Enhanced Recovery After Surgery (ERAS)

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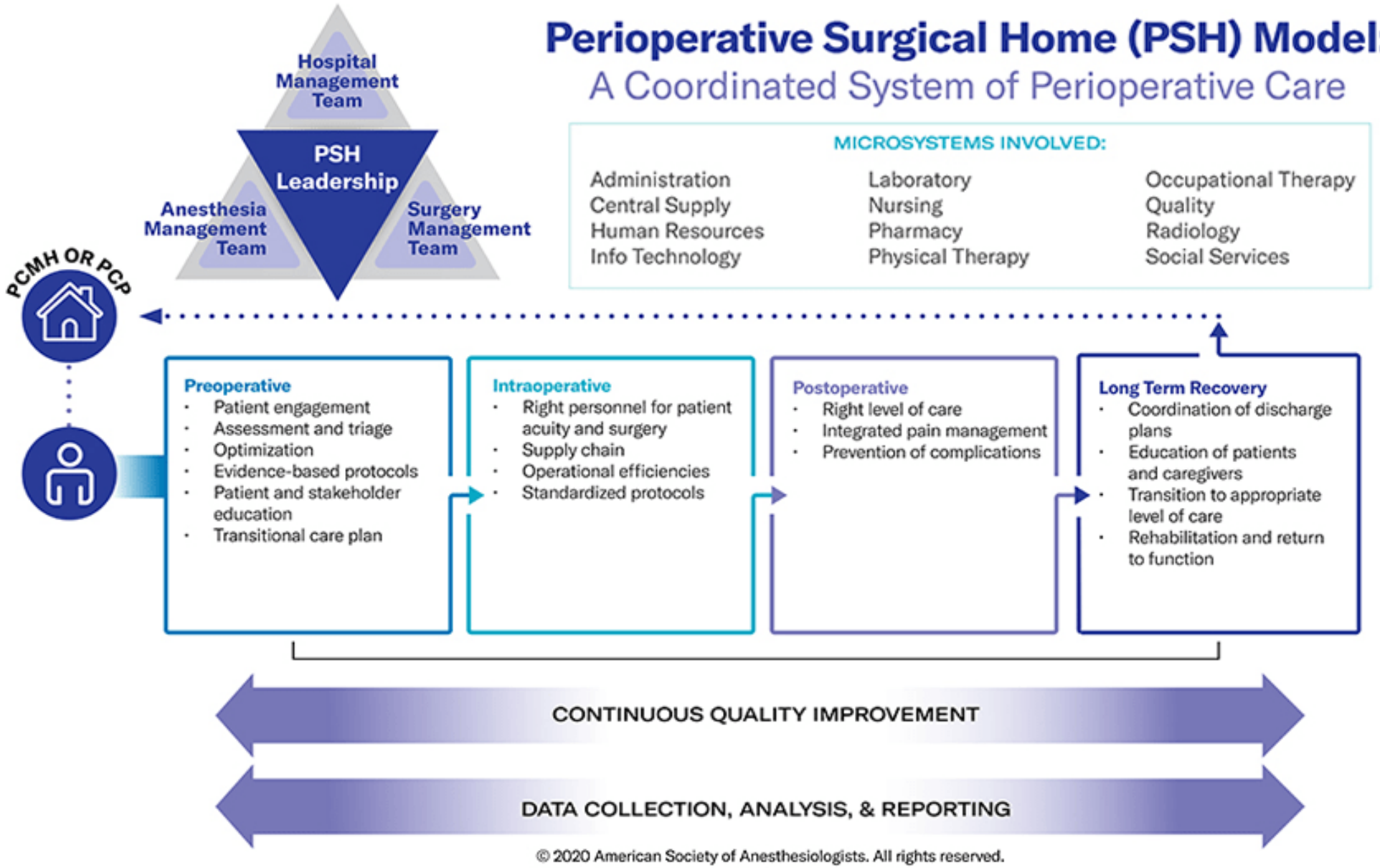
Introduction

- ERAS programs have gained acceptance as a multifactorial, evidence-driven multidisciplinary way of managing patients undergoing surgery.
- Other names include Enhanced Recovery Pathways (ERPs), Fast-track Surgery or Optimized Perioperative Care (OPC).
- Adherence to ERP pathways is associated with better postoperative outcomes, accelerated convalescence, lower costs and less re-admission rates.

- Professor Henrik Kehlet pioneered ERPs in the late 1990s with the aim of reducing the decline in function that occurs during the perioperative period.
- ERPs were initially developed in colorectal surgery, but have since been applied to various surgeries of different specialties.
- The role of anesthesiologist is crucial for successful implementation of these pathways and in PSH.

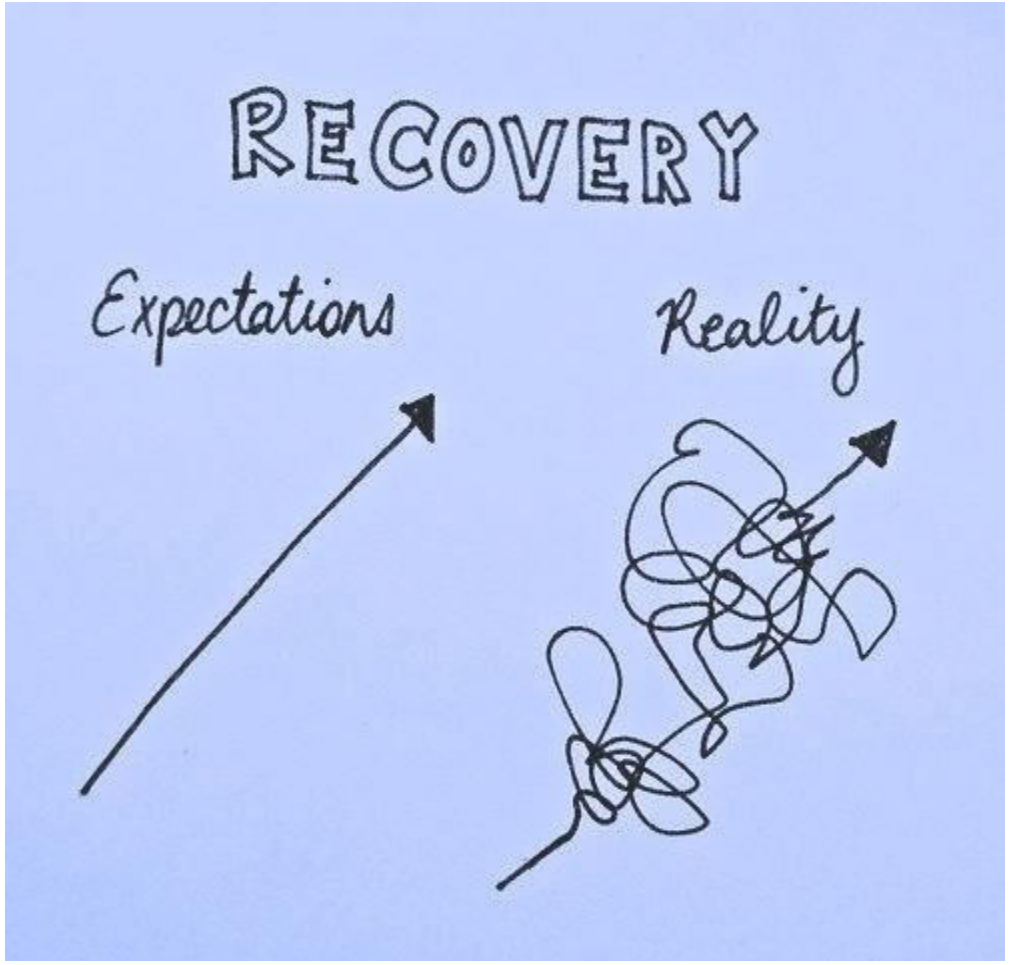
Perioperative Surgical Home (PSH) Model:

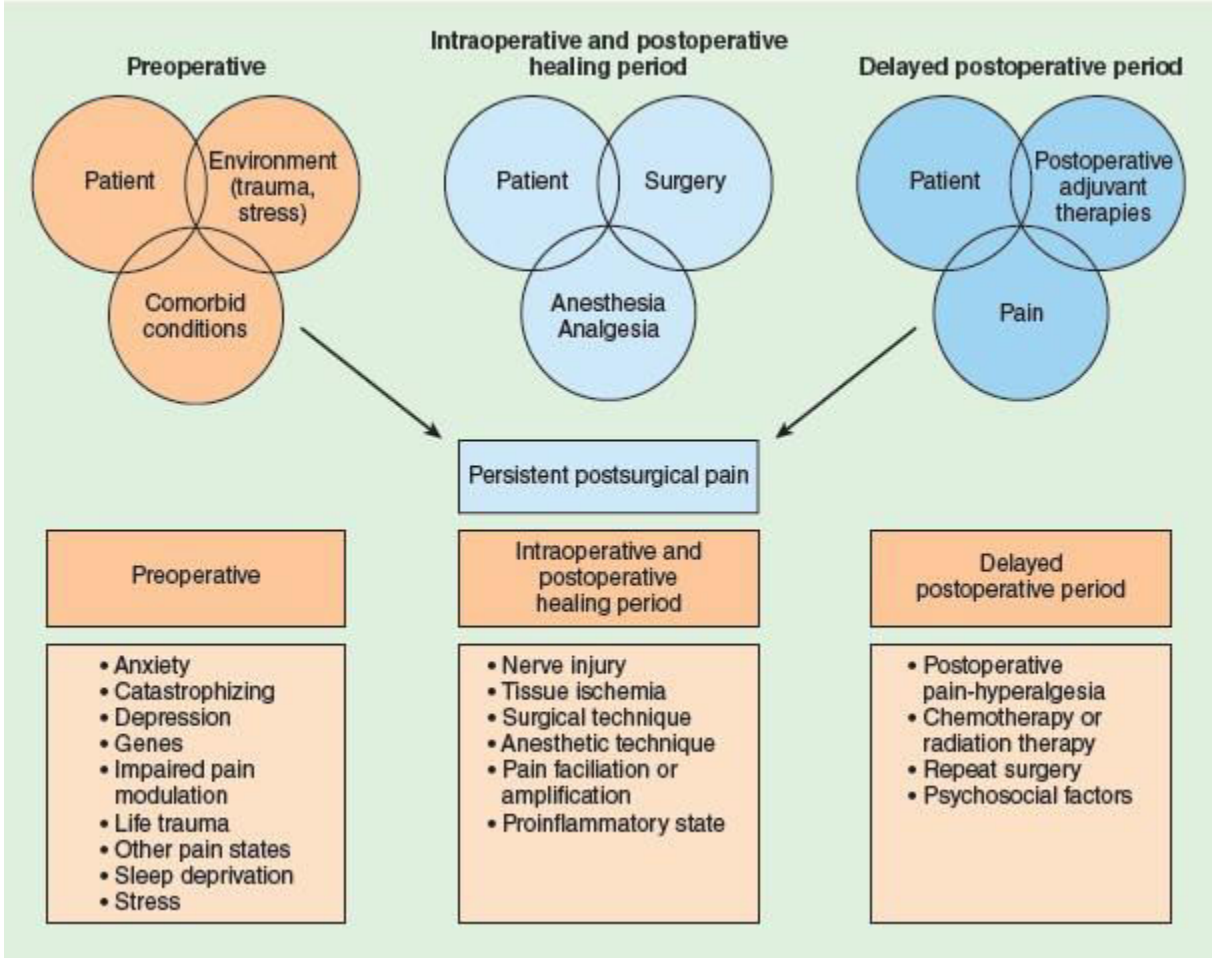
A Coordinated System of Perioperative Care



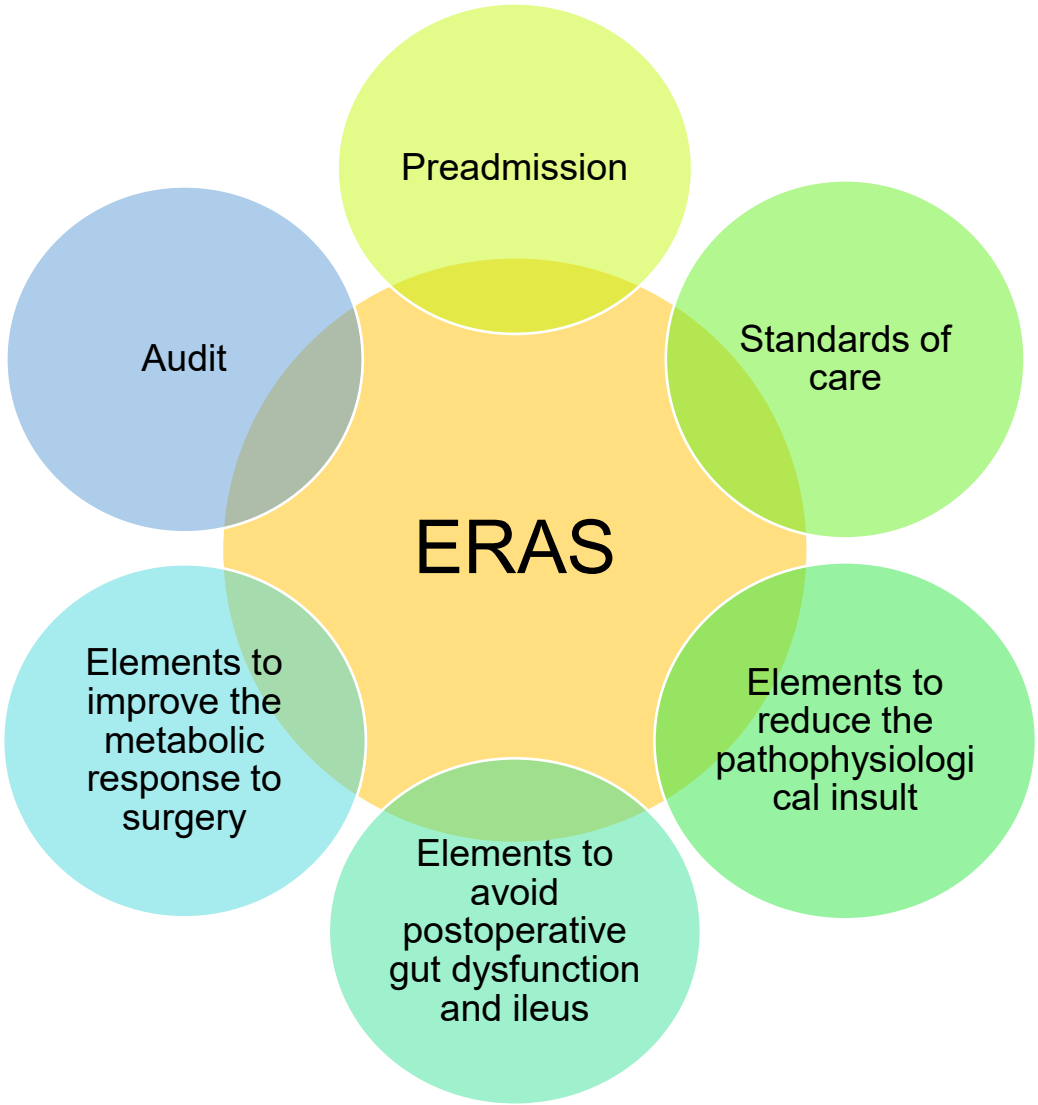
Why ERAS?

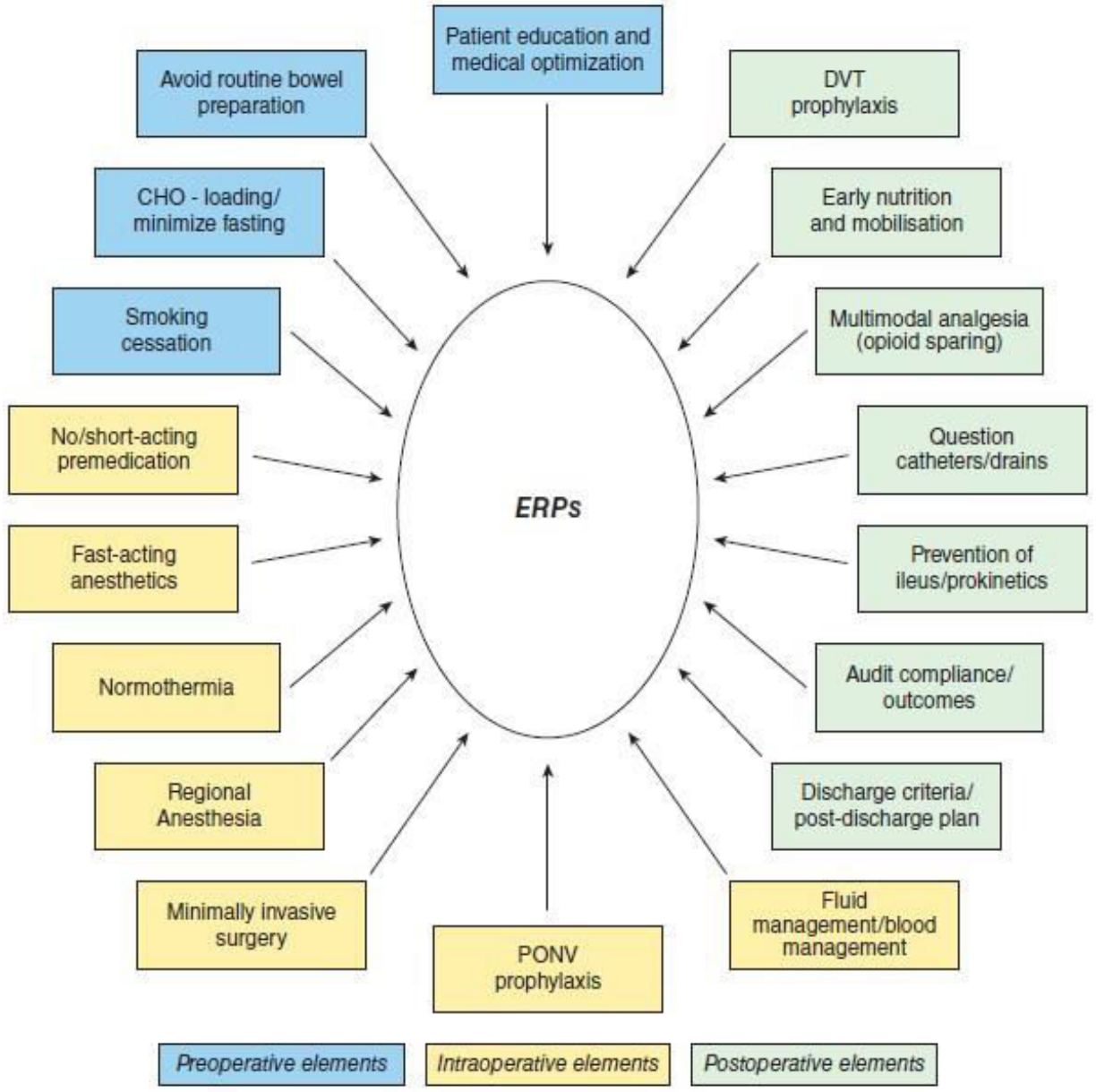
- To aid in recovery of patient and decrease post-operative fatigue





Components

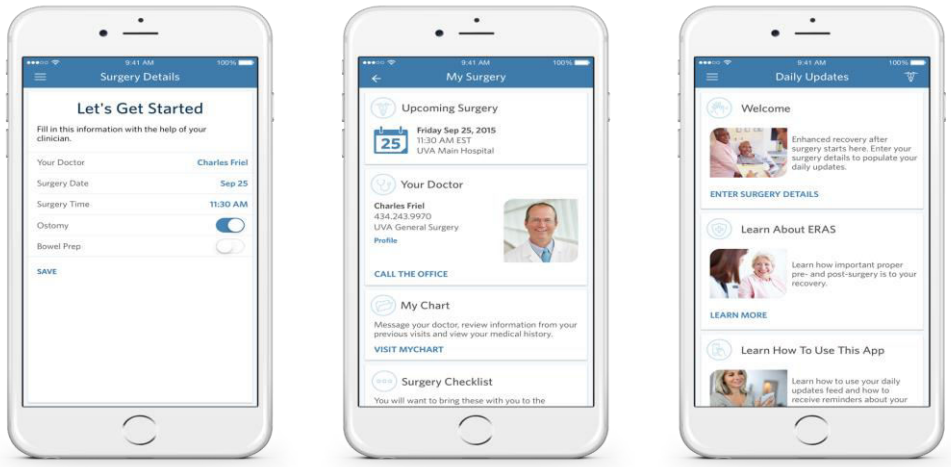

Preadmission
Audit
Standards of care
ERAS
Elements to improve the metabolic response to surgery
Elements to reduce the pathophysiological insult
Elements to avoid postoperative gut dysfunction and ileus

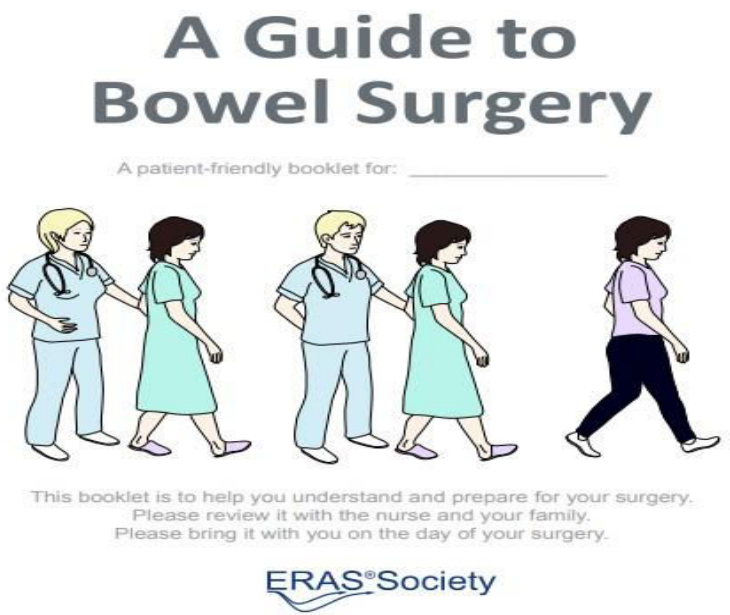

Patient education and medical optimization
Avoid routine bowel preparation
DVT prophylaxis
CHO - loading/ minimize fasting
Early nutrition and mobilisation
Smoking cessation
Multimodal analgesia (opioid sparing)
No/short-acting premedication
Question catheters/drains
ERPs
Fast-acting anesthetics
Prevention of ileus/prokinetics
Normothermia
Audit compliance/ outcomes
Regional Anesthesia
Discharge criteria/ post-discharge plan
Minimally invasive surgery
PONV prophylaxis
Fluid management/blood management
Preoperative elements
Intraoperative elements
Postoperative elements

Pre-operative Period

1. <u>Patient Education:</u>

   - Pre-operative teaching must use plain language and include well-designed print and video materials in the patient's native language.
   - Use of smartphone apps and text-messaging can help in coordinating patient's peri-operative care.

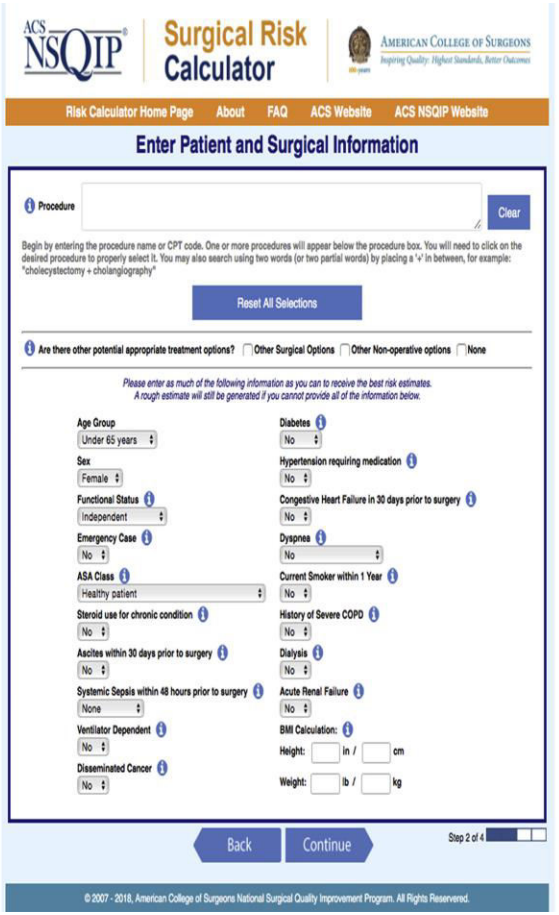




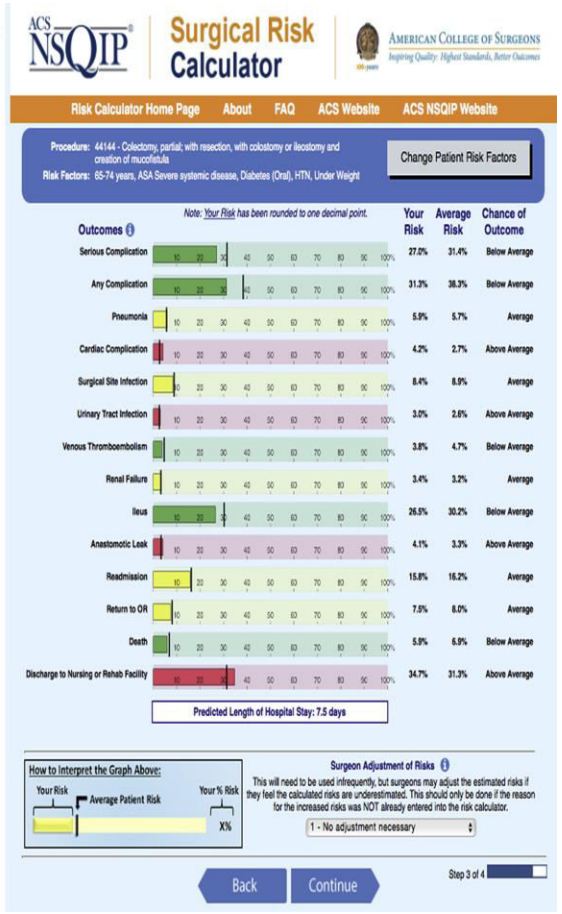
2. Pre-operative Evaluation & Risk Assessment :

- Preoperative evaluation is a complex process and various guidelines are available for assessment and optimization.

A

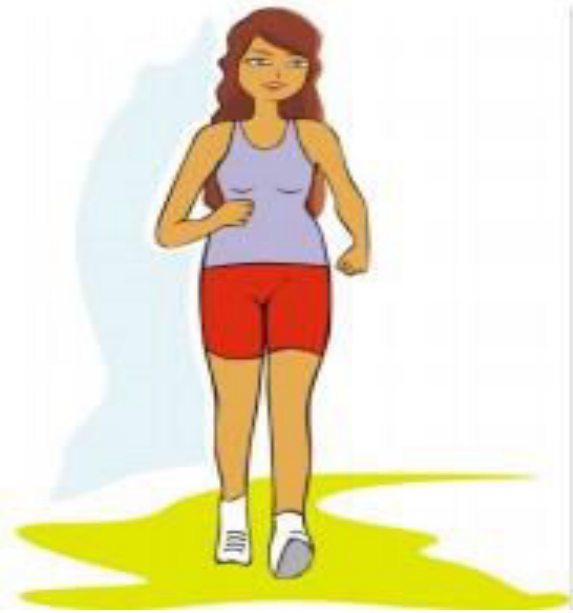


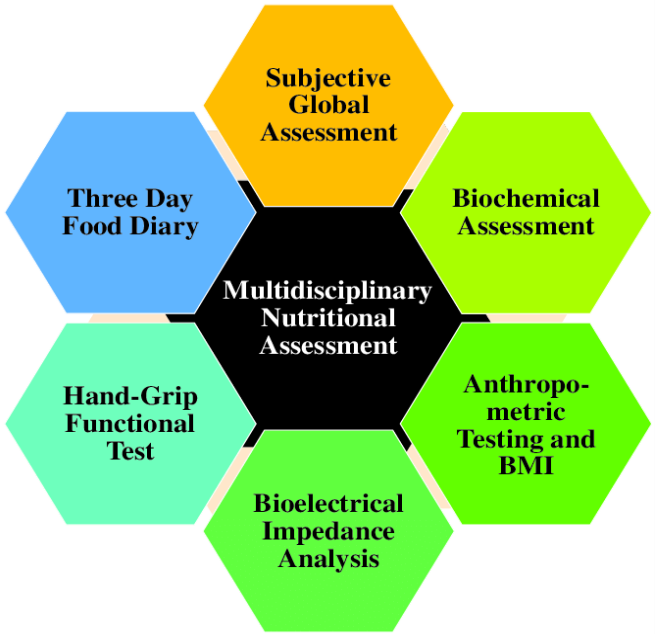
B



3. Optimization of Functional Status:

- Pre-habilitation to improve physical fitness before surgery is an emerging concept that is safe and may be protective.
- Life-style modifications that may significantly impact the patient's short-term and long-term health and quality of life are encouraged.





4. Guidelines for Food & Fluid Intake:

- Preoperative fasting and surgical stress induce insulin resistance.
- Also mechanical bowel preparation (MBP) causes dehydration in patients who are already fasting.
- Research suggests that avoiding preoperative fasting and ensuring adequate hydration may moderate postoperative insulin resistance.
- International fasting guidelines allow clear fluids up to 2 h prior to induction of anesthesia in patients at low risk for pulmonary aspiration.

- Preoperative administration of CHO drinks is safe and reduces insulin resistance, hunger, fatigue, and PONV.
- MRI studies indicate that the residual gastric volume 2hrs after 400ml of CHO drink was similar to that after overnight fast i.e 21ml.

Intraoperative Period

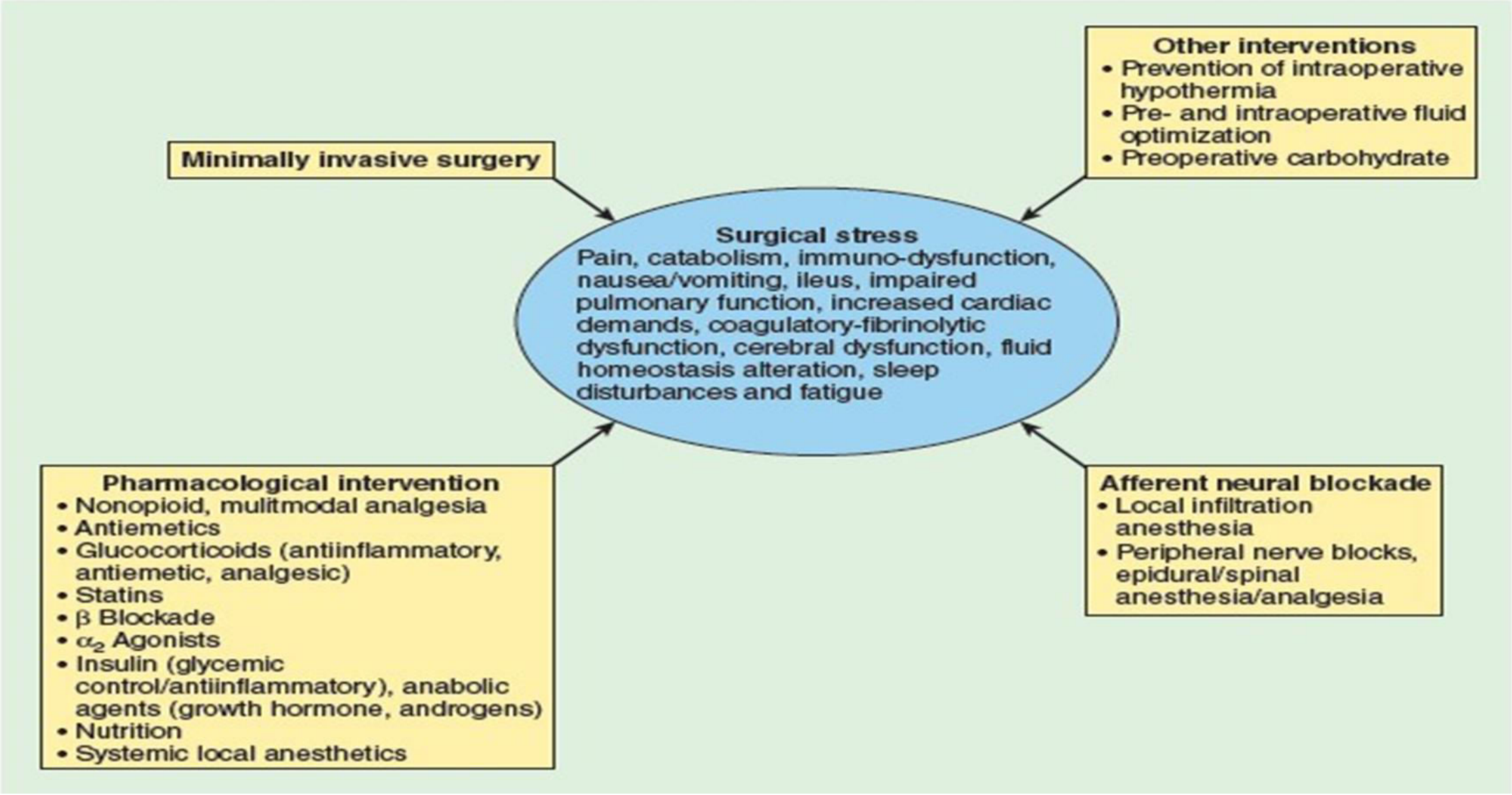
1. <u>Antibiotic Prophylaxis:</u>

   - Appropriate selection and timing reduces the risk of surgical site infections.
   - Administered within 1hr before skin incision and repeated if necessary.
   - Data shows that administration of oral antibiotics 24 h prior to colorectal surgery in patients receiving MBP reduces risk of SSI's.

2. Anti-thrombotic Prophylaxis:

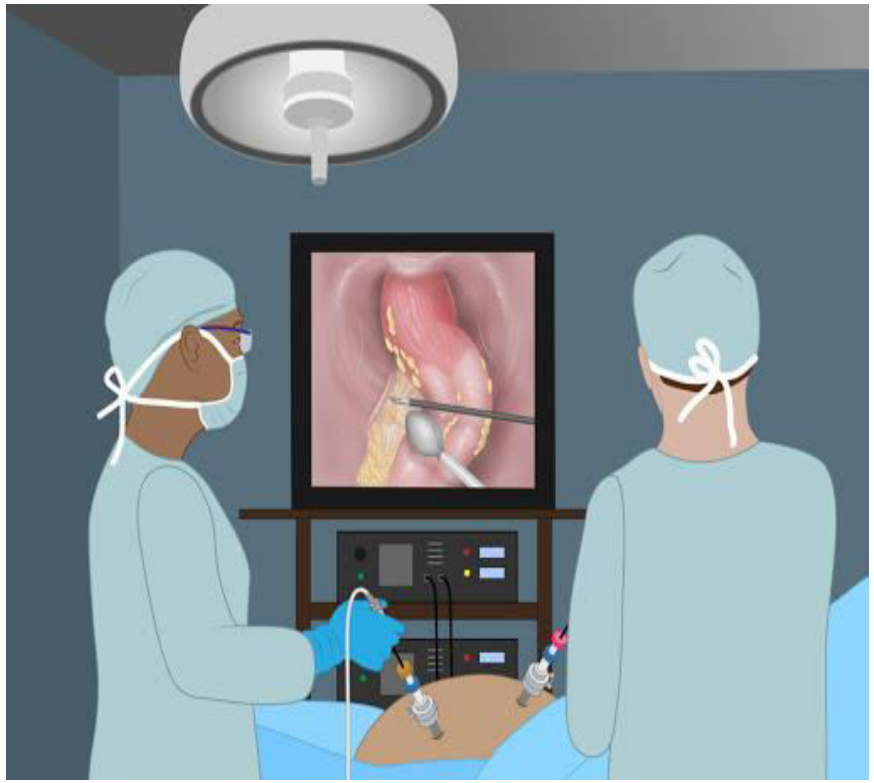
- It reduces perioperative venous thromboembolism risk and related morbidity and mortality.
- Pneumatic compression devices and anticoagulant medications are now commonly used.
- Timing of starting these agents is important, particularly during neuraxial techniques to avoid epidural hematoma.

3. Strategies to Minimize the Surgical Stress Response:



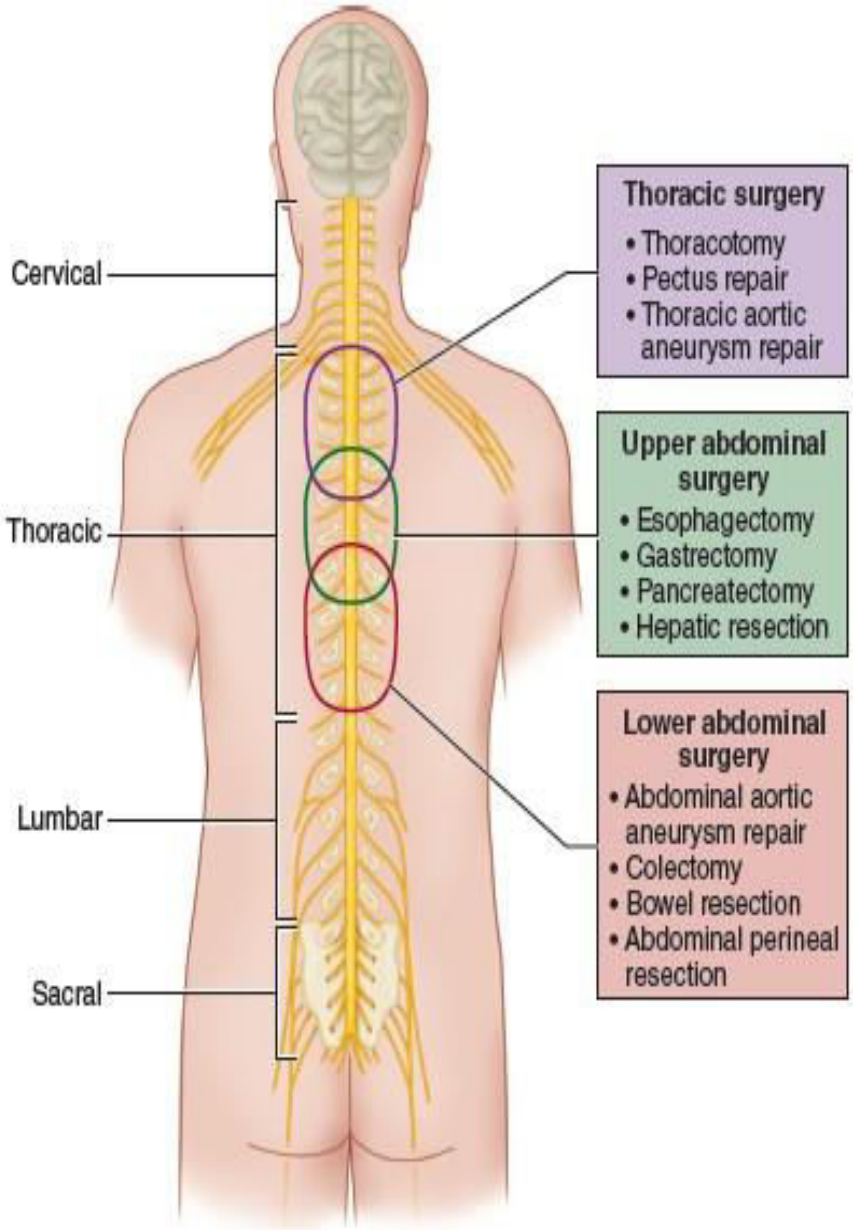
A. Minimally Invasive Surgery:

- Laparoscopic procedures are associated with a reduced incidence of surgical complications when compared with the same procedures performed in “open” fashion.



B. Regional Anesthesia/ Analgesia Techniques:

- Neuraxial blockade of nociceptive stimuli by epidural and spinal local anesthetics has been shown to blunt the stress response to surgery.
- In major open abdominal and thoracic procedures, thoracic epidural blockade with local anesthetic and low dose opioid is recommended.



- If spinal anesthesia is used for fast-track surgery, attention must be paid to delayed recovery.
- Smaller doses of L.A. with opioids can prolong post-op. analgesia and minimize motor block; alternate adjuvants like clonidine can be used.
- USG PNB's with local anesthetics are also an excellent way to minimize the need for systemic opioids .

C. Intravenous Lidocaine Infusion:

- Lidocaine (IV bolus of 1.5–2 mg/kg, f/b continuous infusion of 1.5–3 mg/kg/h or 2–3 mg/min) has analgesic, anti-hyperalgesic and anti-inflammatory properties.

D. β-Blockade Therapy:

- They are used to blunt the sympathetic response during laryngoscopy and intubation and also to attenuate the surgical stress response.

E. α_2-Agonist Therapy

4. Use of Short-Acting Anesthetic Agents:

- Propofol is induction agent of choice for most surgical procedures as well as for deep sedation.
- Desflurane and Sevoflurane may shorten anesthesia emergence, reduce PACU length of stay, and decrease recovery associated costs.
- Avoidance of deep general anesthesia by use of BIS monitoring may improve outcomes.

- Short-acting opioids are commonly used during fast-track surgery in combination with inhalation agents or propofol and with regional anesthesia/ analgesia techniques.
- Evidence shows that the use of opioids should be minimized in all phases of the perioperative course as part of a multimodal analgesia.
- Opioid-free anesthesia has been shown to reduce PONV and postoperative opioid use.

5. Maintenance of Normothermia:

- Forced air-warmers and warm IV fluids.
- Heated humidification of inspired gases.
- Increasing ambient OT temperature.

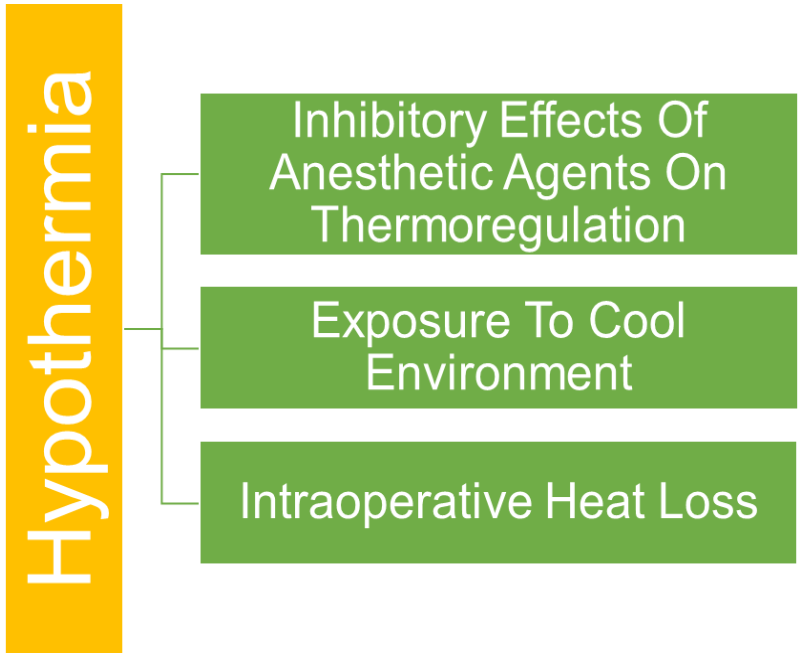


TABLE 52–1 Deleterious effects of hypothermia.

Cardiac arrhythmias and ischemia
Increased peripheral vascular resistance
"Left shift" of the hemoglobin–oxygen saturation curve
Reversible coagulopathy (platelet dysfunction)
Increased postoperative protein catabolism and stress response
Altered mental status
Impaired renal function
Delayed drug metabolism
Impaired wound healing
Increased risk of infection

6. Maintenance of Adequate Tissue Oxygenation:

- Perioperative hypoxia can increase cardiovascular and cerebral complications, so it should be avoided.
- Maintenance of adequate perioperative oxygenation has been associated with the improvement of some outcomes.
- FiO_2 of 80% intra-operatively and post-operatively was associated with increase in arterial and subcutaneous PO_2 and less complications.
- Role of regional anesthesia techniques.
- Early mobilization and avoidance of bedrest.

7. PONV prophylaxis:

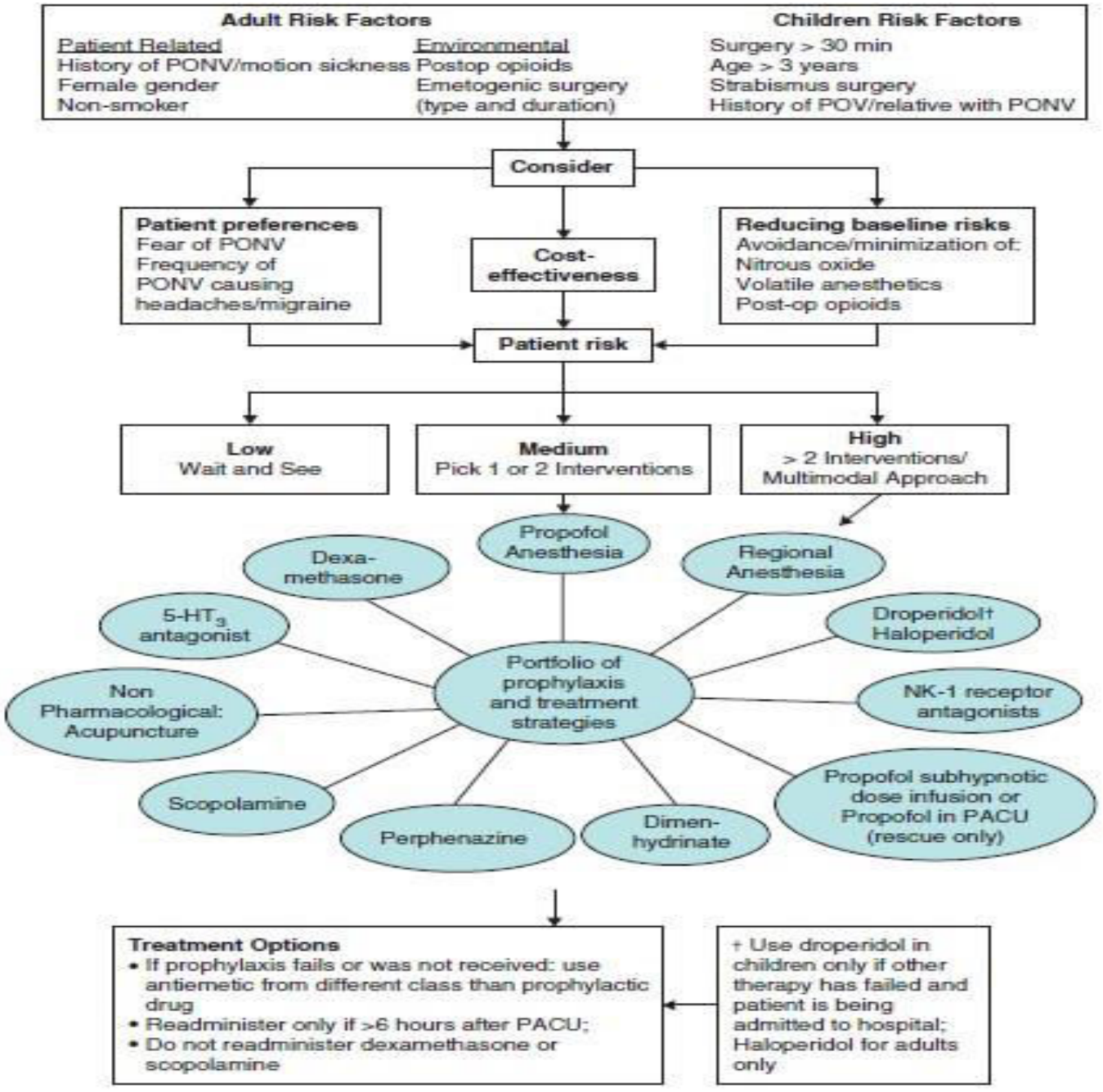
TABLE 56–1 Risk factors for postoperative nausea and vomiting.

Patient factors
- Young age
- Female gender, particularly if menstruating on day of surgery or in first trimester of pregnancy
- Large body habitus
- History of prior postoperative emesis
- History of motion sickness

Anesthetic techniques
- General anesthesia
- Drugs
  - Opioids
  - Volatile agents
  - Nitrous oxide

Surgical procedures
- Strabismus surgery
- Ear surgery
- Laparoscopy
- Orchiopexy
- Ovum retrieval
- Tonsillectomy
- Breast surgery

Postoperative factors
- Postoperative pain
- Hypotension



8. Goal-Directed Fluid Therapy (GDT):

- The concept of GDT is based on optimization of hemodynamic measures obtained by various cardiac output devices.
- It aims to avoid both hypovolemia and fluid excess, and has been shown to be the optimal approach for fluid administration in high-risk surgical patients.

Fig. 47.2 Fluid and salt overload can cause airway problems, increased lung water, congestive heart failure, renal failure, skin breakdown, and vision problems.

BOX 47.1 GOAL-DIRECTED FLUID THERAPY

- Standardizes fluid and hemodynamic management.
- Aims to avoid fluid and salt overload while avoiding hypovolemia.
- Is based on parameters beyond heart rate and blood pressure, such as:
  - Minimally invasive or invasive cardiac output
  - Stroke volume variation (SVV)
  - Pulse pressure variation (PPV)
  - Doppler corrected flow time (FTc)
  - Central venous oxygen saturation
- Many algorithms have been used successfully.
- Algorithm should have physiologic basis and be easy to use.

TABLE 48–3 Physiologically based first-line fluid replacement for goal-directed therapy.[1]

Physiological Requirement	Replace with	Amount
Extracellular		
Insensible perspiration	Crystalloids[2]	
Closed abdomen		0.5 mL/kg/h
Open abdomen		1 mL/kg/h
Urine production	Crystalloids	Measured output[4]
Intravascular		
Blood loss	Colloids[3]	Estimated losses
Further preload deficit	Colloids	According to clinical estimation[5]

BOX 47.2 SURGERIES DURING WHICH GOAL-DIRECTED FLUID THERAPY IS RECOMMENDED[28]

- Exploratory laparotomy
- Resection bowel large; colectomy
- Whipple pancreatoduodenectomy
- Hepatectomy
- Splenectomy
- Kidney transplant
- Dissection of radical neck
- Aortofemoral, popliteal, or axillary bypass
- Total open abdominal hysterectomy or bilateral salpingo-oophorectomy
- Hyperthermic intraperitoneal chemotherapy
- Laminectomy fusion with instrumentation (>3 levels)
- Arthroplasty hip, knee, or elbow
- Excision burn
- Cystoprostatectomy with ileal conduit
- Radical cystectomy

Post-operative Period

1. Strategies to Minimize Postoperative Shivering:

   - Postoperative shivering can greatly increase oxygen consumption, catecholamine release, hemodynamic instability.
   - Hence peri-operative strategies to reduce hypothermia are followed.
   - Drugs like Meperidine, Clonidine and Tramadol can also reduce shivering post-operatively.

2. PONV Treatment:

➢Pharmacological treatment of PONV should be promptly initiated once medical or surgical causes of PONV have been ruled out.

BOX 80.9 Commonly Used Antiemetics (Adult Doses)

Anticholinergics

Scopolamine (1.5 mg) transdermal patch to a hairless area behind the ear before surgery (remove 24 h postoperatively)

NK-1 receptor antagonist

Aprepitant (40 mg per os within 3 h prior to anesthesia)

Corticosteroids

Dexamethasone (4 mg IV after induction of anesthesia)

Antihistamines

Hydroxyzine (12.5-25 mg IM)
Diphenhydramine (25-50 mg IV)

Phenothiazines

Promethazine (12.5-25 mg IM)
Prochlorperazine (5-10 mg IV)

Butyrophenones

Droperidol (0.625-1.25 mg IV); monitor the ECG for prolongation of the QT interval for 2-3 h after administration; preoperative 12-lead ECG recommended
Haloperidol (0.5-<2 mg IM/IV)

Prokinetic

Metoclopramide (10-20 mg IV; avoid if any possibility of gastrointestinal obstruction)

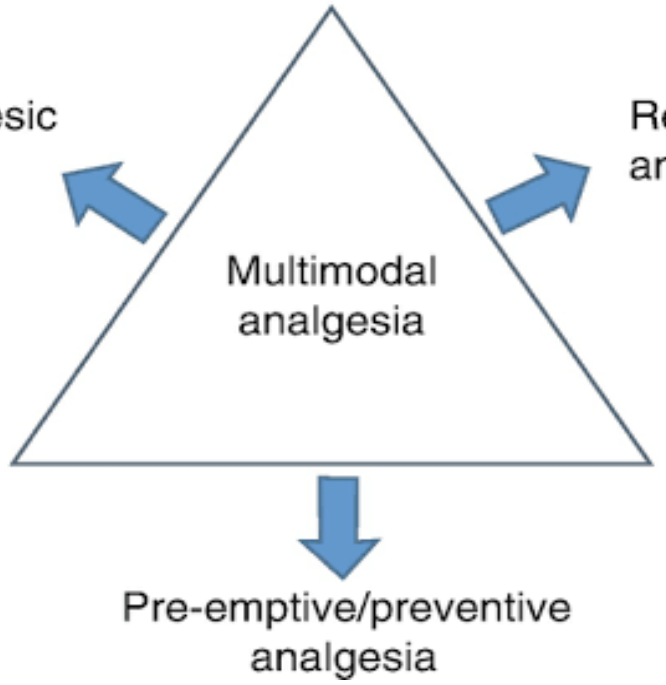
Serotonin Receptor Antagonists

Ondansetron (4 mg IV 30 min before the conclusion of surgery)

3. Multimodal Analgesia:

- Opioids
- NSAIDs and COX2 inhibitors
- Paracetamol
- Alpha2 inhibitors
- NMDA antagonists
- Gabapentinoids
- Steroids

Systemic analgesic medications



Regional anesthesia

- Neuraxial (epidural/intrathecal)
- Abdominal trunk blocks (TAP block and abdominal rectus sheat block)
- Local anesthetics (wound infiltration and CWI)

i. NSAID’s & COX-2 inhibitors:

- NSAID’s & COX-2 inhibitors diminishes post-operative pain intensity, reduces opioid requirements and decreases opioid related side effects.
- NSAID’s may increase the risk of gastrointestinal and wound bleeding, decrease kidney function and impair wound healing.

ii. Acetaminophen:

- It is a common component of MMA, pharmacologically safe and can be given along with regional anesthesia and analgesia techniques, thus reducing use of NSAID’s.

iii. Gabapentinoids:

- Oral gabapentin and pregabalin given as a single dose preoperatively decrease postoperative pain and opioid consumption in the first 24 h following surgery.

iv. NMDA antagonists:

- Ketamine and Magnesium have been associated with significant reduction in pain and opioid consumption.

v. Intravenous lidocaine

vi. Opioids:

- Despite advent of many OFA regimens, systemic opioids remains a cornerstone in the management of surgical pain.

vii. Epidural analgesia:

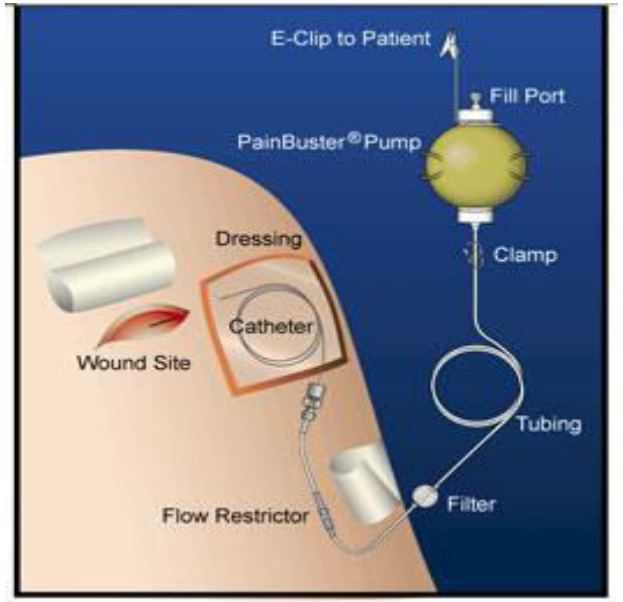
- It provides excellent analgesia as well as blunts the stress response associated with surgery, decreases postoperative morbidity, attenuates catabolism and accelerates postoperative functional recovery.
- Long acting L.A.’s with opioids are used commonly for continuous infusions.

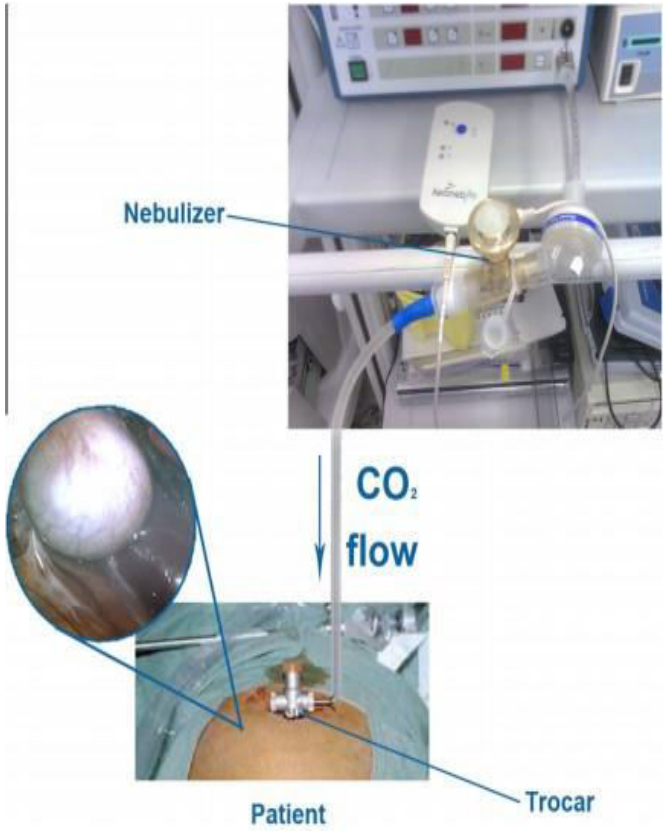
viii. <u>USG PNB's:</u>

➢They frequently utilized for fast-track ambulatory and inpatient orthopedic surgery, and can accelerate recovery from surgery and improve both analgesia and patient satisfaction.

ix. <u>High-volume local anesthetic infiltration analgesia and wound infusion</u>

x. <u>Intraperitoneal instillation and nebulization of local anesthetic</u>





4. Strategies to Facilitate Recovery on the Surgical Unit:

A. Organization of Multidisciplinary Surgical Care:

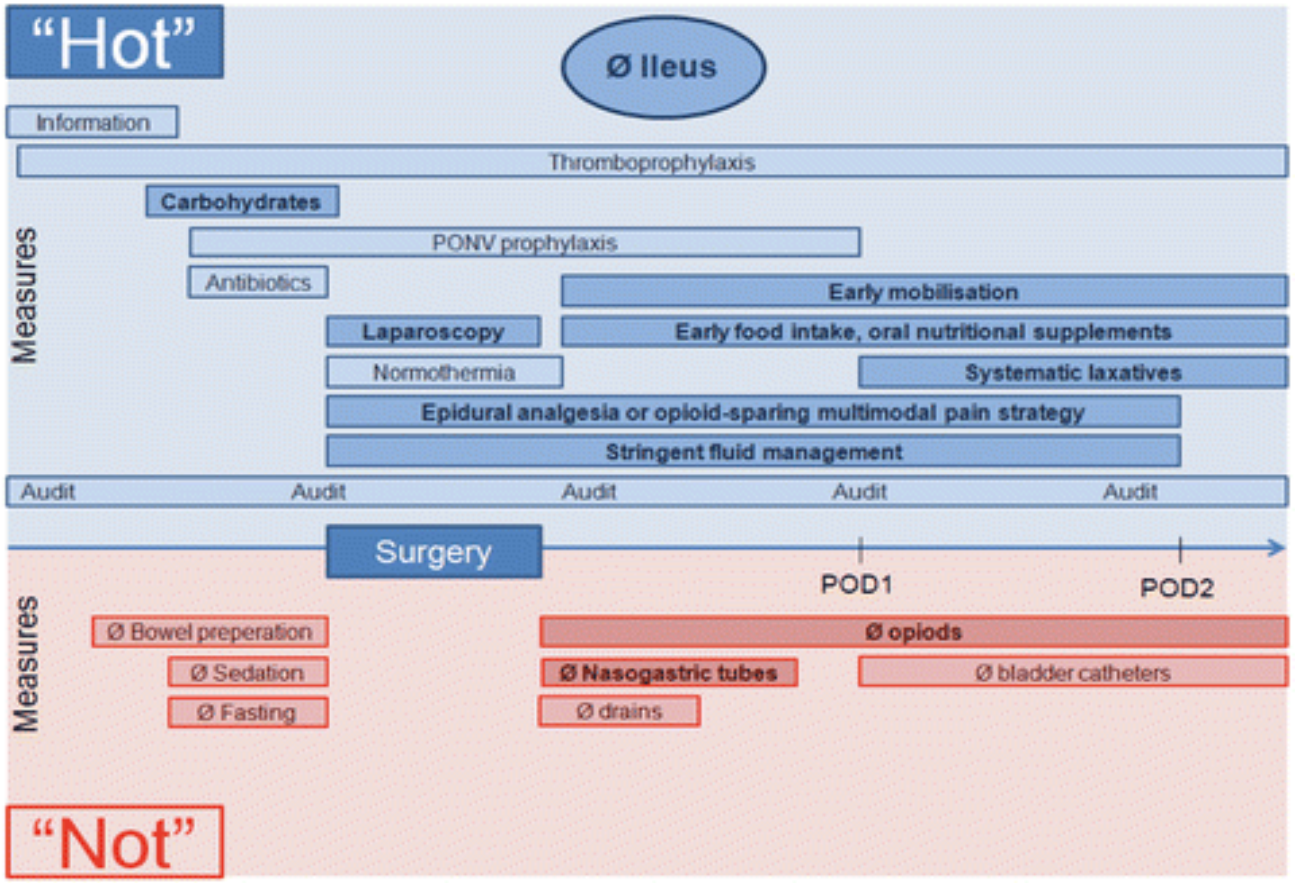
- The multidisciplinary aspect of postoperative care should bring together the specialties involved in patient care based upon standardized, procedure-specific protocols.

B. Optimization of Analgesia to Facilitate Functional Recovery

- A well-organized and well-trained Acute Pain Service (APS) utilizing procedure-specific clinical protocols is helpful to drive ERP's.
- The quality of pain relief and symptom control heavily influences post-operative recovery.
- The surgeon and the APS must identify and employ optimal analgesic techniques tailored to the specific surgical procedure.
- Opioid Free Analgesia is preferred so as to reduce opioid related side effects i.e PONV and post-op. ileus.

C. Strategies to Minimize Post-operative Ileus (POI):

- POI is one of the most common causes of prolonged postoperative hospital length of stay and preventable hospitalization costs.



Discharge

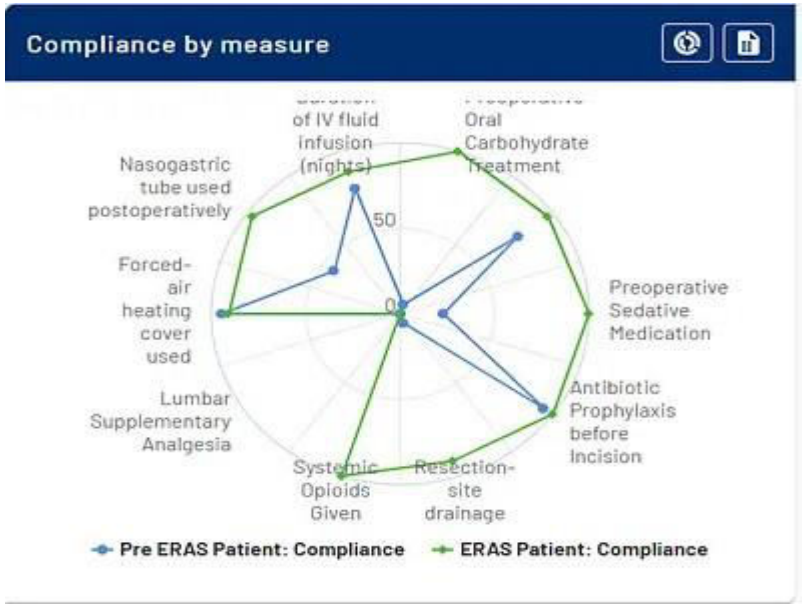
Discharge criteria	*Score*
Level of consciousness	
Awake and oriented	2
Arousable with minimal stimulation	1
Responsive only to tactile stimulation	0
Physical activity	
Able to move all extremities on command	2
Some weakness in movement of extremities	1
Unable to voluntarily move extremities	0
Hemodynamic stability	
Blood pressure < 15% of baseline MAP value	2
Blood pressure 15–30% of baseline MAP value	1
Blood pressure > 30% below baseline MAP value	0
Respiratory stability	
Able to breathe deeply	2
Tachypnea with good cough	1
Dyspneic with weak cough	0
Oxygen saturation status	
Maintains value > 90% on room air	2
Requires supplemental oxygen (nasal prongs)	1
Saturation < 90% with supplemental oxygen	0
Postoperative pain assessment	
None, or mild discomfort	2
Moderate to severe pain controlled with *iv* analgesics	1
Persistent severe pain	0
Postoperative emetic symptoms	
None, or mild nausea with no active vomiting	2
Transient vomiting or retching	1
Persistent moderate to severe nausea and vomiting	0
Total possible score	14

BOX 80.10 Summary of Recommendations for Discharge

1. Patients should be alert and oriented or mental status returned to baseline.
2. A minimum mandatory stay is not required.
3. Vital signs should be stable and within acceptable limits.
4. Discharge should occur after patients have met specified criteria.
5. Use of scoring systems may assist in documenting fitness for discharge.
6. The requirement to urinate before discharge and drink and retain clear liquids should *not* be part of a routine discharge protocol, although these requirements may be appropriate for selected patients.
7. Outpatients should be discharged to a responsible adult who will accompany them home.
8. Outpatients should be provided with written instructions regarding postprocedure diet, medications, activities, and a telephone number to call in case of emergency.

Audit

- An auditing system is used to facilitate implementation and monitor compliance to the ERAS Protocols.
- EIAS is a web-based data entry and analysis system for surgical teams to take advantage of the benefits of the ERAS Protocol.

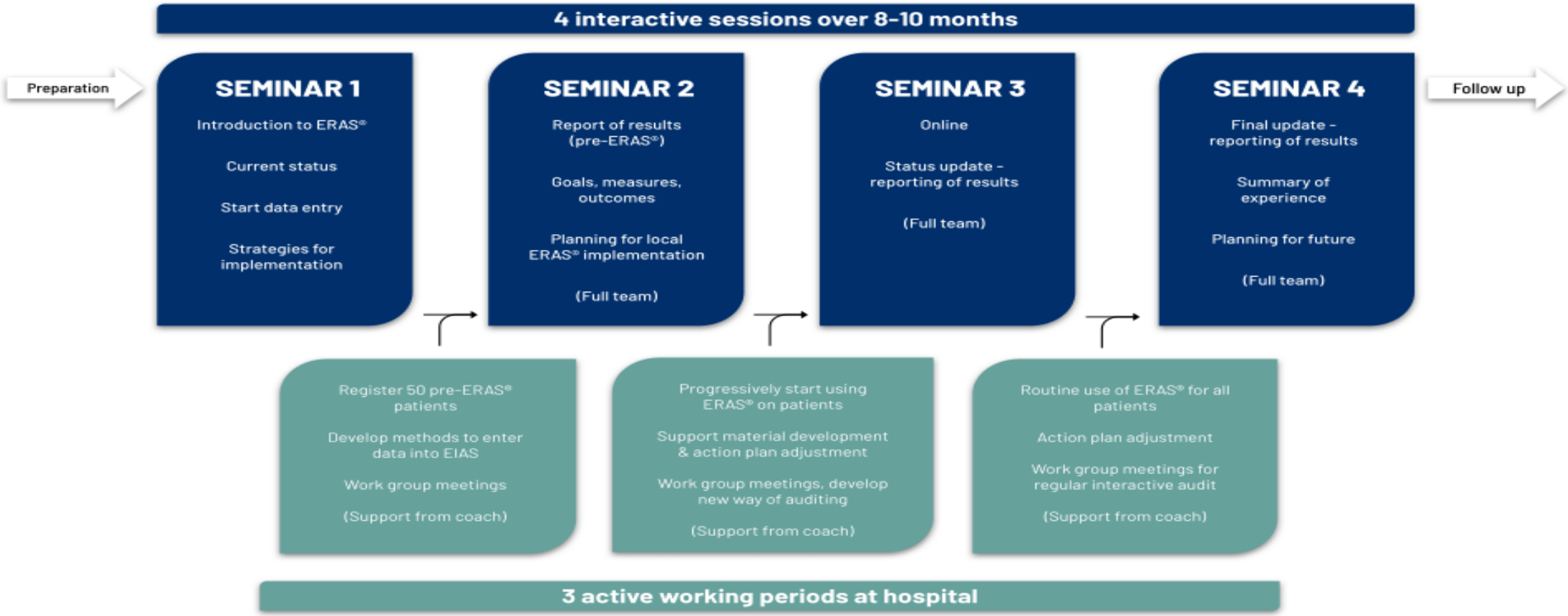


Issues in the Implementation of ERP's

- The success of ERP's depends upon the ability and willingness of perioperative team stakeholders to reach evidence-based inter-disciplinary consensus.
- Many traditional aspects of perioperative care must be challenged and extensively revised in ERP's.
- Patient involvement and patient and family expectations are fundamentally important aspects of these programs.

- The components of ERP’s requires a substantial expansion of the traditional roles of anesthesiologists.
- There is also significant change in the way patients are cared for in PACU as well as Post-surgical unit, requiring well-organized, highly trained, highly motivated nursing staff.
- Local differences in goals, expertise, experience, resources, and politics markedly influence the development, implementation, and management of ERP’s.

- Each family of similar surgical procedures requires a standardized interdisciplinary clinical protocol with specialized input from a team with experience in caring for those patients.



Summary

- ERAS pathways are evidence-based multidisciplinary protocols designed to standardize medical care, accelerate the functional recovery of surgical patients and lower healthcare costs.
- Optimal perioperative care requires the anesthesia provider to be an integral part of the PSH concept as well as for formulation of ERP's.
- Adherence to ERP pathways is associated with better post-operative outcomes, accelerated convalescence, and lower costs.

Table I Key components of a fast-track programme

Multidisciplinary involvement	Nurses
	Surgeons
	Anaesthetists
	Physiotherapists
	Dieticians
Good pre-assessment	Co-morbidities optimally treated
	Appropriate patient selection
	Patient education
Premedication	α_2-agonists
	β-blockers
Anaesthesia	Air/O_2/TIVA or quick-onset volatile agents
	Anti-emetics
	Targeted fluids
Surgery	Oblique/transverse wounds
	Minimally invasive approach
	Minimal drains/no NG tubes
Postoperative care	Multimodal analgesia
	Acute pain team managing epidural
	Early feeding
	Early mobilization


Join Hands
ERAS INDIA
A core group of IAPEN
For Developing
ERAS Guidelines for Indian Population

THANK YOU