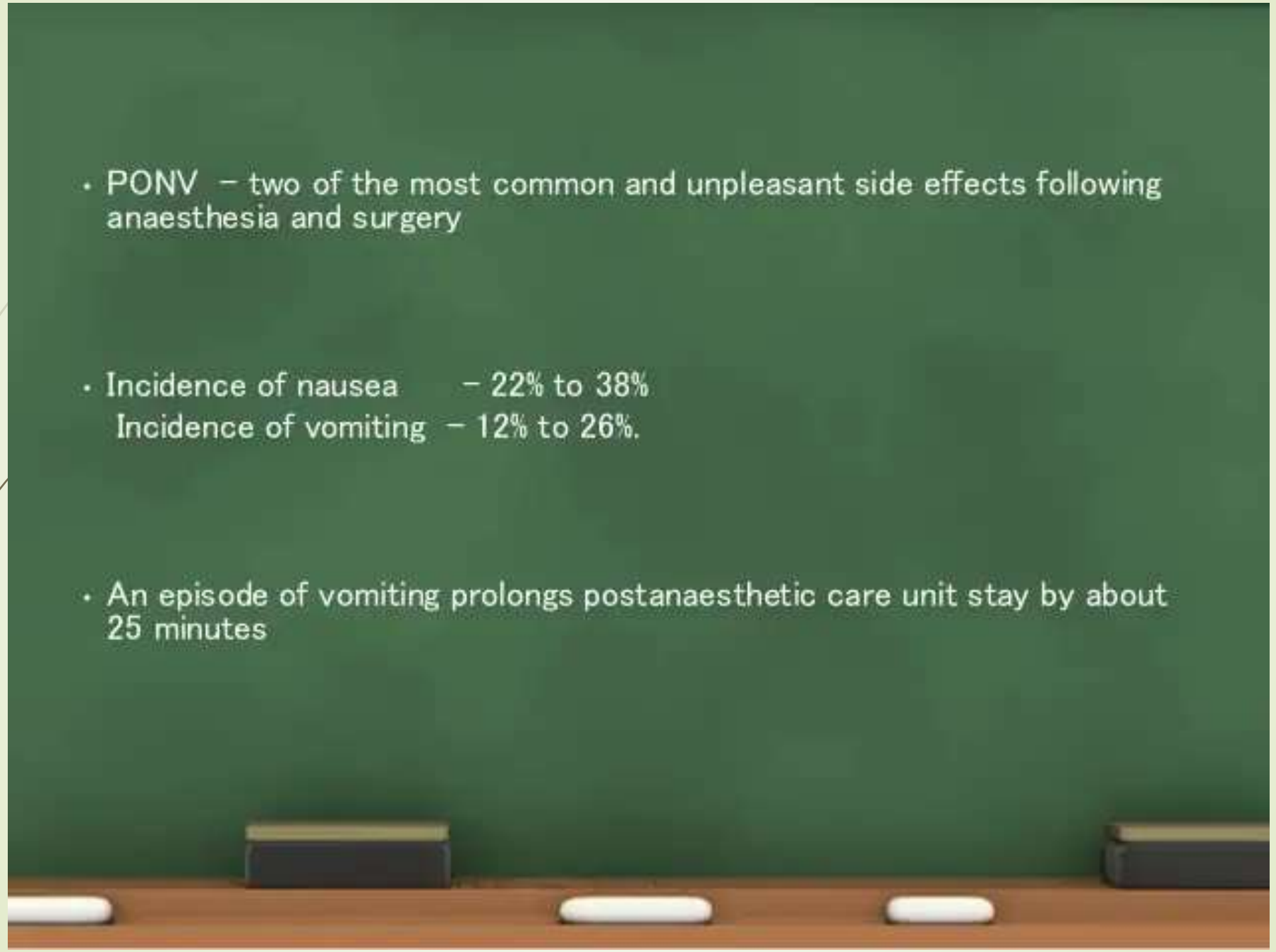
PONV

Maryam.Kamran.MD


• PONV – two of the most common and unpleasant side effects following anaesthesia and surgery
• Incidence of nausea – 22% to 38%
Incidence of vomiting – 12% to 26%.
• An episode of vomiting prolongs postanaesthetic care unit stay by about 25 minutes

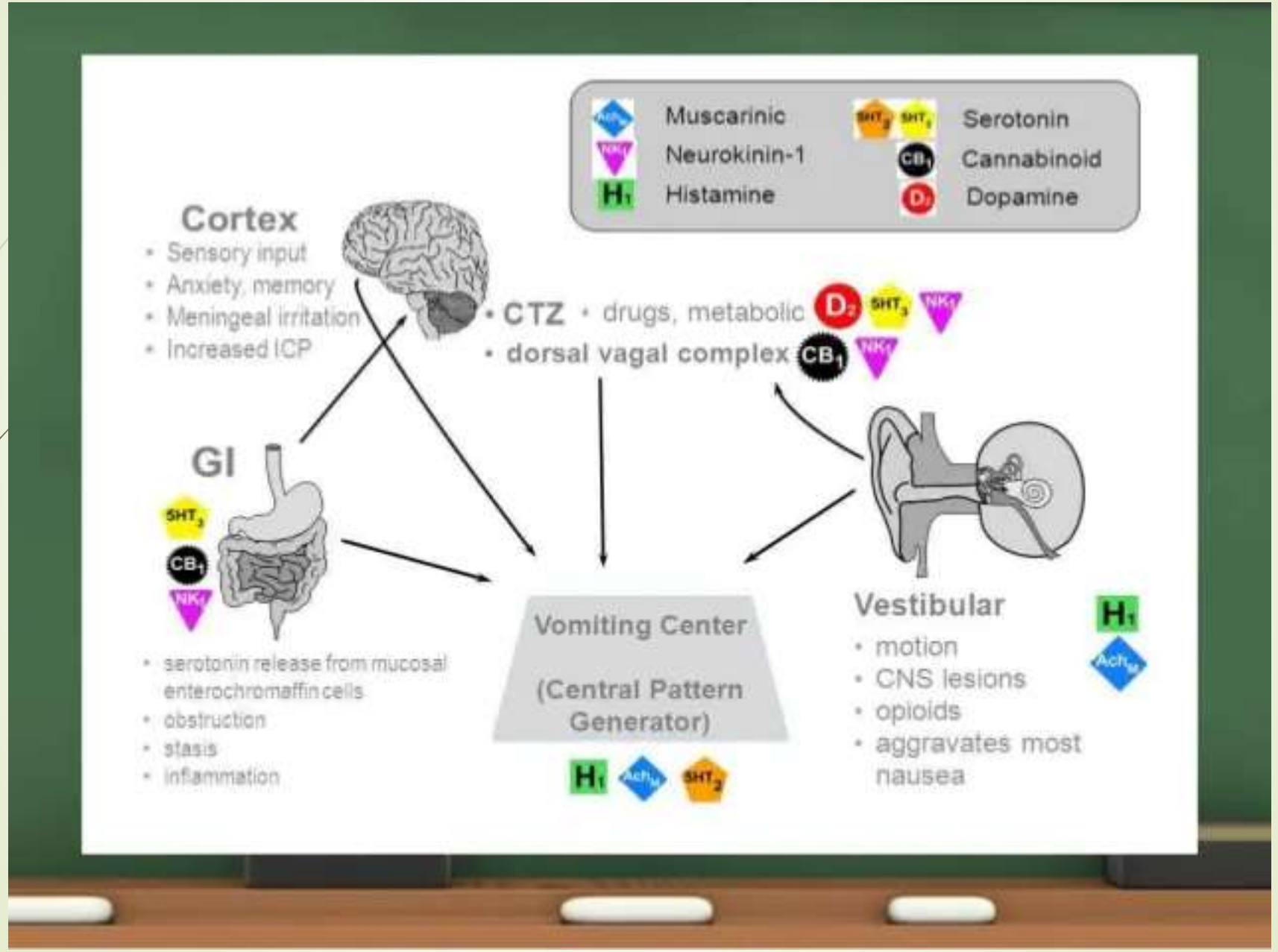
ANATOMY

VOMITING CENTER

Includes multiple sensory, motor, and control nuclei mainly in the medullary and pontine reticular formation but and extending into the spinal cord.

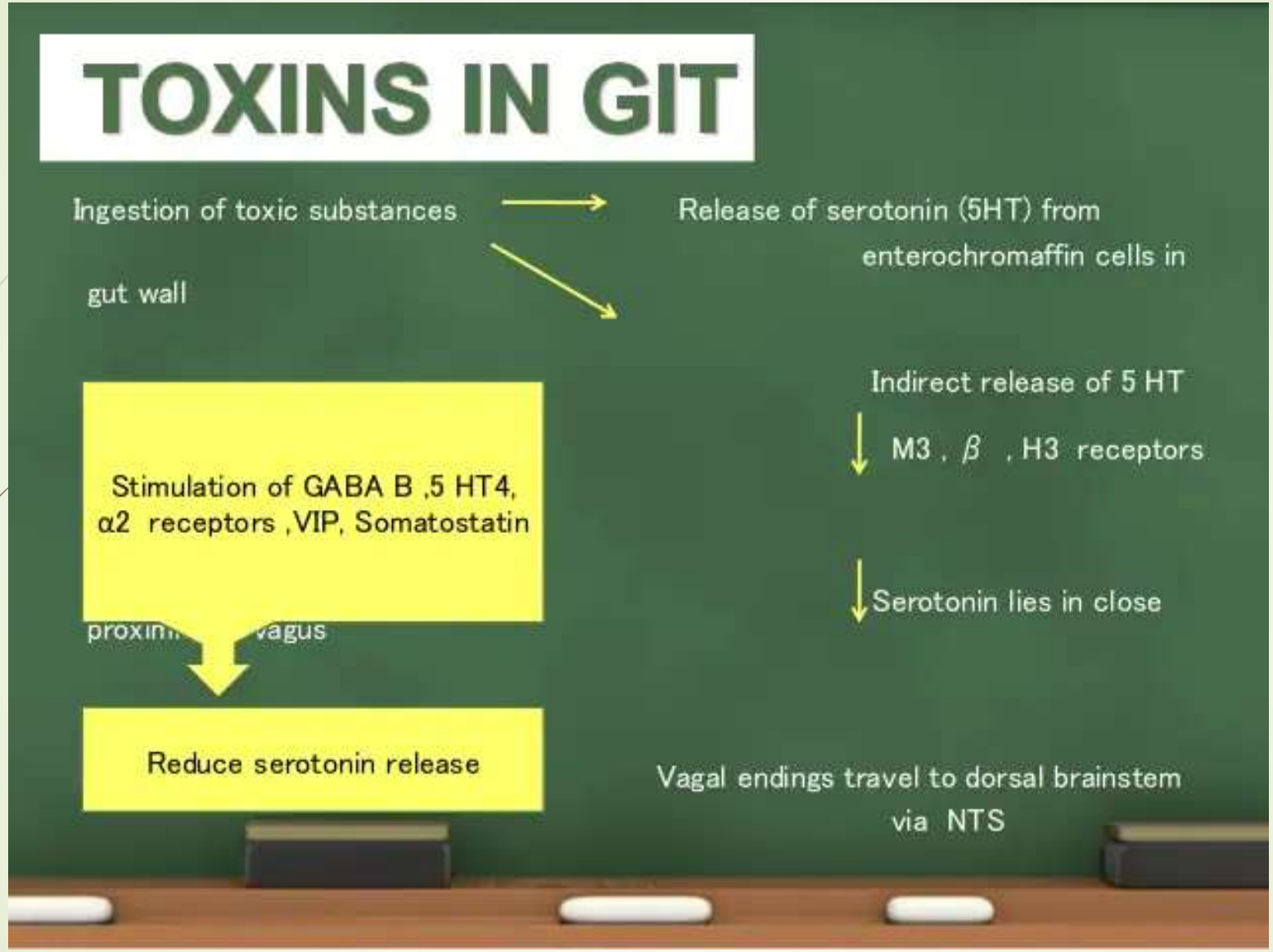
Receives afferent inputs from

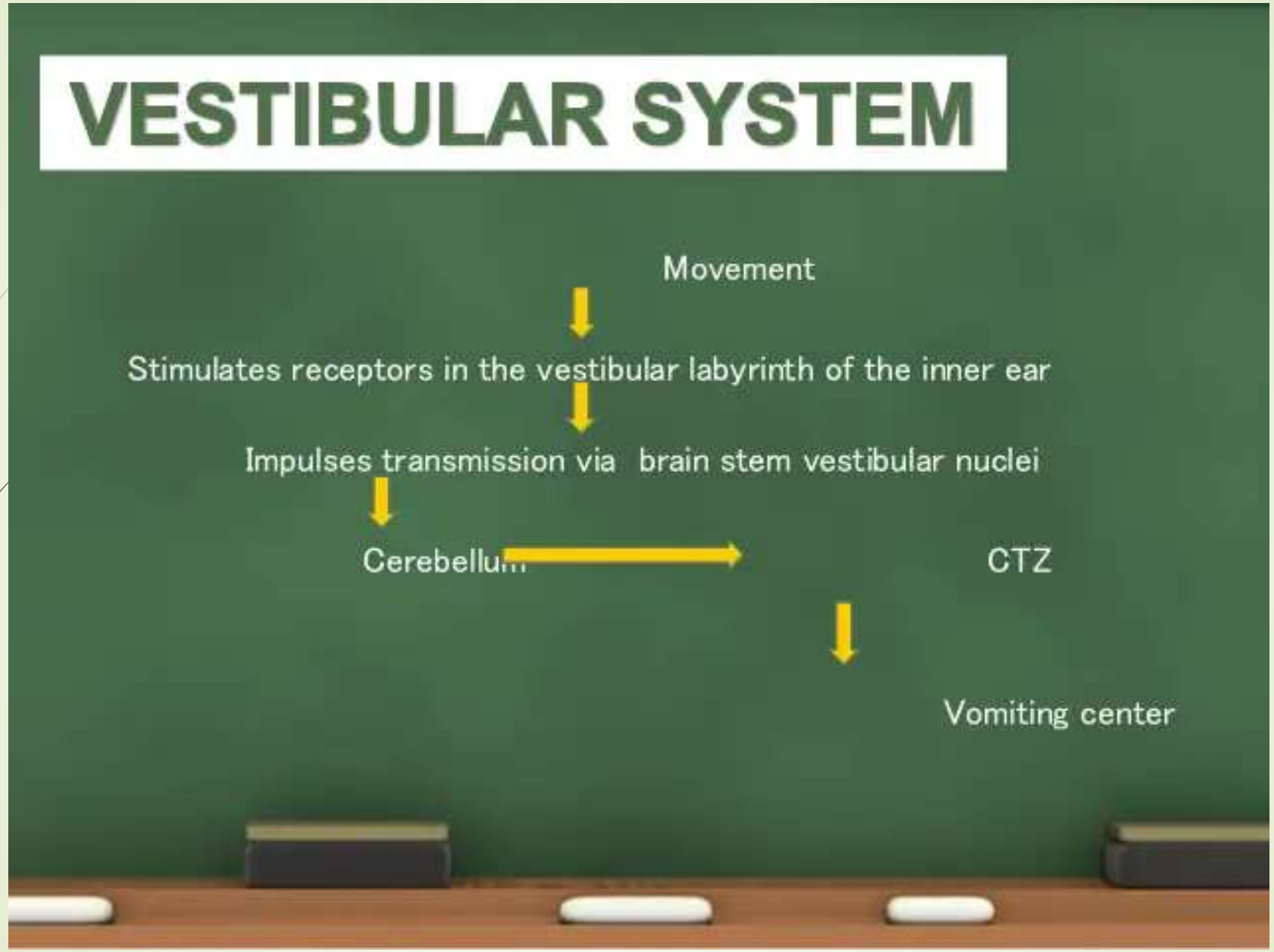
- Higher cortical centers
- Cerebellum
- Vestibular apparatus
- Vagal and
- Glossopharyngeal nerves
- CTZ & NTS


Muscarinic
Neurokinin-1
Histamine
Serotonin
Cannabinoid
Dopamine
Cortex
• Sensory input
• Anxiety, memory
• Meningeal irritation
• Increased ICP
• CTZ • drugs, metabolic
• dorsal vagal complex
GI
• serotonin release from mucosal enterochromaffin cells
• obstruction
• stasis
• inflammation
Vomiting Center
(Central Pattern Generator)
Vestibular
• motion
• CNS lesions
• opioids
• aggravates most nausea

Motor impulses that cause the actual vomiting are transmitted from the vomiting center by

- 5th, 7th, 9th, 10th, and 12th cranial nerves to the upper git
- Vagal and sympathetic nerves to the lower tract
- Spinal nerves to the diaphragm and abdominal muscles


TOXINS IN GIT
Ingestion of toxic substances
Release of serotonin (5HT) from enterochromaffin cells in gut wall
Indirect release of 5 HT
M3 , β , H3 receptors
Stimulation of GABA B ,5 HT4, α2 receptors ,VIP, Somatostatin
Serotonin lies in close
vagus
Reduce serotonin release
Vagal endings travel to dorsal brainstem via NTS

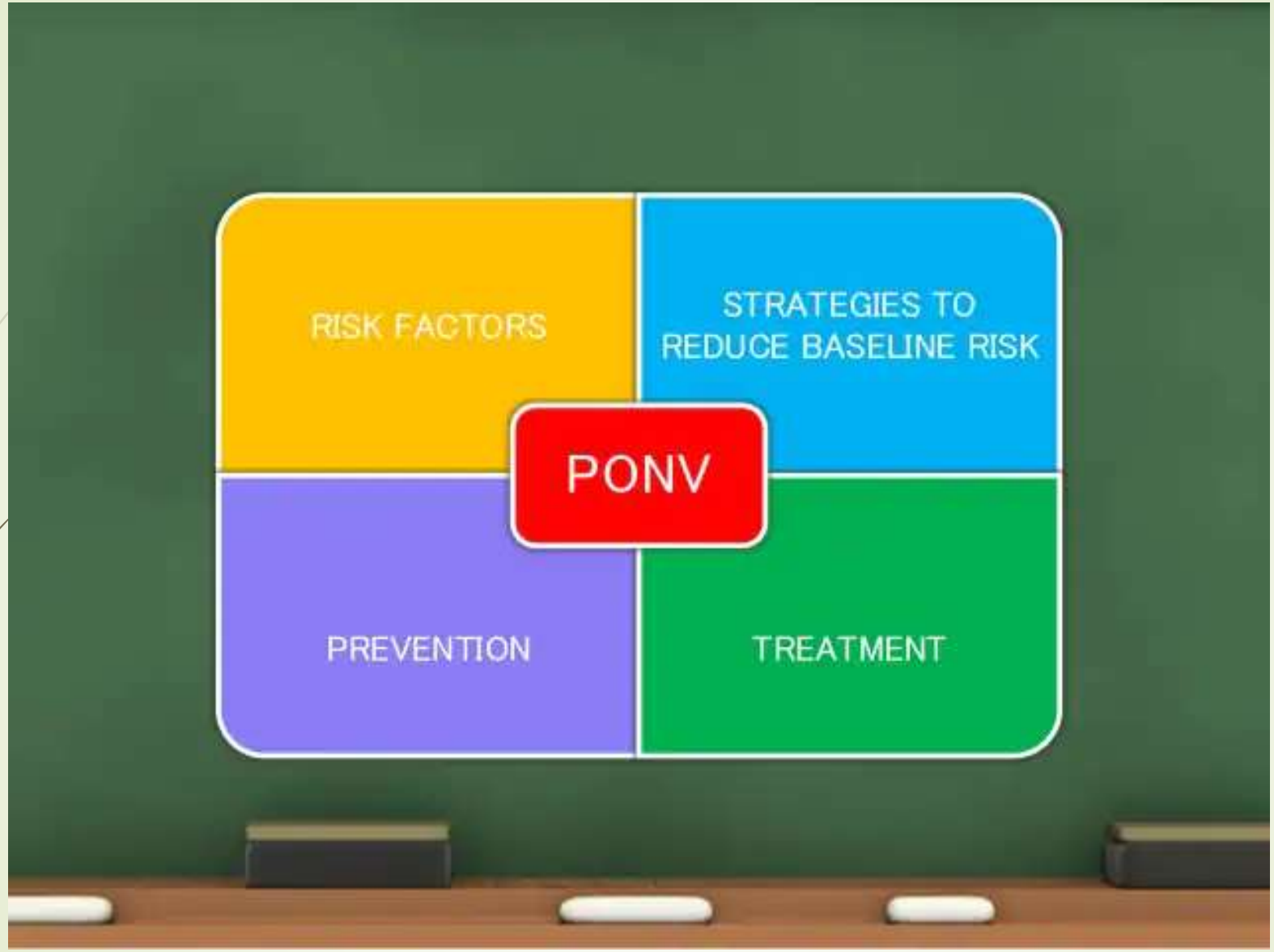

VESTIBULAR SYSTEM
Movement
Stimulates receptors in the vestibular labyrinth of the inner ear
Impulses transmission via brain stem vestibular nuclei
Cerebellum
CTZ
Vomiting center

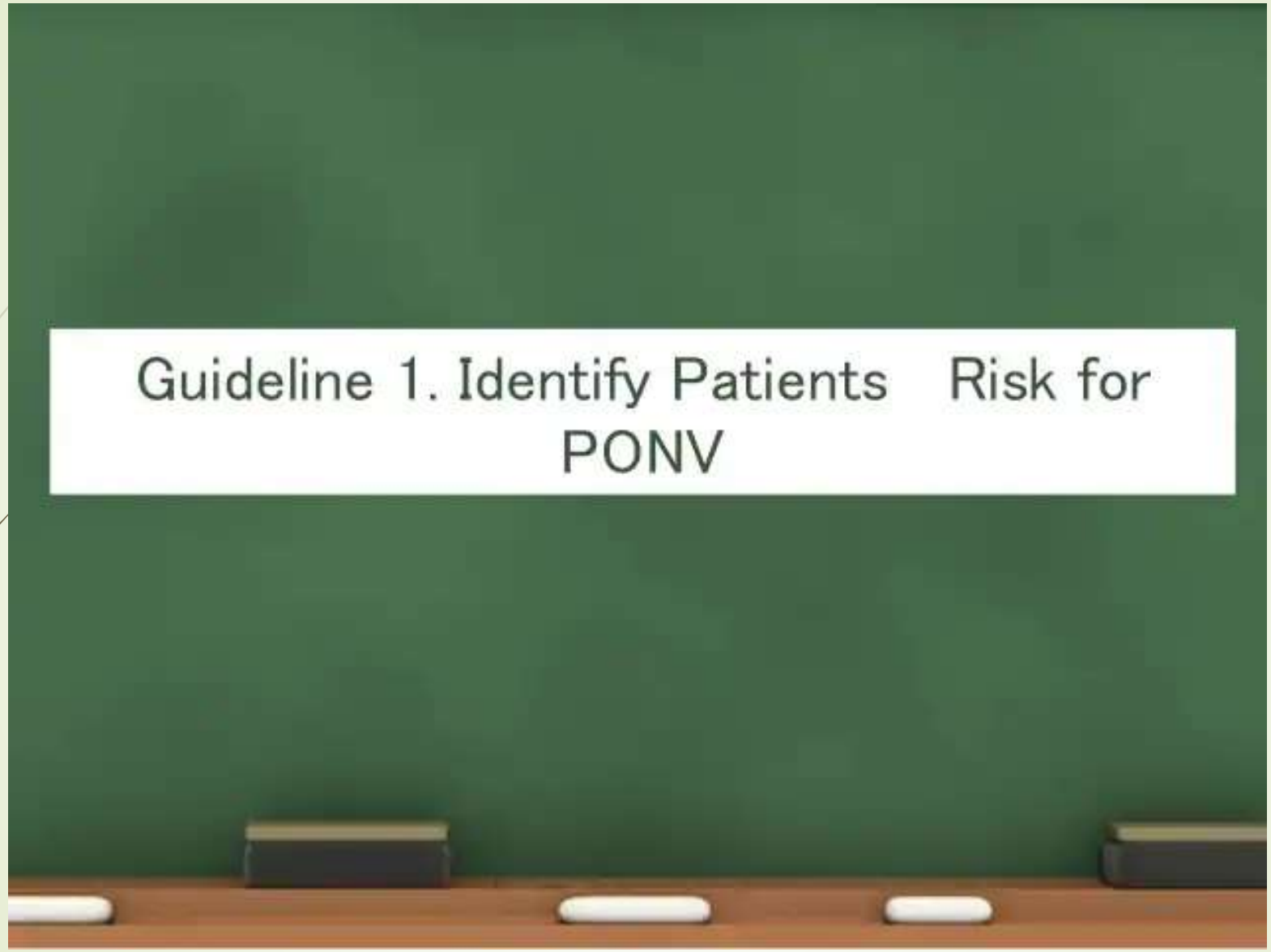
NAUSEA

- Conscious recognition of subconscious excitation in an area of the medulla closely associated with or part of the vomiting center

- Causes

(1) Irritative impulses coming from the gastrointestinal tract
(2) Impulses that originate in the lower brain associated with motion sickness or
(3) Impulses from the cerebral cortex to initiate vomiting.

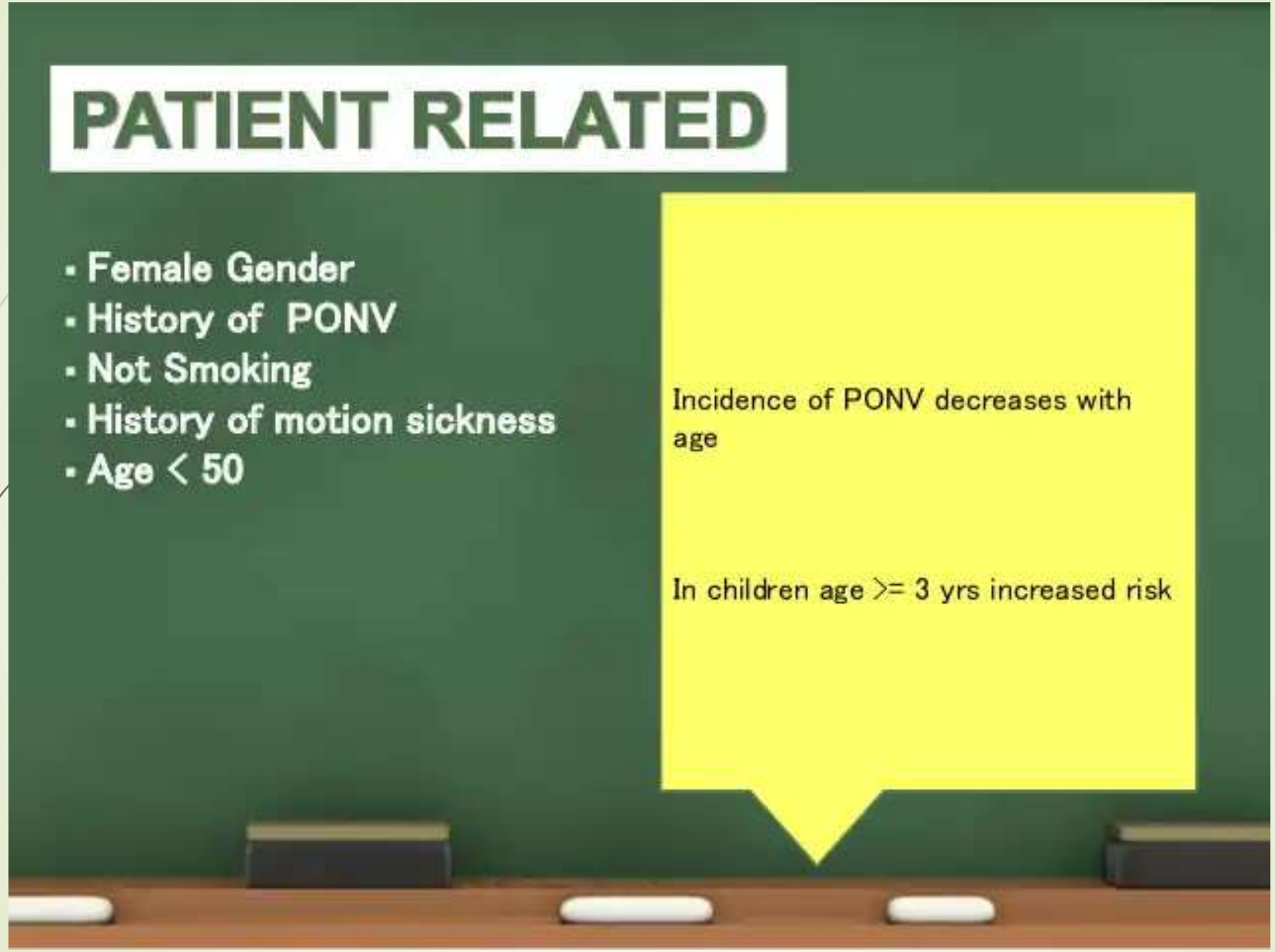

RISK FACTORS
STRATEGIES TO REDUCE BASELINE RISK
PONV
PREVENTION
TREATMENT

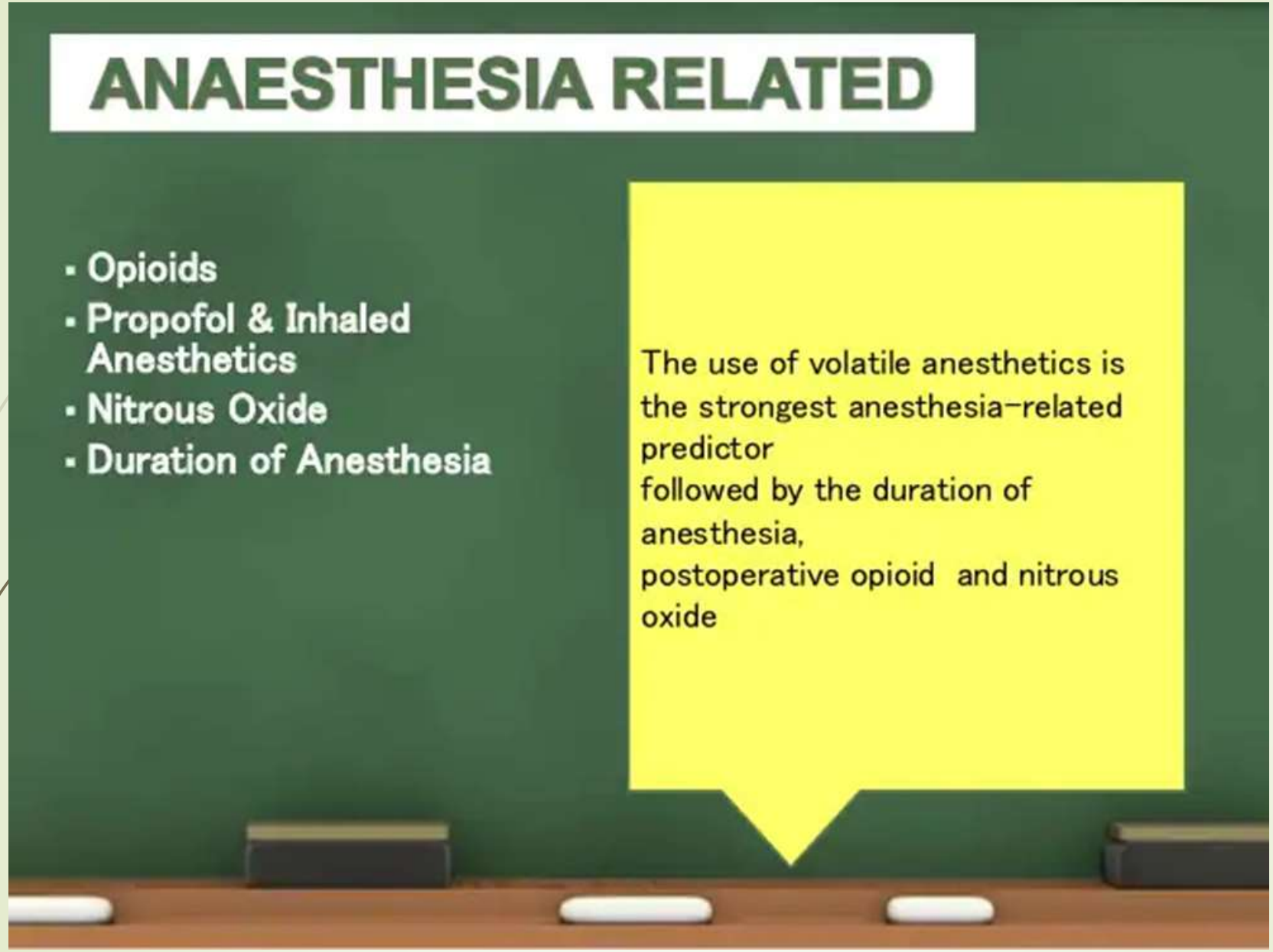

Guideline 1. Identify Patients Risk for
PONV

INDEPENDENT PREDICTORS

PATIENT RELATED | ANAESTHESIA RELATED | SURGERY

RELATED


PATIENT RELATED
• Female Gender
• History of PONV
• Not Smoking
• History of motion sickness
• Age < 50
Incidence of PONV decreases with age
In children age >= 3 yrs increased risk


ANAESTHESIA RELATED
Opioids
Propofol & Inhaled Anesthetics
Nitrous Oxide
Duration of Anesthesia
The use of volatile anesthetics is the strongest anesthesia-related predictor
followed by the duration of anesthesia,
postoperative opioid and nitrous oxide

SURGERY RELATED

- Major abdominal and gynecologic procedures
- Laparoscopy
- Cholecystectomy
- Middle ear surgeries
- Thyroid, breast, plastic surgery neurosurgery
- Strabismus Sx in children

PONV in laparoscopy – due to gas insufflation of abdomen → pressure on vagus nerve → relays to vomiting center

Only laparoscopy ,gynec procedures cholecystectomy and strabismus Sx found to be independent predictors

Emetogenic procedures →

laparoscopy, adult strabismus surgery, middle ear surgery, herniorrhaphy, tonsillectomy, adenoidectomy, and uvulopalatopharyngoplasty

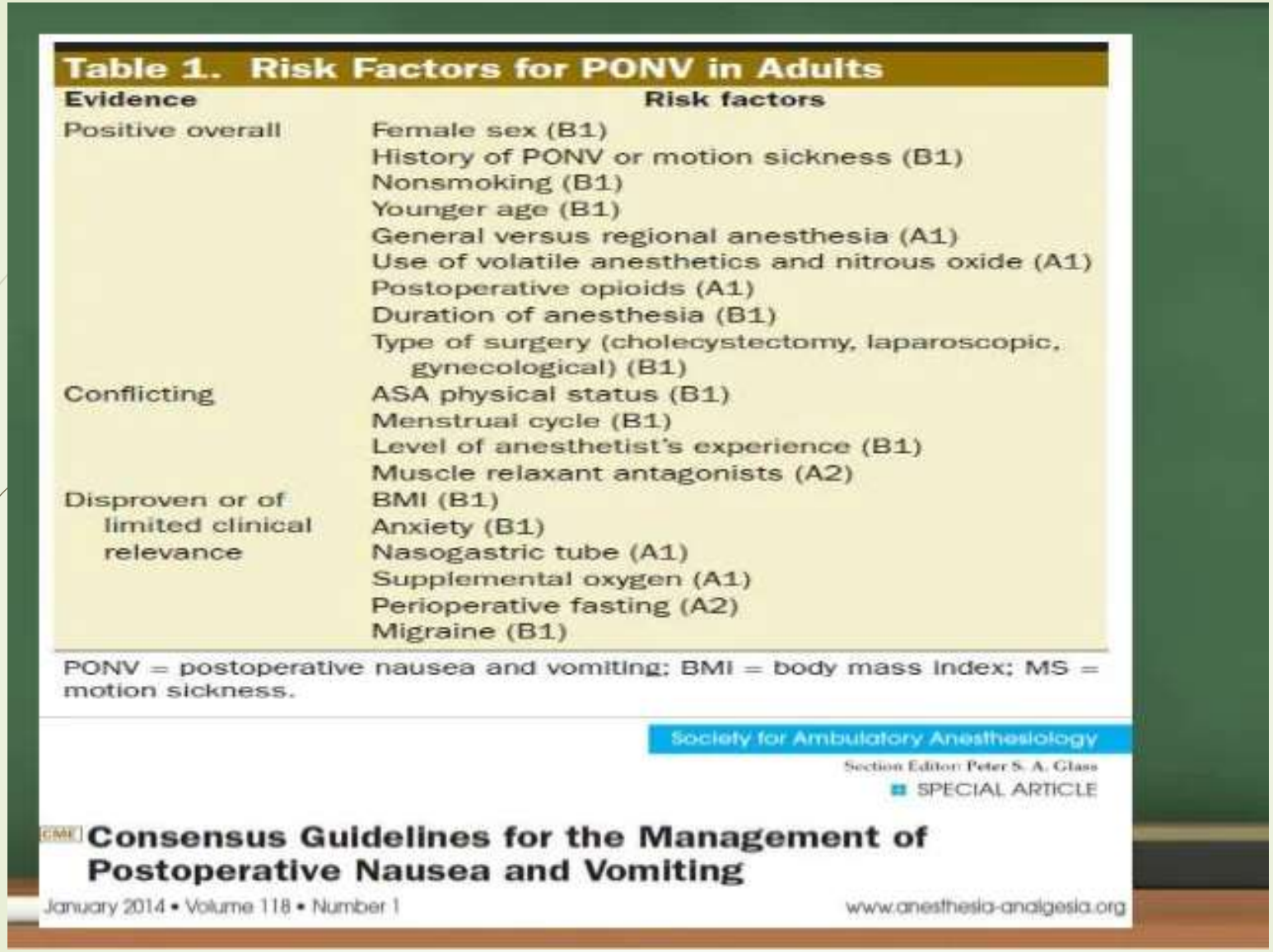


Table 1. Risk Factors for PONV in Adults

Evidence	Risk factors
Positive overall	Female sex (B1)
	History of PONV or motion sickness (B1)
	Nonsmoking (B1)
	Younger age (B1)
	General versus regional anesthesia (A1)
	Use of volatile anesthetics and nitrous oxide (A1)
	Postoperative opioids (A1)
	Duration of anesthesia (B1)
	Type of surgery (cholecystectomy, laparoscopic, gynecological) (B1)
Conflicting	ASA physical status (B1)
	Menstrual cycle (B1)
	Level of anesthetist's experience (B1)
	Muscle relaxant antagonists (A2)
Disproven or of limited clinical relevance	BMI (B1)
	Anxiety (B1)
	Nasogastric tube (A1)
	Supplemental oxygen (A1)
	Perioperative fasting (A2)
	Migraine (B1)

PONV = postoperative nausea and vomiting; BMI = body mass index; MS = motion sickness.

Society for Ambulatory Anesthesiology

Section Editor: Peter S. A. Glass

SPECIAL ARTICLE

CME

Consensus Guidelines for the Management of Postoperative Nausea and Vomiting

January 2014 • Volume 118 • Number 1

www.anesthesia-analgesia.org

PONV IN REGIONAL

- Low incidence of PONV after regional techniques
- PNB < SAB < EPIDURAL < GA

INTRA OP N&V IN SAB INDEPENDENT PREDICTORS

FEMALE GENDER

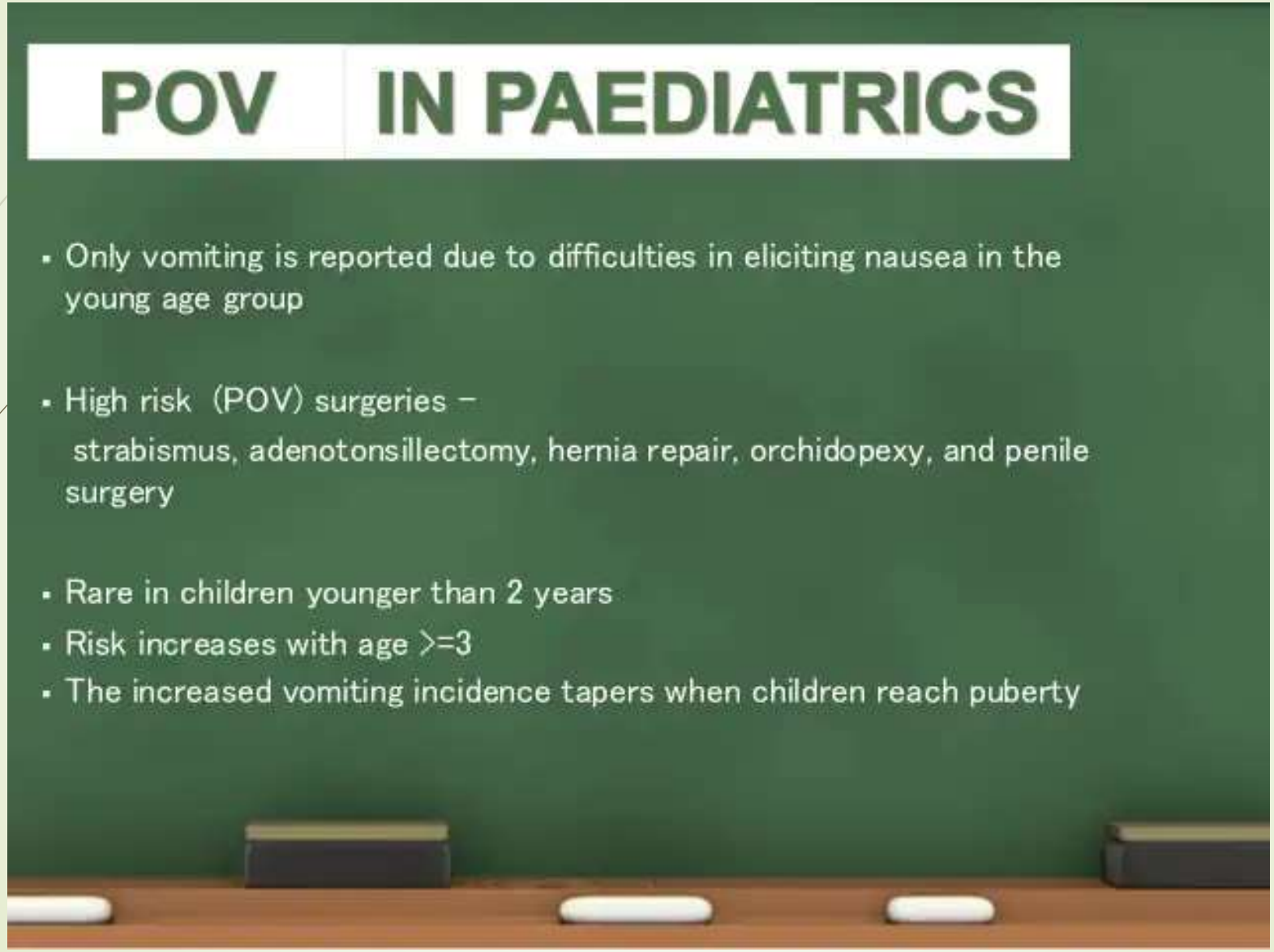
HISTORY OF MOTION SICKNESS

PREOPERATIVE TACHYCARDIA

PREOPERATIVE INTRAVENOUS OPIOIDS

USE OF PHENYLEPHRINE/ EPINEPHRINE

HYPOTENSION
HIGH INTRATHECAL BLOCK


POV IN PAEDIATRICS
• Only vomiting is reported due to difficulties in eliciting nausea in the young age group
• High risk (POV) surgeries –
strabismus, adenotonsillectomy, hernia repair, orchidopexy, and penile surgery
• Rare in children younger than 2 years
• Risk increases with age >=3
• The increased vomiting incidence tapers when children reach puberty

RISK SCORE IN PAEDIATRICS

Eberhart et al

Risk Factors	Points
Surgery ≥ 30 min.	1
Age ≥ 3 years	1
Strabismus surgery	1
History of POV or PONV in relatives	1
Sum =	0 . . . 4

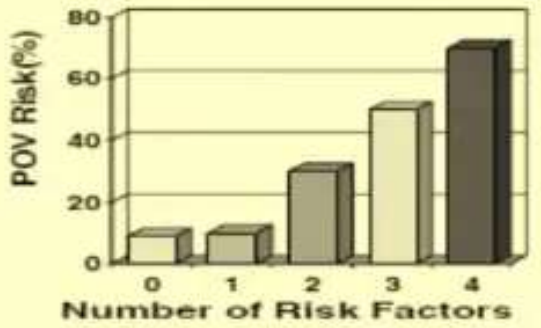
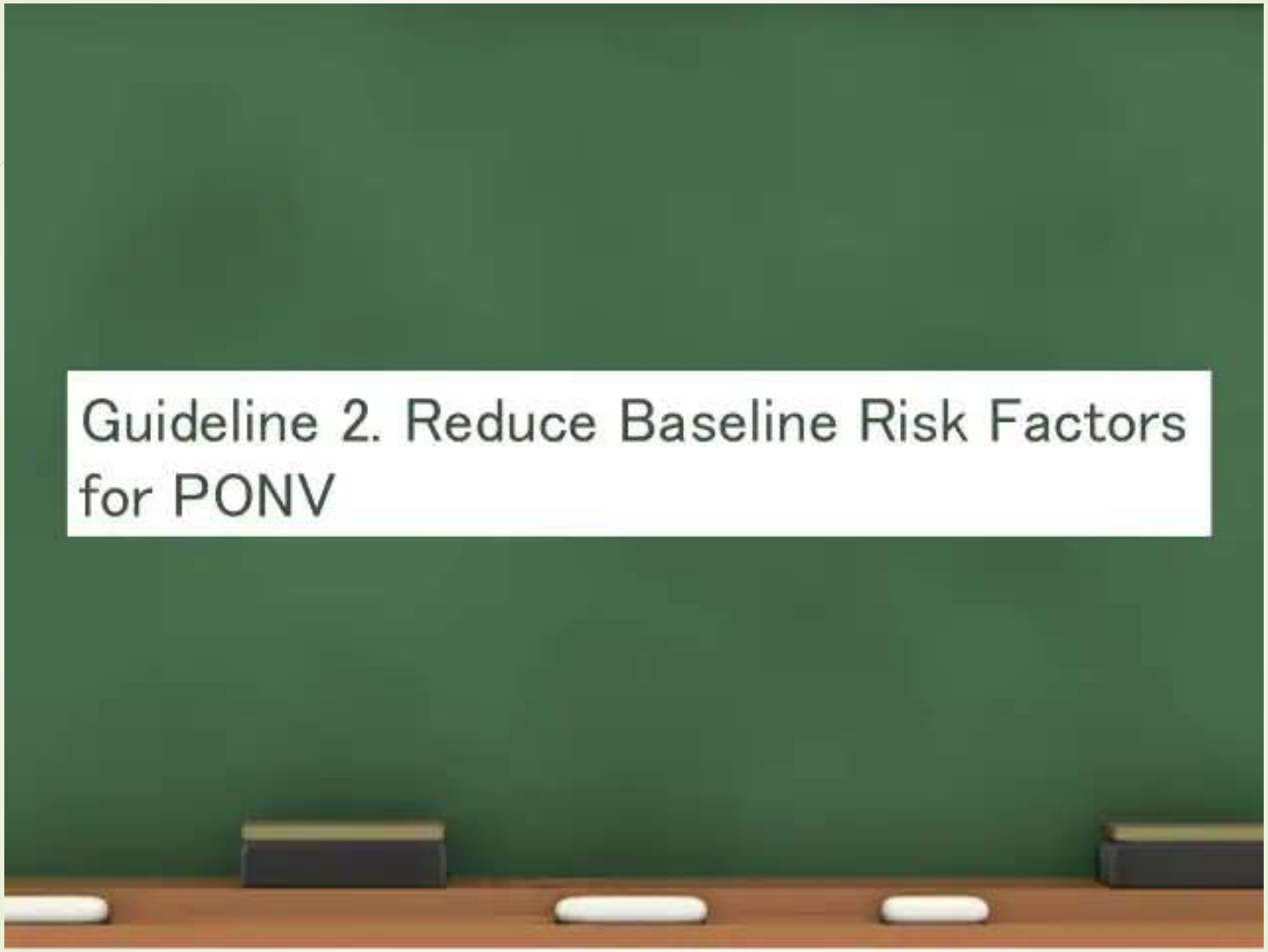


Figure 2. Simplified risk score for POV in children (39). Simplified risk score from Eberhart et al. (39) to predict the risk for POV in children. When 0, 1, 2, 3, or 4 of the depicted independent predictors are present, the corresponding risk for PONV is approximately 10%, 10%, 30%, 55%, or 70%.


Guideline 2. Reduce Baseline Risk Factors for PONV

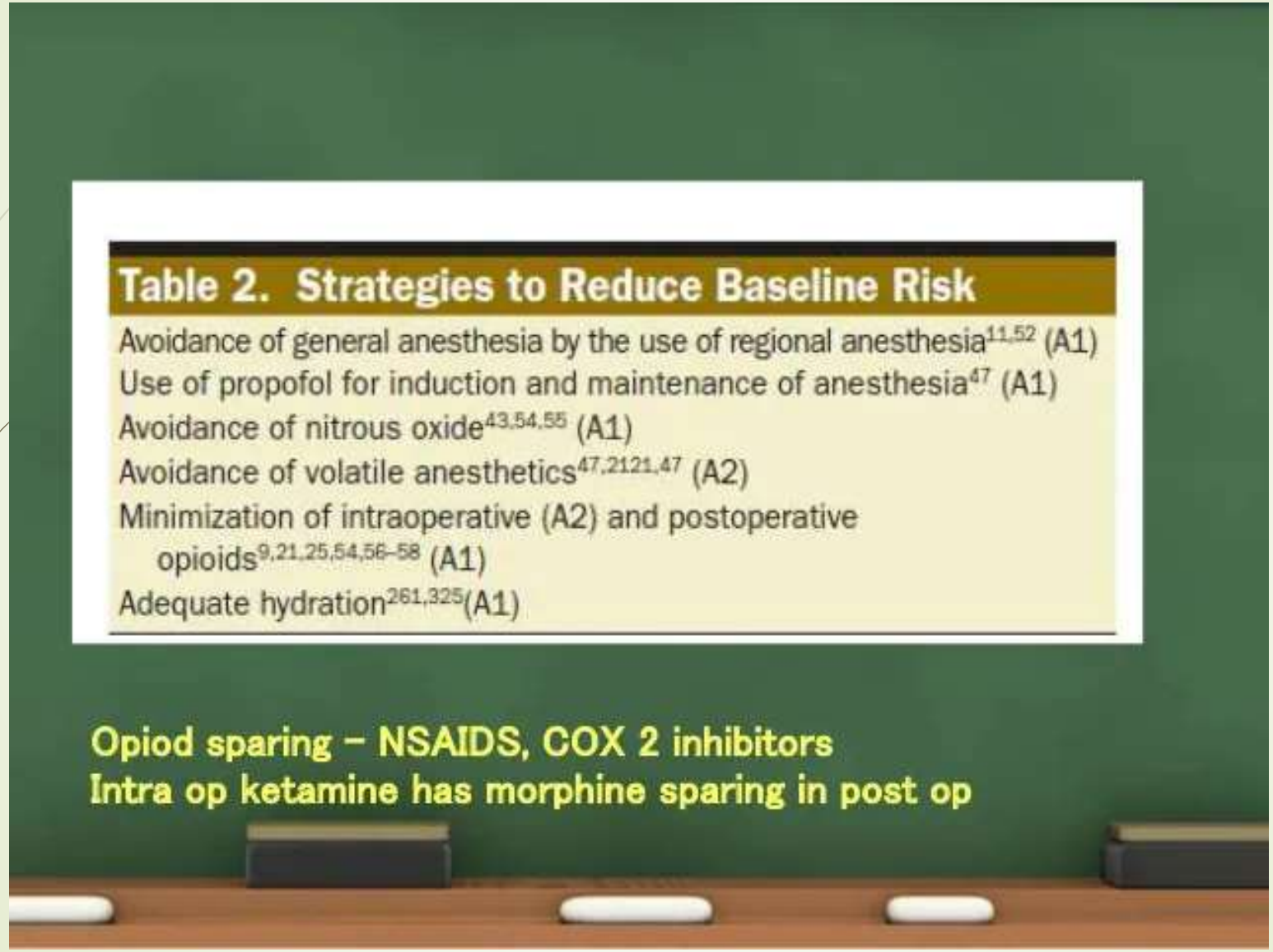
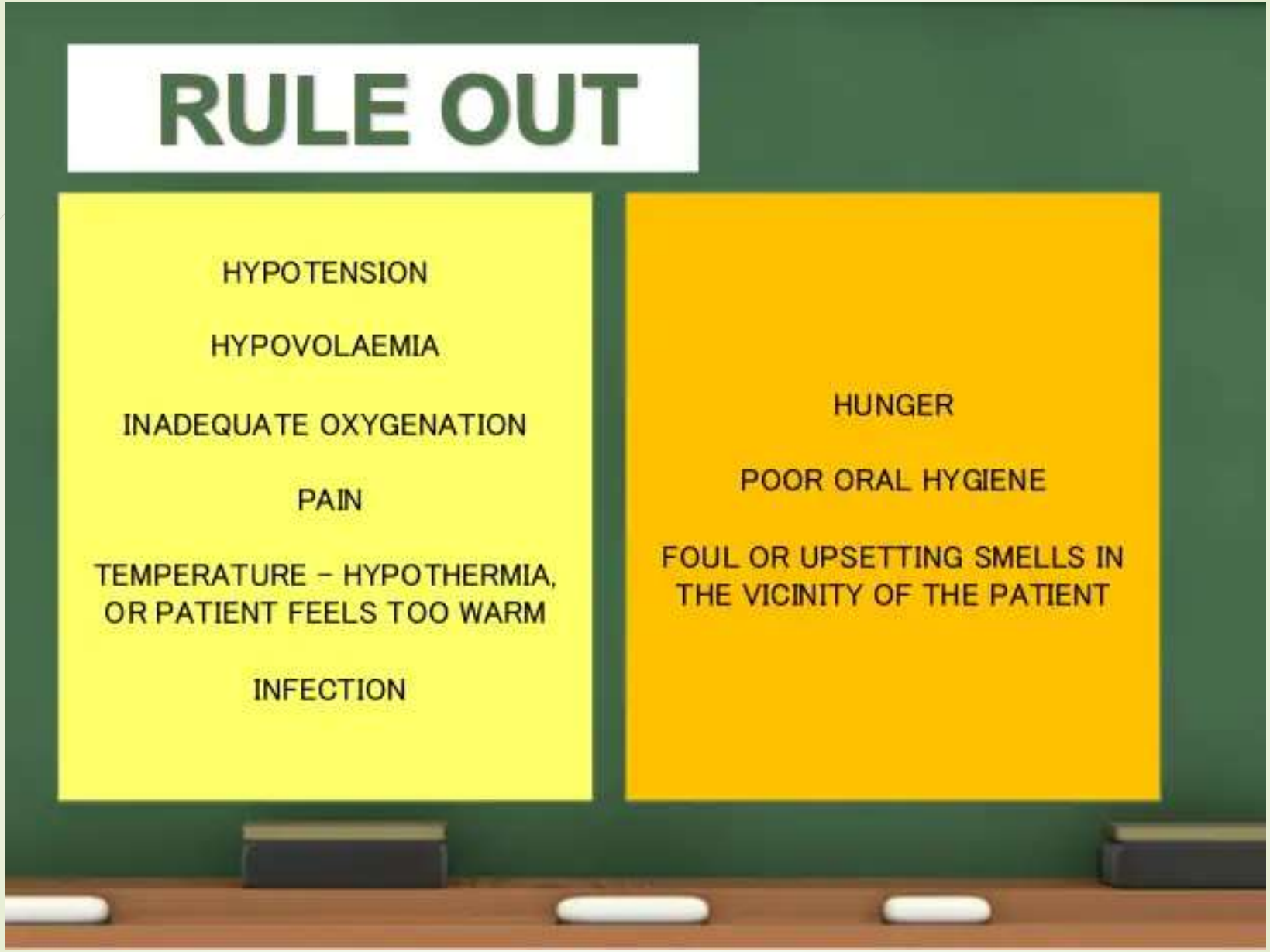
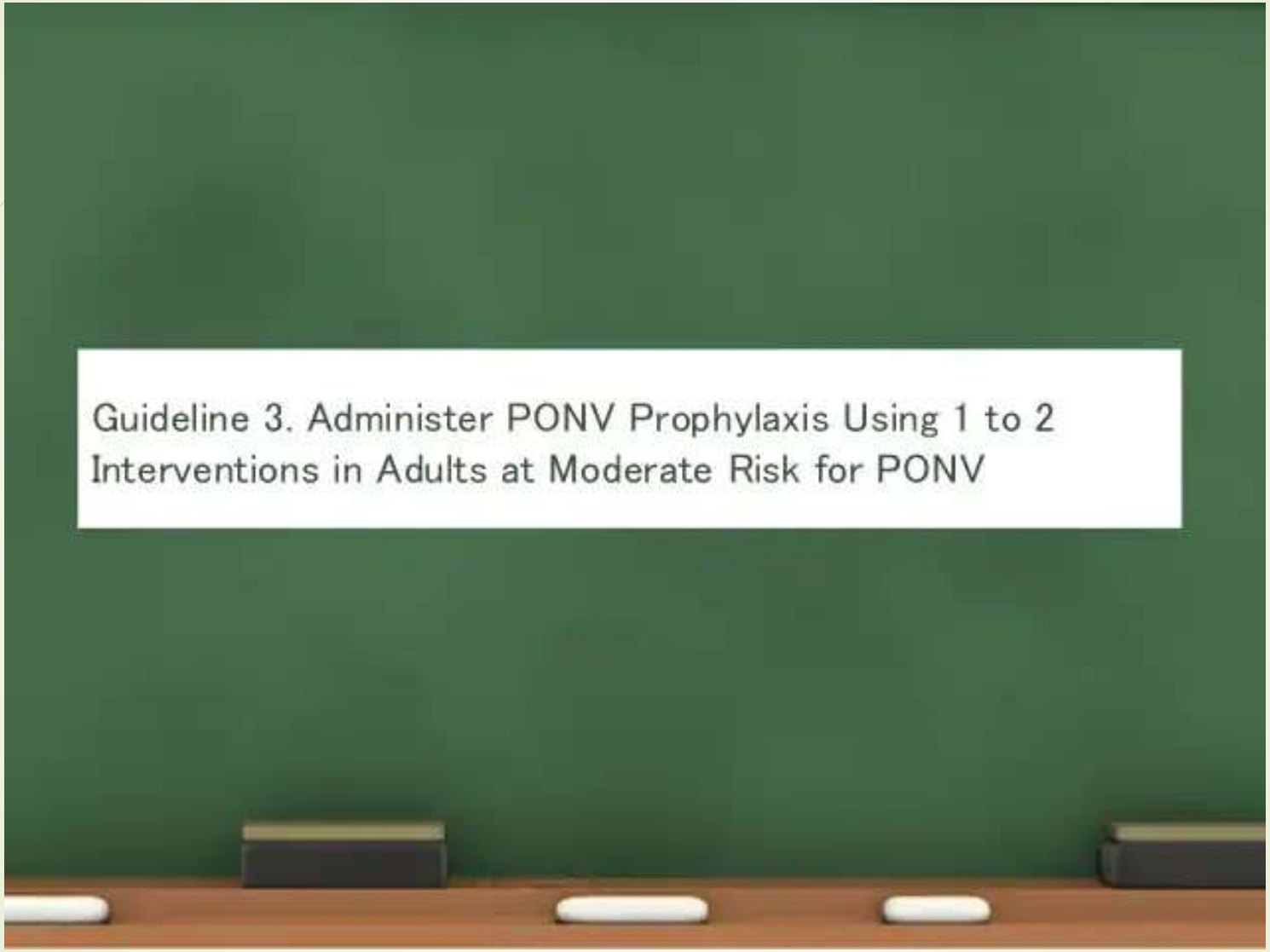
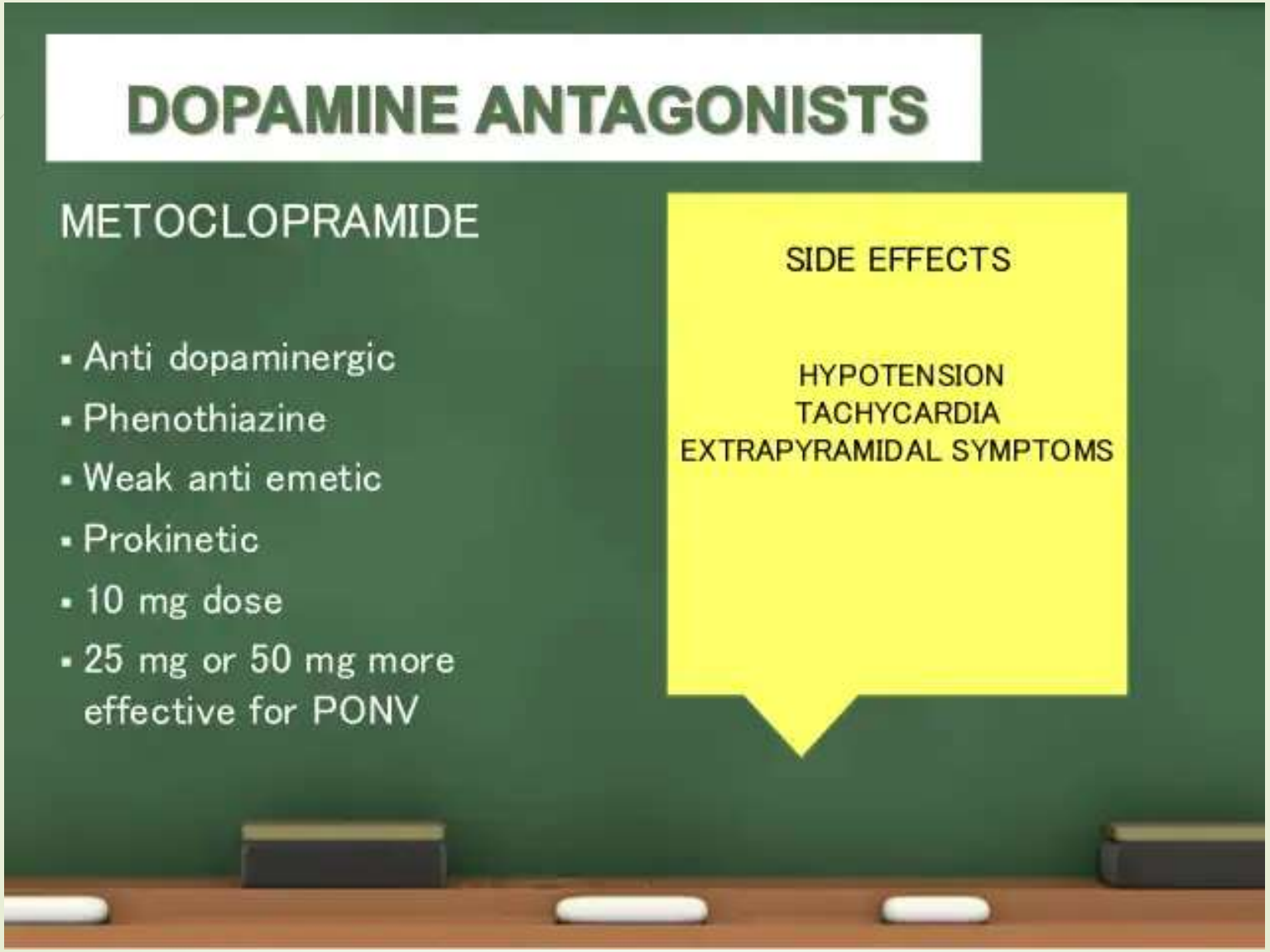
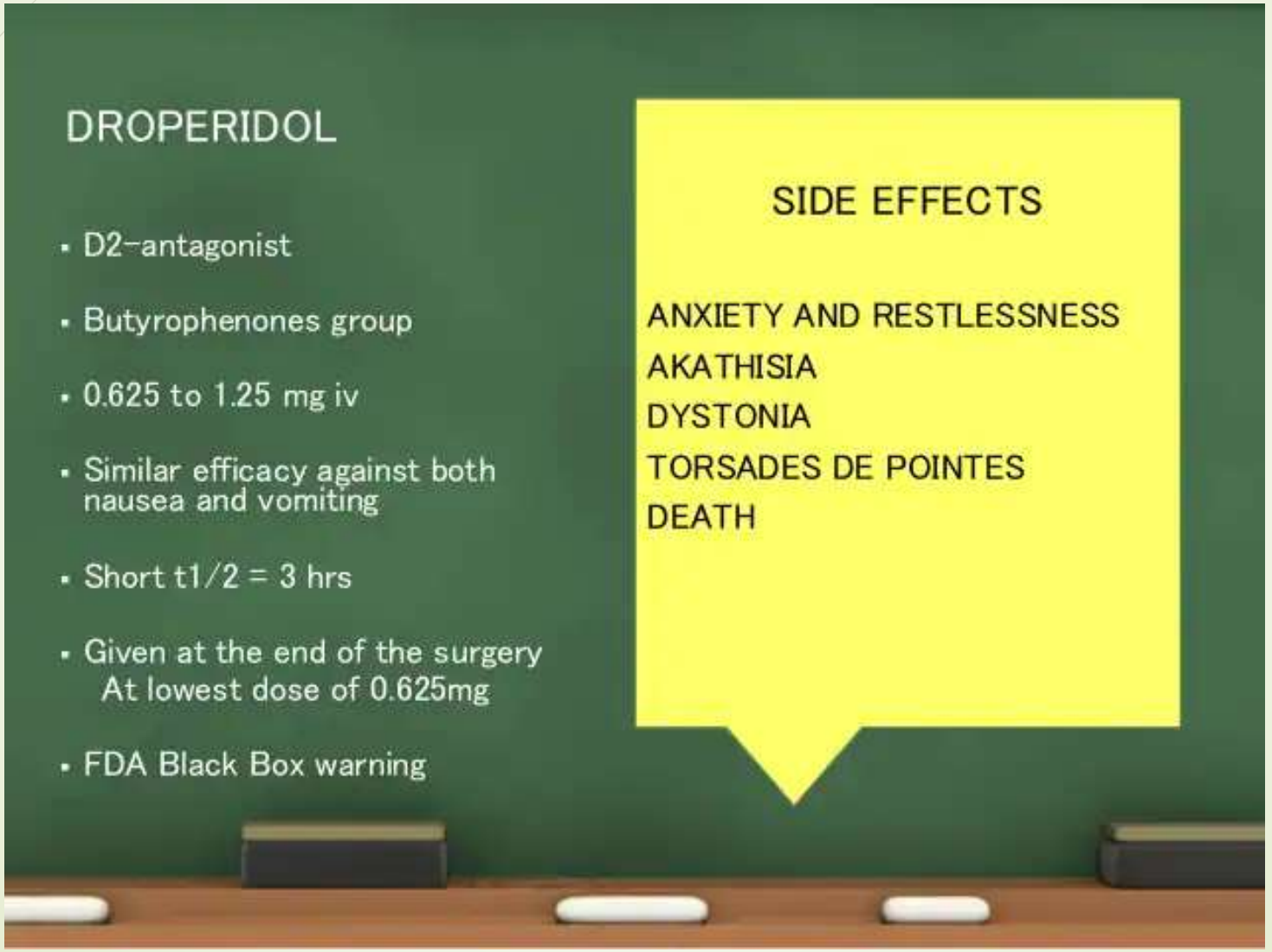


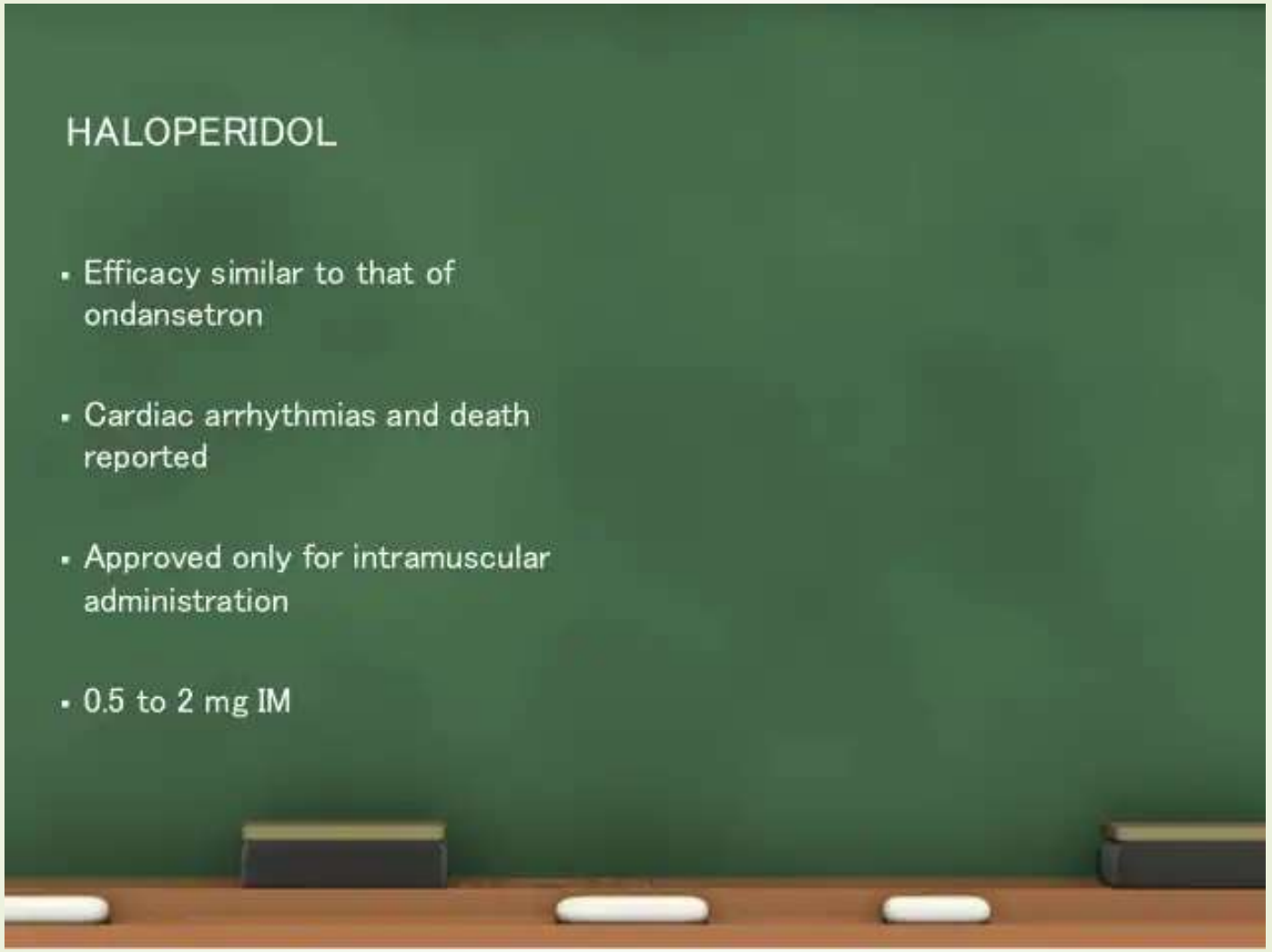
Table 2. Strategies to Reduce Baseline Risk
Avoidance of general anesthesia by the use of regional anesthesia[11,52] (A1)
Use of propofol for induction and maintenance of anesthesia[47] (A1)
Avoidance of nitrous oxide[43,54,55] (A1)
Avoidance of volatile anesthetics[47,2121,47] (A2)
Minimization of intraoperative (A2) and postoperative opioids[9,21,25,54,56–58] (A1)
Adequate hydration[261,325](A1)
Opiod sparing – NSAIDS, COX 2 inhibitors
Intra op ketamine has morphine sparing in post op

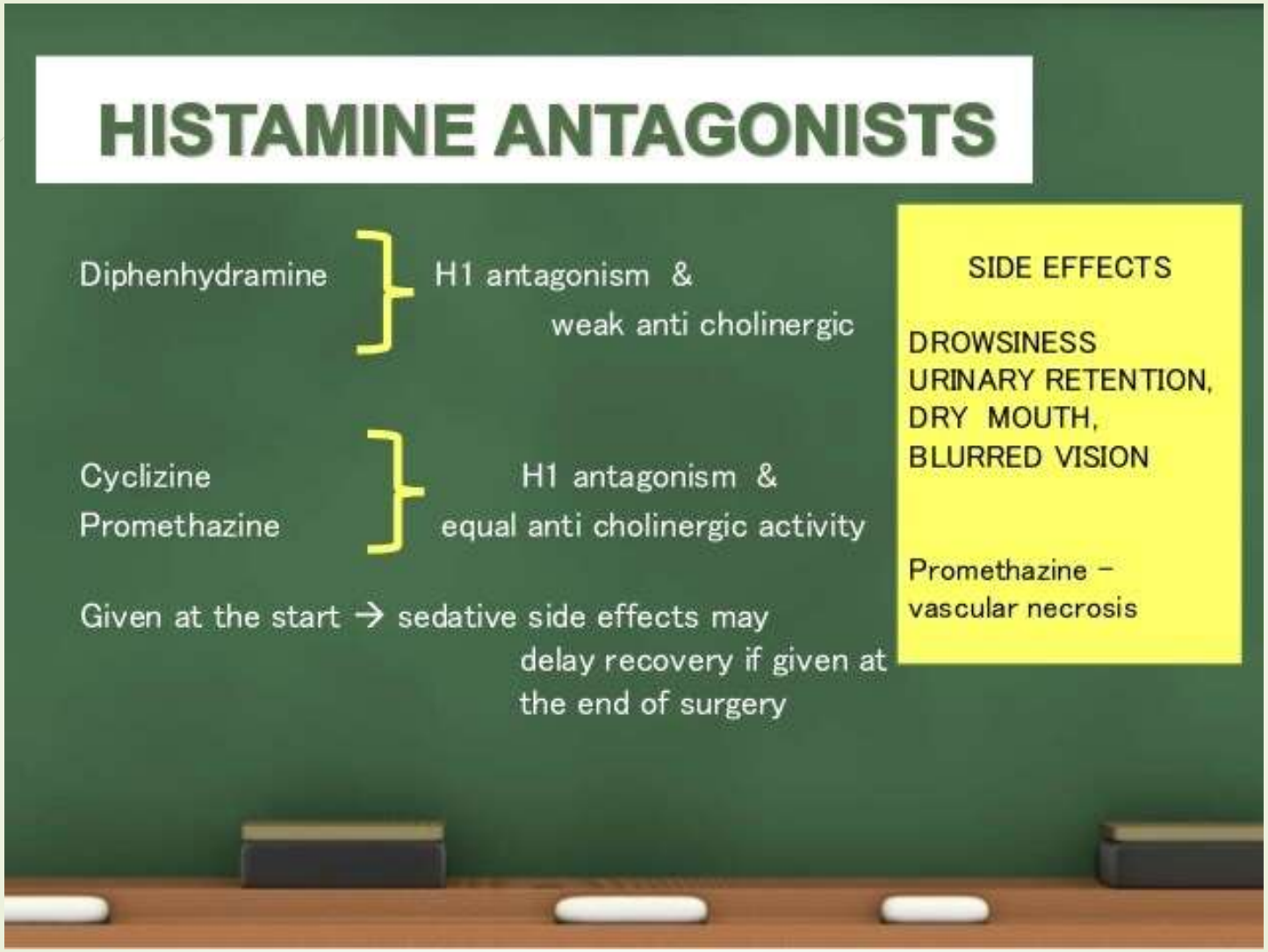

RULE OUT
HYPOTENSION
HYPOVOLAEMIA
INADEQUATE OXYGENATION
PAIN
TEMPERATURE – HYPOTHERMIA, OR PATIENT FEELS TOO WARM
INFECTION
HUNGER
POOR ORAL HYGIENE
FOUL OR UPSETTING SMELLS IN THE VICINITY OF THE PATIENT

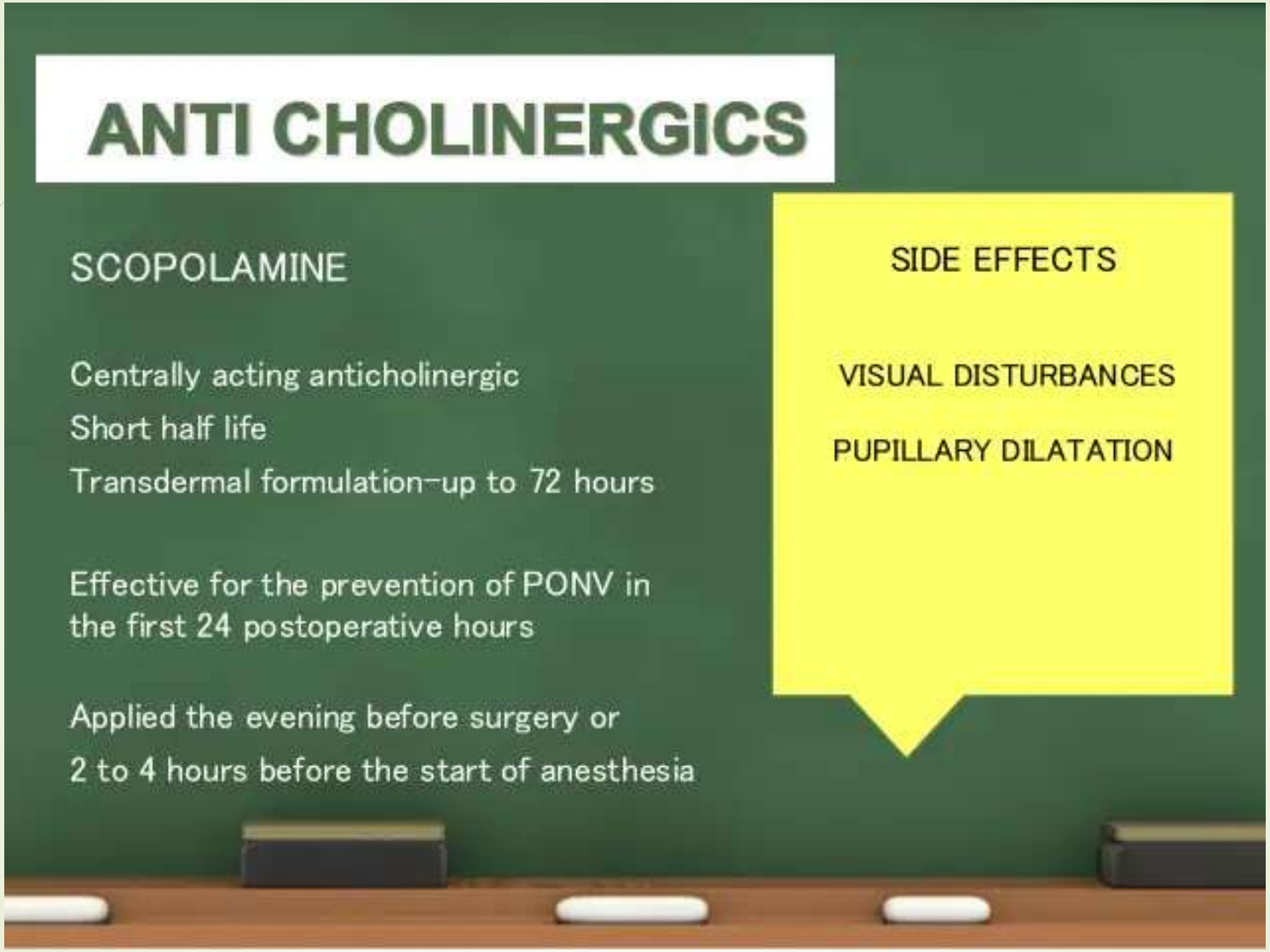

Guideline 3. Administer PONV Prophylaxis Using 1 to 2 Interventions in Adults at Moderate Risk for PONV

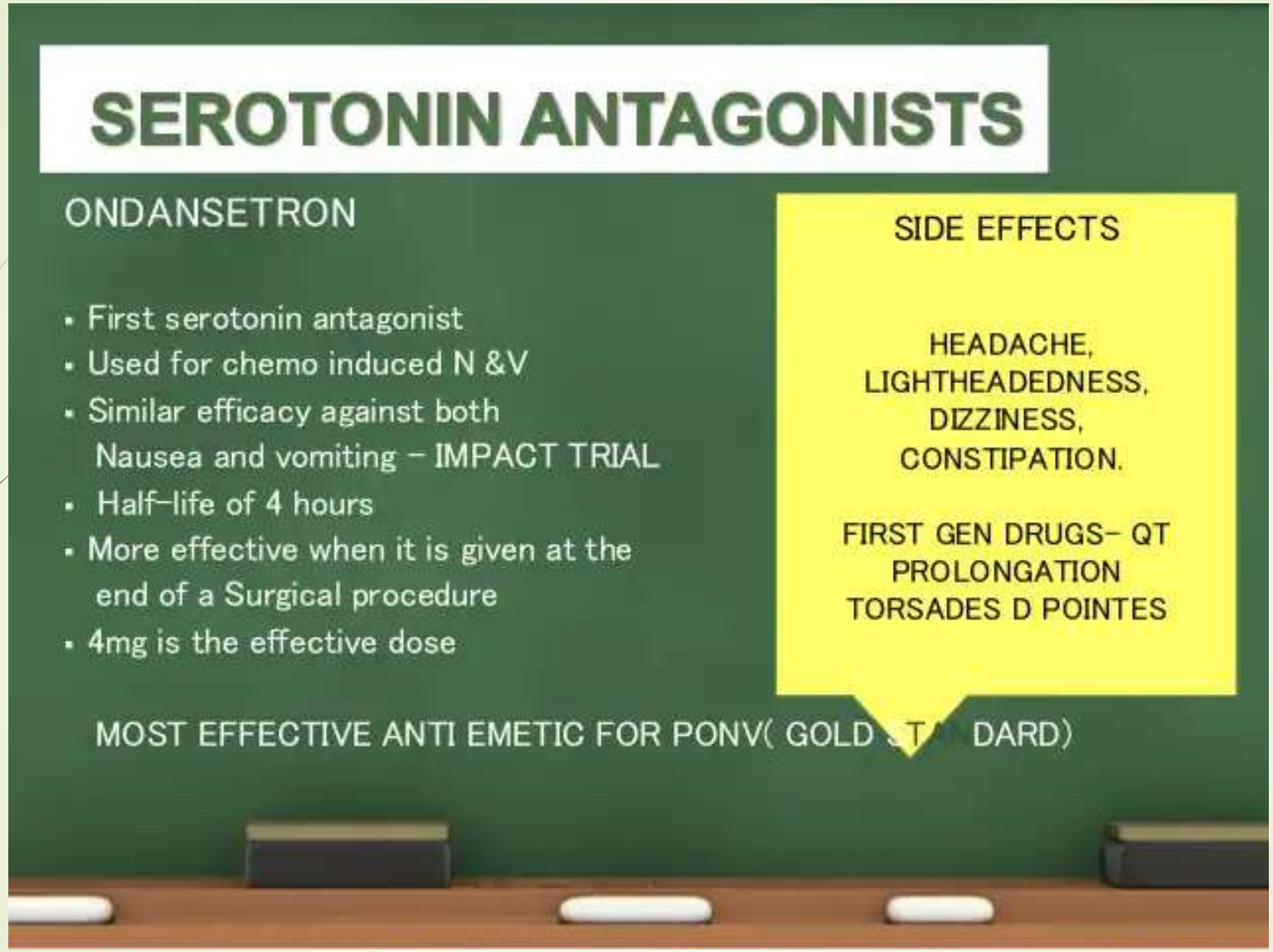

DOPAMINE ANTAGONISTS
METOCLOPRAMIDE
Anti dopaminergic
Phenothiazine
Weak anti emetic
Prokinetic
10 mg dose
25 mg or 50 mg more effective for PONV
SIDE EFFECTS
HYPOTENSION
TACHYCARDIA
EXTRAPYRAMIDAL SYMPTOMS

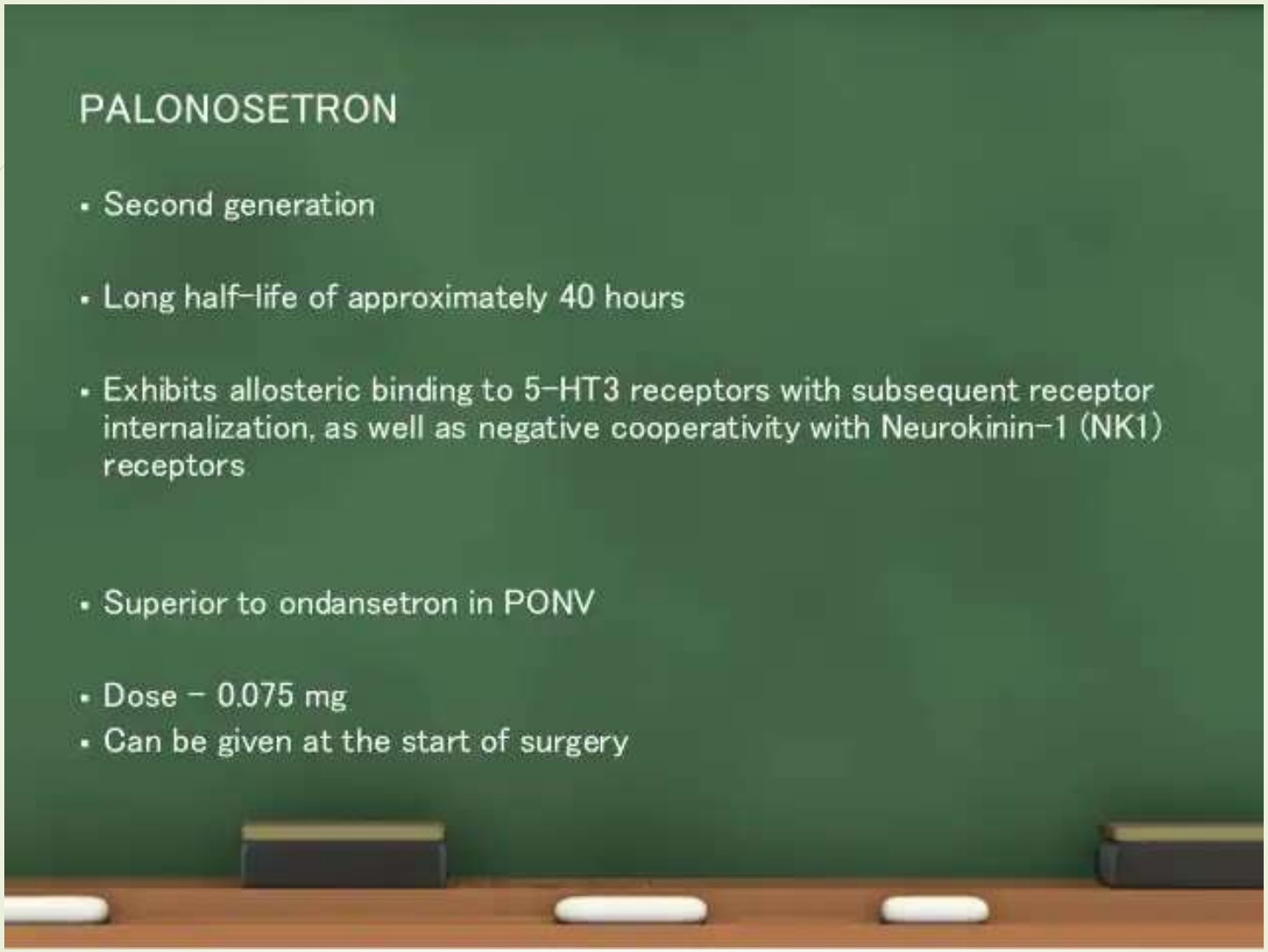

DROPERIDOL
• D2-antagonist
• Butyrophenones group
• 0.625 to 1.25 mg iv
• Similar efficacy against both nausea and vomiting
• Short t1/2 = 3 hrs
• Given at the end of the surgery At lowest dose of 0.625mg
• FDA Black Box warning
SIDE EFFECTS
ANXIETY AND RESTLESSNESS
AKATHISIA
DYSTONIA
TORSADES DE POINTES
DEATH

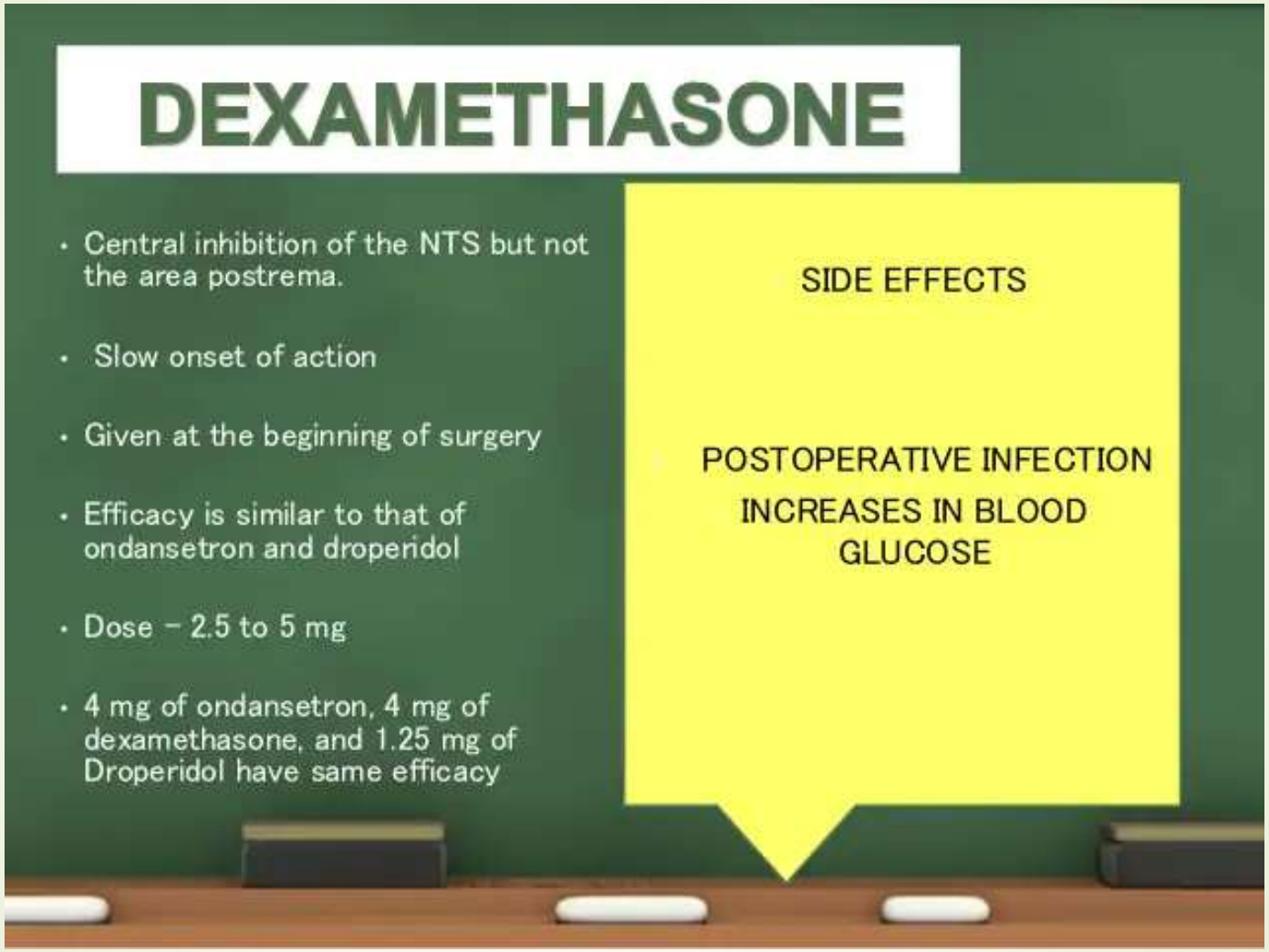

HALOPERIDOL
Efficacy similar to that of ondansetron
Cardiac arrhythmias and death reported
Approved only for intramuscular administration
0.5 to 2 mg IM

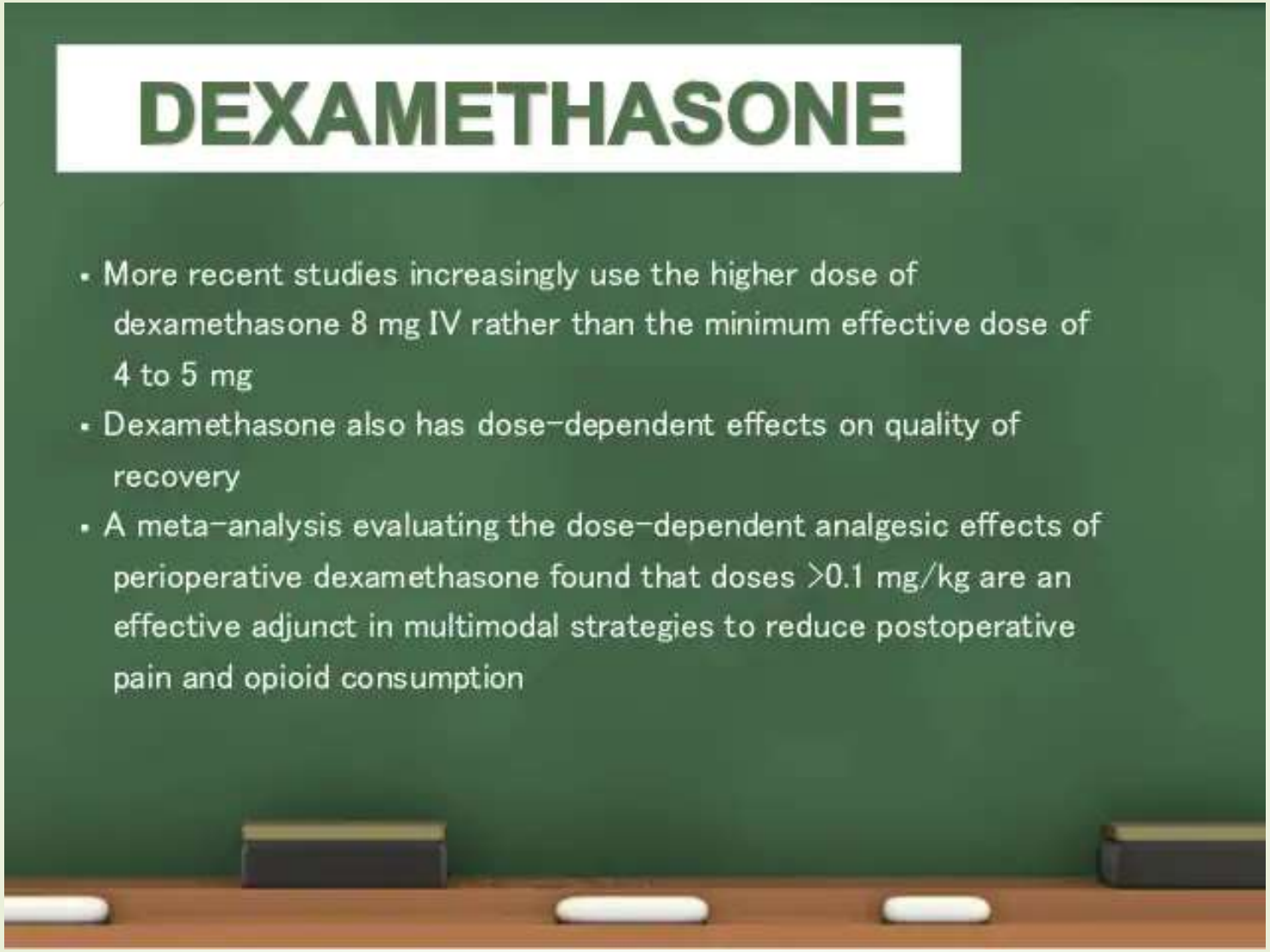

HISTAMINE ANTAGONISTS
Diphenhydramine
H1 antagonism &
weak anti cholinergic
Cyclizine
Promethazine
H1 antagonism &
equal anti cholinergic activity
Given at the start → sedative side effects may
delay recovery if given at
the end of surgery
SIDE EFFECTS
DROWSINESS
URINARY RETENTION,
DRY MOUTH,
BLURRED VISION
Promethazine –
vascular necrosis

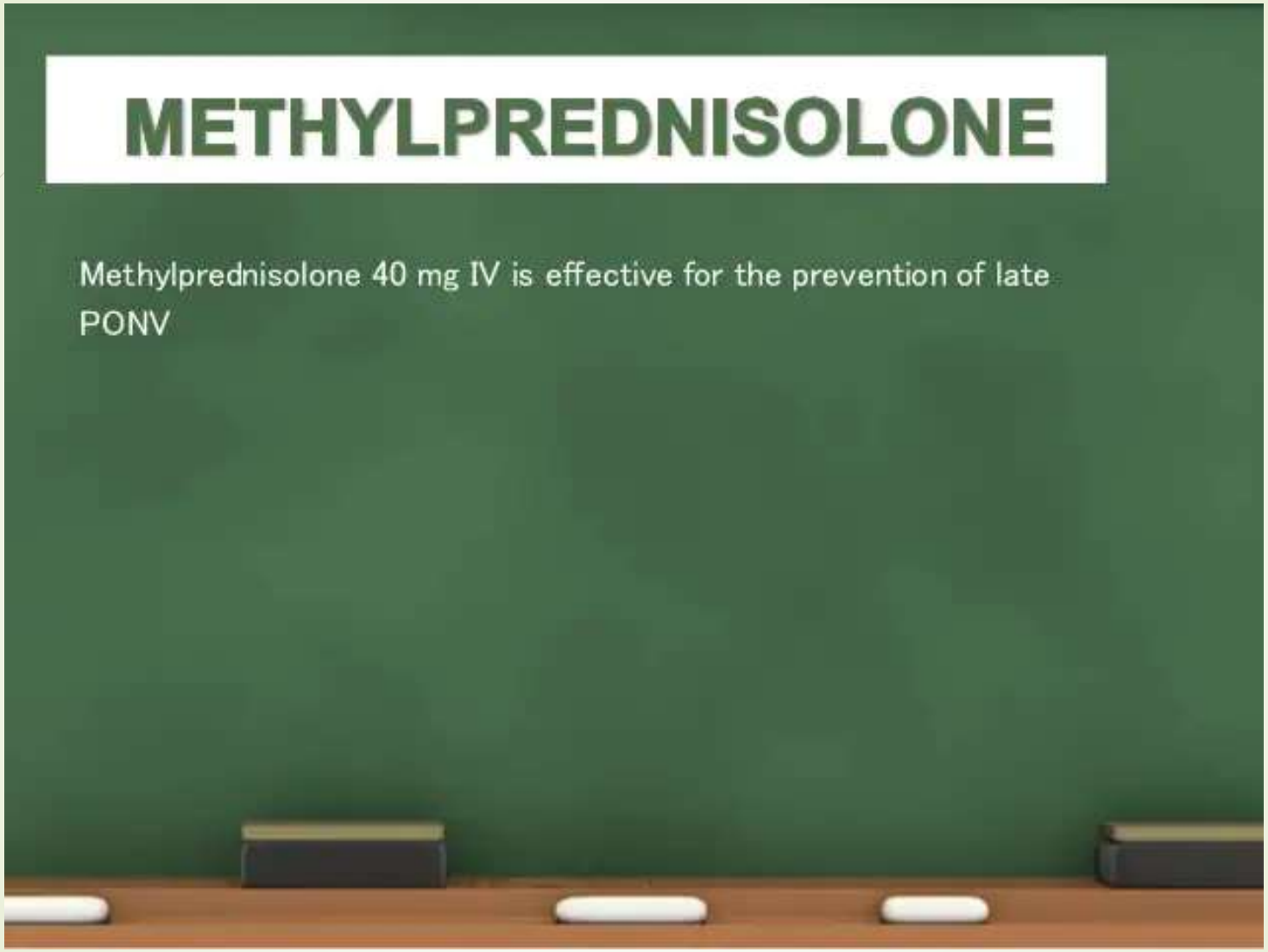

ANTI CHOLINERGICS
SCOPOLAMINE
Centrally acting anticholinergic
Short half life
Transdermal formulation–up to 72 hours
Effective for the prevention of PONV in the first 24 postoperative hours
Applied the evening before surgery or 2 to 4 hours before the start of anesthesia
SIDE EFFECTS
VISUAL DISTURBANCES
PUPILLARY DILATATION

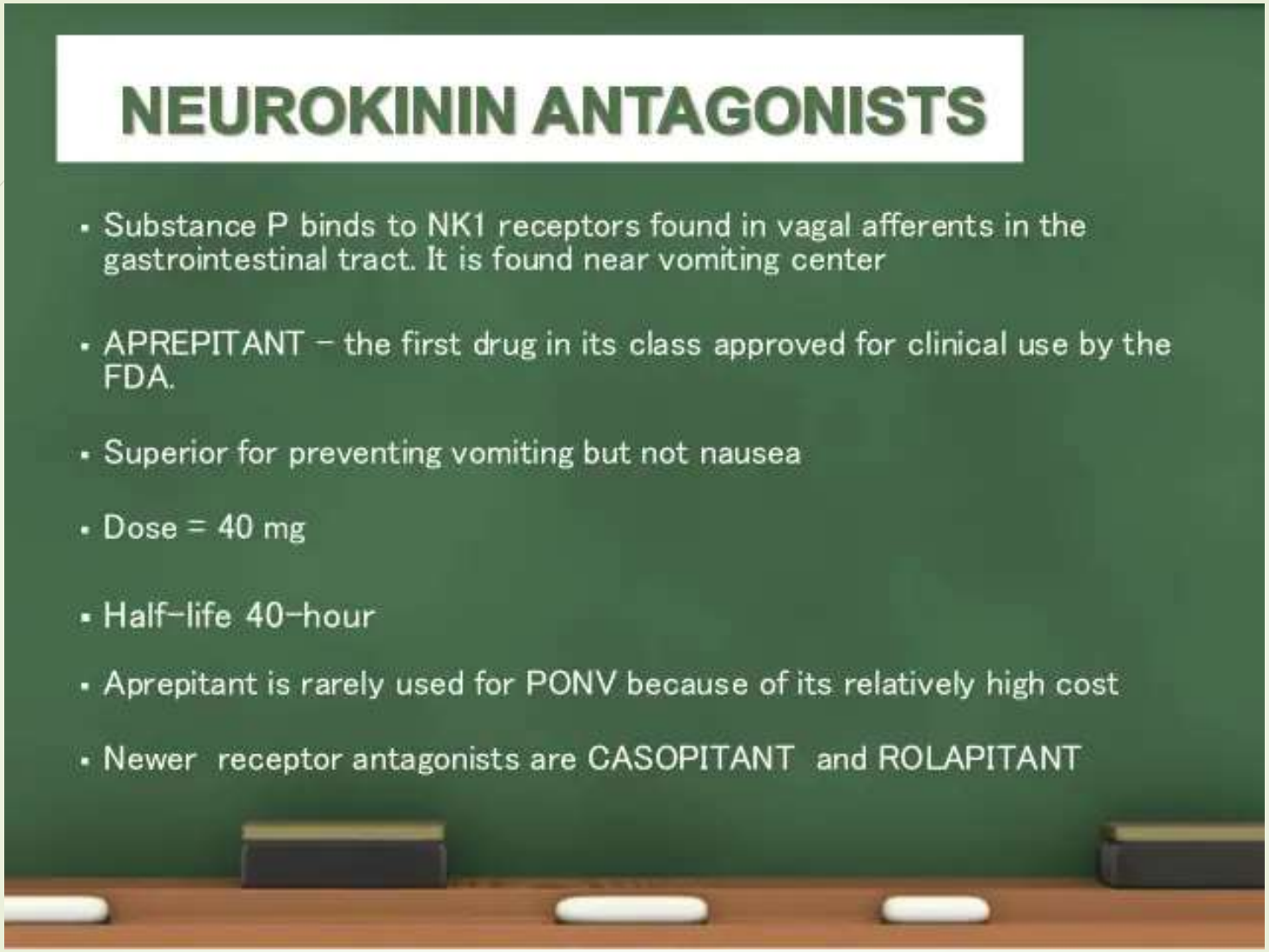

SEROTONIN ANTAGONISTS
ONDANSETRON
First serotonin antagonist
Used for chemo induced N &V
Similar efficacy against both Nausea and vomiting – IMPACT TRIAL
Half-life of 4 hours
More effective when it is given at the end of a Surgical procedure
4mg is the effective dose
SIDE EFFECTS
HEADACHE, LIGHTHEADEDNESS, DIZZINESS, CONSTIPATION.
FIRST GEN DRUGS- QT PROLONGATION TORSADES D POINTES
MOST EFFECTIVE ANTI EMETIC FOR PONV(GOLD

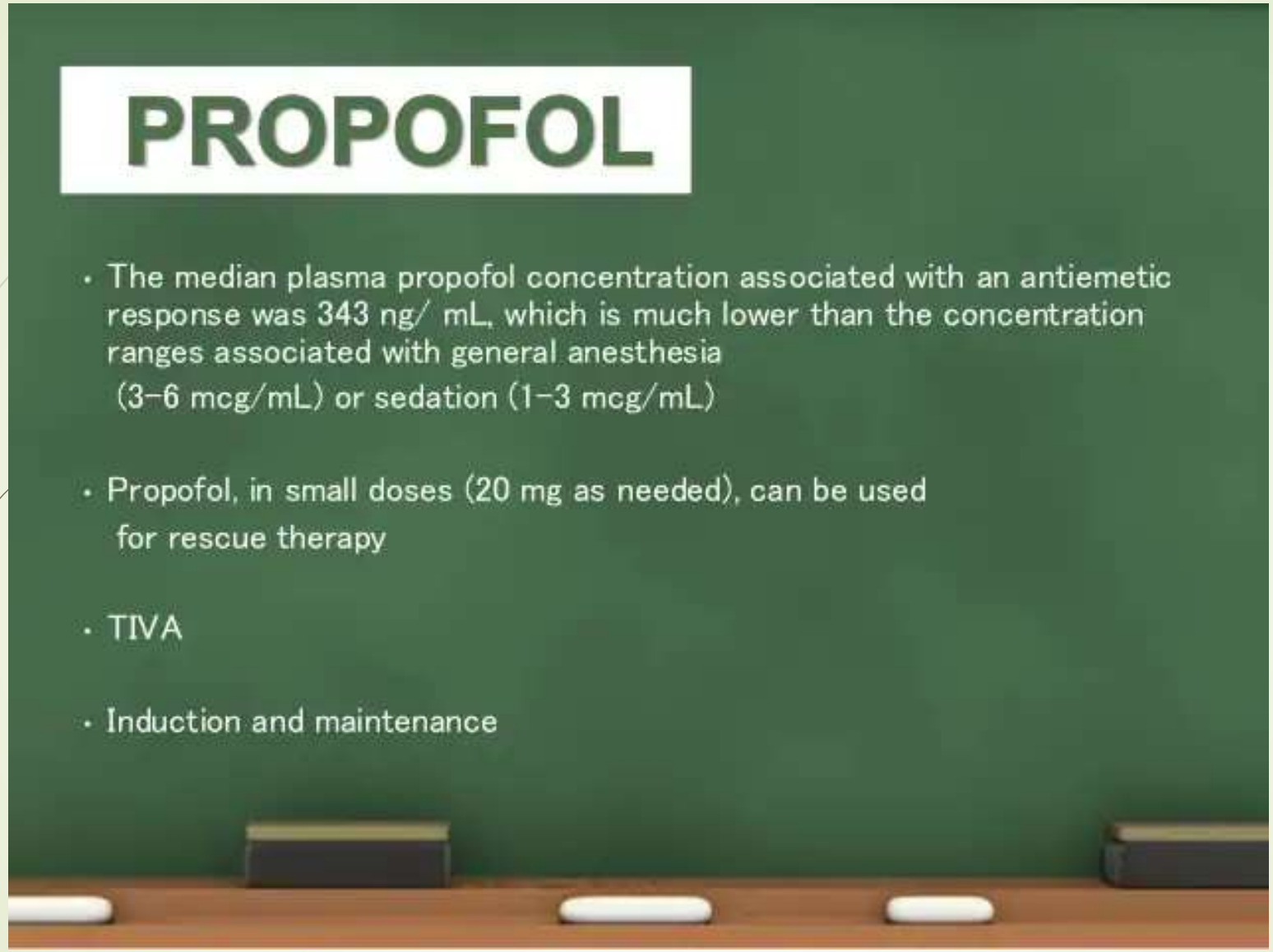

PALONOSETRON
• Second generation
• Long half-life of approximately 40 hours
• Exhibits allosteric binding to 5-HT3 receptors with subsequent receptor internalization, as well as negative cooperativity with Neurokinin-1 (NK1) receptors
• Superior to ondansetron in PONV
• Dose – 0.075 mg
• Can be given at the start of surgery

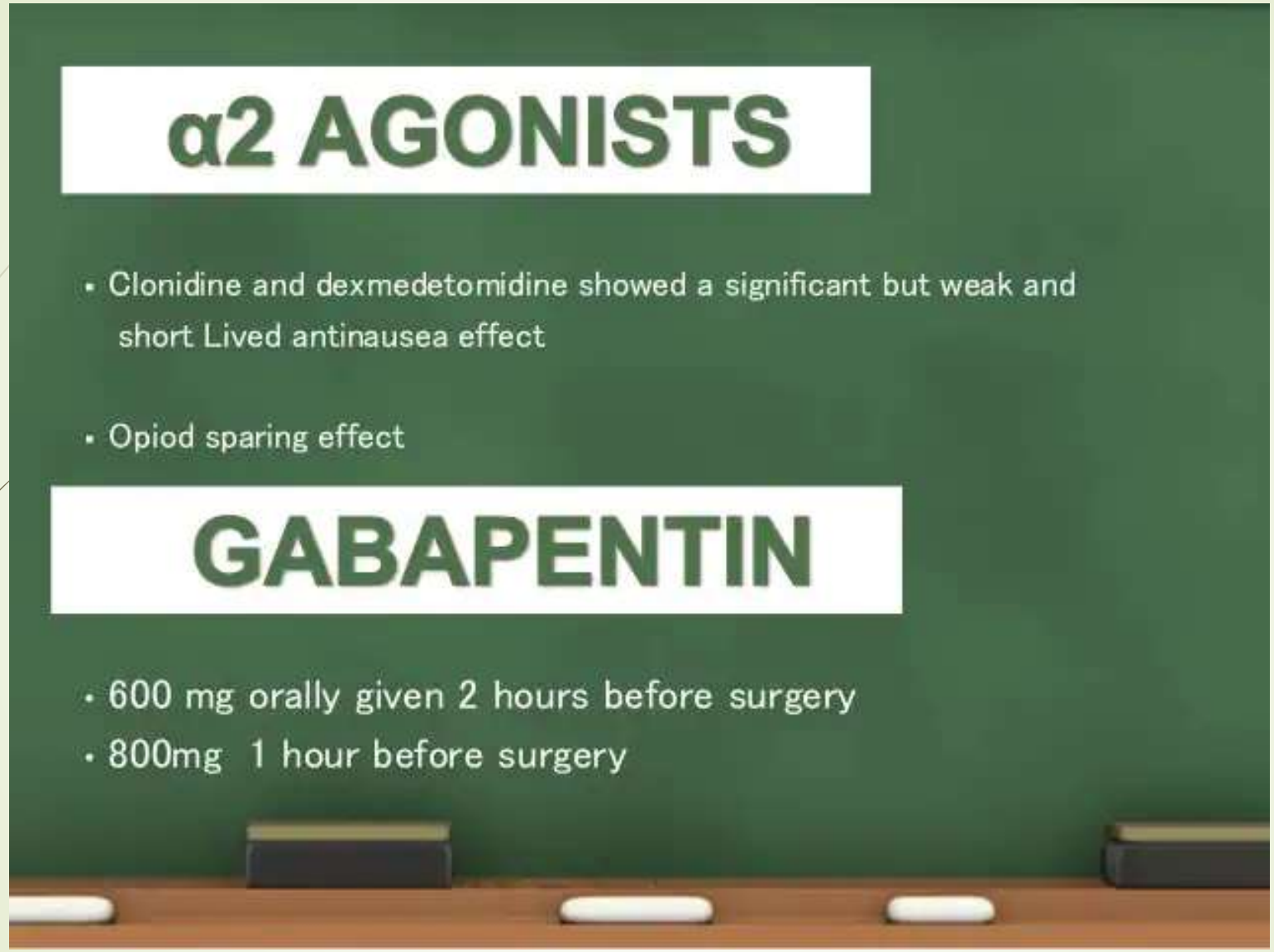

DEXAMETHASONE
• Central inhibition of the NTS but not the area postrema.
• Slow onset of action
• Given at the beginning of surgery
• Efficacy is similar to that of ondansetron and droperidol
• Dose – 2.5 to 5 mg
• 4 mg of ondansetron, 4 mg of dexamethasone, and 1.25 mg of Droperidol have same efficacy
SIDE EFFECTS
POSTOPERATIVE INFECTION
INCREASES IN BLOOD GLUCOSE

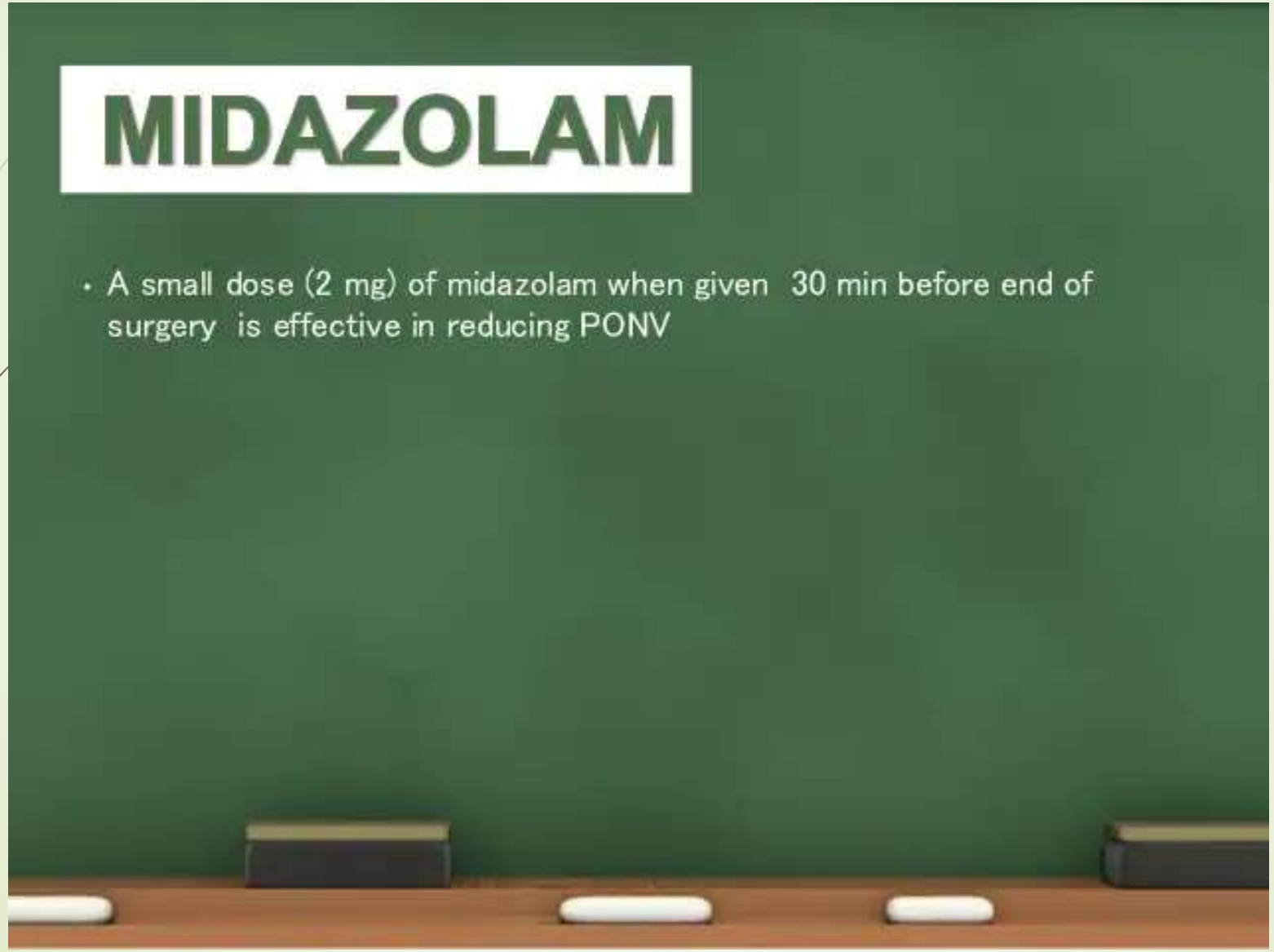

DEXAMETHASONE
• More recent studies increasingly use the higher dose of dexamethasone 8 mg IV rather than the minimum effective dose of 4 to 5 mg
• Dexamethasone also has dose-dependent effects on quality of recovery
• A meta-analysis evaluating the dose-dependent analgesic effects of perioperative dexamethasone found that doses >0.1 mg/kg are an effective adjunct in multimodal strategies to reduce postoperative pain and opioid consumption

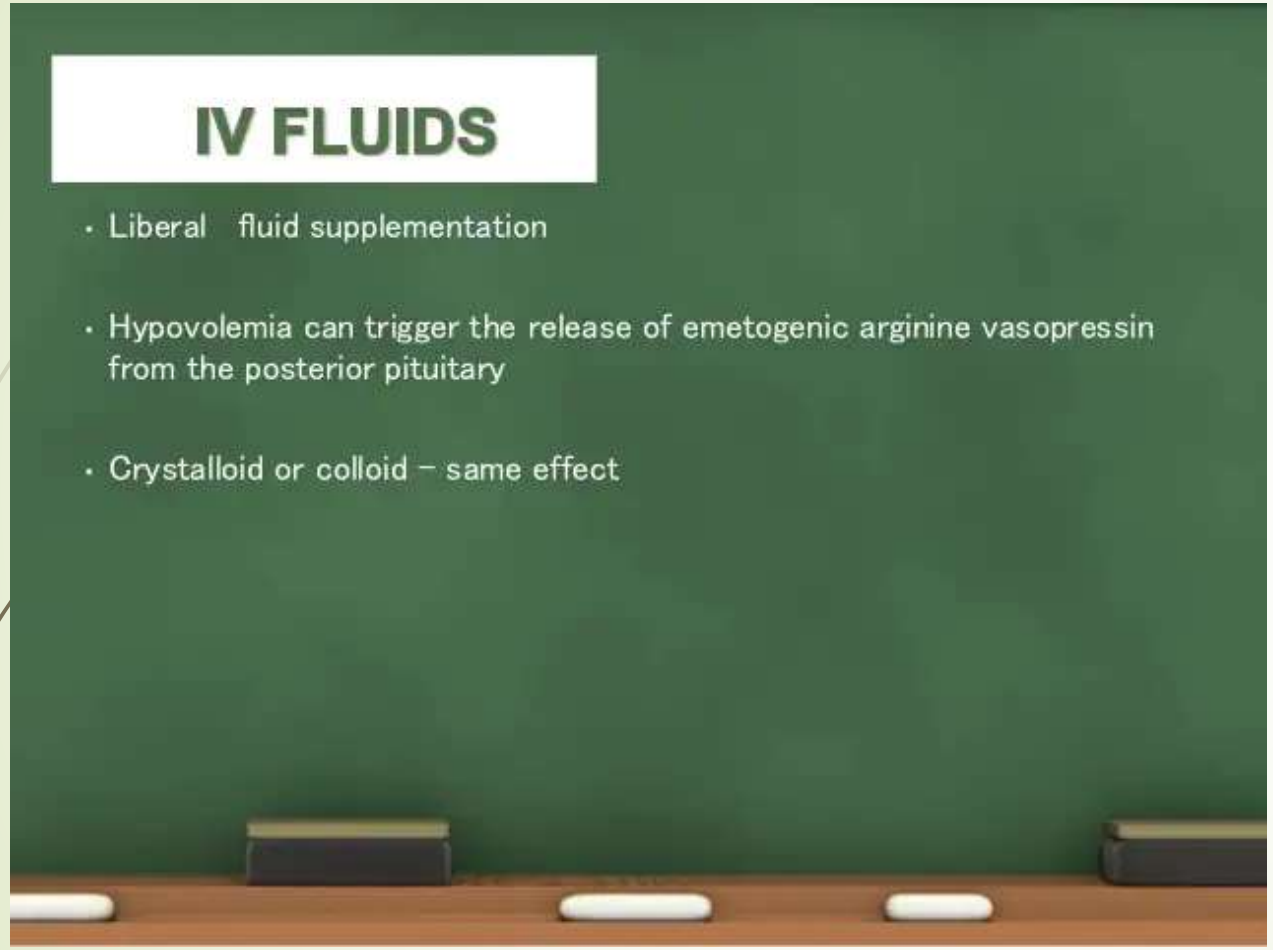

METHYLPREDNISOLONE
Methylprednisolone 40 mg IV is effective for the prevention of late PONV


NEUROKININ ANTAGONISTS
• Substance P binds to NK1 receptors found in vagal afferents in the gastrointestinal tract. It is found near vomiting center
• APREPITANT – the first drug in its class approved for clinical use by the FDA.
• Superior for preventing vomiting but not nausea
• Dose = 40 mg
• Half-life 40-hour
• Aprepitant is rarely used for PONV because of its relatively high cost
• Newer receptor antagonists are CASOPITANT and ROLAPITANT

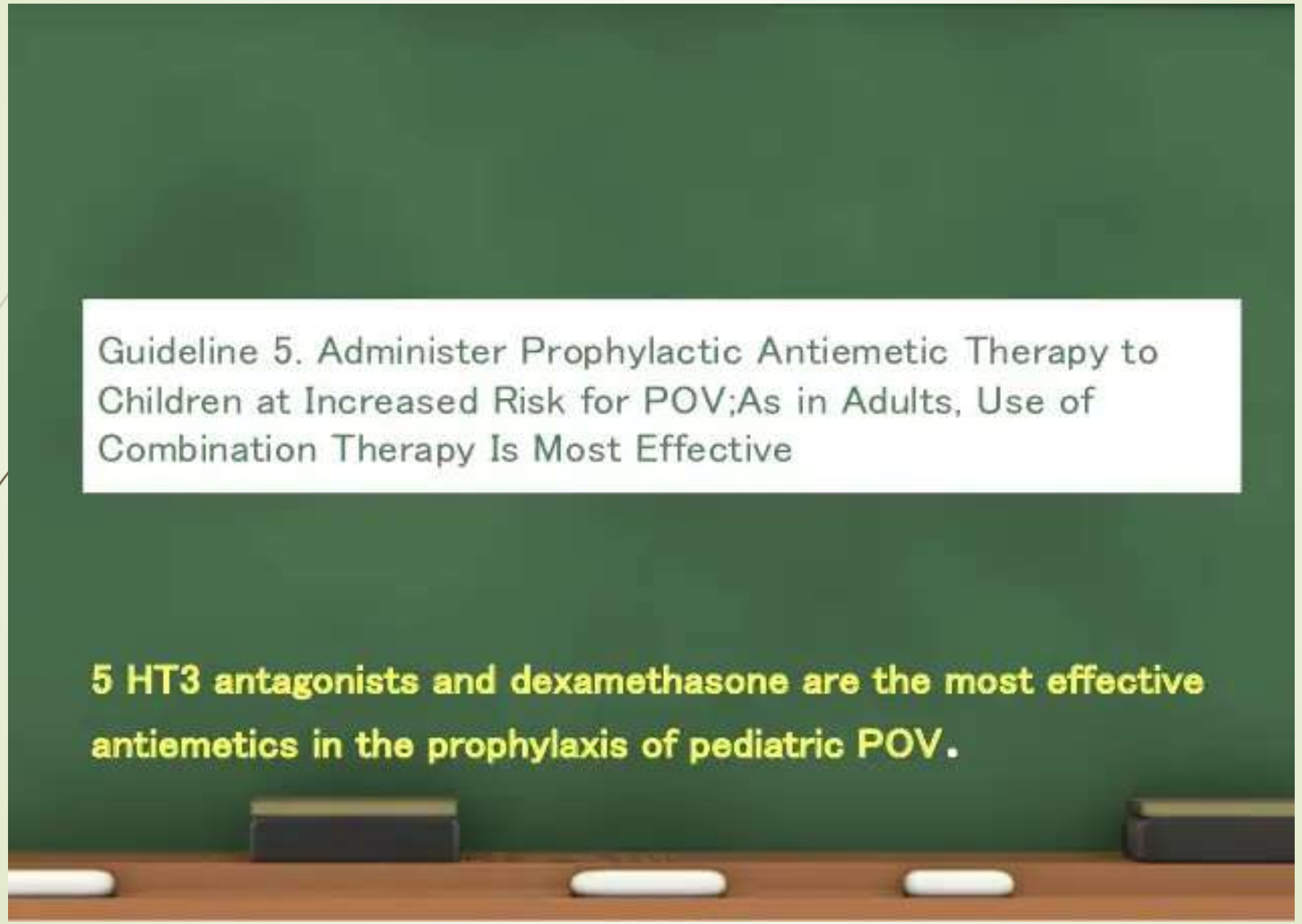

PROPOFOL
• The median plasma propofol concentration associated with an antiemetic response was 343 ng/ mL, which is much lower than the concentration ranges associated with general anesthesia (3–6 mcg/mL) or sedation (1–3 mcg/mL)
• Propofol, in small doses (20 mg as needed), can be used for rescue therapy
• TIVA
• Induction and maintenance


α2 AGONISTS
• Clonidine and dexmedetomidine showed a significant but weak and short Lived antinausea effect
• Opiod sparing effect
GABAPENTIN
• 600 mg orally given 2 hours before surgery
• 800mg 1 hour before surgery

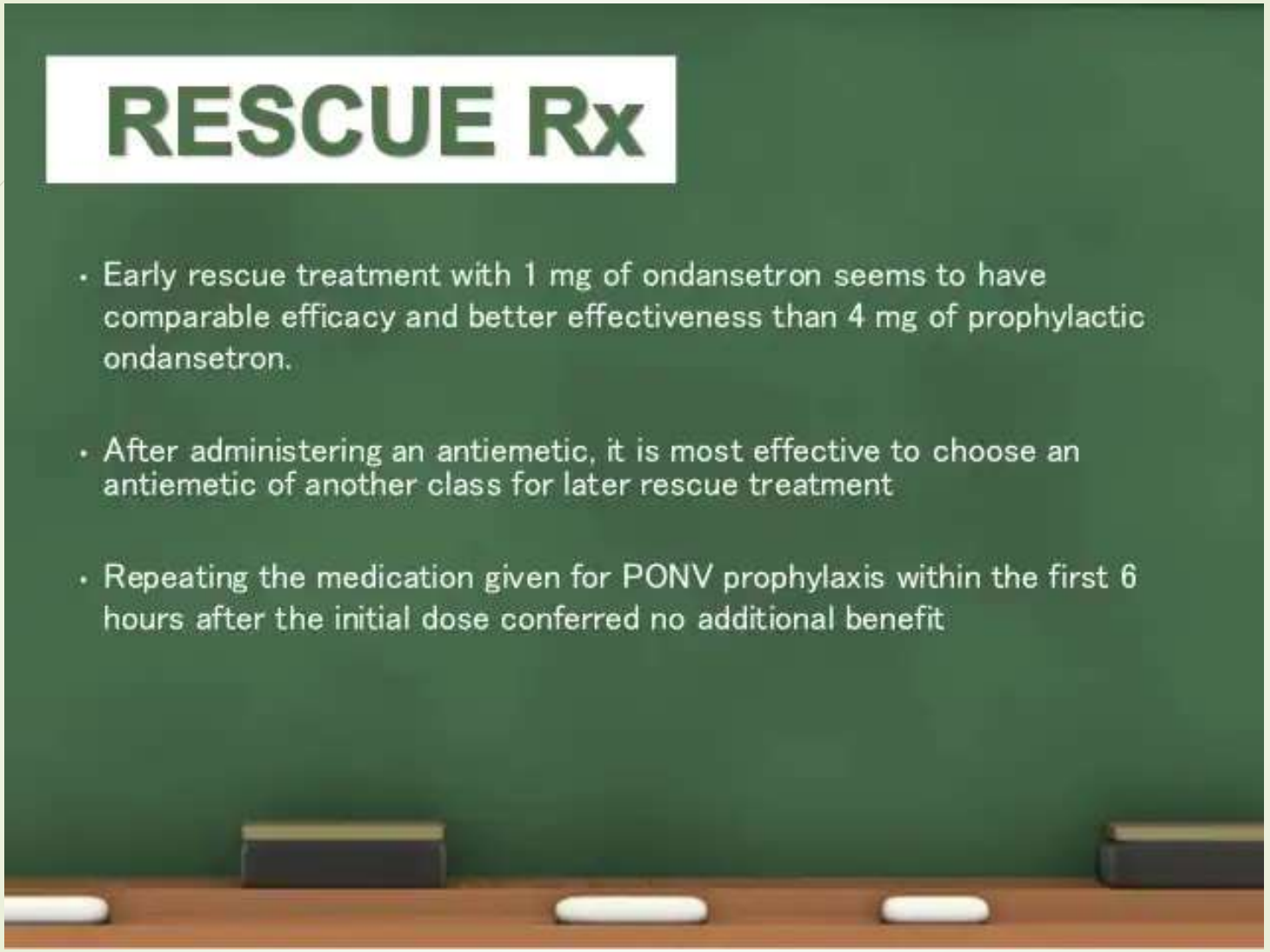

MIDAZOLAM
• A small dose (2 mg) of midazolam when given 30 min before end of surgery is effective in reducing PONV

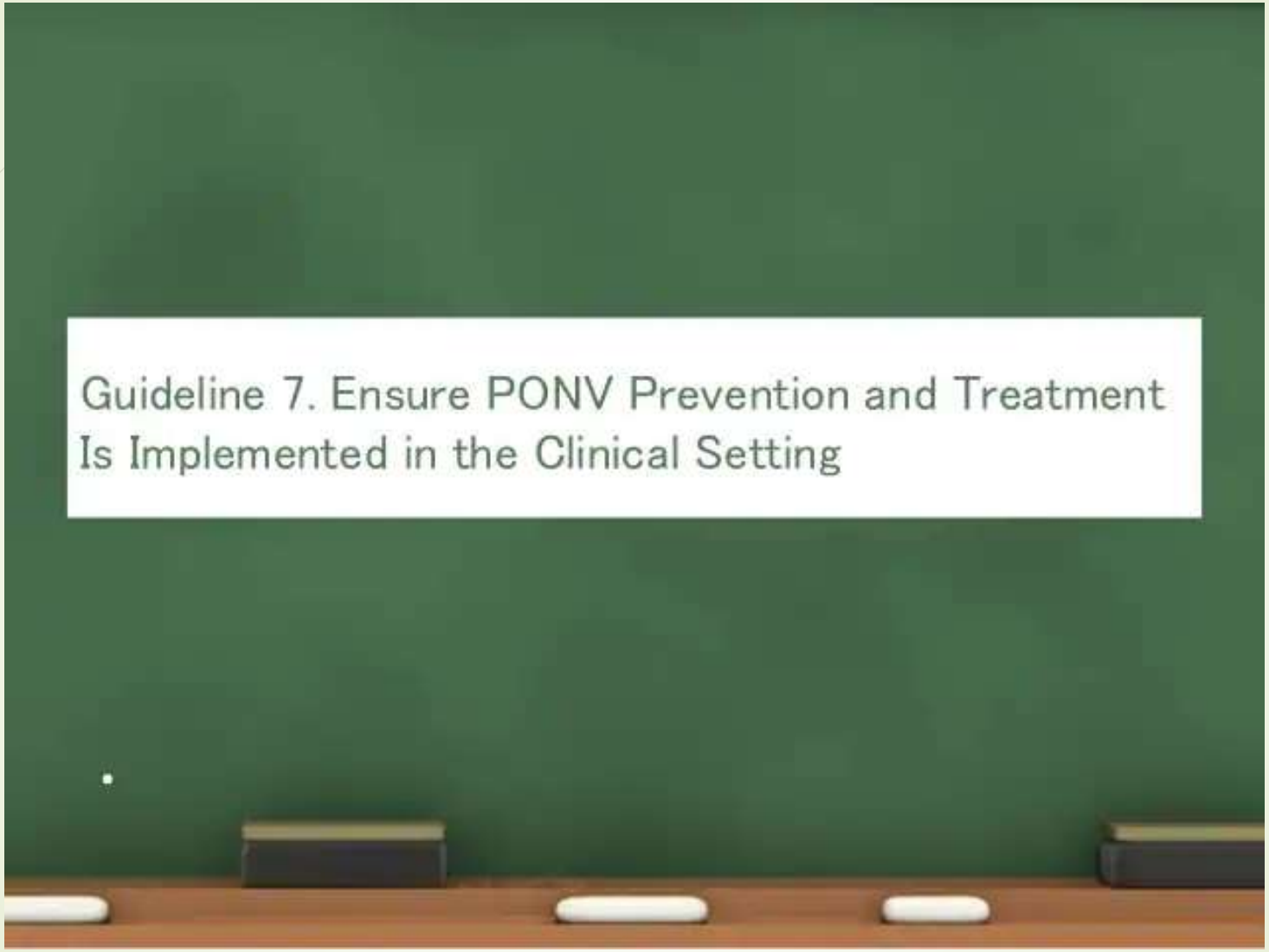

IV FLUIDS
• Liberal fluid supplementation
• Hypovolemia can trigger the release of emetogenic arginine vasopressin from the posterior pituitary
• Crystalloid or colloid – same effect

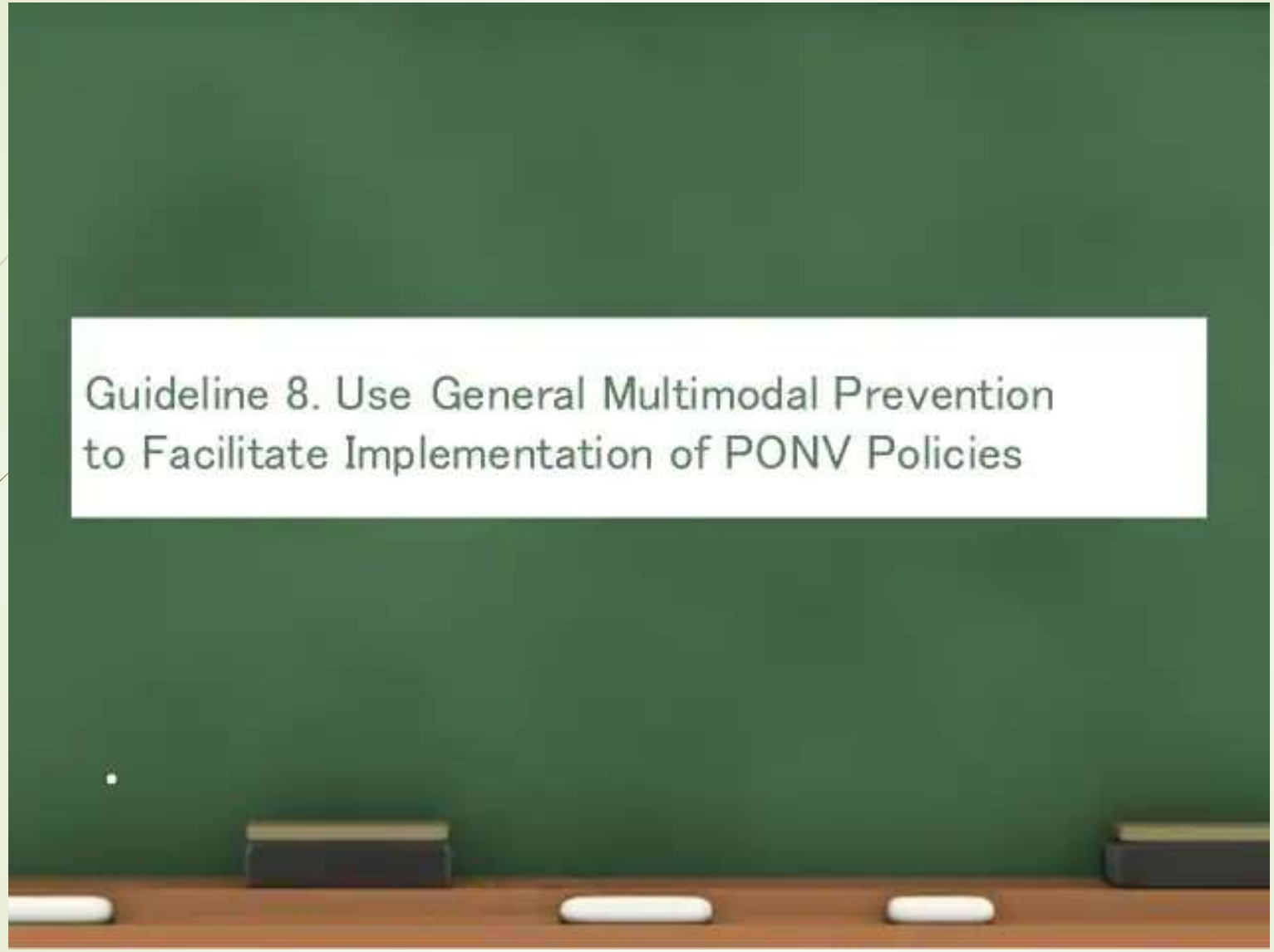

Guideline 4. Administer Prophylactic Therapy With Combination (≥2) Interventions/Multimodal Therapy in Patients at High Risk for PONV


Guideline 5. Administer Prophylactic Antiemetic Therapy to Children at Increased Risk for POV;As in Adults, Use of Combination Therapy Is Most Effective
5 HT3 antagonists and dexamethasone are the most effective antiemetics in the prophylaxis of pediatric POV.


Guideline 6. Provide Antiemetic Treatment to Patients With PONV who did not Receive Prophylaxis or in whom Prophylaxis Failed


RESCUE Rx
• Early rescue treatment with 1 mg of ondansetron seems to have comparable efficacy and better effectiveness than 4 mg of prophylactic ondansetron.
• After administering an antiemetic, it is most effective to choose an antiemetic of another class for later rescue treatment
• Repeating the medication given for PONV prophylaxis within the first 6 hours after the initial dose conferred no additional benefit


Guideline 7. Ensure PONV Prevention and Treatment
Is Implemented in the Clinical Setting


Guideline 8. Use General Multimodal Prevention
to Facilitate Implementation of PONV Policies

THANKS FOR ATTENTION