

Management of Post-Operative Nausea and Vomiting

UNIVERSITY
OF MIAMI



**Miller School of Medicine Academic
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**Christopher A. Fanelli DDS – OMFS
Resident Surgeon**

Disclosure

The following for profit relationships in the past twelve months, by presenter or spouse/partner are related to this presentation:

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- “To study the phenomena of disease without books is to sail an uncharted sea, while to study books without patients is not to go to sea at all.” - *William Osler*

Presentation Objective

Understanding PONV

Patient Analysis - Risk Factors
for Prevention

Decisive Treatment

Key Terminology
Physiological
Mechanism



Patient Specific
Surgically Specific
Anesthesia Specific



Prevention and
Treatment of
PONV

Why is PONV Important?

1. Patients Don't Like It

Postoperative Outcomes Least Preferred by Patients

Rank	Postoperative Outcomes
1	Vomiting
2	Gagging on endotracheal tube
3	Incisional pain
4	Nausea
5	Recall without pain
6	Residual weakness
7	Shivering
8	Sore throat
9	Somnolence

Data from a survey of adult patients (N=101) conducted at Stanford University Medical Center. Patients were eligible if they were scheduled to undergo surgery at the center. Patients were asked to rank-order 10 possible postoperative outcomes from most to least desirable. *F*-test <0.01.

2. Complicating Medical Problems Associated With PONV

Aspiration of Gastric Contents

- Airway Compromise
- Aspiration Pneumonitis, Acute lung injury

Bleeding and Surgical Wound Dehiscence

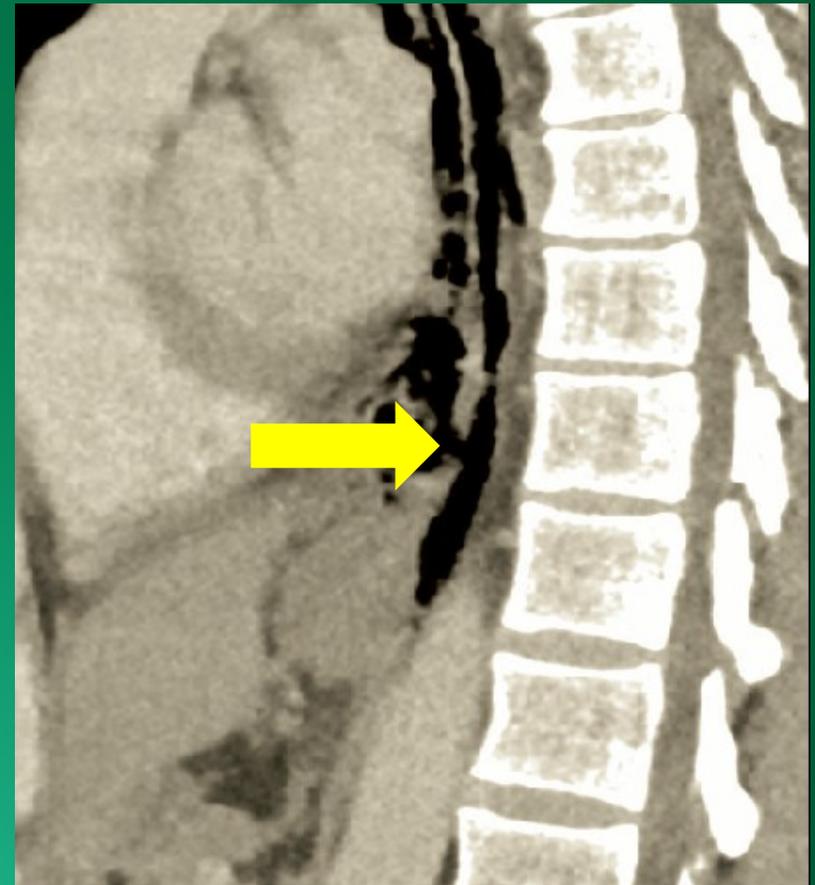
Electrolyte Imbalances and Fluid Loss

Boerhaave Syndrome

Increases ICP – Cerebral Injuries

Risk for Myocardial Infarction and Dysrhythmias

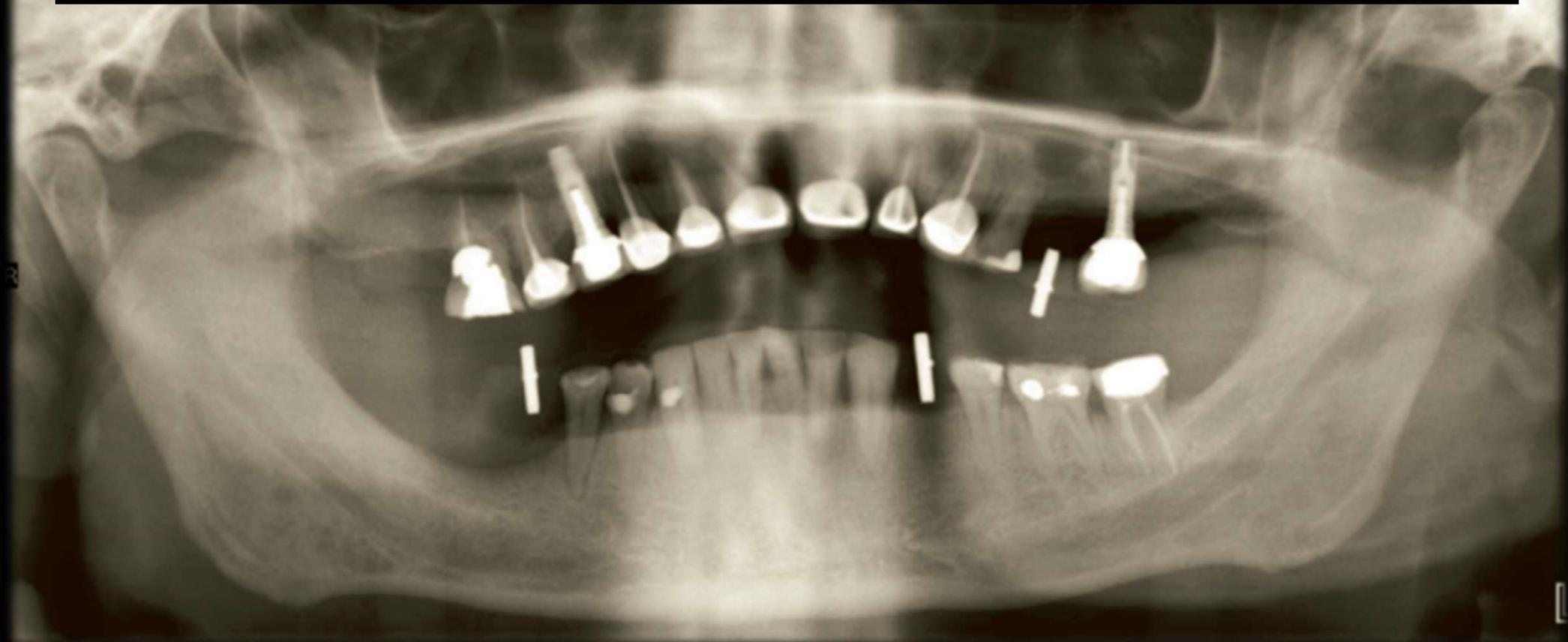
Surgical Factors: Hardware loosening, Anastomosis, intraocular pressure





A WORST CASE SCENARIO

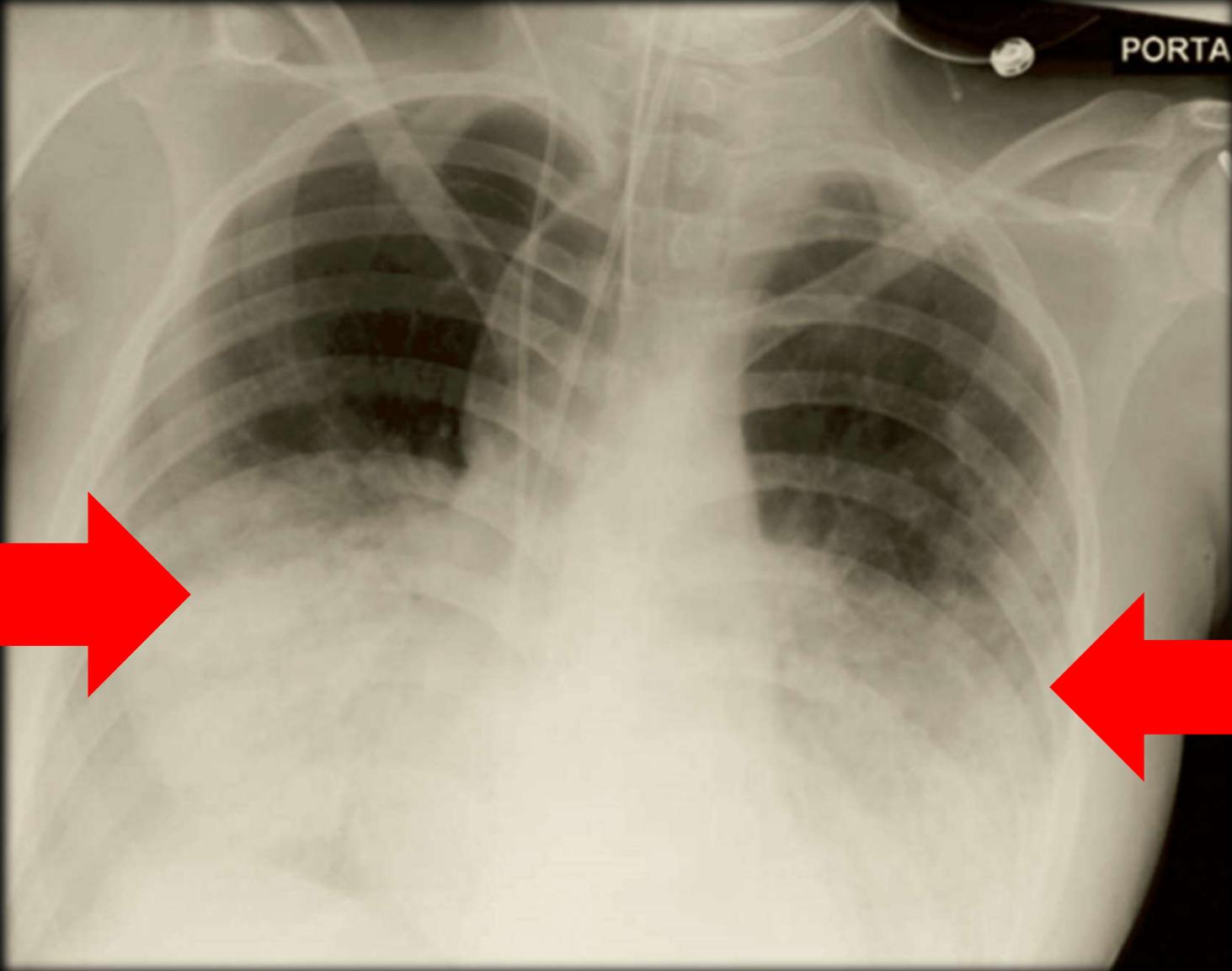
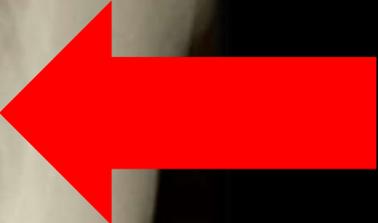
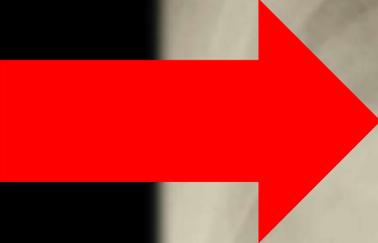
**76 y.o. Man for Implant Placement: #13, 21, 30
with Simultaneous Left Sinus Lift**



3x



PORTAL



3. A Very Common Problem: PONV

Prevalence: 25-30% of ALL Surgical Patients without prophylaxis will Experience Nausea and/or Vomiting Post-operatively

Of these – about 30% of patients experience vomiting and close to 70% of all patients experience Nausea

Patient's with multiple risk factors – the Incidence of new cases high as 70-80%

Multiple studies have cited PONV as the #1 reason for unplanned admissions and second most common reason for Delay in discharging patients

Precise Definitions

Precise Terminology -> Understanding -> Diagnoses -> Treatment

Vomiting: Forceful Oral Expulsion of Gastric Contents Associated with Contraction of Abdominal and Chest wall Musculature

Retching: Contraction of Abdominal and Chest wall Musculature Without Oral Expulsion of Gastric Contents

Nausea: The unpleasant sensation of imminent need to vomit, Usually referred to throat or epigastrium; a sensation that may or May not ultimately lead to the act of Vomiting

- One or More of the Above Three Must Occur Within 2 Days Post-op.

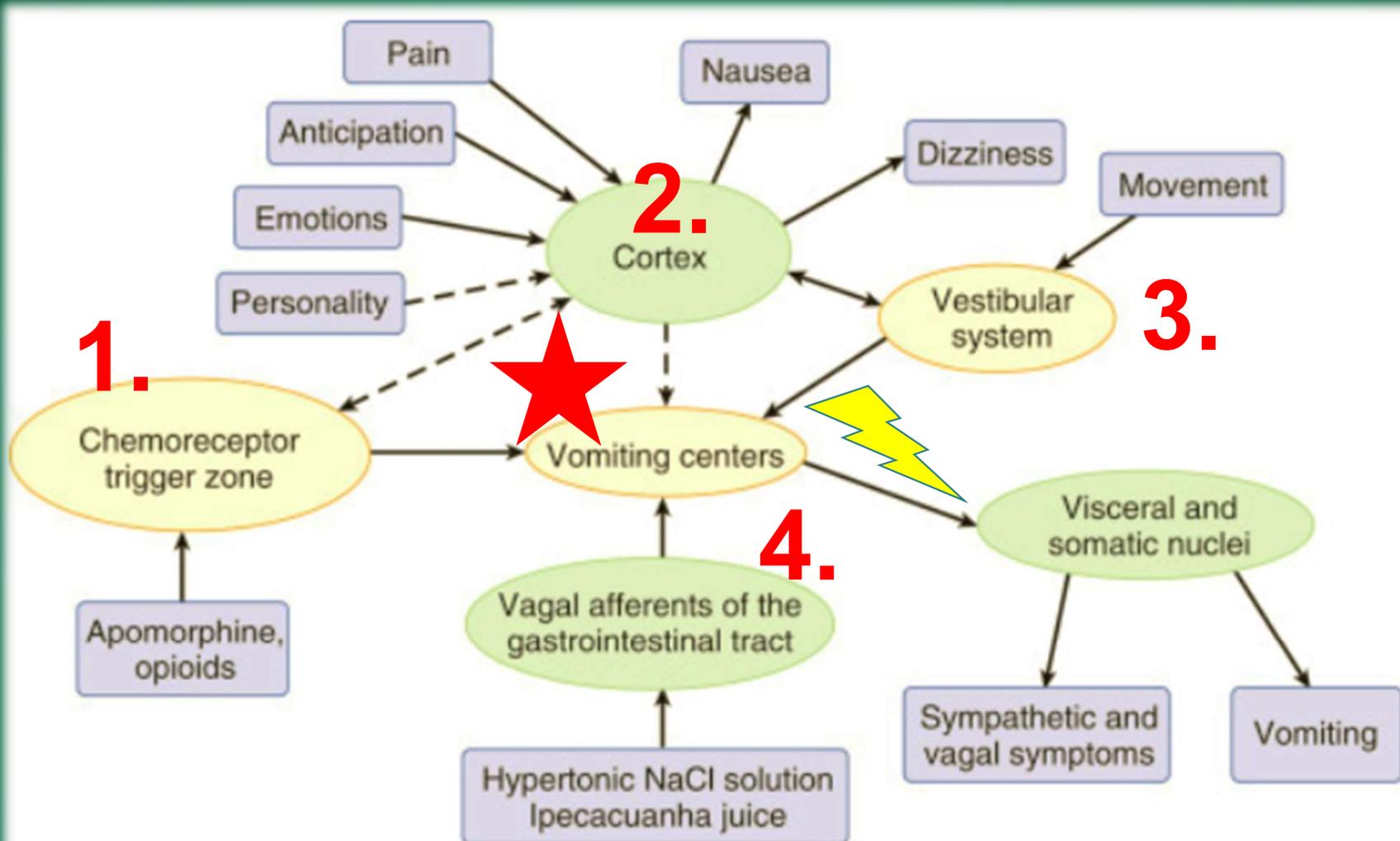


Figure 97-1

Pathways for nausea and vomiting. *Dotted lines* are hypothetical pathways with only indirect

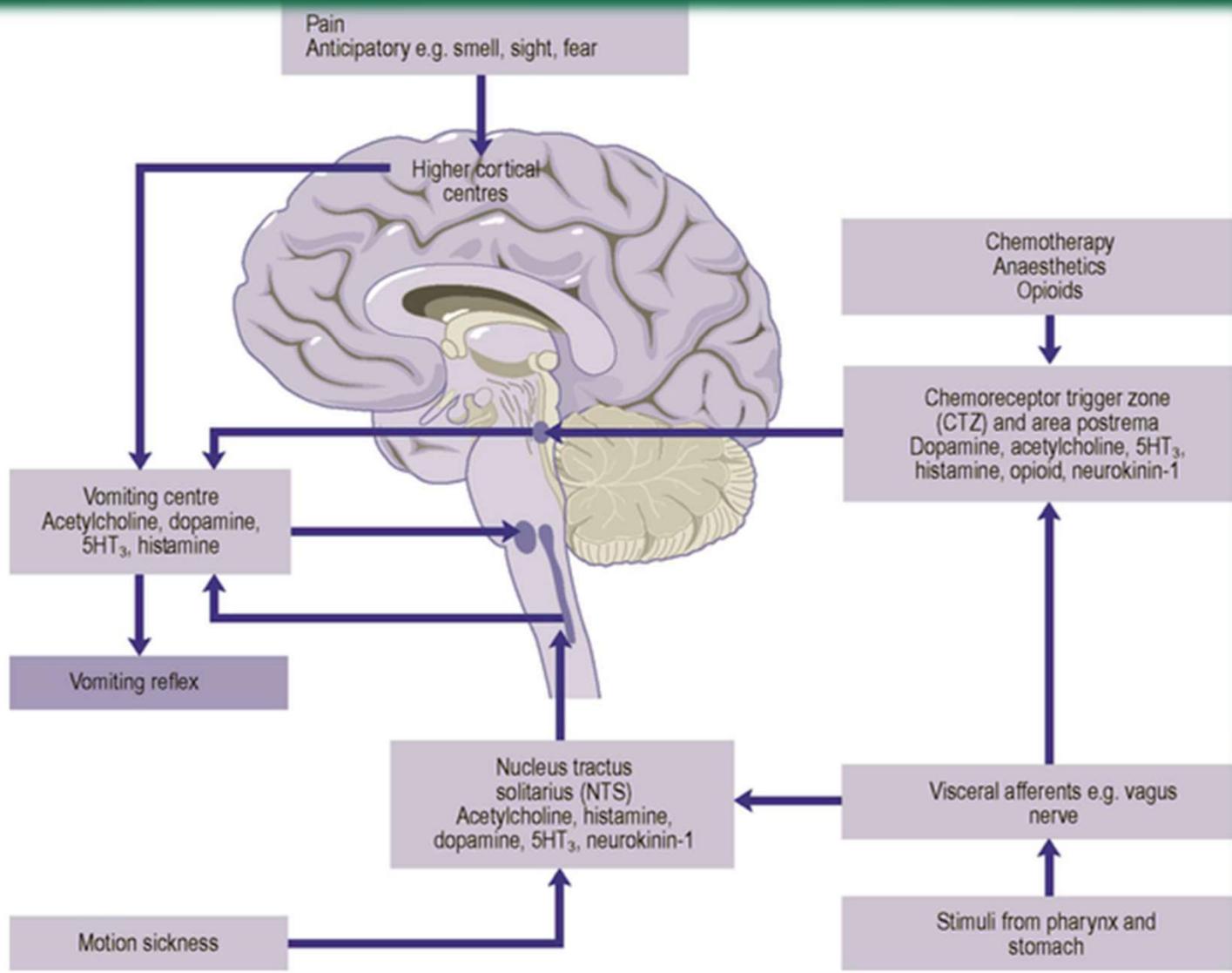


Fig. 34.1 Schematic representation of pathways involved in nausea and vomiting

Presentation Objective

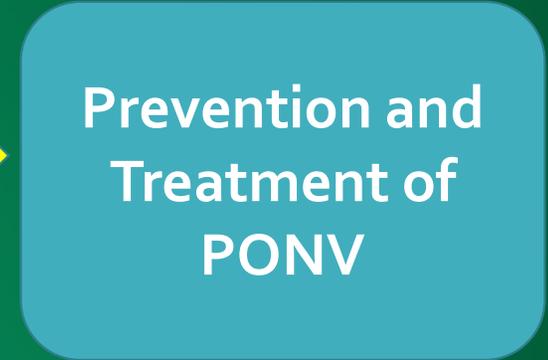
Understanding PONV



Patient Analysis - Risk Factors
for Prevention



Decisive Treatment



Patient Specific Risk Factors:

1. Female Gender
2. Non-Smokers
3. Previous History PONV and/or Motion Sickness and Migraines
4. Age: Patients < 50 years old – higher risk
5. Anxiety disorder



Anesthesia Specific Risk Factors:

General anesthesia is associated with an 11-fold increased risk of PONV. Frequently caused by the emetic properties of volatile anesthetics and the opioids administered

- 1. Post-operative Opioid Administration**
- 2. Volatile Anesthetics – Sevoflurane, Desflurane, Isoflurane**
- 3. Nitrous Oxide – Additive Effect**
- 4. Duration of anesthesia - >120 mins**



High Yield Chart PONV Causes From ASA

Box 1

Possible causes of PONV

- Pain
- Hypotension
- Hypoxia
- Drugs
- Gastrointestinal abnormality (ileus etc)
- Unnecessary nasogastric tube
- Mobilization
- Increased eye pressure (acute glaucoma)

PONV Classification Systems

Apfel's Simplified Risk Score - Inhalational GA

Risk factors	Points
Female gender	1
Nonsmoker	1
History of PONV	1
Postoperative opioids	1
Total	0-4
PONV: Postoperative nausea and vomiting	

When 0,1,2,3,4 factors present –
PONV Risk is 10%,20%,40%,60%,
80% respectively

Predictive rate is 55-80%

Drugs should be given every patient or at least every patient with one or more risk factors

Surgical Specific Risk Factors:

1. Maxillofacial Surgery
2. Strabismic Corrective Surgery
3. Ear Surgery: Manipulation of Inner Ear Labyrinth
4. Abdominal Surgery/Laparoscopy – utilizing Insufflation
5. Increased Operating Time and Invasiveness of Operation – If leads to increased Post-op Pain and Recovery Time





Dobbeleir, M et al. (2018) IJOMS. Postoperative nausea and vomiting after oral and maxillofacial surgery: a prospective study (Belgium)

Purpose of this study was to identify the specific Operations in oral and maxillofacial surgery that carry a greater risk of PONV

**Design: Prospective study included - 308 patients (8 to 87 years old)
All underwent general anaesthesia for maxillofacial surgery**

Surgeries were Categorized by Operation and EBL

Table 2. Patients who experienced postoperative nausea (PON) according to surgical group.

Surgical group	Nausea		
	No	Yes	Yes %
Other minor surgery	50	29	36.7
BIMAX/SARPE/Le Fort I	20	52	72.2
BSSO	8	24	75
Dental extraction	81	32	28.5
TMJ surgery	7	5	41.7

BIMAX, bimaxillary surgery; BSSO, bilateral sagittal split osteotomy; SARPE, surgically assisted rapid palatal expansion; TMJ, temporomandibular joint.

Table 3. Patients who experienced postoperative vomiting (POV) according to surgical group.

Surgical group	Vomiting		
	No	Yes	Yes %
Other minor surgery	67	12	15.2
BIMAX/SARPE/Le Fort I	41	31	43.1
BSSO	22	10	31.2
Dental extraction	102	11	9.7
TMJ surgery	11	1	8.3

BIMAX, bimaxillary surgery; BSSO, bilateral sagittal split osteotomy; SARPE, surgically assisted rapid palatal expansion; TMJ, temporomandibular joint.

N = 308
Patients

Table 4. Differences in postoperative nausea (PON) between the indicated surgical groups.

Surgical groups	Estimate	<i>P</i> -value
Other minor surgery vs. BIMAX/SARPE/Le Fort I	-1.5002	0.0003 ^a
Other minor surgery vs. BSSO	-1.6433	0.0055 ^a
Other minor surgery vs. dental extraction	0.384	0.7421
Other minor surgery vs. TMJ surgery	-0.2083	0.9976
BIMAX/SARPE/Le Fort I vs. BSSO	-0.1431	0.9985
BIMAX/SARPE/Le Fort I vs. dental extraction	1.8842	0.0001 ^a
BIMAX/SARPE/Le Fort I vs. TMJ surgery	1.292	0.2703
BSSO vs. dental extraction	2.0273	0.0002 ^a
BSSO vs. TMJ surgery	1.4351	0.2714
Dental extraction vs. TMJ surgery	-0.5922	0.8791

BIMAX, bimaxillary surgery; BSSO, bilateral sagittal split osteotomy; SARPE, surgically assisted rapid palatal expansion; TMJ, temporomandibular joint.

^a Statistically significant, $P < 0.05$.

Table 5. Differences in postoperative vomiting (POV) between the indicated surgical groups.

Surgical groups	Estimate	<i>P</i> -value
Other minor surgery vs. BIMAX/SARPE/Le Fort I	-1.4402	0.0031 ^a
Other minor surgery vs. BSSO	-0.9313	0.3352
Other minor surgery vs. dental extraction	0.5073	0.7916
Other minor surgery vs. TMJ surgery	0.6781	0.9724
BIMAX/SARPE/Le Fort I vs. BSSO	0.5089	0.7945
BIMAX/SARPE/Le Fort I vs. dental extraction	1.9475	0.0001 ^a
BIMAX/SARPE/Le Fort I vs. TMJ surgery	2.1183	0.2872
BSSO vs. dental extraction	1.4386	0.0348 ^a
BSSO vs. TMJ surgery	1.6094	0.6048
Dental extraction vs. TMJ surgery	0.1708	0.9999

BIMAX, bimaxillary surgery; BSSO, bilateral sagittal split osteotomy; SARPE, surgically assisted rapid palatal expansion; TMJ, temporomandibular joint.

^aStatistically significant, *P* < 0.05.

Results:

Overall, 46.1% of the patients experienced PON and 21.1% experienced POV

Significant differences were found in PON and POV between the Surgical groups:

- Maxillary surgery (BIMAX/ SARPE/Le Fort I osteotomy) and BSSO procedures vs multiple other operations

Main Surgical Factors Cited for PON and POV Differences

- Swallowing Blood
- Hypotension
- Intermaxillary Fixation
- Altered Diet



Presentation Objective

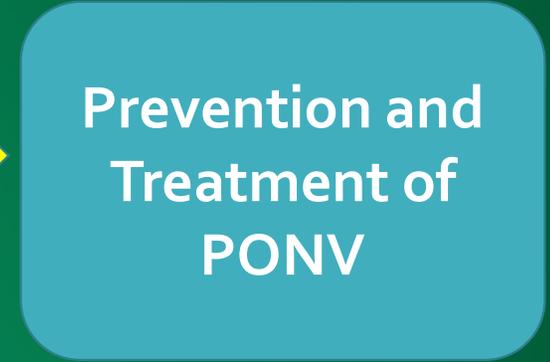
Understanding PONV



Patient Analysis - Risk
Factors for Prevention



Decisive Treatment



Commonly Used PONV Drugs

Table 1
Intravenous antiemetic doses for adults and children

Group	Drug	Adult Dose (mg)	Child Dose (mg/kg)	Side Effects
5-HT ₃ receptor antagonists	Ondansetron	4	0.1	Headache, obstipation, elevated transaminases, QT prolongation
	Dolasetron	12.5	0.35	There are no side effects known yet for Palonosetron
	Tropisetron	2	0.1	
	Granisetron	1	0.02	
	Palonosetron	0.075		
NK1 receptor antagonists	Aprepitant	40 (by mouth)		Headache, obstipation, elevated transaminases, dry mouth, drowsiness
	Fosaprepitant	115		
Glucocorticoids	Dexamethasone	4-8	0.15	Hypotension, reflexive tachycardia, hypertension, increases blood sugar
Antihistamines	Dimenhydrinate	62	0.5	Drowsiness, dry mouth, tachycardia, QT prolongation, visual disturbances, dysuria
	Cyclizine	50		
Cholinergic antagonists	Scopolamine	1 per 24 h (transdermal)		Visual disturbances, dry mouth, confusion, hallucinations
Butyrophenone	Droperidol	0.625-1.25	0.01	QT prolongation, hypotension, reflexive tachycardia, drowsiness, dystonia, anxiety
	Haloperidol	1-2		Agitation, insomnia, akathisia, dyskinesia, headache, hypotension, dry mouth, visual disturbances, QT prolongation
Benzamide	Metoclopramide	25		Hypotension, reflexive tachycardia, dyskinesia

EKG!

Metoclopramide (Reglan)

Benzamide Drug Class

Blocks Dopamine-2 receptors in CTZ and Vomiting Center

Quickens esophageal clearance, gastric emptying, shortens bowel transit time

LESS Effective than Droperidol

Adult dose PONV 25-50mg IV, Rescue 10-20 mg

Duration of Action: 6 Hours

Can Cause: Sedation, Hypotension, Restlessness

Promethazine (Phenergan)

Phenothiazine Drug Class

Blocks Dopamine-2 receptor in CTZ and Vomiting Center

Also blocks Histamine-1 and Muscarinic-1 receptors

Adult dose: 6.25-12.5mg IV

Duration of Action 4-6 hours

Can Cause: Sedation, and Hypotension

Propofol (Diprivan)

10-20mg doses. Best for rescue use only

Must have patient monitored due to sedation

PONV Prophylaxis Algorithm

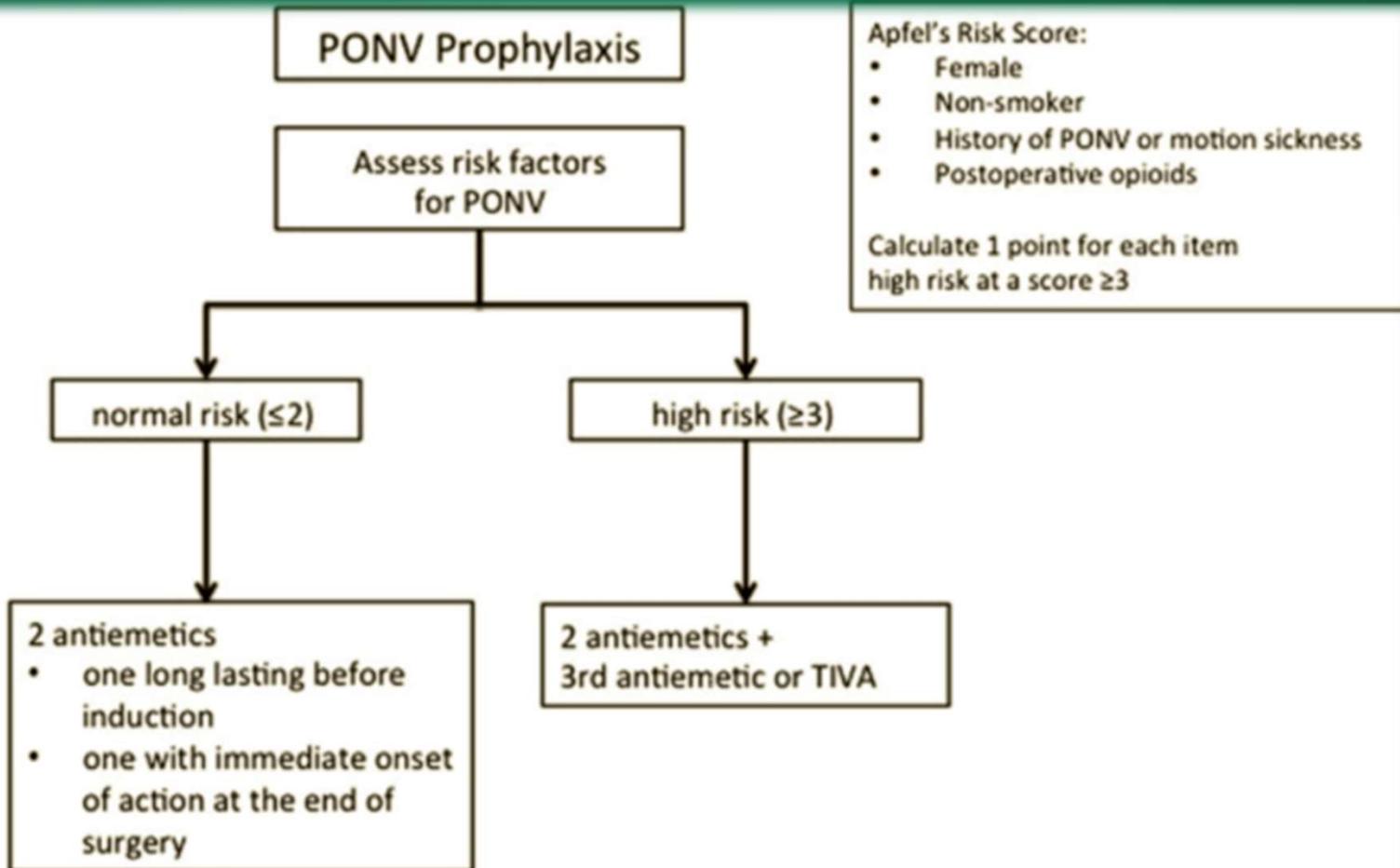
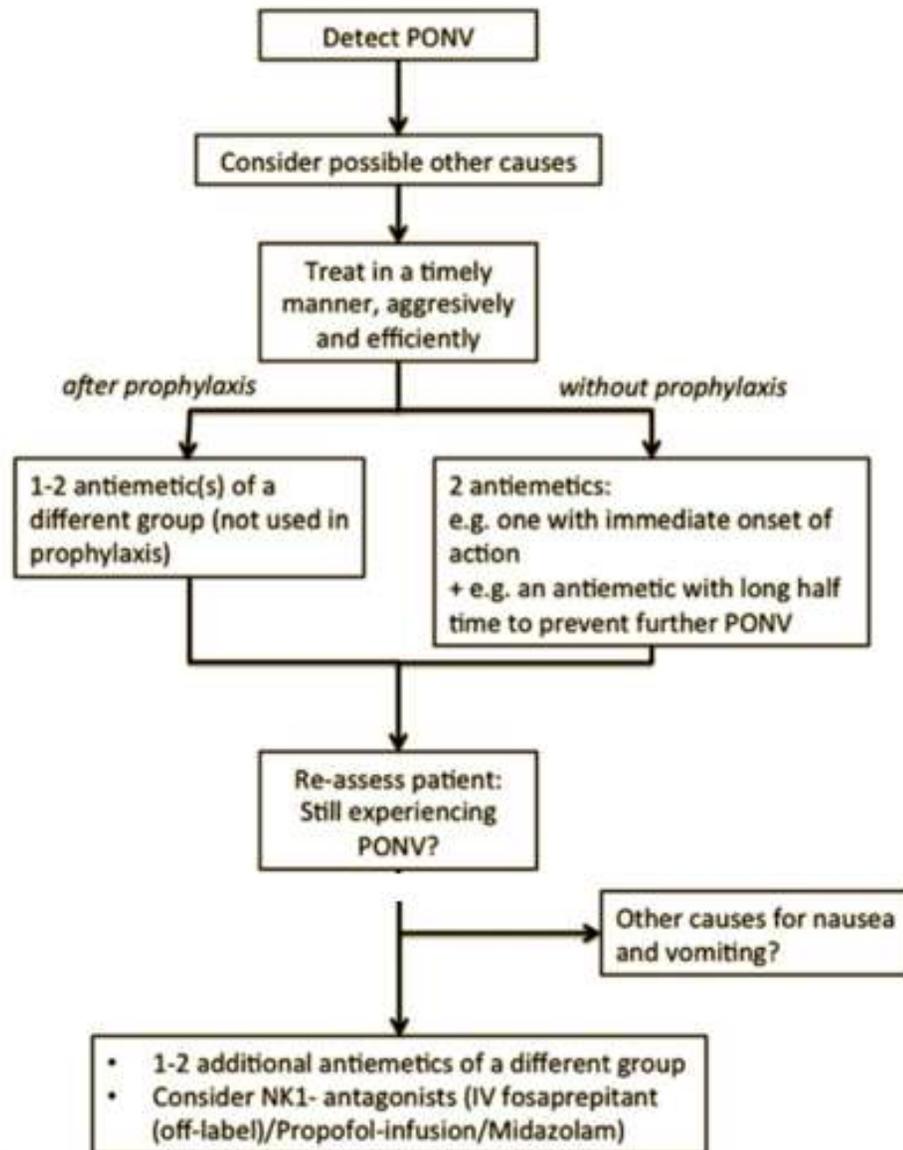


Fig. 1. Algorithm for PONV prophylaxis.



Box 1

Possible causes of PONV

- Pain
- Hypotension
- Hypoxia
- Drugs
- Gastrointestinal abnormality (ileus etc)
- Unnecessary nasogastric tube
- Mobilization
- Increased eye pressure (acute glaucoma)

Example Treatment Algorithm for Refractory PONV - MGH Developed Protocol

- **Step 1.**
- Ondansetron 4 mg IV and dexamethasone 4 mg IV as a single dose
- If nausea and vomiting continues to be problematic after 30 minutes, proceed to step 2:
- **Step 2.**
- Haloperidol 0.25mg IV or
- Metoclopramide 20 mg IV. May be repeated x1 in 4 hours
- If nausea and vomiting continues to be problematic after 30 minutes, proceed to step 3:
- **Step 3.**
- Promethazine 12.5 -25 mg IV q 4 h. or
- Meclizine 25mg orally q 8 h. or
- Prochlorperazine suppository 25 mg per rectum q 12 h.
- If nausea and vomiting continues to be problematic, proceed to step 4:
- **Step 4.**
- Droperidol
- Prior to prescribing droperidol, physician must determine that pre-administration EKG QTc interval is < 440 msec [males] or <450 msec [females]. If within guidelines, then
- *Give droperidol 1.25 mg IV x 1 dose only
- *Patient's EKG must be monitored for 2-3 hr post-dose.
- *Note: These guidelines were developed by an interdisciplinary group of clinicians from the BWH and MGH Pharmacy and Anesthesia Departments.*
- <http://www.massgeneral.org/pharmacy/Newsletters/2002/March%202002/Postoperative%20Nausea%20and%20Vomiting.htm>

Thank You For Your Attention!