APPROVED DOCUMENT

المديرية العامة لمستشفى خولة

Directorate General of Khoula Hospital

Orthopedic Department

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Content

Acronyms

DGKH	Directorate General of Khoula Hospital
DNA	Director of Nursing Affairs
ERAS	Enhanced Recovery After Surgery
AIS	Adolescent Idiopathic Scoliosis
ADS	Adult Degenerative Scoliosis
PONV	Post-Operative Nausea and Vomiting
OPD	Out Patients
NPO	Nil per Oral
VAS	Visual Analog Scale
NSAIDs	Non-Steroid Anti- Inflammatory Drugs
DVT	Deep Vein Thrombosis
PAC	Pre-Anesthesia Check up
TIVA	Total Intravenous Anesthesia
FI	Frailty Index
VTE	Venous Thromboembolic
PE	Pulmonary Embolism
NRS-2002	Nutritional Risk Screening
SSEP	Somato- Sensory Evoked Potential
MEP	Motor Evoked Potential
OSA	Obstructive Sleep Apnea
PCA pump	Patient -Controlled Analgesia pump
ICU	Intensive Care Unit
CBC	Complete Blood Count
MRI	Magnetic Resonance Imaging
CT scan	Computed Tomography scan
BMI	Body Mass Index
MRSA	Methicillin-Resistant Staphylococcus Aurous
FIC	Fasting-Induced Catabolism
OTC	Over- The- Counter

ROM	Range of Motion
ASA	America Society of Anesthesiologist
GDFT	Goal-Directed Fluid Therapy

1. Definitions

1.1 Scoliosis: It is a three-dimensional deformity of the spine characterized by a lateral (sideways) curvature greater than 10 degrees on a standing x-ray (measured by the Cobb angle), often accompanied by rotation of the vertebrae and changes in the normal spine curves.

1.2 Enhanced Recovery after Surgery (ERAS): It is a standardized, multi modal intervention, multi- disciplinary approach, evidence-base protocol for preoperative care for elective surgery.

1.3 Thromboprophylaxis: The use of pharmacologic or mechanical measures to prevent venous thromboembolic (VTE) including deep vein thrombosis (DVT) and pulmonary embolism (PE).

1.4 Opioid: A compound resembling opium in addictive properties or physiological effects.

1.5 Cobb angle: It is the standard measurement used by doctors to determine the degree of spinal curvature in scoliosis.

1.6 Frailty Index (FI): A measure used in healthcare to assess a person's level of frailty, particularly in older adults or patient with chronic illness.

1.7 American Society of Anesthesiologists (ASA) Physical Status Classification System: It is a system used by anesthesiologists to assess and communicate the patient's overall preoperative health and risk before administering anesthesia.

1.8 STOP-BANG Questionnaire: It is a simple and widely used screening tool to identify patients at risk of Obstructive Sleep Apnea (OSA).

1.9 Nutritional Risk Screening (NRS-2002): It's a screening tool developed to identify adult patients who are malnourished or at risk of malnutrition.

1.10 Malnutrition Universal Screening Tool (MUST): It is three steps screening to identify malnutrition risk.

Chapter One

2.Introduction

Enhanced Recovery after Surgery (ERAS) guidelines have become an essential component of modern perioperative care, aiming to optimize patient outcomes, reduce complications, and shorten hospital stay. In scoliosis surgery, which is often associated with significant postoperative pain, prolonged recovery, and high resource utilization, the application of ERAS principles is particularly valuable. Central to the ERAS approach is multimodal pain management, which minimizes reliance on opioids by combining different pharmacological and non-pharmacological strategies. This not only improves analgesia but also reduces opioid-related side effects such as respiratory depression, sedation, and delayed mobilization. Early mobilization is another cornerstone, as it enhances respiratory function, reduces the risk of thromboembolic events, and accelerates return to functional independence. Similarly, early feeding supports gastrointestinal recovery, maintains nutritional status, and strengthens immune function. Optimized anesthesia techniques; tailored to minimize physiological stress, maintain hemodynamic stability, and enable rapid awakening are critical to facilitating early mobilization and reducing the need for intensive care. The ERAS model also promotes the avoidance of unnecessary ICU admission, reserving such resources for patients with clear clinical indications, shortening lengths of hospital stay, thereby improving bed availability and cost-effectiveness without compromising safety.

3. Purpose

The purposes of this guideline are to:

3.1 Standardize perioperative care through evidence-based practices to enhance recovery, minimize complications, and improve patient safety.

3.2 Promote multimodal pain management to reduce opioid use, support early mobilization, and encourage early return to normal function.

3.3 Optimize resource utilization by shortening hospital stay and avoiding unnecessary ICU admissions.

3.4 Foster multidisciplinary collaboration and patient engagement to improve compliance, satisfaction, and overall outcomes.

4.Scope

This guideline of Directorate General of Khoula Hospital (DGKH|) applies to all patients undergoing scoliosis surgery, including adolescent and adult populations, unless specific contraindications are identified. It is intended for use by the entire multidisciplinary team including; surgeons, anesthetists, nurses, physiotherapists, psychologist, dietitians, and allied health professionals to ensure consistent, high-quality perioperative care.

Chapter Two

5. Structure

5.1 Patient should be explained, educated, and counseled about the overview of the surgery up to discharge including:

5.1.1 **Understanding the surgery:** What scoliosis surgery involves (e.g. spinal fusion) .The purpose of the surgery is to correct curvature, improve function and reduce pain.

5.1.2 **Anesthesia and risks:** Discuss general anesthesia process and possible risks such as bleeding, infection, nerve injury (which is very rarely).

5.1.3 **Nutrition and fasting before surgery**:

a. Stop eating food 6 hours before surgery. Do not consume fried, fatty food or meal containing meat **(refer to Pre-operative Fasting Guideline for Surgical and non-Surgical Procedures).**

b. If meat or fatty food have consumed, the fasting period should be extended to more than 8 hours before surgery (patients are encouraged to avoid fatty food and meat for 12 hours to shorten fasting times).

c. Patient may have clear fluids (water, white grape juice, tea or black coffee) up to 2 hours before surgery.

d. If not contraindicated; the patient may have 300-400 ml of carbohydrate drinks up 2 hours before surgery **(refer to Pre-operative Fasting Guideline for Surgical and non- Surgical Procedures).**

e. Encourage high protein and iron - rich diet.

5.1.4 Refer the patient to a physiotherapist for training on general breathing exercises and post- operative mobilization techniques.

5.1.5 Instruct patient to stop smoking and alcohol 4-6 weeks before surgery including other health education (see Appendix 9).

5.1.6 Explain to the patient the possibility of being admitted in ICU. Start moving with assistance as early as day1 after surgery, discharge is expected within 3-7 days (based on ERAS principles) unless there is complication that need further treatment.

5.1.7 Expect the multimodal pain control with less opioid such as PCA pump or regional anesthesia options.

5.1.8 Address anxiety and ensure the patient is free from doubt regarding surgery and its outcome.

5.1.9 Ensure the patient understands hospital expectations, including rights and responsibilities.

5.1.10 Provide educational materials and leaflets in English and Arabic (See appendix 9).

5.2 Pre-op Medical Assessment:

5.2.1 Required blood tests including CBC, coagulation profile, renal/liver and iron panel.

5.2.2 Imaging: Spine X-rays, MRI/CT.

5.2.3 Ensure anesthesia consultation including full neurological assessment.

5.2.4 Refer the case of comorbidities to concerned specialties for assessment and get surgery fitness before a day of admission for surgery.

5.3 Thromboprophylaxis for Adults:

5.3.1 Before admission; if the patient is on anticoagulants, then the medications should be highlighted and the number of days that they have to be stopped before surgery should be specified (2-5 days depending on the type of anticoagulants).

5.3.2 Ensure a balance between the risk for DVT and bleeding before admission for surgery.

5.3.3 Universal Thromboprophylaxis is not recommended for all patients, however, provide pharmacological prophylaxis for moderate and high-risk patients based on the following variables: (Keep in mind the age of the patients in terms of medication types and dosage).

5.3.4 History of VTE in the past (provoked or unprovoked).

5.3.5 Known heritable thrombophilia in the family or family history of VTE.

5.3.6 Active cancer, major knee reconstruction or two and more of the below factors:

a. Patient who require non-weight bearing for more than 7 days.

b. Patient with brace as it limits movement.

c. Patient over 40 years of age.

d. Patient with BMI above 30 kg/m^2.

e. Accompanying infection which needed treatment after discharge.

f. No single fixed duration use until patient is mobilized and out of high-risk window.

g. Duration of thromboprophylaxis can be 5-30 days, but in most cases 7-14 days is typical unless for high risk it required 4-6 weeks depending on the surgeon assessment of the expectant mobility time.

h. Thromboprophylactic options for (Adult) are preferred in the following order of availability, taking into consideration age, renal function and VTE risk assessment:

i. Aspirin 75 mg OD or BID.

ii. Apixaban 2.5mg BID or Rivaroxaban 10 mg OD may be considered if indicated form B should be filled when required.

iii. Enoxaparin 4,000 IU OD or 6,000 IU OD.

5.3.7 If patient on VTE prophylaxis (Enoxaparin) before surgery, then it should be stopped 12 hours before the surgery. Anti-embolic stockings or intermittent pneumatic compression device are recommended.

5.3.8 Balance VTE risk with bleeding risk, especially in spinal surgeries (risk of epidural hematoma).

5.3.9 In Adolescent Idiopathic Scoliosis (AIS), mechanical prophylaxis alone may be sufficient.

5.3.10 Consult Thromboembolism and Clinical Hematology Unit under General Medicine for any case with additional high-risk factors not listed above or when the above thromboprophylactic options are unavailable, renal function is impaired or bleeding factors are present.

5.4 Infection Prophylaxis (Antibiotic Instruction):

5.4.1 Screen the patient for infections and follow the established infection prevention and control guideline.

5.4.2 The recommended first-line prophylactic adult antibiotic dose is Cefazolin IV administered within 60 minutes prior to incision:

a. 1g if the patient weighs below 60 kg.

b. 2 g if the patient weights 60 -120 kg.

c. 3 g if the patient weights above 120 kg.

d. Pediatrics patient dose is 30 mg/kg.

e. Re-dosing is needed if the surgery is longer than 4 hours or blood loss is more than1.5 L

f. For Beta-Lactam Allergy: Clindamycin 900mg IV or Vancomycin 15 Mg/kg/day (1g to be infused slowly over 2 hours and incision can be carried out after 1-2 hours of infusion).

g. Consider starting Mupirocin nasal ointment for MRSA-colonized patients or those at risk.

5.5 Pre-Rehabilitation and Nutritional Optimization:

5.5.1 Diaphragmatic breathing techniques.

5.5.2 Segmental chest expansion exercises.

5.5.3 Breathing coordination with mobility.

5.5.4 Strength and mobility exercises.

5.5.5 The Frailty Index (FI) (See Appendix 5) shall be used to predicts surgical risk of a frailty patient in order to find the proper measures to:

a. Prevent surgical site infection.

b. Prevent long stays in the ICU and hospitalization.

c. Prevent 30 days re-admission and mortality rate.

d. Prevent the delay in functional recovery.

e. Ensure the FI score have critical planning as to:

i. Tailor pre-rehabilitation plan.

ii. Identify the referral needs to nutritional therapy.

iii. Guide the planning for ICU, High Dependency Unit (HDU) or HD in the general ward.

iv. Predict longer hospital stay with specific special care to reduce lengths of stay.

5.5.6 Patient should be instructed to do breathing exercises.

5.5.7 Avoid prolonged fasting more than 6 hours for solid food and ensure patient is well hydrated.

5.5.8 Malnutrition or anemia should be corrected (target Hb $\geq$ 12 g/dL) and patient can be referred to clinical dieticians when required before admission.

5.5.9 If not contraindicated; ensure that patient continue to have carbohydrate loading up to 2–3 hours before surgery.

5.5.10 Prevent dehydration, maintain euvolemia, and reduce Fasting-Induced Catabolism (FIC).

5.6 Required Comprehensive Patient History:

5.6.1 **Medical History:**

5.6.1.1 Ensure the chronic conditions such as asthma, diabetes, hypertension, epilepsy, etc. should be highly considered before surgery.

5.6.1.2 Assess for previous surgeries especially spinal or orthopedic.

5.6.1.3 Assess for any allergies for medications, latex, anesthesia, etc. and document clearly.

5.6.1.4 History of blood transfusion or bleeding disorders should be noted before the surgery.

5.6.2 **Scoliosis-Specific History:**

5.6.2.1 Age of diagnosis.

5.6.2.2 Curve progression and symptoms e.g., back pain, imbalance.

5.6.2.3 Neurological symptoms including numbness, weakness, bowel/bladder issues.

5.6.3 **Family and Medication History:**

5.6.3.1 Thorough family history should be obtained including scoliosis, genetic disorders, and anesthesia complications to ensure safe surgery.

5.6.3.2 Prescription, Over- The- Counter (OTC), herbal supplements.

5.6.3.3 Especially anticoagulants, antiepileptic, or corticosteroids.

5.6.4 **Psychosocial Evaluation:**

a. Assess and refer to the concerned specialist for the case of abnormal mental health status such as anxiety or depression.

b. Ensure there is family support system or refer to social worker service available.

c. Obtain history of smoking, alcohol, substance use and do the needful before surgery.

5.6.5 **Physical Assessment:**

5.6.5.1 Obtain general examination including vital signs: BP, HR, Temp, O2 saturation.

5.6.5.2 Assess patient for malnutrition and refer the case to clinical dieticians as indicated (see Appendix 3 & 4).

5.6.5.3 Inspect spinal alignment (standing, Forward Bend Test).

5.6.5.4 Palpation for tenderness or deformity.

5.6.5.5 Assess the Range of Motion (ROM), gait and balance.

5.6.5.6 Perform neurological assessment including; motor strength (upper and lower limbs), sensory function and reflexes.

5.6.5.7 Assess patient's coordination and cranial nerves if indicated.

5.6.5.8 Assess cardiorespiratory system such as heart sounds, murmurs, and respiratory rate/pattern.

5.6.5.9 Perform auscultation for abnormal breath sounds, pulmonary function testing (especially in thoracic scoliosis).

5.6.6 **Skin Assessment:**

5.6.6.1 Examine skin condition for any signs of infection.

5.6.6.2 Assess bony prominences for pressure sores risks.

5.6.6.3 Assess and document general skin conditions.

5.7 ERAS Recommended Tools for Detection of the Scoliosis Surgery Risks:

5.7.1 Anesthesiologists should use an America Society of Anesthesiologist (ASA) Physical Status Classification System (See Appendix 1) to assess and communicate the patient's overall health and medical risk before surgery, to stratify risk and prepare perioperative plans, and to guide postoperative monitoring needs such as an ICU bed.

5.7.2 STOP-BANG tool (See Appendix 2) should be used to detect the risk of Obstructive Sleep Apnea (OSA) that increase the risk of surgery.

5.7.3 Identify patients with difficult airway (e.g., thoracic deformity and restrictive lung disease) and prepare advanced airway equipment.

5.7.4 Pre-operative fasting as per Pre-operative Fasting Guideline for Surgical and non- Surgical Procedures.

5.7.5 Use carbohydrate loading (300–400 ml) up to 2 hours pre-op unless contraindicated (diabetes with poor control, gastroparesis).

5.8 Optimizing Admission Bed Utilization after Scoliosis Surgery:

5.8.1 ICU Bed should be prepared for:

5.8.1.1 High ASA score above III or IV (severe comorbidities such as heart failure, uncontrolled diabetes.

5.8.1.2 Extensive Surgery: Long fusion levels such as above 8 vertebrae, combined anterior and posterior approaches and severe deformities or kyphoscoliosis correction.

5.8.1.3 Intra-operative complications: these including major blood loos, cardiopulmonary instability, neurological injury or monitoring alerts.

5.8.1.4 Pre-existing conditions such as respiratory compromise (restrictive lung diseases), sleep apnea (especially if untreated) and cardiac disease or history of being admitted in ICU.

5.8.1.5 Very young or elderly patients: Especially infants or older adults with frailty (see Appendix 5).

5.8.1.6 Poor baseline functional status or Frailty: As Identified through (FI) (Annex 5) or poor mobility pre-op.

5.8.1.7 Difficult intubating post-operatively and or prolonged intubation as needed for monitoring and ventilation.

5.8.1.8 Adolescent Idiopathic Scoliosis (AIS): Patients may stay in the ICU 2-4 days as needed.

5.8.1.9 Adult Degenerative Scoliosis: Patient may stay in the ICU care for 4-6 days and complex or revision surgery need 5-7 days or more based on the case.

5.8.1 Most healthy or moderate patients (ASA I-II) undergoing uncomplicated scoliosis surgery can be managed in:

a. Post-Anesthesia Care-Unit (if available).

b. High Dependency Unit (HDU).

c. Ward HD; full equipped with monitors for close observation especially in the first 24 hours and ensure monitoring of the vital signs hourly for the first 8 hours.

d.Avoid unnecessary ICU stay when patient meets stability criteria.

5.9 Pre-Operative Care and Post-operative Pain Management for Scoliosis:

5.9.1 Ensure pain management initiated based on Visual Analog Scale (VAS) assessment.

5.9.2 Ensure patient comfort and safety by initiating Epidural Infusion in OT up to 48 hours after surgery as per National Policy and Procedure of Pain Management (See appendix 8).

5.9.3 Multimodal prophylaxis is recommended for patients with moderate to high risk of post-operative nausea and vomiting (PONV).

5.9.4 Dexamethasone is often combined with ondansetron for better efficacy.

5.9.5 Avoid opioid overuse intra- and post-operatively to reduce PONV risk (See appendix 7)

5.10 Intraoperative Anesthetic and Others Management:

5.10.1 Pre-induction preparation: Patient warming, neuromonitoring preparation, vascular access and baseline labs.

5.10.2 Anesthetic Induction: Opioid-sparing approach, pre-induction analgesia, agents to preserve neuromotor and airway management.

5.10.3 Maintenance of Anesthesia: TIVA (Total Intravenous Anesthesia), multimodal adjuncts, blood conservation, temperature and fluid management.

5.10.4 Maintain normovolemia, optimize tissue perfusion, avoid fluid overload.

5.10.5 Goal-Directed Fluid Therapy (GDFT) using dynamic monitoring (stroke volume variation, cardiac output).

5.10.6 Baseline: maintenance rate + surgical losses.

5.10.7 Use a balanced crystalloids (e.g., Plasma-Lyte, Ringer's lactate).

5.10.8 Replace blood loss with 3:1 crystalloid or 1:1 colloids/blood.

5.10.9 Consider cell-saver for major deformity corrections.

5.10.10 Avoid excessive normal saline to reduce hyperchloremic acidosis.

5.10.11 Adults: 1–3 mL/kg/hours maintenance + losses.

5.10.12 Pediatrics: 4-2-1 rule (first 10 kg: 4 mL/kg/hour, 2nd 10 kg: 2 mL/kg/hour, remaining: 1 mL/kg/hour).

5.11 Surgical Technique:

5.11.1 Each Surgeon has a unique surgical technique.

5.11.2 Positioning: Prone position with care to avoid pressure injuries.

5.11.3 Use chest rolls or use open frame table to reduce abdominal pressure and venous bleeding

5.11.4 Exposure and Instrumentation: Minimally invasive or muscle-sparing approaches where feasible, careful dissection to preserve paraspinal muscle integrity and reduce postoperative pain, use of intraoperative navigation or 3D imaging to improve accuracy and reduce operative time.

5.11.5 Spinal cord protection: Continuous somatosensory evoked potential (SSEP) and motor evoked potential (MEP) monitoring throughout, immediate correction if monitoring signals deteriorate (check BP, oxygenation, positioning, surgical compression).

5.11.6 Blood loss minimization: Stepwise correction of curve to avoid sudden hemodynamic instability, topical hemostatic agents (fibrin sealants, oxidized cellulose), Judicious cautery to minimize muscle bleeding.

5.11.7 Closure: Layered closure with meticulous hemostasis, local infiltration of long-acting local anesthetics (e.g., bupivacaine with epinephrine) for postoperative analgesia.

5.12 Early Mobilization and Post-Operative Consideration:

5.12.1 Day 0 (from 6–12 hours): Assist the patient to sit at edge of bed, or in an upright chair with assistance. Encourage deep breathing and incentive spirometry.

5.12.2 Day 0-3: Assist the patient in walking short distances with walker support and gradually increase distance and independence. Assist with safe sitting, standing. Teach breathing exercises using an incentive spirometer. Educate on log-rolling techniques to protect spine and prevent DVT by ankle pumps and leg elevation.

5.12.3 Day 2-3: Ambulate the patient 3 to 4 times daily and initiate gentle core activation and posture training.

5.12.4 Apply brace before mobilization (if prescribed) and then teach the patient how to wear and remove it.

5.12.5 Multimodal approach: Paracetamol, NSAIDs, gabapentin, regional anesthesia (epidural or local as per National Policy and Procedure for Pain Management).

5.12.6 Consider regular analgesic and antiemetic, but avoid or minimize Opioid when possible.

5.12.7 Physiotherapist should ensure patient has been mobilized within 6-24 hours post operatively.

5.12.8 Continue the use of compression stockings, intermittent pneumatic compression if available.

5.12.9 Low molecular weight heparin (e.g. enoxaparin or low-dose heparin. Start 6-12 hours post-op (once bleeding risk is controlled) for 7-14 days or until full ambulation.

5.12.10 IV fluids only if oral intake inadequate, but avoid overhydration to reduce risk of pulmonary complications.

5.12.11 Resume oral intake as soon as tolerated within 4-8 hours, but fluid 2-4 hours.

5.12.12 Consider constipation prophylaxis and stool softener to prevent constipation after this major surgery.

5.12.13 Maintain clinical assessment, daily weight, urine output and electrolyte monitoring if large volume shifts occurred.

5.12.14 Foley catheter should be removed as soon as possible within 24 hours.

5.12.15 Clear criteria: Pain control, mobility, eating, bowel/bladder function.

5.12.16 Provide home care instructions and follow-up appointments (See Appendix 9).

5.12.17 Ensure Psychological support and physical rehab plan.

5.12.18 Drain should be removed 24-48 hours for uncomplicated case.

5.12.19 Ensure the patient has a clear pain control plan with oral medications.

5.12.20 Educate about safe medication use and side effect.

5.12.21 Encourage early safe mobilization as per physiotherapy recommendation.

5.12.22 Ensure patient has educational materials (See Appendix 9).

5.12.23 Explain the use of any assistive devices or brace if prescribed.

5.12.24 Teach the patient how to care for the surgical wound and ensure follow up with physiotherapy based on situation.

5.12.25 Scheduled follow-ups with surgeon; typically, at 2 weeks, 6 weeks, 3 months, 6 months, up to 1 year.

5.12.26 Emphasize well balance diet and bowel care (laxatives if needed).

5.12.27 Provide psychosocial support and involve family or caregivers in education for support at home.

5.13 Physiotherapy Consideration at Immediate Phase (Days 0–3 in hospital):

5.13.1 Breathing exercises: Use your incentive spirometer 10–15 times every 1–2 hours to prevent lung complications.

5.13.2 Moving safely: Learn how to sit, stand, and walk with help. Use the "log-roll" technique to turn in bed without twisting your spine.

5.13.3 Ankle pumps: Move your feet up and down to prevent blood clots.

5.14 Early Recovery (Weeks 1–6):

5.14.1 Walking: Aim for short, frequent walks every day. Increase distance slowly.

5.14.2 Gentle exercises: Light movements of arms and legs without bending or twisting your back.

5.14.3 Posture: Keep your back straight and avoid slouching.

5.15 Intermediate Recovery (Weeks 6–12):

5.15.1 Strengthening: Start core and leg strengthening exercises as advised by your therapist.

5.15.2 Balance: Practice standing and walking with good balance.

5.15.3 Aerobic activity: Low-impact exercises like walking or swimming.

5.16 Advanced Recovery (3–12 months):

5.16.1 Gradually return to daily activities and sports when your doctor says it's safe.

5.16.2 Continue strengthening and flexibility exercises.

5.17 Important Precautions:

5.17.1 Avoid bending, twisting, or heavy lifting for at least 6–8 weeks.

5.17.2 Stop any exercise that causes sharp pain or numbness.

5.17.3 Report any new weakness, severe pain, or swelling to your healthcare team immediately.

5.18 Pre and Post Respiratory Therapy Consideration:

5.18.1 Train the patient on deep breathing exercises.

5.18.2 Give instruction on incentive spirometry use and ensure preoperative respiratory therapy is done with the incentive spirometer.

5.18.3 Assist and instruct coughing techniques to clear secretions.

5.18.4 Ensure the inspiratory muscle training is done.

5.18.5 Practice sessions with threshold devices if available.

5.18.6 Ensure there is daily supervised sessions before surgery.

5.18.7 Emphasis on improving lung capacity and strength.

5.18.8 Huffing and effective cough training.

5.18.9 Positioning for secretion drainage.

5.18.10 Use of assistive devices if required.

5.18.11 Reinforcement of incentive spirometry use immediately post-op.

5.18.12 Assisted coughing techniques with pillow splinting.

5.18.13 Education on gradual progression of breathing exercises.

5.19 Restrictions and Monitoring During Rehab:

5.19.1 Avoid bending, lifting, twisting for 6–8 weeks.

5.19.2 Avoid driving for 4–6 weeks or while on opioids.

5.19.3 Avoid strenuous activity until cleared by your surgeon.

5.19.4 Watch and report for leg weakness/numbness, worsening back pain and signs of infection.

5.19.5 If possible; provide scheduled follow-ups: typically, at 2 weeks, 6 weeks, 3 months, 6 months, 1 year.

Chapter Three

6. Responsibilities

6.1 The Directors/Heads of Departments Shall:

6.1.1 Ensure all concerned departments adhere to this guideline.

6.2 The Orthopedic Consultant/ Head of Orthopedic Teams Shall:

6.2.1 Emphasize to all doctors and residents the importance of adhering to this guidelines.

6.2.2 Arrange for auditing using ERAS Guidelines Auditing Tool and ensure the action is taken promptly based on the auditing findings report from auditors.

6.3 The Anesthetist Consultant/ Doctors shall:

6.3.1 Emphasize to all doctors the importance of adhering to this guideline.

6.3.2 Ensure clear collaboration and communication with multidisciplinary teams.

6.4 The Director of Nursing Affairs (DNA) shall:

6.4.1 Emphasize to all Head of Sections and Unit supervisors the importance of adhering to this guidelines.

6.4.2 Ensure the auditing is done in (OT, Daycare ward, In-patients ward, OPDs) frequently and feedback is given to all concerned departments for action plan.

6.5 Nursing Head of Sections / Nursing Unit Supervisors / Nursing Shift Supervisors/Ward In charges Shall:

6.5.1 Ensure all nurses adhere to this guideline.

6.5.2 Ensure the auditing is done and report is submitted to DNA.

6.6 All Nurses Shall:

6.6.1 Adhere to this guideline.

6.6.2 Ensure all patients have received a thorough explanation regarding the educational leaflet

6.7 The Medical Rehabilitation Services Department Shall:

6.7.1 Adhere to this guidelines.

6.7.2 Participate in interdisciplinary assessments and discharge planning for patient undergoing scoliosis surgery.

6.7.3 Provide patient/relative teaching/training on exercise therapy which needs to be performed after surgery.

6.7.4 Instruct the patient about the follow up appointment with Medical Rehabilitation Services Department including its location.

6.8 The Nutrition Therapists Shall:

6.8.1 Adhere to this guideline and ensure that all diet related requests are addressed and fulfilled in a timely manner.

6.8.2 Educate and counsel the patient on appropriate diet and dietary modification before and after surgery, tailored to the patient's medical condition and as requested by surgeon.

6.8.3 Conduct a comprehensive nutrition assessment prior to surgery, including screening for malnutrition, BMI, recent weight changes, and dietary history.

6.8.4 Develop an individual dietary care plan in collaborate with the multidiscipline teams (surgeons, anesthesiologists, nurses, physiotherapist etc.).

6.8.5 Ensure preoperative dietary optimization, including adequate protein, energy, and micronutrient intake to support healing and recovery.

6.8.6 Monitor postoperative oral intake and tolerance, and recommend oral nutrition supplements or specialized feeding methods (e.g. enteral nutrition) if required.

6.8.7 Educate the patient and caregivers on the importance of hydration, protein-rich foods, and balanced meals to promote wound healing and reduce complications.

6.8.8 Document all dietary assessments, plans, and patient education provided, ensuring clear communication with the healthcare team.

6.8.9 Participate in follow-up care to assess recovery progress, dietary adherence, and provide ongoing support to prevent long-term complications such as undernutrition or deficiencies.

6.9 Pharmacists Shall:

6.9.1 Ensure all the required medications have been prescribed, reviewed and provided on time.

6.9.2 Ensure all the staff adhere to this guideline.

6.9.3 Ensure high compliance score and take necessary action plan for low auditing score report.

6.9.4 Ensure the proper documentation of medication allergy, type and severity

Chapter Four

7.Document History and Version Control

Version	Description	Name of authors		Review Date
1	Initial Release	Dr. Sultan Al Kalbani	Ms. Saida Al Harthi	2029
2	Version two			

8.Related Documents

8.1 Infection Prevention & Control Guideline.

8.2 National Antimicrobial Guidelines.

8.3 National Policy and Procedure for Pain Management.

8.4 Preoperative Fasting Guidelines for Surgical and Non-surgical Procedures

9. References

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10. Annexes

10.1 Appendix (1)Annexes: ASA Physical Status Classification

(Annex 1)	ASA Physical Status Classification	
ASA Class	**Definition**	**Examples**
ASA I	A normal healthy patient	No smoking, no medications, no medical conditions
ASA II	A patient with mild systemic disease	Well-controlled hypertension, mild asthma, smoker, obesity (BMI 30–40)
ASA III	A patient with severe systemic disease but, not life-threatening	Poorly controlled diabetes, morbid obesity (BMI > 40), stable angina
ASA IV	A patient with severe systemic disease that is a constant threat to life	Recent heart attack, advanced kidney/liver failure
ASA V	A moribund patient not expected to survive without the operation	Ruptured aneurysm, massive trauma, brain bleed etc.
ASA VI	for organ donation	Organ donor

An "**E**" (emergency) is added to any class if the surgery is emergent (e.g., ASA II **E**).

Why ASA Matters in ERAS & Scoliosis Surgery:

- It Helps anesthesiologists to stratify risk and prepare perioperative plans.
- Used in preoperative clearance and risk discussions.
- It guides postoperative monitoring needs, such as ICU admission.

10.2 Appendix (2): STOP-BANG Questionnaire to Identify Patients at Risk of Obstructive Sleep Apnea (OSA)

Lette	STOP-BANG Questionnaire to Identify Patients at Risk of Obstructive Sleep Apnea (OSA)	Yes	No
S = Snoring	Do you snore loudly (louder than talking or heard through doors)?		
T =Tired	Do you often feel tired, fatigued, or sleepy during daytime?		
O =Observed	Has anyone observed you stop breathing during your sleep?		
P = Pressure	Do you have or are you being treated for high BP?		
B = BMI	Is your body mass index (BMI) over 35 kg/m²?		
A = Age	Are you older than 50 years?		
N = Neck	Is your neck circumference > 40 cm (15.7 inches)?		
G = Gender	Are you male?		
Total Score			
Grand Total Score			

Scoring and Interpretation Each "Yes" = 1-Point, Total Score = 0 to 8.

0–2 points: Low risk of OSA

3–4 points: Intermediate risk

5–8 points: High risk

or ≥ 3 STOP questions + male or BMI > 35 or neck > 40 cm

Crucial in Scoliosis Surgery (ERAS) as Patients with moderate to high risk need:

1-Pre-op sleep studies

2-Anesthesia precautions: Post-op monitoring (e.g., avoid over sedation, oxygen support)

10.3 Appendix (3): Malnutrition Universal Screening Tool (MUST) 3 Steps Screening to Identify Malnutrition Risk

Component	Score	Interpretation
BMI	20 = 0	0 = Low risk
	18.5 = 2	
Weight loss in past 3 to 6 months	< 5 % = 0 5 –10 % = 1 10 % = 2	1 = Medium risk ≥ 2 = High risk
Not able to take food > 5days	2	

10.4 Appendix (4):Nutritional Risk Screening (NRS-2002) Scoring Table

Component	Score 0	**Score 1**	**Score 2**	**Score 3**
Nutritional Status (BMI, weight loss, intake)	Normal	Weight loss >5% in 3 months Food intake 50 –75% of normal	Weight loss >5% in 2 months or BMI is 18.5–20.5 or food intake 25 to 60 % of normal	Weight loss >5% in 1 month or BMI <18.5 or intake is 0 to 25% of normal
Severity of Disease (Stress metabolism impact)	Normal (no stress)	Mild (e.g. hip fracture, chronic diseases)	Moderate (e.g. major abdominal surgery, stroke, pneumonia)	Severe (e.g. ICU, head injury, bone marrow transplant)
Age ≥ 70 years Add 1 **Final Score: Total of all above (0–7).** **Nutritional risk is present if the score is ≥ 3.**				

10.5 Appendix (5): ERAS Principle for Clinical Status Classification

(Frailty Index (FI) Scoring Table of 40 Variables)

SNO	Variable	Score (0/1)	SNO	Variable	Score (0/1)
1	Difficulty walking		21	Unintended weight loss (>5% in 6 mo)	
2	Difficulty climbing stairs		22	Low appetite	
3	Needs assistance with bathing		23	Chronic fatigue	
4	Needs assistance with dressing		24	BMI < 18.5 or > 30	
5	Needs assistance with toileting		25	Polypharmacy (≥5 meds)	
6	Needs assistance with feeding		26	Hypertension	
7	Falls in last 6 months		27	Diabetes mellitus	
8	Fear of falling		28	Heart disease (CHF, IHD)	
9	Poor balance		29	Chronic lung disease (COPD)	
10	Low grip strength		30	Stroke or TIA history	
11	Hearing impairment		31	Kidney disease (CKD)	
12	Vision impairment		32	Osteoarthritis or joint pain	
13	Incontinence (urine or stool)		33	Cancer (past or active)	
14	Memory problems		34	Anemia	
15	Confusion or delirium episodes		35	Vitamin D deficiency	
16	Diagnosed dementia		36	Difficulty managing money	
17	Depression		37	Difficulty cooking or shopping	
18	Anxiety		38	Difficulty using transport	
19	Social isolation or loneliness		39	Difficulty managing medications	
20	Poor sleep quality		40	Hospital admission in past year	
(1 point of deficit = 1abnormal) (1point normal = 0) Final Frailty Index (FI) = Total Points / 40					
Calculate (FI) = Number of deficits divided into / 40 {E.g. 10/40 = 0.25}					

Frailty Index Interpretation

{FI < 0.10 → Robust = Healthy/Low risk} {FI 0.10 – 0.20 → Pre-frail= Mild vulnerability, monitor}

{FI 0.21 – 0.44 → Frail= Moderate to high surgical risk} {FI ≥ 0.45 → Severely frail= Very high risk, needs full optimization}

10.6 Appendix (6): Indication for ICU Admission Post Operatively

Factors	Conditions for I CU Bed Need
High ASA Score ≥ III or IV	Severe comorbidities (e.g., heart failure, uncontrolled diabetes).
Extensive Surgery	Long fusion levels (e.g. > 8 vertebrae) Combined anterior + posterior approaches Severe deformities or kyphoscoliosis correction
Intraoperative Complications	Major blood loss, Cardiopulmonary instability, Neurological injury or monitoring alerts.
Pre-existing Conditions	Respiratory compromise (e.g., restrictive lung disease), Sleep apnea (especially if untreated) and Cardiac disease or history of ICU need.
Very Young or Elderly Patients	Especially in infants or older adults with frailty.
Poor Baseline Functional Status or Frailty	Identified via Frailty Index or poor mobility pre-op.
Inability to Extubate Safely Post-op	Prolonged intubation needs monitoring and ventilation.

ERAS Goal is to Minimize ICU/HDU Stay While Ensuring Patient Safety:

- Avoid ICU if not necessary
- Early mobilization and transfer to general ward (within 24–48 hours)
- Reduce hospital stay and complications

10.7 Appendix (7): ERAS Guideline for Prevention of PONV in Scoliosis Surgery

Medication	Dose + Route	Timing	Frequency	Notes
Ondansetron	4 mg IV	At induction or end of surgery	Single dose	5-HT3 receptor antagonist
Dexamethasone	4-8 mg IV	After induction	Single dose	Also helps reduce inflammation
Metoclopramide	10 mg IV	At end of surgery	Single dose or every 6-8 hours	Dopamine antagonist

10.8 Appendix (8): ERAS Guideline for Prevention of PONV in Scoliosis Surgery for Adult with Pediatric Doses

Phase	Medication / Intervention	Adult Dose & Frequency	Pediatric Dose & Frequency	ERAS Rationale
Pre-operative (1–2 hours before surgery)	Paracetamol	1 g PO	15 mg/kg PO (max 1 g)	Baseline analgesia, opioid-sparing
	Parecoxib	20–40 mg IM/IV every 6 hours (first dose after surgery)	Not routinely used in <18 years (limited evidence)	Anti-inflammatory, reduces central sensitization
	Gabapentin / Pregabalin	Gabapentin 300–600 mg PO or Pregabalin 75–150 mg PO once	Gabapentin 10–15 mg/kg PO once (max 600 mg)	Neuropathic pain modulation
	Regional Analgesia Planning	Mark ESP block site	Same as adult (weight-adjust LA)	Supports early mobilization and less opioid
Intra-operative	Paracetamol IV	1 g over 15 min	15 mg/kg IV (max 1 g)	Continues baseline analgesia
	Parecoxib	20–40 mg IM/IV every 6 hours (first dose after surgery)	Not recommended routinely	Opioid-sparing
	Low-dose Ketamine Infusion	Bolus 0.25–0.5 mg/kg, then 0.1–0.2 mg/kg/hr	Bolus 0.25–0.5 mg/kg, then 0.1–0.2 mg/kg/hr	Reduces post-op opioid need
	IV Lidocaine (optional)	Bolus 1.5 mg/kg, then 1–2 mg/kg/hr	Same dosing as adult (weight-adjusted)	Decreases pain & ileus
	Regional Block (ESP / wound infiltration)	Ropivacaine 0.2–0.375%, 20–30 mL per side	0.5–1 mg/kg per injection site (max safe dose)	Prolonged local analgesia

Post-operative (48–72 hrs)	Paracetamol	1 g PO/IV q6h (max 4 g/day)	15 mg/kg PO/IV q6h (max 60 mg/kg/day)	Foundation of MMA
	Parecoxib	20–40 mg IM/IV every 6 hrs	Not routinely used in <18 years	Anti-inflammatory
	Gabapentin/ Pregablin	Gabapentin 300 mg q12h or Pregabalin 75 mg BID	Gabapentin 5–10 mg/kg q12h (max 600 mg/day)	Neuropathic pain control
	Opioid (Rescue only)	Morphine PCA: 1 mg bolus, lockout 5–10 min	Morphine PCA: 0.02–0.05 mg/kg bolus, lockout 5–10 min	Breakthrough pain only
	Epidural Infusion	Ropivacaine 0.1–0.2% ± Fentanyl 2 mcg/mL at 4–8 mL/hour	Ropivacaine 0.1% ± Fentanyl 1–2 mcg/mL at 0.1–0.3 mL/kg/hour	Continuous local pain control
	ESP Block top-up	Ropivacaine 0.2% 10–15 mL/side q12–18h	0.5–1 mg/kg per side	Regional adjunct
	Non-pharmacologic Adjuncts	Ice packs, positioning, breathing, music	Age-adjusted relaxation, distraction	ERAS holistic recovery
Discharge Phase	Paracetamol	1 g PO q6h for 5–7 days	15 mg/kg PO q6h for 5–7 days	Maintain baseline control
	Parecoxib	20–40 mg IM/IV every 6 hrs (short course only)	Not recommended routinely	Continue anti-inflammatory
	Gabapentinoid (optional)	Pregabalin 75 mg BID for up to 2 weeks	Gabapentin 5–10 mg/kg BID (max 600 mg/day)	Step-down therapy

10.9 Appendix (9):Patient Health Education – Scoliosis Surgeries (ERAS Guideline)

This leaflet explains how you can prepare for your scoliosis surgery, what will happen during your hospital stay, and how to recover well at home.

Preparation before Surgery

- Eat meals with enough protein, fruits, and vegetables to help wound healing.
- Stay active walk or do gentle exercises as advised.
- Stop smoking and alcohol at least 4-6 weeks before surgery.
- You will be instructed to stop solid food 6–8 hours before surgery
- You will be instructed to have clear fluids up to 2 hours before surgery.
- Shower with antiseptic soap the night before and the morning of surgery.
- Discuss medicines with your doctor some may need to be stopped.

- ❖ Practice breathing and movement exercises to help after surgery.

Day of Surgery

- ❖ Arrive at the hospital at the time given.
- ❖ Wear clean, loose, comfortable clothing.
- ❖ You will have anesthesia and pain control planned to reduce side effects.
- ❖ The surgical team will monitor your spinal nerves for safety.
- ❖ Your family will receive updates during your operation.

In the Hospital after Surgery

- ❖ The pain will be controlled by mouth medicine, IV, or a patient-controlled pump.
- ❖ You will be helped to sit up and walk as soon as possible after surgery
- ❖ You can drink fluids as tolerated after surgery and eat soft foods within 6-4 hours.
- ❖ You will be instructed to do deep breaths and use a breathing incentive spirometer
- ❖ You have to move your feet and legs regularly and you wear special stockings.
- ❖ Keep the incision clean and dry, report redness, swelling, or fever.
- ❖ Report and difficult in urination

At Home Discharge Care

- ❖ Follow all instructions for wound care and medicines.
- ❖ Walk daily – short, frequent walks are better than lying in bed.
- ❖ Keep follow-up appointments with your surgeon for wound checks and X-rays.
- ❖ Do not miss physiotherapy follow ups as schedule for better outcome
- ❖ Visit hospital if you have high fever, severe pain not relieved by medicine, numbness or weakness, trouble breathing, or signs of infection at the wound.
- ❖ Avoid heavy lifting (more than 2–3 kg) until cleared by your surgeon.
- ❖ Avoid twisting and bending your back suddenly.
- ❖ A high-impact activities (running, jumping, sports) until fully recovered.
- ❖ Avoid prolonged sitting or lying down without movement change position every 30–60 minutes.

Nutrition after Scoliosis Surgery

- ❖ Make sure to drink enough water daily (8–10 cups) to prevent dehydration and constipation.
- ❖ Focus on protein-rich foods such as chicken, fish, eggs, legumes, and low-fat dairy products to support wound healing and muscle recovery.
- ❖ Eat fruits and vegetables every day to provide your body with essential vitamins and minerals (especially Vitamin C and zinc) that promote faster healing.
- ❖ Choose whole grains (such as oats, brown rice, and whole wheat bread) to help regulate bowel movements.
- ❖ If you experience loss of appetite, eat small and frequent meals, and consider adding protein-rich soups or nutritional supplements as recommended by your dietitian.
- ❖ Limit fatty, fried foods and carbonated drinks, as they may cause constipation or slow down recovery.
- ❖ Follow your doctor's or dietitian's advice regarding supplements (such as Vitamin D, iron, or protein powders) if prescribed.

التثقيف الصحي للمريض – جراحة الجنف) إرشادات التعافي المعزز بعد الجراحة

توضح هذه النشرة كيفية الاستعداد لجراحة الجنف، وما الذي سيحدث أثناء إقامتك في المستشفى، وكيفية التعافي بشكل جيد في المنزل.

التحضير قبل الجراحة

- تناول وجبات تحتوي على كمية كافية من البروتين والفواكه والخضروات للمساعدة على التئام الجروح.
- حافظ على نشاطك بالمشي أو ممارسة التمارين الخفيفة كما يُنصح.
- التوقف عن التدخين والكحول قبل الجراحة بـ 4–6 أسابيع على الأقل.
- سيطلب منك التوقف عن تناول الطعام الصلب قبل الجراحة بـ 6–8 ساعات.
- يمكنك تناول السوائل الشفافة حتى ساعتين قبل الجراحة حسب التعليمات.
- الاستحمام بصابون مطهر في الليلة السابقة وفي صباح يوم الجراحة.
- مناقشة الأدوية التي تتناولها مع الطبيب، فقد تحتاج لإيقاف بعضها.
- التدرب على تمارين التنفس والحركة للمساعدة بعد الجراحة.

يوم الجراحة

- الحضور إلى المستشفى في الوقت المحدد لك.
- ارتداء ملابس نظيفة وفضفاضة ومريحة.
- سيتم إعطاؤك التخدير وخطة للتحكم بالألم لتقليل الآثار الجانبية.
- سيقوم فريق الجراحة بمراقبة أعصاب العمود الفقري لضمان سلامتك.
- سيتم إبلاغ عائلتك بتطورات العملية أثناء إجرائها.

في المستشفى بعد الجراحة

- سيتم التحكم بالألم عن طريق الأدوية بالفم أو عبر الوريد أو باستخدام مضخة يتحكم بها المريض.
- ستتم مساعدتك على الجلوس والمشي في أسرع وقت ممكن بعد الجراحة.
- يمكنك عادة شرب السوائل بعد الجراحة مباشرة، وتناول الأطعمة اللينة خلال 4-6 ساعات.
- سيطلب منك القيا بتمارين التنفس العميق واستخدام جهاز تحفيز التنفس.
- يجب تحريك قدميك وساقيك بانتظام، وارتداء الجوارب الطبية الخاصة.
- حافظ على نظافة وجفاف مكان الجرح، وأبلغ عن أي احمرار أو تورم أو حرارة.

العناية بعد الخروج من المستشفى (في المنزل)

- اتبع جميع التعليمات الخاصة بالعناية بالجرح والأدوية.
- امشِ يوميًا – المشي القصير والمتكرر أفضل من البقاء علي السرير لفترات طويلة.
- الالتزام بالمواعيد المحددة لمراجعة الجرح والأشعة والعلاج الطبيعي
- راجع المستشفى فورًا إذا كان لديك: حرارة مرتفعة، ألم شديد لا يخف بالأدوية، تنميل أو ضعف، صعوبة في التنفس، أو علامات التهاب في الجرح.
- تجنب حمل الأشياء الثقيلة (أكثر من 2–3 كجم) حتى يسمح لك الطبيب.
- تجنب التواء أو انحناء ظهرك فجأة.
- تجنب الأنشطة عالية التأثير (مثل الجري، القفز، الرياضات) حتى التعافي التام.
- تجنب الجلوس أو الاستلقاء لفترة طويلة دون حركة – غيّر وضعك كل 30–60 دقيقة.