) is necessary (Howe et al., 2017). Post-surgical nursing care includes pain management, monitoring for complications, and providing emotional and psychological support, especially for adolescent patients who may be concerned about fertility and body image.

While pharmacological treatments play a secondary role, they are essential in managing pain and reducing inflammation. However, surgical detorsion and fixation remain the primary interventions for preserving testicular viability.

#### 16. The Role of Education and Prevention

Educating both the public and healthcare providers about the signs and symptoms of testicular torsion is vital for promoting early recognition and timely intervention. Awareness campaigns and training for healthcare professionals can improve the outcomes of this urological emergency.

#### 17. Conclusion

Testicular torsion is a urological emergency with significant potential for morbidity if not treated promptly. Advancements in diagnostic tools, surgical techniques, and nursing interventions have improved outcomes for patients. However, early diagnosis and intervention remain the cornerstones of effective management. Nurses play a crucial role throughout the patient journey, from initial assessment and preparation for surgery to postoperative care and education. Their efforts significantly impact patient outcomes, ensuring optimal recovery and minimizing complications. By fostering interdisciplinary collaboration and enhancing public awareness, the healthcare community can continue to improve the prognosis for patients with testicular torsion.

#### Author contributions

All authors contributed significantly to this study. S.G.A.O. led the conceptualization and supervision. A.A.M.A. managed data acquisition and analysis. T.M.N.B.B. drafted and revised the manuscript. K.A.R.S.A. handled statistical validation, while A.I.A. and A.A.A. supported methodology and data management. T.A.A. prepared visuals, and S.F.A. coordinated administrative tasks. A.O.A. edited the manuscript, with B.S.A. reviewing and approving it. A.S.A. ensured quality, K.R.M.A. collected field data, and H.D.T.A. provided funding and final approval. All authors reviewed and approved the final manuscript.

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#### Competing financial interests

The authors have no conflict of interest.

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