



CASA Bulletin of Anesthesiology

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SPREAD LOVE EVERYWHERE YOU GO. LET NO ONE EVER COME
TO YOU WITHOUT LEAVING HAPPIER. -MOTHER TERESA

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主编快讯

CASA Tweeter 上线了!!

曾经，我们的祖先在快马骑飞的尘埃里，在信鸽高飞翱翔中传递着遥远的信息。也曾经，近代人从纸墨飘香的报纸中检索出世界各方的发生。世界便因此由小变大，直到我们有了电话，电视，那遥远的新闻便成了一条条线，一帧帧图像带来的暖声。多年前的一个金色之秋，微信则将地球上数个陆地上的，海洋上的知人好友连在了一起，无数的信息在分分秒秒中无时无刻不带来喜怒哀乐。

二十年来，CASA 历经人员编制的由少至多，组织活动的从难到易；从起始与成员联系使用的 email, 电话，发展为有了自己的网站：chineseasa.org，进而又创立了 CASA 自己的杂志: CASA Bulletin，及 CASA 华人麻醉医学会微信群。今天，CASA Tweeter 的上线更以其新的面貌将 CASA 协会的丰富多彩的活动呈现于世，而我们在美国的麻醉同仁们也拥有了另一个信息传播的渠道。

CASA Tweeter 于 10 月 19 日正式上线，在 Tweeter 中的网名为 CASA_society。这一新的信息传播通道，不仅为老朋友增加了新的了解 CASA 发生的即时新闻，参与互动，更可以以世界为视角扩大影响，与不同国籍的麻醉专业人士相互交流。在此由衷感谢学会成员李娟，麻浩波医生为建立此网络做出的贡献。



恭喜 CASA 在广大同仁的共同努力下向前跃进了新的一步!

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封面设计 陆晓薇

Review article

Cytoreductive Surgery with Hyperthermic Intraperitoneal Chemotherapy and Anesthesia

Ning Miao, Xiaowei Lu, Andrew Mannes, MD

Department of Perioperative Medicine, Clinical Center, NIH

Main points

1. Peritoneal carcinomatosis (PC) is a poor prognostic factor for all malignancies. PC recurrence following CRS/HIPEC is common, particularly with a high peritoneal cancer index (PCI) scores and unfavorable histology [1].
2. Cytoreductive surgery (CRS) with hyperthermic intraperitoneal chemotherapy (HIPEC) is increasingly offered for the treatment of patients with peritoneal surface malignancies, including those of appendiceal, colorectal, mesothelial, gastric and gynecological origin [1-4]. Due to histologically heterogenicity of cancer, thermal sensitivity varies, and a single thermal effect dose is unlikely effective for all tumors [5]
3. CRS/HIPEC was reported to improve 5-year survival rate by 40-45% and is possibly the only curative treatment of peritoneal surface malignancies (primary and secondary peritoneal cancers) [6].
4. CRS/HIPEC is one of the most complex, high-risk, long duration abdominal surgeries offered for patients with advanced cancers. It can cause extensive tissue trauma with subsequent inflammation and substantial fluid loss that lead to potentially life-threatening side effects: morbidity 22-51% [6, 7] and mortality 2-5% [6, 8, 9] but is becoming a standard treatment for some peritoneal surface malignancies.

Peritoneal structure and function [1, 10]

Structure

1. Protective serous membrane covering the abdominal and pelvic organs (parietal and visceral layers)
2. Parietal mesoderm develops into parietal pleural and parietal peritoneum
3. Visceral mesoderm becomes visceral pleural and visceral peritoneum
4. Peritoneal space form conduit for vessels, nerves and lymphatics

Function

1. Peritoneal space carries 5-100ml of fluid for homeostasis, lubrication, tissue healing and immunity.
2. Exchange of nutrients, metabolites and gases;
3. Serves as a barrier to infectious agents and as a line of defense through the transfer of innate and adaptive immune cells, cytokines and chemokines

4. Diaphragmatic movement encourages peritoneal fluid circulation by hydrostatic pressure. This can explain why cancer easily disseminates throughout the peritoneal cavity and forms deposits along the diaphragm and omentum.

Clinical manifestation [1]

1. Early: asymptomatic or nonspecific symptoms: bloating, anorexia, abdominal pain, back pain.
2. Advanced stage: new onset of ascites, intestinal obstruction and bowel perforation.

Peritoneal cancer index (PCI) [1, 11]

PCI is a diagnostic and prognostic tool that is a sum of tissue burden. Each region receives a score of 0-3 based on the largest tumor size (in each of the 13 abdominal regions). Scores range from 0 to 39 with higher scores indicative of more widespread and/or larger tumors in the peritoneal cavity [3]. PCI is an important prognostic indicator and independent risk factor for morbidity and mortality for patients undergoing CRS/HIPEC. A PCI < 20 has a prognosis of 94% at 20 years [12].

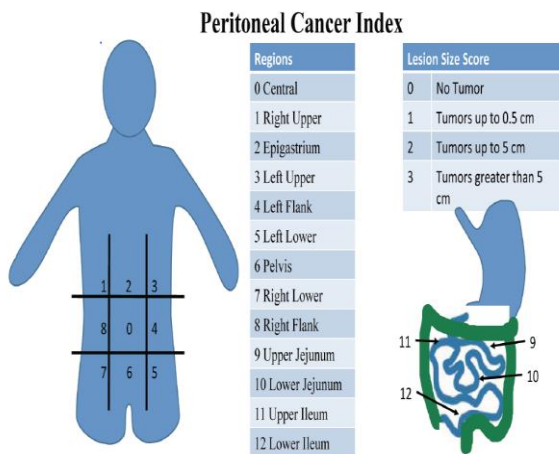


Figure 1: Peritoneal Cancer Index (PCI) scoring system. PCI is a diagnostic and prognostic tool that is a sum of scores in thirteen abdominal regions. Each receives a score of 0-3 based on the largest tumor size in each region. Scores range from 0 to 39. Higher scores indicate more widespread and/or larger tumors in the peritoneal cavity.

Table 1: CC is the completeness of cytoreduction score.

| Completeness of Cytoreduction scores | |
|--------------------------------------|---|
| Score | Size of largest post-surgery residual tumor |
| CC-0 | No visible tumor |
| CC-1 | Less than 0.25 cm |
| CC-2 | Between 0.25 cm and 2.5 cm |
| CC-3 | >2.5 cm or confluent |

It indicates the size of the largest tumor that remains after cytoreductive surgery.

[3, 11]

Diagnosis [10]

1. Clinical manifestation
2. Imaging: CT: Sensitivity and specificity: 68% and 88% respectively
MRI: Functional added to morphological sequences, staging and F/U
PET-CT: Combined function and morphology to increase accuracy. Sensitivity and specificity: 84% and 98% respectively
3. Tumor markers (blood): Carcinoembryonic antigen (CEA) and CA19-9 for GI cancer diagnosis and F/U
4. Surgery: diagnostic laparoscopy establishes the PCI and can exclude 54% of non-resectable patients.
5. Histological assessment and cytology: Diagnosis of cancer cell patterns, rare or aggressive cancer.

Treatment of Peritoneal carcinomatoses [10]

1. Systemic chemotherapy: No specific regimen at present.
2. Immunotherapy, molecularly targeted treatment and hormone therapy
3. CRS: resect all visible tumors implants within the abdomen
4. Intraperitoneal chemotherapy
5. Nano-medicines for intraperitoneal therapy
6. Near-infrared, fluorescence-guided surgery

Contraindications to CRS/HIPEC [12]**Absolute**

1. Extension outside the peritoneal cavity
2. Biliary obstruction
3. Multiple small bowel obstructions

Relative

1. Poor functional status of patient
2. Cardiac contraindication
3. Foreshortened mesentery that would result in postoperative short bowel syndrome. CT scan can be used for assessing length but it is not always reliable.

CRS/HIPEC theoretical principles [6, 8, 13]

1. Reduce tumor nodes to a quasi-microscopic size to compensate for the poor drug penetration.
2. Manual massage of the peritoneal cavity (open/closed approach) to improve the homogeneity of chemotherapeutic agent distribution.
3. Heating chemotherapy solution to enhance tumor cell cytotoxicity.

Surgical steps

1. Diagnostic laparoscopy is required to assess the peritoneal disease and cytology
2. The aim of CRS: reduce tumor burden by removing all of the visible disease by CRS. Lymphadenectomy and removal of all peritoneal implants, peritonectomies [14]. Positive effect on overall survival of CRS in management of PM; The role of HIPEC is still debated for some indications [15]
3. Complete CRS: Subtotal peritonectomy; multi-visceral resection; multi-visceral anastomosis and reconstruction, and omentectomy [16]

The effect of HIPEC on human body [5]

1. Hypermetabolic response:
 - Hyperthermia (41-43°C)
 - Metabolic acidosis
2. Hyperdynamic response:
 - Tachycardia

Renal system

1. Preoperative assess electrolytes (K, Ca, Na, Cr, BUN, Mg)
2. Glomerular filtration rate (GFR) help assess renal function at risk patients

Coagulation status

CBC, PT/PTT/INR to r/o any baseline coagulopathy

Anemia

Screen and treat as needed:

Etiology: Iron
 Folate acid
 Vitamin B12 deficiency
 Renal insufficiency
 GI bleeding

Nutrition:

1. Risk: Poor nutrition increase postoperative M/M.
2. Nutrition score: Low BMI < 18.5
 Poor food intake
 Old age > 65-year-old
 Recent weight loss over 3-6 months
 Low serum albumin < 30mg/L
3. Management: Oral nutritional supplements \geq 7 days (protein 1.2—2 gms/kg/day)
 Enteral/-parenteral nutrition for malnutrition: 7-14 days

Psychological support: Better management of anxiety from cancer and surgery

Intraoperative management

The effect of CRS/HIPEC on organs during the surgery [8, 13, 17, 18], [7-9]

1. Respiratory function: increased EtCO₂, respiratory and metabolic acidosis
2. Hemodynamics: increase cardiac work, myocardial O₂ demand and cardiac risk
3. Liver and kidney function: chemotherapy related toxicity
4. Fluid shift and blood loss, electrolytes imbalance and serum lactate level increase
5. Chemo-perfusion causes increased abdominal pressure, and SVR reduces cardiac output
6. Chemo-perfusion intraperitoneal can result in toxicity

OR and anesthesiologist safety issues with HIPEC

1. Source of exposure to chemotherapeutic agents:
 - a. At high temp, agents are aerosolized which can be inhaled by OR personnel
 - b. Direct contact with the drugs
 - c. Contact with perfusate solution, tubing and tissues
2. Care to prevent spillage with universal precautions
3. Appropriate disposal of residual drugs and tubing

4. Due to higher risks of exposure, pregnant, lactating, immunocompromised personnel with allergies to chemo agents should not be in the OR

Anesthesia induction and maintenance [19]

1. GA and thoracic epidural placed for post-operative pain management
2. Monitors:
 - Routine ASA monitors
 - Arterial line (hemodynamic and ABG measurements)
 - PPV, SVV (positive ventilation caused change in preload. normal<13%)
 - Continuous cardiac output monitoring
 - Urine output

Opioid-free pain control strategy [20]:

1. IV lidocaine 1.5mg/kg
2. Propofol 1.5-2 mg/kg
3. Ketamine 0.25mg/kg
4. IV magnesium sulfate 40mg/kg in 100 ml NS single dose IV drip
5. Dexmedetomidine 0.7mcg/kg/h

Clinical consideration during HIPEC

1. Hemodynamic change (hyperthermic, hyperdynamic, vasodilated circulatory state)
 - Tachycardia > 100bpm: short-acting β blocker in small increment doses:
 - Low SVR: small doses vasopressor
2. IVF shift: Goal-directed regimen (1L crystalloid, typically results in only 200ml remaining intravascular at 1 hour)
 - Passive leg raises test (PLR): CI 10% \uparrow after PLR=volume responsive (500ml Colloid), No change in CI = euolemia or possible LV function \downarrow . Colloid can remain intravascular for several hours
3. Nephrotoxicity: Maintain intraoperative UOP 100ml/15 min during HIPEC
4. Thermoregulation: Maintain normothermia during surgery
 - During HIPEC or CRS, maintain temperature <39°C
 - Prior to HIPEC, maintain systemic temperature between 35.5-36°C
5. Electrolytes and acid-base:
 - 15min before HIPEC, lab results (CBC, ABG and electrolytes)
 - Replace electrolytes (Ca, Mg and K) as needed
 - Recheck them after HIPEC

Intraoperative chemotherapy [21]

Cisplatin: An alkylating agent specifically a metal salt.

Indications:

- Mesothelioma
- Ovarian cancer
- Gastric cancer

Mitomycin (MMC)

Benefits: Large molecule that is not rapidly absorbed systemically
 Stability at high temperatures and synergistic effect with heat
 Synergistic effect with heat
 Compatibility with other drugs to allow combination therapy

Indications: Appendiceal carcinoma
 Pseudomyxoma peritonei (PMP)
 Colorectal carcinoma
 Gastric (in combination with other drugs)

Oxaliplatin: Binds to DNA crosslinking which prevents DNA replication. It is most commonly used systemically in combination with 5-FU and leucovorin (FOLFOX regimen) for gastrointestinal malignancies.

Doxorubicin: DNA intercalation, inhibition of topoisomerase II, formation of oxygen free radicals.

Postoperative management

Early extubation: Presence of metabolic acidosis is not a contraindication for early extubation [7, 21]
 Early extubation/quick to ambulation can decrease hospital LOS.
 Early extubation have an early return of bowel function and low complications.

Postoperative recommendations: Postoperative CRS/HIPEC M/M: 12-65% [18, 22]

1. Post-operative disposition is typically to the ICU (67-100% patients) [8, 9]
 - Possible mechanical ventilation, lung recruitment, lung PT
 - Organ function assessment and normalize metabolic abnormalities
 - Complication management (infection, bile leak, bowel injury, bleeding, DVT, PE)
 - Fluid management
 - Analgesia
 - Coagulation abnormality identifying and correction
 - Assess neurologic function: neurotoxic response and cognitive function
2. Postoperative prediction of morbidity and mortality [8]
 - Higher PCI score >14
 - Longer duration of surgery
 - Higher delta temperature
 - Massive blood loss and blood transfusion
 - Higher intraoperative IVF infusion
 - Requirement of vasopressors
 - Lower MAP
 - Diaphragmatic peritonectomy
 - Fluid leak in drains >1500 ml at the first 24 hours
3. Major surgical complication [9]

- Anastomosis leak 0-9%
 - Intra-abdominal abscess 0-37%
 - Fistula 0-23%
 - Prolonged ileus 0-86%
 - Intra-abdominal bleeding
 - Bile leak
 - Pancreatitis
 - Major wound infection
 - Mesenteric ischemia
 - Cholecystitis
 - Mechanical intestinal obstruction
 - Reoperation rate 0-23%
4. Postoperative nausea and vomiting common after CRS/HEPIC (25-35%) [7]
- Treatment: ≥ 2 antiemetic drugs prevent PONV (Zofran, Reglan, Phenergan etc.)
5. Postoperative Analgesia [8, 22]
- T5-11 thoracic epidural catheter insertion (LA + opioid)
 - Opioid sparing analgesia: ketamine IV, gabapentin, lidocaine etc.
 - IV PCA, intrathecal opioids
 - Other regional block: paravertebral, TAP blocks
6. Prophylactic against thromboembolism [9, 22]: 30-50% DVT risk with no prophylaxis postop.
5-10% DVT incidence postop with prophylaxis
- Risk factors: Disease burden
Blood transfusion
Operative time. Surgery is prothrombotic
Length of hospital/ ICU stay
 - Postoperative coagulopathy may peak at 24-48 hours and liver /renal dysfunction
 - Postoperative transfusion individualized based on TEG results
 - Prevent DVT: Early ambulating
Mechanical prophylaxis by intermittent pneumatic compression
Anticoagulant medications
All cancer patients undergoing surgery > 30 min need heparin or lovenox
7. Postoperative airway management:
- Ventilator support: extubation timing based on respiratory, metabolic and hemodynamic status
 - O₂ support: Wean early
8. Hemodynamic, electrolytes and IVF management
- Monitor hemodynamics to manage vital signs status and perfusion
 - Fluid loss can persist for 2-3 days. Goal-directed IVF better (optimize IVF, CO and O₂ delivery)
 - Monitor and manage electrolytes and hypermetabolic status

Glucose monitor [22]: uncontrolled hyperglycemia increases morbidity and mortality (140-180 mg/dl are recommended to decrease postoperative mortality)

9. Postoperative renal dysfunction [9, 22]: 1.3-5.7% risk rate.
 - Risk factor: Chemomedication: cisplatin, esp. dose > 240mg, mitomycin
Perioperative volume shift/loss cause acute renal injury
 - Prevent: Optimize IVF by goal-directed therapy for fluid resuscitation
Maintain Cardia output
Maintain O₂ delivery
Avoid additional nephrotoxic agents/agent
10. Postoperative temperature monitoring
 - Postoperative hyperthermia persists for 1 -2 days,
 - Temperature related to high-inflammatory syndrome.
11. Postoperative nutrition
 - Postoperative nutrition needs to restart as soon as tolerated
NGT nutrition preferred
TPN for postoperative ileus, stress ulcer, anastomosis leak
12. Postoperative infection control
 - Antibiotics selected per patient assessment and clinical manifestation.

References

1. Harper, M.M., J. Kim, and P.K. Pandalai, *Current Trends in Cytoreductive Surgery (CRS) and Hyperthermic Intraperitoneal Chemotherapy (HIPEC) for Peritoneal Disease from Appendiceal and Colorectal Malignancies*. J Clin Med, 2022. **11**(10).
2. Guerra-Londono, C.E., et al., *Risk of Intraoperative Hyperthermia and Outcomes in Adults Undergoing Cytoreductive Surgery (CRS) with Hyperthermic Intraperitoneal Chemotherapy (HIPEC)*. Ann Surg Oncol, 2022. **29**(3): p. 2089-2099.
3. McMullen, J.R.W., et al., *Peritoneal carcinomatosis: limits of diagnosis and the case for liquid biopsy*. Oncotarget, 2017. **8**(26): p. 43481-43490.
4. Sugarbaker, P.H., *Optimizing regional chemotherapy for epithelial ovarian cancer*. J Obstet Gynaecol Res, 2022. **48**(6): p. 1306-1317.
5. Guerra-Londono, C.E., et al., *The Role of Hyperthermia in the Treatment of Peritoneal Surface Malignancies*. Curr Oncol Rep, 2022. **24**(7): p. 875-887.
6. Bezu, L., et al., *Haemodynamic management during hyperthermic intraperitoneal chemotherapy: A systematic review*. Anaesth Crit Care Pain Med, 2020. **39**(4): p. 531-542.
7. Hubner, M., et al., *Guidelines for Perioperative Care in Cytoreductive Surgery (CRS) with or without hyperthermic IntraPEritoneal chemotherapy (HIPEC): Enhanced recovery after surgery (ERAS(R)) Society Recommendations - Part I: Preoperative and intraoperative management*. Eur J Surg Oncol, 2020. **46**(12): p. 2292-2310.
8. Garg, R., S. Bhatnagar, and SpringerLink, *Textbook of Onco-Anesthesiology*. 1st 2021. ed. 2021, Singapore: Springer Singapore : Imprint: Springer.

9. Raspe, C., et al., *Best practice for perioperative management of patients with cytoreductive surgery and HIPEC*. Eur J Surg Oncol, 2017. **43**(6): p. 1013-1027.
10. Cortes-Guiral, D., et al., *Primary and metastatic peritoneal surface malignancies*. Nat Rev Dis Primers, 2021. **7**(1): p. 91.
11. de Bree, E. and D. Michelakis, *An overview and update of hyperthermic intraperitoneal chemotherapy in ovarian cancer*. Expert Opin Pharmacother, 2020. **21**(12): p. 1479-1492.
12. Shankar, S., et al., *Neoplasms of the appendix: current treatment guidelines*. Hematol Oncol Clin North Am, 2012. **26**(6): p. 1261-90.
13. Rajeev, R. and K.K. Turaga, *Hyperthermic Intraperitoneal Chemotherapy and Cytoreductive Surgery in the Management of Peritoneal Carcinomatosis*. Cancer Control, 2016. **23**(1): p. 36-46.
14. Manzanedo, I., et al., *Review of management and treatment of peritoneal metastases from gastric cancer origin*. Journal of Gastrointestinal Oncology, 2021. **12**: p. S20-S29.
15. Noiret, B., G. Piessen, and C. Eveno, *Update of randomized controlled trials evaluating cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) in prevention and therapy of peritoneal metastasis: a systematic review*. Pleura Peritoneum, 2022. **7**(2): p. 51-61.
16. Eveno, C. and M. Pocard, *Randomized controlled trials evaluating cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) in prevention and therapy of peritoneal metastasis: a systematic review*. Pleura Peritoneum, 2016. **1**(4): p. 169-182.
17. Patel, K., et al., *Analgesia for Gynecologic Oncologic Surgeries: A Narrative Review*. Curr Pain Headache Rep, 2022. **26**(1): p. 1-13.
18. Garg, R., *Anesthesia for cytoreductive surgery with hyperthermic intraperitoneal chemotherapy*. Vol. 37. 2021: Springer Nature Singapore Pte Ltd. 2021. Textbook of Onco-Anesthesiology.
19. Rothfield, K.P. and K. Crowley, *Anesthesia considerations during cytoreductive surgery and hyperthermic intraperitoneal chemotherapy*. Surg Oncol Clin N Am, 2012. **21**(4): p. 533-41.
20. Tejedor, A., et al., *Feasibility and effectiveness of opioid-free anesthesia in cytoreductive surgery with or without heated intraperitoneal chemotherapy*. J Surg Oncol, 2022. **125**(8): p. 1277-1284.
21. Goodman, M.D., et al., *Chemotherapy for intraperitoneal use: a review of hyperthermic intraperitoneal chemotherapy and early post-operative intraperitoneal chemotherapy*. J Gastrointest Oncol, 2016. **7**(1): p. 45-57.
22. Hubner, M., et al., *Guidelines for Perioperative Care in Cytoreductive Surgery (CRS) with or without hyperthermic IntraPERitoneal chemotherapy (HIPEC): Enhanced Recovery After Surgery (ERAS(R)) Society Recommendations - Part II: Postoperative management and special considerations*. Eur J Surg Oncol, 2020. **46**(12): p. 2311-2323.



POCUS 讲座(3)


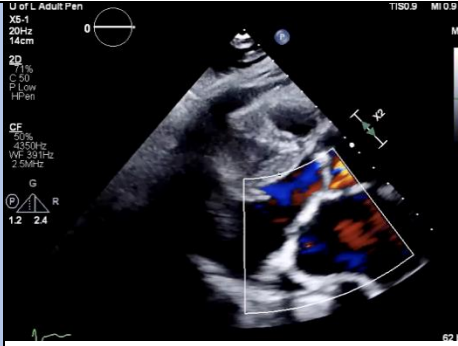

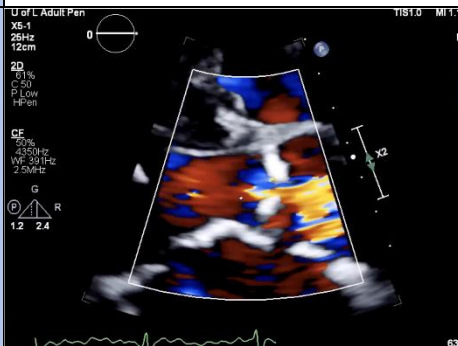
围术期心脏，肺部及胃部超声

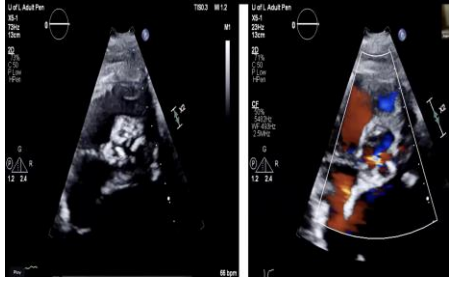
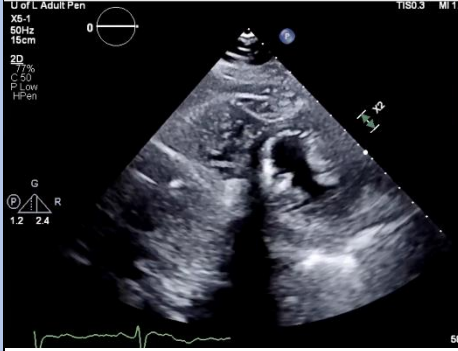


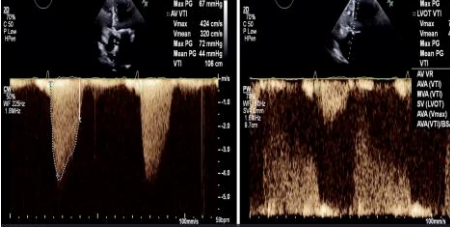
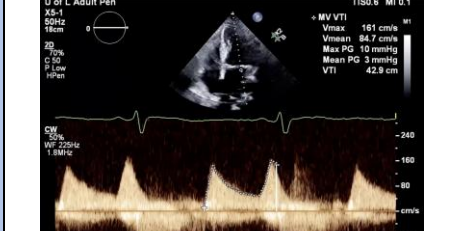
主讲人：黄佳鹏教授 录音整理：李娟

黄佳鹏教授首先从两个病例开始讲解 POCUS 如何指导我们麻醉医生临床决策。

病例 1: 94-year-old female fell at home. No cardiac history. Presented for bilateral external fixation ankle. Left open fracture. R closed fracture. TTE (Transthoracic Echocardiogram) was performed on Saturday due to the age of 94 years old. No Reading on TTE until Monday.

黄佳鹏教授做了一个床旁心脏超声，截图如下：

| | | | | | |
|----------------|---|--|-----------------------------------|--|--|
| <p>PLAX</p> |  | <p>Grossly normal LVF and RVF, LVH, severe AV and MV calcification, small opening of AV during systole</p> | <p>PLAX with color doppler</p> |  | <p>Increased blood flow velocity of AV and MV during systole with mild regurgitation during diastole</p> |
| <p>PLAX AV</p> |  | <p>Severe AV calcification</p> | <p>PLAX AV with color doppler</p> |  | <p>Increased blood flow velocity of AV during systole</p> |

| | | | | | |
|------------------------|--|---|----------------------------|---|--|
| <p>PSAX AV</p> |  | <p>Small opening of AV from PSAX view, increasing blood flow velocity</p> | <p>PSAX LV</p> |  | <p>Hyper-dynamic LV, LVH</p> |
| <p>Parasternal TV</p> |  | <p>Good function RV and normal TV</p> | <p>Apical Five Chamber</p> |  | <p>Severe calcification of AV and small opening during systole</p> |
| <p>AVA calculation</p> |  | <p>AVA 0.46cm², severe AS</p> | <p>PG of MV</p> |  | <p>Mean PG 3mmHg, mild MS</p> |

问题如下:

Will you cancel the case? Will you do both ankle ORIF?

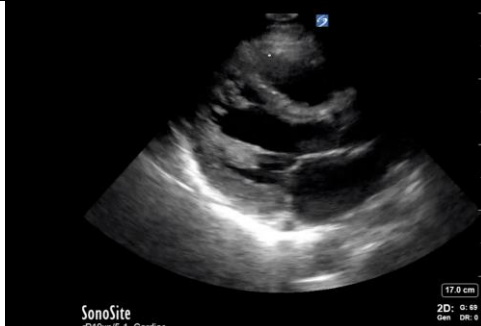

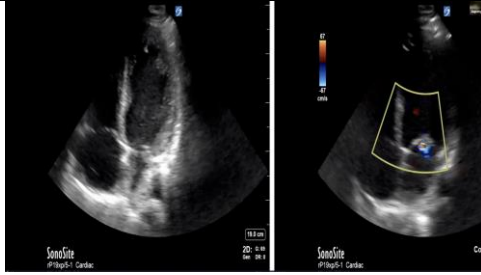

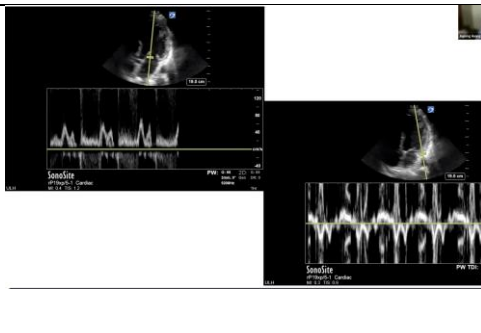




How do you do anesthesia?

How to manage aortic valve stenosis?

How to manage mitral stenosis? Diastolic dysfunction? TAVR? When?

最后的决定是先做左侧踝关节开放性骨折的手术。考虑到 POCUS TTE 诊断病人有重度的主动脉瓣狭窄，全麻风险比较大，因此我们做了 regional anesthesia-adductor canal and popliteal fossa block with minimal intraoperative sedation. 术后病人被送到心脏专科医院进行了 TAVR 手术。病人心脏手术后回到我们医院进行了右侧踝关节的闭合性骨折修复。针对这个病人的轻度二尖瓣狭窄，暂时没有手术指征。从这个病例说明 POCUS 在救助病人中发挥了很大作用。

病例 2. 61-year-old male s/p CAD, stents x 4 to RCA/LCX. Noncompliant with Coreg/Eliquis. Came for R inguinal hernia repair. No chest pain, some SOB, limited physical activity. 病人从外院转来，没有心脏超声记录。我们即刻给病人做了一个床旁心脏超声如下:

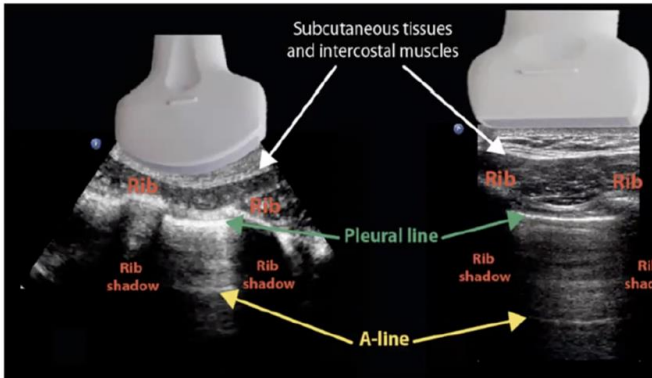
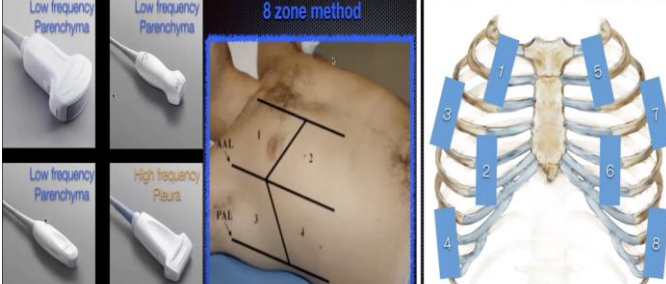
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| <p>PLAX</p> |  | <p>LVH with severely decreased LVF</p> | <p>PSAX</p> |  | <p>LVEF grossly 15%</p> |
| <p>A4C</p> |  | <p>Decrease d LVF, especially apical wall akinetic, with MVR</p> | <p>A4C focus -ed on RV</p> |  | <p>Grossly normal RVF with minimal TR</p> |
| <p>Pulse wave doppler and tissue doppler</p> |  | <p>Grade 2 diastolic dysfunction</p> | <p>Subcostal 4C</p> |  | <p>Grossly normal RVF, severely decreased LVF</p> |
| <p>IVC</p> |  | <p>IVC about 1cm, almost 100% collapsed with respiration</p> | <p>Lung US</p> |  | <p>Multiple B lines, can indicate pulmonary edema</p> |
| <p>Gastric POCUS</p> |  | <p>Solid food can be notified</p> | | | |

尽管从心脏超声看 IVC 右心容量是低的，但是由于病人左心功能很差，还是导致病人肺水肿，所以不能只从容量上来判断。从胃超声可以看到病人胃里面还有固体食物，尽管病人已经禁食 12 小时，但是从胃超声提示还是有误吸的风险。麻醉诱导我们做了 Rapid sequence induction, 术后我们给这个病人安排心内科会诊，将他常规的心脏药物重新加上。病人曾擅自停用 Eliquis，很可能其心脏支架又重新堵塞。

今天我的重点是胃部和肺部超声，肺部超声可以用于评估几个方面，首先是气胸，比如深静脉置管后通常会做一个 Xray 来评估气胸，现在则可以用床旁超声诊断。其次是诊断胸腔积液，肺水肿或者肺炎。胃部的超声可以评估胃的容量，判断有没有固体的食物，腹部超声可以应用 eFAST 评估有否存在腹腔的液体，也可以评估膀胱容量。

有调查显示，在应用 POCUS 评估时，有一半的情况会影响我们对病人的管理决策。30%的情况是做出了新的诊断，27%是确认了当时的诊断。目前，ACGME/American Board of Anesthesiology 对 POCUS 也有了具体的要求。2022 年，ABA oral board 考试就已经加入心脏超声。2023 年的考试会增加肺超声，及至明年胃部超声也将加入其中。

我们现在来重点讲讲肺超声在临床上的应用，首先是肺超声的优势：学习简单，准确，重复性高，病变容易诊断。

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| <p>超声伪像及实际结构</p> |  | <p>做肺超声，我们大部分情况是通过伪像来判断病人的病变</p> |
| <p>肺超声探头和区域</p> |  | <p>正常肺超声，超声探头要和胸膜成 90 度的角</p> |

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| <p>正常肺超声</p> | <p style="text-align: center;">胸膜滑动征</p> | <p>胸膜滑动征 Z line 是正常的, 跟 B line 的区别是比较短</p> |
| <p>正常肺超声</p> | <p style="text-align: center;">Normal lung ultrasound typical sliding, lung pulse and sea shore sign</p> | <p>我们用得比较多的就是 M mode, 时间的分辨率特别好, 肉眼看可能区分不出来。M mode 的图分两块, 上面的这块叫 bar code, 下面的这块像沙滩 sandy beach or sea shore, 红箭头画出的这些抖动的我们叫 lung pulse, 代表心脏跳动能传导给肺, 说明肺是正常的, 说明没有气胸之类的</p> |

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| <p>B line 定义</p> | <p style="text-align: center;">Localized reverberation artifact</p> <ol style="list-style-type: none"> 1. Start at pleura 2. Respiratory motion 3. All the way down 4. >3 B lines=Pathology 5. Z line: 3-4cm, not anyway down, normal <p style="color: red; font-size: small;">laser-like, vertical, hyperechoic artifacts that arise from the pleural line, extend to the bottom of the screen without fading, and move synchronously with lung sliding</p> | <p>B line 深度至少 18cm</p> |
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| <p>B line protocol</p> | <p style="text-align: center;">B Line Protocol</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>STEP 1. Patient Position and Protocols</p> <p>8-zone protocol</p> <p>Four areas per side: - Anterior zones (upper and lower) - parasternal and anterior axillary lines - Lateral zones (upper and lower) - anterior and posterior axillary lines</p> <p>6-zone protocol</p> <p>Three areas per side: - Anterior Zone 1, 2nd intercostal space on the mid-clavicular line - Anterior Zone 2, 4th intercostal space on the anterior axillary line - Lateral Zone 3rd intercostal space on the mid-axillary line</p> <p>28-zone protocol</p> <p>Sixteen areas right hemithorax: (2nd, 3rd, 4th, 5th intercostal space) Twelve areas left hemithorax: (2nd, 3rd, 4th intercostal space)</p> </div> <div style="width: 30%;"> <p>STEP 2. Probe selection</p> <p>1st choice Lower frequency curvilinear (5-2 MHz)</p> <p>2nd choice Lower frequency phased array (5-1 MHz)</p> <p>3rd choice High-frequency (13-6 MHz)</p> </div> <div style="width: 30%;"> <p>STEP 3. Image acquisition</p> <p>http://pic.medutoronto.ca/POCUS</p> <ul style="list-style-type: none"> - Cephalo-caudal orientation - Identify: <ul style="list-style-type: none"> a) superior and inferior ribs b) pleural line - Adjust gain to maximize contrast and visualization of pleural line and B-lines (if present) - Start medially and slide laterally/posteriorly according to chosen protocol </div> </div> | <p>一般是 8 个 zone 从内往外扫, B line 增加提示肺间质性病变, 提示肺里面的密度增加了。这可以有两个原因, 一个是肺里的重量增加, 其可以是肺里的水, 细胞, 脓液, 蛋白质, 或者是肺不张的。例如气管插管插到右侧, 左侧就呈现为肺不张。前面谈到 B</p> |
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STEP 4. Image Interpretation

Normal Lung
Lung sliding
Lung pulse
Short vertical artifacts

Interstitial Syndrome (increased lung density)
- Increased lung weight (swell, cells, blood, etc., causes compression, leads to)

B-lines
- Discrete laser-like vertical hyperechoic reverberation artifacts
- Arise from the pleural line
- Extend to the bottom of the screen without fading
- Move synchronously with lung sliding

Interstitial Syndrome:
≥ 3 B-lines/intercostal space

Short vertical artifacts (formerly called Z lines) and vertical artifacts originating above the pleural line (formerly called E lines - seen in the context of subcutaneous emphysema) should not be confused with B lines
12 August 2023

Interstitial Syndrome

- Diffuse
 - ± associated findings:
 - Changes in lung sliding and pulse
 - Gravity-dependent or -independent pattern
 - B lines "density"
- Focal

- B lines distribution
B1 B2

- Pleural line abnormalities

- Subpleural abnormalities

线定义，超过 3 条 B 线则是异常的

B line 鉴别诊断

| | | |
|----------------------------|-------------------------|-----------------------------------|
| CHF | Unilateral | Bilateral |
| Pneumonia | Infection | ARDS |
| ARDS | Contusion | Bilateral infection |
| Diffuse parenchyma disease | PE | Pulmonary edema |
| Pulmonary fibrosis | Fat embolism | Pulmonary hemorrhage |
| Atelectasis | Amniotic fluid embolism | Interstitial pneumonias |
| Lung contusion | Hemorrhage | Connective tissue disease-related |
| Lung infarct | Malignancy | |
| Malignancy | | |

胸腔积液



Zone 3 and Zone 4

超声特征

Supradiaphragmatic area



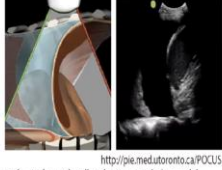

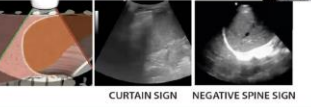
Lung Artifacts
Liver
Diaphragm
Spine

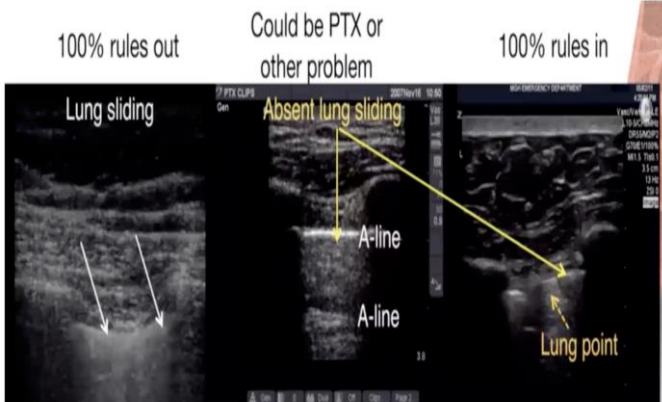

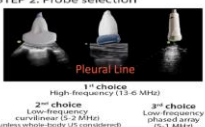
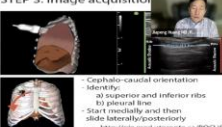
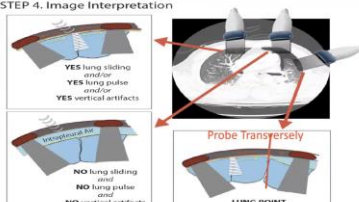
A. Positive Curtain Sign
Expiration
Inspiration


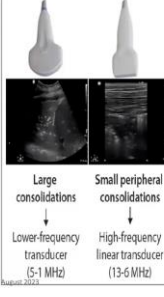
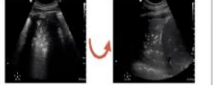

B. Negative Spine Sign

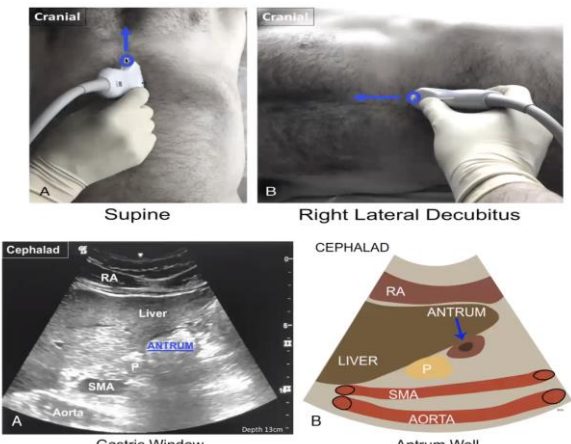
12 August 2023

Normal:
Positive curtain sign
Negative spine sign

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| <p>Protocol</p> | <p>STEP 1. Patient position</p>  <p>1st choice Semi-sitting position maximizes effect of gravity and sensitivity of scan</p> <p>2nd choice Supine position</p> <p><i>Loculated vs. Non-loculated</i></p> <p>STEP 2. Probe selection</p>  <p>YES - Low-frequency curvilinear (5-2 MHz)</p> <p>NO - Low-frequency phased array (5-1 MHz)</p> <p>STEP 3. Image acquisition</p>  <p>- Probe at the mid-axillary line in a cephalo-caudal orientation with slight counterclockwise rotation</p> <p>- Beam directed posteriorly towards the vertebral column</p> <p>- Identify lung artifacts, diaphragm, liver/spleen and vertebral column</p> <p>- Visualization of the spine is essential</p> <p>STEP 4. Image Interpretation</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="544 546 771 682"> <p>PLEURAL EFFUSION</p>  <p>NO CURTAIN SIGN & POSITIVE SPINE SIGN</p> </div> <div data-bbox="820 546 1144 682"> <p>NO PLEURAL EFFUSION</p>  <p>CURTAIN SIGN NEGATIVE SPINE SIGN</p> </div> </div> <div style="margin-top: 10px;"> <p>1. Anechoic region above the diaphragm between the visceral and parietal pleura. <i>Sinusoid Sign</i></p> <p>2. Absent curtain sign Lung artifacts and diaphragm do not descend with inspiration and the abdominal organs remain visible throughout</p> <p>3. Positive spine sign The spine is visualized above as well as below the diaphragm because the fluid conducts the ultrasound beam</p> <p>4. Lung consolidation/collapse within effusion</p> </div> <p><small>Beware of findings and/or conditions that may cause false positive or false negative results (e.g. free fluid below the diaphragm) - see Table</small></p> <p style="text-align: right;"><small>Guide Thoracentesis</small></p> | |
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| <p>气胸超声诊断</p> | <p>100% rules out Could be PTX or other problem 100% rules in</p>  <p>Lung sliding Absent lung sliding Lung point</p> <p>A-line A-line</p> | <p>Suggests PTX</p> <ul style="list-style-type: none"> -Lung Point (sudden appearance of sliding within an area of A-line pattern for PTX) <p>Rules against PTX</p> <ul style="list-style-type: none"> -B-lines -Lung Pulse |
| <p>Protocol</p> | <p>STEP 1. Patient position Supine: 2-4 Intercostal space Sitting: Apical, ?Clavicle</p>  <p>STEP 2. Probe selection</p>  <p>1st choice High-frequency (13-6 MHz)</p> <p>2nd choice Low-frequency curvilinear (5-2 MHz)</p> <p>3rd choice Low-frequency phased array (5-1 MHz)</p> <p>STEP 3. Image acquisition</p>  <p>- Cephalo-caudal orientation</p> <p>- Identify superior and inferior ribs to pleural line</p> <p>- Start medially and then slide laterally/posteriorly</p> <p>STEP 4. Image Interpretation</p>  <p>Identify Pleural line</p> <pre> YES → Lung Sliding Identified? NO → Lung Pulse Identified? YES → Vertical Artifacts Identified? NO → PTX LIKELY YES → Lung Point Identified? YES → PTX HIGHLY LIKELY </pre> <p><small>Beware of findings and/or conditions that may cause</small></p> | <p>Supine or sitting position</p> <p>Use high frequency probe</p> <p>如果有胸膜滑动征, lung pulse or z line 代表正常</p> |

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| <p>肺实变</p> | <ul style="list-style-type: none"> Fluid disorder <ul style="list-style-type: none"> Transudate, Exudate, Blood, Water, Saline, etc. can fill an alveoli Individually, a fluid-filled alveolus is too small to be visualized with ultrasound Usually contiguous alveoli tend to be fluid-filled and these are surrounded by interstitial tissue—interlobular septa Interlobular septa containing fluid-filled alveoli make a macroscopic pattern on ultrasound | <p>一个肺泡看不出来，都是多个肺泡一起</p> |
| <p>Protocol</p> | <p>12 August 2023</p> <p>STEP 1. Patient position</p> <ul style="list-style-type: none"> Both <i>supine</i> or <i>semi-sitting</i> positions can be used Because alveolar syndrome is more common in dependent (posterior) zones of the chest, it can be useful to slightly rotate the patient in the <i>lateral decubitus</i> to facilitate insonation  <p>STEP 2. Probe selection</p>  <ul style="list-style-type: none"> Large consolidations → Lower-frequency transducer (5-1 MHz) Small peripheral consolidations → High-frequency linear transducer (13-6 MHz) <p>STEP 3. Image acquisition</p> <ul style="list-style-type: none"> Systematic insonation of the entire chest bilaterally If a particular region is clinically suspicious (e.g., auscultatory finding, area of pain), start with the region of interest, and then progress to the entire lung After obtaining standard cephalo-caudal intercostal view: rotate transducer to allow the beam to penetrate the intercostal space for better visualization  <p>STEP 4. Image Interpretation</p> <ol style="list-style-type: none"> Poorly echogenic or tissue-like image (hepatization) arising from the pleural line Shred sign - interior border of consolidated lung tissue that abuts aerated lung appears shredded and irregular Air bronchogram Hyperechoic spots or branch-like structures seen within consolidated lung: <ul style="list-style-type: none"> static air bronchograms dynamic air bronchograms (moving with the respiratory cycle)  <p>Alveolar syndrome is a non-specific sonographic finding in many different lung conditions; essential to integrate relevant clinical information and other sonographic findings to narrow the differential diagnosis</p> <p>Other factors to consider: shape, margin, distribution, vascularization pattern (Doppler) and presence of fluid bronchograms</p> <p>Only conditions that reach the pleural line can be identified on LUS</p> | <p>Translobar consolidation -“tissue-like sign”, hepalization of lung</p> <p>Non-translobar consolidation -“The shred sign”</p> <p>Air bronchogram</p> |

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| <p>胃超声</p> |  <p>Supine and Right Lateral Decubitus positions are shown for scanning the epigastrium.</p> <p>Gastric Window shows RA, Liver, ANTRUM, SMA, and Aorta.</p> <p>Antrum Wall diagram shows RA, ANTRUM, LIVER, P, SMA, and AORTA.</p> | <p>-Scan the epigastrium in a sagittal plane</p> <p>-sweep the transducer from the left to the right subcostal margins</p> <p>-Supine and RLD</p> |
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| Type of gastric content | GRADE ANTRAL SHAPE ANTRAL WALL CONTENT | | | |
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| | Empty | Flat and collapsed OR round (Bull's eye) | Thick with prominent muscularis propriae | None (Grade 0) OR Small amount of hypoechoic content (Grade 1) |
| | Solid | Round, distended | Thin | Heterogeneous, particulate ± mixed with air |
| | Clear Fluid | Round, distended | Thin | Hypoechoic |
| | Milk or suspensions | Round, distended | Thin | Hyperechoic |

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| Empty stomach | <p>A: antrum; Ao: aorta; D: diaphragm; L: liver; P: pancreas; R: rectus abdominis muscle; Sma: superior mesenteric artery</p> | <p>-The antrum has no appreciable content in both supine and RLD</p> <p>-It appears flat and collapsed or with a round-to-ovoid shape (bull's eye or target pattern)</p> |
| Solid early stage | <p>A: antrum; Ao: aorta; L: liver; R: rectus abdominis muscle</p> | <p>-“Frosted-glass” pattern usually shortly after a solid meal</p> |
| Solid late stage | <p>A: antrum; Ao: aorta; L: liver; P: pancreas; R: rectus abdominis muscle; S: spine; Sma: superior mesenteric artery</p> | <p>-heterogeneous, particulate contents</p> <p>-homogeneous, hyperechoic content</p> <p>-milk curdles can have a typical biphasic appearance</p> |
| Clear fluid | <p>A: antrum; Ao: aorta; D: diaphragm; L: liver; P: pancreas; R: rectus abdominis muscle; S: spine; Sma: superior mesenteric artery</p> | <p>-the content appears anechoic or hypoechoic</p> <p>-the size of the antrum is proportional to the gastric volume</p> <p>-the antrum will appear larger in the RLD position</p> |

| <p>Fluid with air bubbles</p> | | <p>“starry night” usually seen shortly after ingestion of clear fluids or effervescent drinks Volume assessment can be done</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p>Gastric volume assessment (clear liquid)</p> | <table border="1"> <thead> <tr> <th>Height (cm)</th> <th>30</th> <th>35</th> <th>40</th> <th>45</th> <th>50</th> <th>55</th> <th>60</th> <th>65</th> <th>70</th> <th>75</th> <th>80</th> </tr> </thead> <tbody> <tr><td>3</td><td>31</td><td>18</td><td>5</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>4</td><td>48</td><td>32</td><td>20</td><td>7</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>5</td><td>60</td><td>47</td><td>34</td><td>21</td><td>9</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>6</td><td>74</td><td>62</td><td>49</td><td>36</td><td>23</td><td>10</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>7</td><td>89</td><td>76</td><td>63</td><td>51</td><td>38</td><td>25</td><td>13</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>8</td><td>103</td><td>88</td><td>78</td><td>65</td><td>55</td><td>40</td><td>27</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>9</td><td>118</td><td>105</td><td>93</td><td>80</td><td>67</td><td>54</td><td>41</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>10</td><td>133</td><td>120</td><td>107</td><td>94</td><td>82</td><td>69</td><td>54</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>11</td><td>147</td><td>135</td><td>122</td><td>109</td><td>96</td><td>83</td><td>70</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>12</td><td>162</td><td>149</td><td>136</td><td>124</td><td>111</td><td>98</td><td>85</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>13</td><td>177</td><td>164</td><td>151</td><td>138</td><td>125</td><td>113</td><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>14</td><td>191</td><td>178</td><td>165</td><td>153</td><td>140</td><td>127</td><td>114</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>15</td><td>206</td><td>193</td><td>180</td><td>167</td><td>155</td><td>142</td><td>129</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>16</td><td>220</td><td>207</td><td>194</td><td>182</td><td>169</td><td>156</td><td>145</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>17</td><td>235</td><td>222</td><td>209</td><td>200</td><td>184</td><td>173</td><td>158</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>18</td><td>249</td><td>236</td><td>224</td><td>212</td><td>198</td><td>185</td><td>175</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>19</td><td>264</td><td>251</td><td>239</td><td>226</td><td>213</td><td>200</td><td>187</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>20</td><td>278</td><td>266</td><td>253</td><td>240</td><td>227</td><td>214</td><td>202</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>21</td><td>293</td><td>281</td><td>268</td><td>255</td><td>242</td><td>229</td><td>217</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>22</td><td>307</td><td>295</td><td>282</td><td>269</td><td>256</td><td>244</td><td>231</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>23</td><td>321</td><td>310</td><td>297</td><td>284</td><td>271</td><td>259</td><td>246</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>24</td><td>335</td><td>324</td><td>311</td><td>298</td><td>285</td><td>273</td><td>260</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>25</td><td>349</td><td>339</td><td>326</td><td>313</td><td>301</td><td>288</td><td>275</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>26</td><td>363</td><td>353</td><td>340</td><td>327</td><td>315</td><td>302</td><td>289</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>27</td><td>377</td><td>368</td><td>355</td><td>342</td><td>329</td><td>317</td><td>304</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>28</td><td>391</td><td>382</td><td>369</td><td>357</td><td>344</td><td>331</td><td>318</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>29</td><td>405</td><td>397</td><td>385</td><td>372</td><td>359</td><td>346</td><td>333</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>30</td><td>419</td><td>411</td><td>398</td><td>386</td><td>373</td><td>360</td><td>347</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>30</td><td>433</td><td>427</td><td>414</td><td>401</td><td>388</td><td>375</td><td>363</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> </tbody> </table> <p>• The cross-sectional area of the antrum (CSA) has a linear correlation with the gastric volume • To measure the CSA: • Identify the antrum at the level of the aorta in the RLD • Obtain a still image of the antrum at rest (between peristaltic contractions) • Use the free-tracing tool of the ultrasound machine to measure the CSA including the full thickness of the gastric wall (from serosa to serosa) • Use a predictive model to assess the gastric volume</p> <p>VOLUME (ML) = 27.0 + 14.6 X RIGHT-LAT CSA – 1.28 X AGE</p> <table border="1"> <thead> <tr> <th>GRADE</th> <th>ANTRAL PRESENTATION</th> <th>VOLUME IMPLICATIONS</th> <th>ASPIRATION RISK</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Empty in both supine and RLD position</td> <td>Minimal</td> <td>Low risk</td> </tr> <tr> <td>1</td> <td>Empty in supine, clear fluid visible in the RLD</td> <td>≤ 1.5 mL/kg, compatible with baseline gastric secretions</td> <td>Low risk</td> </tr> <tr> <td>2</td> <td>Clear fluid visible in both positions</td> <td>> 1.5 mL/kg, likely in excess of baseline gastric secretions</td> <td>High risk</td> </tr> </tbody> </table> | Height (cm) | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 3 | 31 | 18 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 48 | 32 | 20 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 60 | 47 | 34 | 21 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 74 | 62 | 49 | 36 | 23 | 10 | 0 | 0 | 0 | 0 | 0 | 7 | 89 | 76 | 63 | 51 | 38 | 25 | 13 | 0 | 0 | 0 | 0 | 8 | 103 | 88 | 78 | 65 | 55 | 40 | 27 | 0 | 0 | 0 | 0 | 9 | 118 | 105 | 93 | 80 | 67 | 54 | 41 | 0 | 0 | 0 | 0 | 10 | 133 | 120 | 107 | 94 | 82 | 69 | 54 | 0 | 0 | 0 | 0 | 11 | 147 | 135 | 122 | 109 | 96 | 83 | 70 | 0 | 0 | 0 | 0 | 12 | 162 | 149 | 136 | 124 | 111 | 98 | 85 | 0 | 0 | 0 | 0 | 13 | 177 | 164 | 151 | 138 | 125 | 113 | 100 | 0 | 0 | 0 | 0 | 14 | 191 | 178 | 165 | 153 | 140 | 127 | 114 | 0 | 0 | 0 | 0 | 15 | 206 | 193 | 180 | 167 | 155 | 142 | 129 | 0 | 0 | 0 | 0 | 16 | 220 | 207 | 194 | 182 | 169 | 156 | 145 | 0 | 0 | 0 | 0 | 17 | 235 | 222 | 209 | 200 | 184 | 173 | 158 | 0 | 0 | 0 | 0 | 18 | 249 | 236 | 224 | 212 | 198 | 185 | 175 | 0 | 0 | 0 | 0 | 19 | 264 | 251 | 239 | 226 | 213 | 200 | 187 | 0 | 0 | 0 | 0 | 20 | 278 | 266 | 253 | 240 | 227 | 214 | 202 | 0 | 0 | 0 | 0 | 21 | 293 | 281 | 268 | 255 | 242 | 229 | 217 | 0 | 0 | 0 | 0 | 22 | 307 | 295 | 282 | 269 | 256 | 244 | 231 | 0 | 0 | 0 | 0 | 23 | 321 | 310 | 297 | 284 | 271 | 259 | 246 | 0 | 0 | 0 | 0 | 24 | 335 | 324 | 311 | 298 | 285 | 273 | 260 | 0 | 0 | 0 | 0 | 25 | 349 | 339 | 326 | 313 | 301 | 288 | 275 | 0 | 0 | 0 | 0 | 26 | 363 | 353 | 340 | 327 | 315 | 302 | 289 | 0 | 0 | 0 | 0 | 27 | 377 | 368 | 355 | 342 | 329 | 317 | 304 | 0 | 0 | 0 | 0 | 28 | 391 | 382 | 369 | 357 | 344 | 331 | 318 | 0 | 0 | 0 | 0 | 29 | 405 | 397 | 385 | 372 | 359 | 346 | 333 | 0 | 0 | 0 | 0 | 30 | 419 | 411 | 398 | 386 | 373 | 360 | 347 | 0 | 0 | 0 | 0 | 30 | 433 | 427 | 414 | 401 | 388 | 375 | 363 | 0 | 0 | 0 | 0 | GRADE | ANTRAL PRESENTATION | VOLUME IMPLICATIONS | ASPIRATION RISK | 0 | Empty in both supine and RLD position | Minimal | Low risk | 1 | Empty in supine, clear fluid visible in the RLD | ≤ 1.5 mL/kg, compatible with baseline gastric secretions | Low risk | 2 | Clear fluid visible in both positions | > 1.5 mL/kg, likely in excess of baseline gastric secretions | High risk | <p>Adult volume >100cc is concerning for aspiration</p> <p>This grading system has been validated in children, obese, non-obese and obstetrics patients</p> |
| Height (cm) | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 31 | 18 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 48 | 32 | 20 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 60 | 47 | 34 | 21 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 74 | 62 | 49 | 36 | 23 | 10 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 89 | 76 | 63 | 51 | 38 | 25 | 13 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 103 | 88 | 78 | 65 | 55 | 40 | 27 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 118 | 105 | 93 | 80 | 67 | 54 | 41 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | 133 | 120 | 107 | 94 | 82 | 69 | 54 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 26 | 363 | 353 | 340 | 327 | 315 | 302 | 289 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 27 | 377 | 368 | 355 | 342 | 329 | 317 | 304 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 28 | 391 | 382 | 369 | 357 | 344 | 331 | 318 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29 | 405 | 397 | 385 | 372 | 359 | 346 | 333 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 30 | 419 | 411 | 398 | 386 | 373 | 360 | 347 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 30 | 433 | 427 | 414 | 401 | 388 | 375 | 363 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRADE | ANTRAL PRESENTATION | VOLUME IMPLICATIONS | ASPIRATION RISK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Empty in both supine and RLD position | Minimal | Low risk | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Empty in supine, clear fluid visible in the RLD | ≤ 1.5 mL/kg, compatible with baseline gastric secretions | Low risk | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Clear fluid visible in both positions | > 1.5 mL/kg, likely in excess of baseline gastric secretions | High risk | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Qualitative exam workflow</p> | | <p>Solid-high risk Clear fluid: need to measure volume</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



Problem-Based Learning Discussion (PBLD) #3

Sept. 16, 2023

Provide Safety and Keep Our Sanity for Remote Non-OR Anesthesia

曹錫清, MD, FASA; 姚熱風, MD

Department of Anesthesiology, Medstar Washington Hospital Center, Washington DC

程國章, MD

Department of Anesthesia, Sinai Hospital, Baltimore

曹錫清: 各位同仁晚上好, 非常高興在 CASA Zoom 與大家見面! 今年的“基于问题的学习讨论 (PBLD)”系類講座在前兩年《聊聊麻醉-策略與困惑》的基礎上進一步發展, 收到了很好的效果, 也更受年輕麻醉醫生的青睞。真誠希望在綫的醫生們也分享你们在非手术室麻醉 (NORA) 中遇到的棘手问题, 我们相互借鉴共同成长! NORA 危机四伏, 正是具有丰富临床经验和在其他科室医生中有良好口碑和声望的高年麻醉医生大显神威的地方。我们的知识累积和成熟稳重、和风细雨的沟通能力也令 proceduralists 和 Advanced Anesthesia Providers (CRNA, CAA, NP)信服, 我们的工作高效率, 靈活機動, 以患者和 proceduralist 的需求為中心的態度和吃苦耐劳解決難題的能力有目共睹。有我们在远离手术室的地方把关既是患者安全的福音, 又让麻醉科领导放心和医院的 risk manager 放心。这就是为什么越来越多的 CASA 会员成为我们麻醉科的形象大使负责与 NORA 科室合作, 也有很多人到各个日间手术中心服务。

近年來在世界各地尤其是美國在手術室外需要麻醉醫生參與的手術/操作越來越多, 我所在的醫院每天在胃腸/肺 endoscopy suite, 心內 arrhythmia EP lab 和心導管 cath lab, 放射介入治療 IR 偶爾 MRI 的手術量與日俱增, volume exceeds over 50% OR cases, 其中內窺鏡數量佔 NORA 操作數量之首。這一方面是由于醫療器械包括導管微創, robotic, augmented precision 定位技術的日新月異的發展; 另一方面是由于預防醫學篩查的年齡提前或普及, 比如結腸鏡普查結腸癌的年齡提前了五年, 胸部 CT 對有吸煙史的患者早期診斷肺癌的指南更新; 第三方面是醫學經濟學在發揮作用, 往往這些新技術治療手段相比傳統的外科手術既能提高患者的生存質量減少術後併發症, 又能給醫院帶來豐厚的投資回報。我們經常接觸這些技術創新前沿發展, 也有助于我們在麻醉管理方面與時俱進。然而, 高回報錢幣的另一面是風險也在不斷增加, 過去外科手術禁忌的超高齡合并多系統疾病的患者也變成了 NORA procedures 的常客。

表 1: 與 NORA 相關的麻醉管理挑戰

1. 患者病重, 存在多系統 comorbidity
2. 遠離藥房和器械供應房
3. 很多 MAC, 缺乏合適的麻醉深度監測儀器

4. 麻醉人員分散在醫院的不同樓層和角落，不利於團隊配合緊急搶救
5. 缺乏麻醉後勤輔助人員支持，缺乏訓練有素的 OR 護士配合
6. 有限的 workspace, 特別是 GI/Robotic Bronchoscopy 房間擁擠，燈光黑暗，環境嘈雜，氣味難聞；COVID-19, TB 等傳染病職業危害
7. 需要穿厚重防 radiation 的鉛衣，特別是 EP/IR/Cath Lab
8. 患者體溫調節保溫差，特別是時間長的手術
9. 有限的患者 access
10. 值班時急診的 NORA 病例不斷增加，NORA 中 IR 的急診比例也相對 OR 更高。比如肺栓塞取栓，腦血管意外，車禍后創傷血管栓塞止血等。

文獻檢索證實“procedures performed in the endoscopy suite make up the largest number of nonoperating room closed claims anesthesia cases. Oversedation and subsequent inadequate oxygenation/ventilation account for the majority of malpractice claims. Conclusions from the current literature emphasize the importance of complying with monitoring standards and having well prepared providers to improve patient outcomes in nonoperating room locations.”根據去年 ASA 年會的講座：“Malpractice claims for non-operating room anesthesia care (NORA) had a higher proportion of claims for death than claims in operating rooms (ORs). NORA claims most frequently involved monitored anesthesia care. Inadequate oxygenation /ventilation was responsible for one-third of NORA claims, often judged probably preventable by better monitoring.”（圖 1）

| Patient Safety and NORA | | | | | |
|-------------------------|--------|--------|------------------------|------|------|
| Observed mortality data | | | Closed claims data | | |
| Years | NORA | OR | Years | NORA | OR |
| 1998-2007 ¹ | 0.025% | 0.014% | 1970-2001 ³ | 54% | 24%* |
| 2013-2017 ² | 0.049% | 0.043% | 2006-2009 ⁴ | 54% | 29%* |
| | | | 2000-2012 ⁵ | 61% | 30%* |

*Statistically significant with p<0.05

¹Girshin M et al. *J Comput Assist Tomogr* 2009; 33(2):312-5.
²Choi JW et al. *J Korean Med Sci* 2018;33(28):e183.
³Robbertze R et al. *Curr Opin Anaesthesiol* 2006;19:436-42.
⁴Metzner J et al. *Curr Opin Anaesthesiol* 2009;22:502-8.
⁵Woodward ZG et al. *Anesthesiol Clin* 2017;35:569-81.

圖 1: 2022 ASA Annual Meeting Lecture

上個月的 PBLD 由周少鳳教授帶領大家討論分析了主動脈血管瘤夾層 dissection 的麻醉管理，今晚來自巴爾地魔 Sinai Hospital 的程国章医生将讨论主动脉夹层合并肺动脉高压做 PEG 胃管的难题，程醫生有多年豐富的 GI 麻醉管理經驗，他特別重視與外科及 GI 醫生的交流。然後我本人將帶領大家讨论重度心衰合并重度主动脉瓣狭窄做 EGD/ERCP 的麻醉管理，心脏移植术

前、LVAD 患者的 GI 管理，最後由姚热风医生帶領我們讨论房颤 cardioversion 发生的罕见并发症。欢迎大家積極踴躍參與討論發言，隨時舉手或在 chat box 留言，有請程醫生分享。

程國章：謝謝曹醫生邀請我參加 PBLD，謝謝 CASA 在彭勇剛會長領導下多次舉辦 PBLD，我也聆聽了周教授上個月的分享，受益匪淺。

我也有一例主動脈夾層 Type B 保守觀察的患者，住院兩周後因為咽食困難到 GI Lab 準備做 percutaneous endoscopy gastrostomy tube (PEG)，術前評估發現同時有肺動脈高壓。

現在能不能做，危險多高，和大家共同探討。

PBLD Objectives:

1. To address the importance of preoperative multispecialty communication
2. To be aware that anesthesiologist may be the final check person before a dangerous proposal for a non-emergent procedure
3. To appreciate the dynamic change of pulmonary hypertension
4. To explore possible beneficial effect of prophylactic Sildenafil in pulmonary hypertension for NORA procedures

Case #1

67-year-old male was admitted for Type B aortic dissection. He was in MICU for BP and heart rate control after cardiology and vascular surgery consultations recommending medical treatment (BP <120 to 140 mmHg, HR < 70-80 BPM). Two weeks after admission, GI was consulted for PEG placement due to dysphagia.

His PMH includes Hypertension, Dual-chamber pacemaker for 7 years, Hypertrophic cardiomyopathy, Tri fascicular bundle branch block, Hyperlipidemia, Bipolar affective disorder and irritable bowel syndrome. After admission, the patient was found to have sepsis, bilateral pneumonia, urinary track infection, hypoxic respiratory failure requiring HFNC, now in step- down MICU with nasal cannula oxygen.

Vital and Physical Examination: 53.8 kg, BP 116/84, P 107, RR 18, SpO2 96 on RA,

Mallampati 2.

Chest CT (first CT, April 1): Stanford type B dissection involving the thoracic aorta, measuring 10 cm in craniocaudal dimension; normal abdominal aorta, Small left pleural effusion, Bilateral lower lobe sub-segmental atelectasis.

Lab: H/H 10/32, plt.447, BMP and PT/PTT/INR all normal. COVID-19 negative.

CXR: Bilateral pleural effusions, Bilateral infiltrate.

Chest CT (3 days later, April 4): Aortic dissection, no significant change. No evidence of active extravasation/rupture. Small pleural effusion, Bibasilar airspace disease.

Let's review the **Stanford classification**:

Hyperacute: <24 hr,

Acute: 1 to 14 days,

Subacute: 15 to 90 days, (圖 2) :

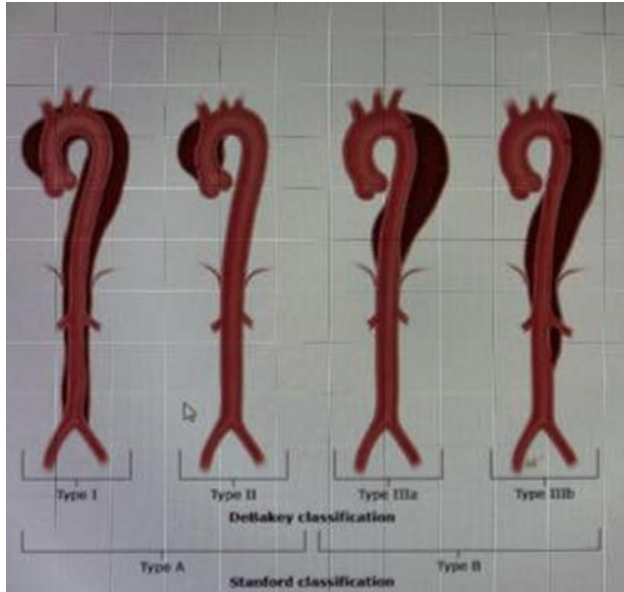


圖 2: From Uptodate, James H Black III, MD, July 2023

Now what are your options?

曹錫清: Excellent case, 我想知道爲什麼着急做 PEG, cause of dysphagia 是否短暫的?

麻浩波: 我可以從 ICU 角度回答, 如果病人在轉去 Rehab 之前有 dysphagia, 有許多 nursing home 不接受有胃管(NG tube)的病人, 需要有 PEG。

潘偉: 雖然 type B dissection 原則上可以保守觀察, 但是如果 Aorta 已經 10cm dilated with potential up to ascending aorta, why not consider endovascular aortic balloon therapy to prevent further expanding dissection. Second, this pt. has h/o hypertrophic cardiomyopathy, we need to have adequate filling preload, avoid hypotension induced myocardial hypoperfusion. Is there an echocardiogram to evaluate the risk?

程國章: 很好的問題, 謝謝! 我先回答 Indications of PEG placement:

- 1, Dysphagia, if the underlying condition is expected to persist for at least four weeks
- 2, Head, neck, or esophageal cancer
- 3, Palliative gastric decompression
- 4, Other

I did literature review:

A. **Gastrostomy Placement and Mortality Among Hospitalized Medicare Beneficiaries**

Mark D. Grant, MD, MPH; Mark A. Rudberg, MD, MPH; Jacob A. Brody, MD
 JAMA. 1998;279(24):1973-1976. doi:10.1001/jama.279.24.1973

-Hospitalized Medicare beneficiaries aged 65 years or older discharged in 1991 following gastrostomy placement.

-Results: In 1991, claims reflecting gastrostomy insertion were submitted for 81105 older Medicare beneficiaries following hospital discharge. The in-hospital mortality rate was 15.3%. Cerebrovascular disease, neoplasms, fluid and electrolyte disorders, and aspiration pneumonia were the most common.

-primary diagnoses. The overall mortality rate at 30 days was 23.9% , reaching 63.0% at 1 year and 81.3% by 3 years.

B. High In-hospital mortality after percutaneous endoscopic gastrostomy: results of a nationwide population-based study. Gaurav Arora 1 , Don Rockey, Samir Gupta. Clin Gastroenterol Hepatol. 2013 Nov;11(11):1437-1444.e3. doi: 10.1016/j.cgh.2013.04.011.

-Results: In-hospital mortality was 10.8% among 181,196 patients who underwent PEG in 2006 per US Nationwide Inpatient Sample (NIS)

C. In-Hospital Mortality with Use of Percutaneous Endoscopic Gastrostomy in Traumatic Brain Injury Patients: Results of a Nationwide Population-Based Study. Rabail Chaudhry , Sachin Batra, Omar L Mancillas , Robert Wegner, Navneet Grewal , George W Williams. Neurocrit Care 2017 Apr;26(2):232-238. doi: 10.1007/s12028-016-0330-2.

-Results: In-hospital mortality after PEG was 6% (95% CI, 0.05-0.76%) among the TBI population with 0.2% occurring in the first 7 days and 2% occurring in the first 14 days.

第二個問題是關鍵，去年潘偉教授講了 pulmonary hypertension review and treatment, 印象深刻，學習了。我們看：

ECHO (April 1):

Technically difficult. LVEF 55-60%, moderate concentric LV hypertrophy, Upper septal hypertrophy, normal variant. Mod to severe MR, mod AR, mild valvular PR, mild TR, LA moderately dilated. RVSP >60 mmHg, RV is normal in size and function.

Now you know the patient has type B aortic dissection and pulmonary hypertension,

Do you still want to proceed?

彭勇剛：我們不能根據 RVSP 確定肺動脈高壓的具體嚴重程度，因為 RVSP 的計算會受到 tricuspid valve regurgitation 影響， 需要有 right heart cath to measure pulmonary systolic/diastolic pressure. 另外，急性肺動脈高壓 對右室功能造成衰竭 的可能性更大，慢性的肺動脈高壓可能導致右室代償，患者的 RV 正常，是否有既往 Echo?

程國章：有道理，繼續深挖病史：

TEE (11/29/2017, CRISP). Mild MR / TR / AR, RVSP normal, Pacemaker leads in the RA / RV

看來 RSVP 升高是比較新的。Besides PEG, there are alternative approach to PEG:

- Nasogastric tube
- Dobhoff tube
- Radiologically inserted gastrostomy
- Surgical gastrostomy

I did further research:

Radiologic, endoscopic, and surgical gastrostomy: an institutional evaluation and meta-analysis of the literature. B Wollman, H B D'Agostino, J R Walus-Wigle, D W Easter, A Beale. Published Online: Dec 1, 1995, <https://doi.org/10.1148/radiology.197.3.7480742>

PURPOSE: To evaluate the effectiveness and safety of radiologic, percutaneous endoscopic (PEG), and surgical gastrostomy.

MATERIALS AND METHODS: This project involved 5,752 patients (837 patients underwent radiologic gastrotomy; 4,194, PEG; and 721, surgical gastrostomy). Seventy-two (47 male, 25 female; age range, 12-94 years) underwent gastrostomy within 1 year in this series (radiologic gastrostomy, n = 33; PEG, n = 35; surgical gastrostomy, n = 4). A meta-analysis of 5,680

additional cases from literature published from 1980 to the present were also performed.

RESULTS: Rates of successful tube placement were higher for radiologic gastrostomy than for PEG in our series and in the meta-analysis (99.2% vs 95.7%, $P < .001$). Major complications occurred less frequently after radiologic gastrostomy in our series and in the meta-analysis (5.9% vs 9.4% for PEG and 19.9% for surgery, $P < .001$). **Thirty-day procedure-related mortality rates were highest for surgery (2.5% vs 0.3% for radiologic gastrostomy and 0.53% for PEG, $P < .001$).**

CONCLUSION: Radiologic gastrostomy is associated with a higher success rate than is PEG and less morbidity than either PEG or surgery.

I decided to persuade the primary care physician to consider radiologic gastrostomy, however, there is a supply chain problem at our hospital, we are short of contrast dye, which is reserved for other necessary radiological applications.

The PEG is postponed, then second Echo was done in four weeks:

ECHO (Second ECHO, 5/6):

-LVEF 60-65%, mild concentric LVH, Mild TR / AR / MR /valvular PR, **RVSP 45 mmHg**
RV normal in size and function, Upper septal hypertrophy (sigmoid septum).

ECHO (May 17, third ECHO):

-LVEF 55-65%, Mod to severe MR, mild TR / AR, Upper septal hypertrophy (sigmoid septum)

RVSP normal, RV normal in size and function. LA mildly dilated. Pacemaker lead in RV.

So pHTN is dynamic, it may change to normal pressure after correcting the attributing factors like hypoxia, pneumonia.

Clinical classification of pulmonary hypertension (6th World Symposium on pulmonary Hypertension)

1. PAH
2. PH due to left heart disease
3. PH due to lung disease and/or hypoxia
4. PH due to pulmonary artery obstruction
5. PH with unclear and/or multifactorial mechanisms

A. Cardiovascular outcomes of patient with pulmonary hypertension undergoing non-cardiac surgery. Smilowitz NR, et al. Am J Cardiol. 2019;123:1532

Among 17,853,194 hospitalizations for major noncardiac surgery, 143,846 (0.81) had PH

| | PH | non PH |
|-------------|------|--------|
| Major MACE | 8.3% | 2.0% |
| Death | 4.4% | 1.1% |
| Nonfatal MI | 3.2% | 0.6 |

B. Perioperative management of patients with pulmonary hypertension undergoing non-cardiothoracic, non-obstetric surgery: a systematic review and expert consensus statement. Price LC, et al. B J Anaesthesia. 2021;126(4),p774-790.

30-day mortality after noncardiac and non-obstetric surgery in patients with PH was 2% to 18% for elective procedure, 15% to 50% for emergent surgery, usually relating to acute RV failure.

How did this patient get pulmonary hypertension?

Aortic dissection presenting with secondary pulmonary hypertension caused by: compression of pulmonary artery by dissecting hematoma: a case report. Kim DH, et al. Korean J Ridiol 2004;5(2):139-142

Case: 64-year female, CP, SOB for 4 days, ECHO: EF 56%, mod to severe TR, bilat pleural effusion, **PASP 75 mmHg**, idiopathic RV failure.

CT: DeBakey type II, hematoma compressing the PA

Surgery: the dissecting hematoma was found to compress both main PA, postoperative PASP 20 mmHg

Does pulmonary hypertension only get worse over time? It depends!

Example one: 69 patients with acute PE, CT pulmonary angiograms 81% showed complete resolution of PE on CT angiography after 28 days.

Stein PD, et al. **Resolution of pulmonary embolism on CT pulmonary angiography.** AM J Roentgenology 2010;194: 1263-1268

Example two: One hundred eleven consecutive PE patients, retrospective cohort imaging study

Clot burden resolved completely in 77% of patients with at least one follow-up pulmonary CTA within 1 year.

Aghayev A, et al. **The rate of resolution of clot burden measured by pulmonary CT angiography in patients with acute pulmonary embolism.** Am J Roentgenology 2013;200: 791-797

Now, my last discussion point: *Do you use Sildenafil before surgery/procedure in patients with severe pulmonary hypertension?*

見圖 3 (1-2) 幾篇文獻資料：

ORIGINAL ARTICLE

Sildenafil Citrate Therapy for Pulmonary Arterial Hypertension

Nazzareno Galè, M.D., Hossein A. Ghofrani, M.D., Adam Torbicki, M.D., Robyn J. Barst, M.D., Lewis J. Rubin, M.D., David Badesch, M.D., Thomas Fleming, Ph.D., Tamara Parpia, Ph.D., Gary Burgess, M.D., Angelo Branzi, M.D., Friedrich Grimminger, M.D., Marcin Kurzyna, M.D., et al., for the Sildenafil Use in Pulmonary Arterial Hypertension (SUPER) Study Group

| | | |
|----------------|----------------------|----------------------------------|
| Article | Figures/Media | November 17, 2005 |
| | | N Engl J Med 2005; 353:2148-2157 |
| | | DOI: 10.1056/NEJMoa050010 |

40 References 1765 Citing Articles

METHODS

In this double-blind, placebo-controlled study, we randomly assigned 278 patients with symptomatic pulmonary arterial hypertension (either idiopathic or associated with connective-tissue disease or with repaired congenital systemic-to-pulmonary shunts) to placebo or sildenafil (20, 40, or 80 mg) orally three times daily for 12 weeks. The primary end point was the change from baseline to week 12 in the distance walked in six minutes. The change in mean pulmonary-artery pressure and World Health Organization (WHO) functional class and the incidence of clinical worsening were also assessed, but the study was not powered to assess mortality. Patients completing the 12-week randomized study could enter a long-term extension study.

RESULTS

The distance walked in six minutes increased from baseline in all sildenafil groups; the mean placebo-corrected treatment effects were 45 m (+13.0 percent), 46 m (+13.3 percent), and 50 m (+14.7 percent) for 20, 40, and 80 mg of sildenafil, respectively ($P < 0.001$ for all comparisons). All sildenafil doses reduced the mean pulmonary-artery pressure ($P = 0.04$, $P = 0.01$, and $P < 0.001$, respectively), improved the WHO functional class ($P = 0.003$, $P < 0.001$, and $P < 0.001$, respectively), and were associated with side effects such as flushing, dyspepsia, and diarrhea. The incidence of clinical worsening did not differ significantly between the patients treated with sildenafil and those treated with placebo. Among the 222 patients completing one year of treatment with sildenafil monotherapy, the improvement from baseline at one year in the distance walked in six minutes was 51 m.

Indian Journal of Pharmacology

CURRENT ISSUE
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Indian J Pharmacol, 2014 May-Jun; 46(3): 281-285.
doi: 10.4103/0253-7613.132158

PMCID: PMC4071704
PMID: 24987174

Effect of preoperative oral sildenafil on severe pulmonary artery hypertension in patients undergoing mitral valve replacement

Mansoor Ghafoor, Binay Shah, Ramkishor Patel, Divyesh Toshani, Jyotsna Bhatnagar, Jyotsna Kathari, and Naman Chandra

圖 3-1

Table 2
Hemodynamic parameters during mitral valve replacement surgery in sildenafil versus control groups

| Parameter | T1 time | T2 time | T3 time | T4 time | T5 time |
|-----------------------------------|-----------------|-----------------|-----------------|-----------------|----------------|
| HR (beats/min) | | | | | |
| C | 86.15±10.40 | 86.80±8.77 | 87.76±10.70 | 88.78±9.04 | 90.85±9.91 |
| S | 87.25±12.87 | 86.75±12.01 | 86.16±9.05 | 89.10±11.47 | 90.50±9.77 |
| MAP (mmHg) | | | | | |
| C | 75.80±7.83 | 73.30±4.68 | 77.30±6.84 | 78.30±6.35 | 79.78±7.74 |
| S | 73.45±6.50 | 75.60±6.83 | 73.90±7.57 | 77.65±6.63 | 80.15±7.98 |
| SVWP (mmHg) | | | | | |
| C | 70.90±9.04 | 64.40±8.04 | 62.75±7.41 | 59.38±7.48 | 59.05±7.58 |
| S | 54.20±7.85* | 59.70±7.78* | 56.20±6.19* | 47.85±6.90* | 45.30±6.60* |
| MPAP (mmHg) | | | | | |
| C | 47.70±7.9 | 43.85±6.58 | 42.40±6.79 | 39.75±6.68 | 39.50±6.58 |
| S | 31.90±5.88* | 29.55±5.08* | 28.80±4.88* | 26.75±4.82* | 25.70±3.74* |
| PCWP (mmHg) | | | | | |
| C | 23.25±3.19 | 20.85±2.51 | 19.35±2.43 | 18.20±2.19 | 17.20±2.28 |
| S | 21.60±2.83 | 20.30±2.75 | 19.75±2.71 | 18.35±2.29 | 16.85±2.00 |
| CI (l/min/m ²) | | | | | |
| C | 3.40±0.54 | 3.44±0.49 | 3.40±0.46 | 3.49±0.44 | 3.54±0.46 |
| S | 3.43±0.47 | 3.41±0.40 | 3.50±0.41 | 3.51±0.36 | 3.51±0.44 |
| SVRI (dynes·sec/cm ⁵) | | | | | |
| C | 1831.38±364.61 | 1739.39±310.374 | 1800.45±380.029 | 1807.78±328.025 | 1836.38±369.66 |
| S | 1748.45±349.281 | 1802.15±273.327 | 1702.46±191.901 | 1788.67±183.88 | 1832.20±283.15 |
| PVRI (dynes·sec/cm ⁵) | | | | | |
| C | 603.63±211.408 | 562.12±178.424 | 561.84±182.671 | 580.34±161.85 | 519.36±165.86 |
| S | 343.04±84.43* | 315.16±75.768* | 297.27±68.63* | 197.25±60.90* | 202.72±68.263* |

MAPs are means (SD) (mmHg), HRs, or actual number as appropriate; Chi-square test and unpaired T test used to calculate P values. *P<0.001 sildenafil versus control group; C = Control group; S = Sildenafil group; T1 = 20 min after cessation of 100% oxygen anesthesia; T2 = 20 min after weaning from CPB; T3 = 1 h after ending the postoperative recovery room; T4 = 2 h after ending the postoperative recovery room; T5 = 4 h after ending the postoperative recovery room; HR = Heart rate; MAP = Mean arterial pressure; MPAP = Mean pulmonary artery pressure; PCWP = Pulmonary capillary wedge pressure; CI = Cardiac index; SVRI = Systemic vascular resistance index; PVRI = Pulmonary vascular resistance index; SD = Standard deviation.

On comparison of CI and SVRI there was no statistical significance between the two groups. PVRI was significantly lower in sildenafil group after induction, after weaning from CPB, and in the postoperative period (Table 2).



The Annals of Thoracic Surgery
Volume 79, Issue 1, January 2005, Pages 194-197



Original article
Cardiovascular

Oral Sildenafil Reduces Pulmonary Hypertension After Cardiac Surgery

Presented at the Fiftieth Annual Meeting of the Southern Thoracic Surgical Association, Bonita Springs, FL, Nov 13-15, 2003.

Aaron L. Trachte MD,^a Emilio B. Lobato MD,^b Felipe Urdaneta MD,^{b,c}
Phillip J. Hess MD,^a Charles T. Klodell MD,^a Tomas D. Martin MD,^a
Edward D. Staples MD,^a Thomas M. Beaver MD,^a

Methods

We reviewed the charts of eight adult patients with postoperative pulmonary hypertension who received oral sildenafil (25 to 50 mg) to facilitate weaning of IV (milrinone, nitroglycerine, and sodium nitroprusside) and inhaled (nitric oxide) pulmonary vasodilators. Hemodynamic data were recorded before and 30 and 60 minutes after the initial dose of sildenafil.

Results

After the initial dose of sildenafil, mean pulmonary artery pressure was reduced by 20% and 22% at 30 and 60 minutes, respectively ($p < 0.05$). Pulmonary vascular resistance index decreased by 49% and 44% at 30 and 60 minutes, respectively ($p < 0.05$). Sildenafil had no clinically significant effects on cardiac index, mean arterial pressure, or systemic vascular resistance. Subsequent doses of sildenafil were administered at regular intervals, allowing successful weaning of concomitant pulmonary vasodilators.

圖 3-2

潘偉: 我不主張術前口服 Sildenafil, 術中的反應不可掌控, 有時會造成極高血壓。

彭勇剛: 20 年前研究熱鬧了一陣, 目前還沒有臨床普及使用。

程國章: 這個患者最後決定六周后做 PEG placement, *do you prefer GETA or sedation?*

According to a French study, 37 procedures in 26 patients, 31/37, 84% used sedation, 6/37, 16% used general, mild pHTN, mPAP 40-43mmHg.

Our patient finally had PEG done uneventfully with MAC, it worths the waiting.

In summary

1. **Not all proposed case should be done right away**
2. Be aware of possible dynamic changes in patients with pulmonary hypertension. If it may change your anesthetic plan, it is worthwhile to dig deep to get more information as much as possible.
3. Sildenafil prophylactic use? Not sure.

曹錫清: 感謝程醫生精彩的主動脈夾層案例和大量的文獻分享, 學習了在 IR 做 RIG 胃管比 PEG 成功率高并發症又少, 肺動脈高壓的動態變化, 術前評估深入挖掘更多信息、不可輕視檢索文獻學習他人經驗幫助我們臨床決策的重要性。Anesthesia is now the riskiest part of the NORA procedure, how to identify the risky patients and plan for the safe navigation through the troubled water?

My PBLD objectives are:

1. To address the unique challenge of sedation to minimally invasive procedures on patients with significant cardiovascular and/or respiratory comorbidities.
2. To recognize the anesthetic risk of severe aortic stenosis and understand the physiology of AS and cardiomyopathy.
3. To formulate anesthetic plans that are optimized for geriatric patients with critical AS, severe pulmonary HTN, severe OSA, severe CMP with ultra-low EF, LVAD and pre-heart transplant undergoing GI procedures
4. To communicate with multi-specialty stakeholders to choose strategies for the best outcome and minimize potential perioperative complications.

Stem Case (2):

Pt. is a 76 yo white male with history of CAD (s/p NSTEMI 2018, CABG x3 2009), carotid artery stenosis s/p R CEA; HFrEF. 2/5/23 TTE LV dilation EF 20%, LVH. Mild to moderate aortic regurgitation. Severe AS. AVA of 0.7 cm². large pleural effusion. EKG: NSR with RBBB

His HTN was controlled, other PMH include HLD, DM 2 (healing foot ulcer after completed ABX regimen), CKD stage III (Cr 1.8), Iron deficiency anemia, penile CA (removal no radiation/chemo), Gout.

He presented to local community hospital on 2/3/2023 for SOB, orthopnea and swelling and was treated with furosemide on 2/4/2023-2/5/2023 with unimproved symptoms. Echo 2/5/23 as above.

He was transferred to MWHC on 2/6/2023 for aortic valve evaluation.

His further work up included:

1. normal lung V/Q scan (2/3/2023): normal ventilation, no ventilation defects. Perfusion: Multiple segmental nonsegmental bilateral perfusion defects most pronounced in the right lower lobe.
2. CXR (2/4/2023): stable CHF with stable effusions.
3. CT chest without contrast (2/3/2023): likely congestive heart failure with cardiomegaly and extensive coronary atherosclerosis, mitral annular calcifications, and aortic calcifications. Bilateral moderate pleural effusions. Aortic valve calcifications can be seen with aortic stenosis.
4. CT Angiography Abd and Pelvis (2/7/23):
 - 1) No abdominal aortic aneurysm or dissection
 - 2) Calcified and narrowed visceral arteries
 - 3) Partially visualized pulmonary disease
 - 4) Small gastric nodularity may be a polyp, bleeding site or ingested material but no precontrast scan is present to demonstrate if this lesion is vascular. GI evaluation could be considered.

Interventional Cardiologist requested GI consult 2/8/23 who planned for EGD to evaluate new gastric nodule prior to TAVR. The logic was if the gastric nodule turned out to be malignant, then TAVR would not be performed.

5. TTE 2/7/23 with contrast injection:
 - LV mildly dilated. LV thrombus not detected. Mild concentric LVH. Scar of septum. LV systolic function is severely reduced. Indeterminate diastolic function due to underlying arrhythmia. EF 20%. The inferior wall is akinetic. severe global hypokinesis in the remaining wall segments of the left ventricle.
 - RV grossly mildly dilated. RV systolic function moderately reduced
 - The mitral leaflets are apically tethered. There is moderate mitral regurgitation. Aortic valve leaflet(s) are severely thickened. Severe valvular aortic stenosis.
 - Irregular rhythm and associated variability in aortic velocities results in a wide range of gradients
 - Mean aortic gradient is 25-40 mmHg.
 - There is mild aortic regurgitation. Mild to moderate tricuspid regurgitation. RVSP is at least 55 mmHg.
 - Left pleural effusion present
 - Compared to prior study from 2/7/18, there is biventricular dysfunction. There is persistent severe aortic stenosis
6. Heart cath 2/8/23:

3 vessel native CAD with patent bypass grafts including LIMA to the LAD and SVG to the OM2 and OM3, filling the left PDA. Elevated filling pressures and decreased cardiac output.

Hemodynamics: RA 10 mmHg, RV 69/3 mmHg, PA 69/22 mmHg, PA Mean 33 mmHg, PCW 20 mmHg, LVEDP 20mmHg, CO (thermal) 6.7 L/min, CI (thermal) 3.3 L/min/m², CO (Fick) 4.5 L/min, CI (Fick) 2.2 L/min/m², RA Sat 61%, PA sat 61 %, SAO₂ 94 %.
7. Lab:

FEB 09 06:46

140 | 102 | 22 /
 _____ 96
 3.8 | 31 | H 1.43 \

FEB 09 06:46

\ L 11.2 /

L 3.81 ----- 151

/ L 35.0 \

Now, for Anesthesia Preop evaluation,

1. *What do you like to know more about this patient during your preop evaluation?*
2. *Is his age a factor in your decision regarding the choice of anesthetic?*
3. *What is your primary concern at the moment?*
4. *Should you cancel, postpone or proceed the procedure as posted?*
5. *If you decide to proceed, should this case be moved to MOR? What kind of monitors would you like to place prior to induction?*
6. *Is there any alternative way for patient's preop optimization prior to EGD? Are you going to call the primary team and interventional cardiology team to seek the second opinion?*

彭勇剛：我認為術前檢查已經相當完善，不需要再做其他檢查。因為患者有左右室衰竭伴隨 AS, pHTN, 還有 pleural effusion, 可以考慮先利尿治療心衰和 pleural effusion, 情況好轉后術前放置 A line for continuous monitoring. EGD 時間短，不需太多鎮靜。

曹錫清：謝謝，患者在轉入我院前兩天已開始 furosemide 利尿，但症狀沒有明顯改善，心內認為患者屬於 severe AS stage D1, D2, 根據美國心臟學會 2020 年的指南，需要立即置換主動脈瓣膜，TAVR 會改變患者預後，減少死亡率(圖 4-5)：

Treatment

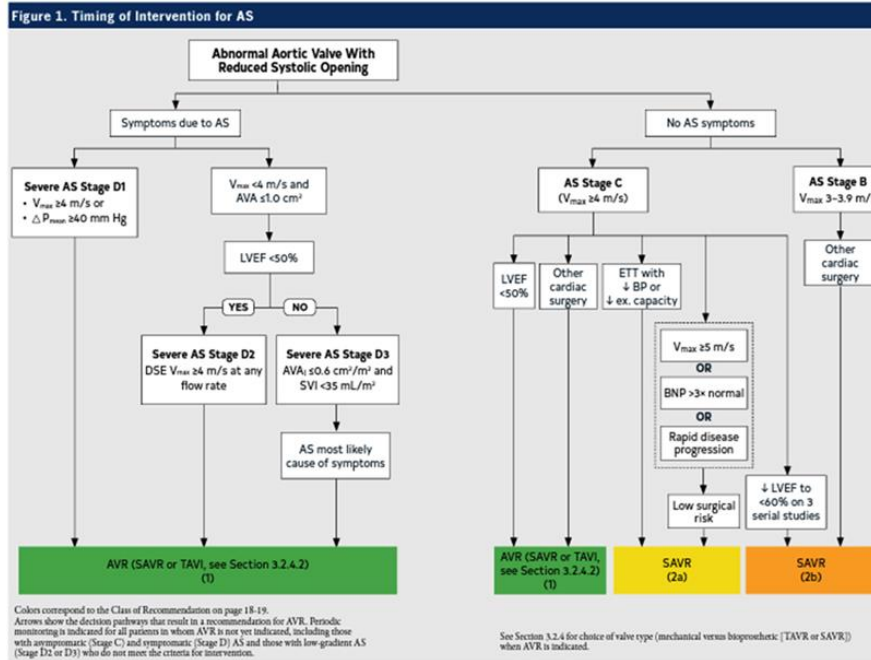


圖 4: AS 干預時機步驟

Treatment



Table 4. Stages of AS

| Stage | Definition | Valve Anatomy | Valve Hemodynamics | Hemodynamic Consequences | Symptoms |
|----------------------------------|---|--|--|---|---|
| A | At risk of AS | <ul style="list-style-type: none"> Bicuspid aortic valve (or other congenital valve anomaly) Aortic valve sclerosis | Aortic $V_{max} < 2$ m/s with normal leaflet motion | None | None |
| B | Progressive AS | <ul style="list-style-type: none"> Mild to moderate leaflet calcification/fibrosis of a bicuspid or trileaflet valve with some reduction in systolic motion or Rheumatic valve changes with commissural fusion | <ul style="list-style-type: none"> Mild AS: Aortic V_{max} 2.0–2.9 m/s or $\Delta P_{max} < 20$ mm Hg Moderate AS: Aortic V_{max} 3.0–3.9 m/s or ΔP_{max} 20–39 mm Hg | <ul style="list-style-type: none"> Early LV diastolic dysfunction may be present Normal left ventricular ejection fraction (LVEF) | None |
| C: Asymptomatic severe AS | | | | | |
| C1 | Asymptomatic severe AS | Severe leaflet calcification or congenital stenosis with severely reduced leaflet opening | <ul style="list-style-type: none"> Aortic $V_{max} \geq 4$ m/s or $\Delta P_{max} \geq 40$ mm Hg Aortic valve area (AVA) typically ≤ 1.0 cm² (or AVAi 0.6 cm²/m²) but not required to define severe AS Very severe AS: Aortic $V_{max} \geq 5$ m/s or $\Delta P_{max} \geq 60$ mm Hg | <ul style="list-style-type: none"> LV diastolic dysfunction Mild LV hypertrophy Normal LVEF | None: Exercise testing is reasonable to confirm symptom status |
| C2 | Asymptomatic severe AS with LV dysfunction | Severe leaflet calcification/fibrosis or congenital stenosis with severely reduced leaflet opening | <ul style="list-style-type: none"> Aortic $V_{max} \geq 4$ m/s or $\Delta P_{max} \geq 40$ mm Hg AVA typically ≤ 1.0 cm² (or AVAi 0.6 cm²/m²) | LVEF < 50% | None |
| D: Symptomatic severe AS | | | | | |
| D1 | Symptomatic severe high-gradient AS | Severe leaflet calcification/fibrosis or congenital stenosis with severely reduced leaflet opening | <ul style="list-style-type: none"> Aortic $V_{max} \geq 4$ m/s or $\Delta P_{max} \geq 40$ mm Hg AVA typically ≤ 1.0 cm² (or AVAi ≤ 0.6 cm²/m²) but may be larger with mixed AS/AR | <ul style="list-style-type: none"> LV diastolic dysfunction LV hypertrophy Pulmonary hypertension (PHTN) may be present | <ul style="list-style-type: none"> Exertional dyspnea or decreased exercise tolerance Exertional angina Exertional syncope or presyncope |
| D2 | Symptomatic severe low flow/low-gradient AS with reduced LVEF | Severe leaflet calcification with severely reduced leaflet motion | <ul style="list-style-type: none"> AVA ≤ 1.0 cm² with resting aortic $V_{max} < 4$ m/s or $\Delta P_{max} < 40$ mm Hg Dobutamine stress echocardiography (DSE) shows AVA < 1.0 cm² with $V_{max} \geq 4$ m/s at any flow rate | <ul style="list-style-type: none"> LV diastolic dysfunction LV hypertrophy LVEF < 50% | <ul style="list-style-type: none"> Heart failure (HF) Angina Syncope or presyncope |
| D3 | Symptomatic severe low gradient AS with normal LVEF or paradoxical low flow severe AS | Severe leaflet calcification/fibrosis with severely reduced leaflet motion | <ul style="list-style-type: none"> AVA < 1.0 cm² (indexed AVA ≤ 0.6 cm²/m²) with an aortic $V_{max} < 4$ m/s or $\Delta P_{max} < 40$ mm Hg, AND Stroke volume index < 35 mL/m² Measured when patient is normotensive (systolic blood pressure < 140 mm Hg) | <ul style="list-style-type: none"> Increased LV relative wall thickness Small LV chamber with low stroke volume Restrictive diastolic filling LVEF $\geq 50\%$ | <ul style="list-style-type: none"> HF Angina Syncope or presyncope |

圖 5: AS 分期

Reference:

Mortality Due to Aortic Stenosis in the United States, 2008-2017. Graham H. Bevan, MD1; David A. Zidar, MD, PhD2; Richard A. Josephson, MS, MD2; et alSadeer G. Al-Kindi, MD2

Author Affiliations Article Information

JAMA. 2019;321(22):2236-2238. doi:10.1001/jama.2019.6292

- Symptomatic severe AS is associated with **high mortality rates, up to 50% at 1 year**
- Subgroup analyses: age groups (45-80 vs ≥ 80 years), sex, race/ethnicity (white, black, or Hispanic), and urbanization (metropolitan vs nonmetropolitan) to assess for mortality disparities.
- AS attributes to total of 139 229 deaths in this decade, with 89.2% occurring in aged >75 years and 59.6% in women. Overall crude and age-adjusted mortality rates were 109.9 and 111.2 per 1 million persons, respectively. The crude mortality rate was highest in the older population: 238.8 and 1535.8 per 1 million persons in patients aged 75-84 and >85 years, respectively. (?1/100 in >95 years old)
- Between 2014 and 2017, the observed number of AS deaths was 3938 lower than expected from trend of 2008-2013 among non-Hispanic whites living in metropolitan areas. The number of TAVR procedures increased from 4627 in 2012 to almost 35 000 in 2016, suggesting that the observed mortality trends may be related to TAVR, especially because there were no other major advances in aortic stenosis therapy during this time.

My next step: attending to attending talk:

- **Understand the logic of interventional cardiologist, learn their perspectives, why EGD prior to TAVR?**
- **Communicate clearly my concern of the severity of AS, need cardiac team, scheduling difficulty, preinduction Aline for monitoring, milrinone/epi support for RV failure and pHTN**
- **Interventional cardiologist then presented alternative risk-sharing and reduction strategy:**
 - **Prior to EGD, a temporary balloon aortic valvoplasty dilatation (BAV) could be performed under local anesthesia, the severe AS will be alleviated to possible mild aortic insufficiency.**
 - **Successful balloon aortic valvuloplasty (BAV) 2/9/23 afternoon.**

Cardiac cath s/p BAV: HR 74 bpm, RA 11 mmHg, RV 76/0 mmHg, PA 73/23 mmHg, PA Mean 40 mmHg, PCW 35 mmHg, CO (Fick) 4.17 L/min, CI (Fick) 2.09 L/min/m², SVR 921 D/S, PVR 1.2 Wood Units, RA Sat 46 %, PA sat 58 %, SAO₂ 97 % .
 - **The aortic valve was dilated once using a 22 mm Maxi balloon under rapid RV pacing. The cross AV mean gradient decreased from 45 to 15 mmHg.**

李成付: 我自己也遇到一例 severe AS requiring BAV dilation before a lower extremity orthopedic fracture procedure. It allowed me to use regional epidural block after BAV.

曹錫清: 謝謝 Chris 分享。Now GI attending requested EGD right after the BAV, “I will be quick, in and out, ok?”

7. What might be your concern to perform EGD on the same day of BAV?

8. What are the most common post TAVR complications? Treatment?

I politely rejected his suggestion to do EGD on the same day after BAV, according to my experience working at EP lab, complete heart block or A.fib are very common after TAVR. I agreed to add the case the next day if pt. stable, no arrhythmia occurred.

Reference:

Midterm Durability and Structural Valve Degeneration of Transcatheter Aortic Valve Replacement in a Federal Facility. Rachel Yang, Aaron F. Grober, MD*, Ramon Riojas, MD, PhD, Vimala Ponna, BS, Kendrick A. Shunk, MD, PhD, Jeffrey M. Zimmet, MD, PhD, Joshua Gustafson, MD, Liang Ge, PhD, and Elaine E. Tseng, MD. Innovations Volume 17, Issue 5, September/October 2022, Pages 382-391

- 344 consecutive patients who underwent transarterial TAVR from 11/2013 to 6/2020 at SF VAH, excluding only transapical TAVR, median age, 78 years old.
- Survival from all-cause mortality was 91.3% at 1 year, 75.1% at 3 years, and 61.7% at 5 years.
- Death within 30 days occurred in 4 patients (1.2%), a mean of 14.5 days.
- The most common < 30 days complication: conduction disturbance (n = 109, 31.7%). 15.7%(n=54) required a PPM (8: self-expanding valves (14.8%) and 46: balloon-expanding valves (85.2%).
- VARC-3 vascular <30 days complications occurred in 11 patients (3.2%)
- Cardiac structural complications occurred in 5 patients, all of which were major including LV perforation (n = 3, 0.9%), RV perforation (n = 1, 0.3%), and new pericardial effusion with tamponade (n = 1, 0.3%).
- Aortic reintervention was required within 30 days for 2 patients (0.6%); 1 required a redo TAVR for device migration, while the other required a redo valve-in-valve TAVR for severe PVL.

表 2. Outcomes of Veterans Undergoing TAVR at the San Francisco Veterans Affairs Medical Center. All patients (N = 344)

| | | |
|--|----------------------------------|--------------------------------|
| Short-term outcome (within 30 days) | Baseline mean AV gradient, mm Hg | 9 (5.6) |
| Paravalvular leak | | |
| None | 163 (47.4) | |
| Trace | 120 (34.9) | |
| Mild | 54 (15.7) | |
| Moderate | 7 (2.0) | |
| Death | 4 (1.2) | Time to death, days 14.5 ± 6.0 |
| VARC-3 bleeding | 109 (31.7) | |
| Type 1 | 69 (20.1), | |
| Type 2 | 28 (8.1) | |
| Type 3 | 12 (3.5) | |
| Type 4 | 0 | |
| VARC-3 CNS injury NeuroArc type 1 | 10 (2.9) | |
| New permanent pacemaker | 54 (15.7) | |
| VARC-3 vascular complications | | |
| Minor vascular complications | 11 (3.2) | |
| Dissection | 3 (0.9) | |
| Pseudoaneurysm | 3 (0.9) | |

| | |
|--|------------|
| Unplanned stenting | 3 (0.9) |
| Distal embolization | 2 (0.6) |
| Major vascular complications | 0 |
| VARC-3 cardiac structural complications | |
| Minor | 0 |
| Major | 5 (1.5) |
| Left ventricular perforation | 3 (0.9) |
| Right ventricular perforation | 1 (0.3) |
| Pericardial effusion with tamponade | 1 (0.3) |
| VARC-3 acute kidney injury | 40 (11.6) |
| Type 1 | 33 (9.6) |
| Type 2 | 3 (8.7) |
| Type 3 | 2 (0.6) |
| Type 4 | 2 (0.6) |
| Conduction disturbance | 109 (31.7) |
| AV reintervention | 2 (0.6) |
| Long-term outcome | |
| Moderate hemodynamic SVD | 13 (3.7) |
| Bioprosthetic valve failure | 4 (1.2) |
| Endocarditis | 4 (1.2) |
| Thromboembolism | 15 (4.4) |

Abbreviations: AV, aortic valve; CNS, central nervous system; SVD, structural valve degeneration; TAVR, transcatheter aortic valve replacement; VARC-3, Valve Academic Research Consortium-3. Data are presented as mean \pm SD, n (%), or median (IQR).

The patient underwent EGD the next day following BAV, topicalization and small incremental doses of etomidate, Optiflow HFNC, biopsy negative.

Later on, Successful TAVR, developed Post-TAVR LBBB progressed to 3rd degree AVB requiring a pacemaker placement.

Now I would like to mention that we have done trials and then introduced High Flow Nasal Cannula to our high-risk GI procedures with great satisfaction. Some of our providers still use SuperNova for morbidly obese patients.

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Case #3

Two weeks later, another 75 YO White Female with pancreatic cyst/? mass transferred from rural OSH for ERCP, Echo showed normal LVEF, AS with AVA 0.72, significant DOE/SOB.

麻醉方案如法炮製，局麻下行主動脈瓣氣囊擴張術后第二天全麻 ERCP with biopsy & stent。

Biopsy revealed a benign pancreatic cyst, then underwent TAVR two weeks later. A few months later (9/23), she came back to have ERCP for stent removal. When I asked her about her overall condition, her SOB/DOE disappeared, started mild cardio workout, Pt states “you have the best hospital with the best doctors”! Her accolades inspired me to do my best to take care of our most vulnerable patients.

Finally, I would like to discuss our GI daily hurdles. Given the majority of our GI patients are ASA 3 above, many referred from outside hospitals, I have implemented morning huddles with GI attendings and fellows to help me prioritize the in-patients flow, focusing my attention on the most problematic patients. Our hospital is LVAD center with more than 350 LVAD patients, TAVR center, arrhythmia center, many patients are on anticoagulants, as a result, increase their risk of GI bleeding.

1. Emergency bleeder including Jehovah Witness, collaborate with bloodless JW coordinator at Team group.
2. LVAD (in- and out-patients)
3. Morbid obesity patients undergoing pre-heart transplant EGD & Colonoscopy evaluation.
4. GI subspecialty liver experts, patients with cirrhosis, coagulopathy
5. Severe pHTN, AS, LV or RV failure
6. Bronchoscopy with pulmonologists communicating at Team group.

姚熱風：補充一點，LVAD 的關鍵是保證 RV returning blood volume, RV function and contractility, LV function is relatively fixed with LVAD, need to maintain preload, therefore pump flow. MAP is best to keep between 65-85mmHg. IF afterload too high, we need to increase depth of anesthesia, if MAP too low, need to give fluid and reduce anesthesia depth.

彭勇剛：最好避免使用 phenylephrine for MAP purpose in LVAD patients.

潘偉：防止 hypotension induced RV ischemia is important, avoid increasing pulmonary pressure for LVAD.

曹錫清：術前與病人詳細溝通特別重要，絕大多數 LVAD 病人非常 compliant, 如果必要，也能忍受較淺度的麻醉。In summary,

1. Multiple comorbidity patients at GI, anesthesia is the riskiest part.
2. Communicating with all stakeholders, teamwork is critical.
3. Safety is the No.1 priority, prepare for the worst and achieve the best.
4. High volume, quick turnover, multiple add-ons and emergencies
5. Pay attention to details, pick up abnormal symptoms & labs.
6. Avoid over sedation, propofol is dangerous! Topicalizing thoroughly for very high-risk patients, “Arm-strong”, small incremental, stop, watch... instead of auto-pilot pump for sick patients. Be very patient!!!

接下來由我的同事姚熱風醫生分享她在 EP Lab 遇到的 cardioversion 后發生的罕見併發症。姚醫生有 20 多年豐富的臨床處理疑難病症的經驗，歡迎姚醫生分享。

Case #4

姚熱風：謝謝師姐介紹，很高興有機會參加 PBLD 討論。

This was a 39yoF with PMH of HTN, OSA on CPAP, AKI, DM2, hypertrophic cardiomyopathy s/p myectomy and PFO closure in 2008, LBBB, wide complex tachycardia, s/p ablation, HFrEF <20% s/p AICD. presenting with newly onset AFib with RVR.

ECHO 2/23 showed EF <20%, unclear RV function, moderate to severe MR, severe TR, flattened septum, moderate pHTN, RVSP 49mmHg, severely dilated right and left atrium.

Metoprolol, apixaban, and torsemide at home. Lasix given on the floor.

Afib RVR HR100-120 SBP 90-100, Plan for TEE and cardioversion

Severely symptomatic and unable to lay flat. BMI 36, Short neck, OSA on CPAP every night.

Anesthetic Plan:

Given the body posture and concerning about her unfavorable airway, I decided to put her to sleep instead of MAC sedation, and in one of EP procedure rooms with anesthesia machine rather than a holding area.

Induction

1. GETA with elective glidescope to avoid CO2 retention
2. Aline set up
3. Norepi on pump ready to start
4. Discuss with EP Anesthesiologist-in-charge, may need second hand help

Intraop:

1. Starting HR 110-120s and BP 90s/60s
2. Stable induction with etomidate, midazolam, and rocuronium
3. Easy intubation with glidescope
4. BP 100-120s with 1 bolus phenylephrine 200mcg, HR 100-115
5. HR gradually increased to 140s, SBP 120-160s
6. Called Dr. EP attending, if need beta blockers
7. Dr. EP attending: Check clots then cardiovert
8. TEE in, HR climb up to 160s, BP soft then not readable by cuff, but strong carotid pulse
9. Switched to portable LifePak BP 70/40, Still strong carotid pulse
10. TEE no clots, cardioverse
11. External CV x1, Afib to SR HR 100-110
12. NIBP readable but soft need frequent phenylephrine boluses to raise to above 90s
13. Reversed with sugammadex waking up
14. Strong ventilation and moving all extremities, reaching for tube but not following commands
15. BP still soft, we started Norepi, attempting Aline. Called for help
16. Clear secretion in ETT, TV OK but SatO2 started to drop to low 90s
17. ETT suction and Manual ventilate
18. secretions turn pinky, realized it's Pulmonary Edema
19. Code Cardiac Surgery called
20. Keep **Desatting** to 70s, copious pinky secretion from ETT
21. Reverse T-burg, Norpi, Lasix, Morphine
22. SatO2 back to 90s after suctioning and positive pressure

23. ICU team arrived--dobutamine epi gtt started, ECMO considered
24. Sat back to and maintained at low 90s, BP maintained with pressors
25. transport to ICU

ICU Stay:

1. Diagnosis: Post cardioversion Atrial stunning
2. Aggressive diuresis to CVP<10 with continued inotropy
3. Extubated 2 days post op
4. RT IJ and arterial line removed 3 days post op
5. Discharged 7 days postop

彭勇剛: 患者有可能是 extubation 時 fighting and suction 造成的 negative pressure induced pulmonary edema. 我們一般不用 GETA for cardioversion. For severe cardiomyopathy with very low EF, I might start very low dose Epinephrine infusion, even with a peripheral line, 0.05 mcg/min, then start propofol drip slowly until patient asleep, sometimes it might take 10 minutes, then start TEE.

曹錫清: HFNC or SuperNova is an option. If for the sake of airway protection requiring GETA, if you do it all over again, then it might be helpful to insert a preinduction Aline, use etomidate, start Norepi drip after induction, adding Epinephrine as needed, might prevent hypotension, myocardial ischemia and subsequent cardiogenic shock.

潘偉: We have been handling many very sick patients for TEE and cardioversion, I don't use GETA, often use good topicalization and slowly induced sedation.

姚熱風: EP 醫生認為是 atrial stunning, 現在我們一起看看定義。

Review Int J. Cardio 2003 Dec;92(2-3):113-28. doi: 10.1016/s0167-5273(03)00107-4.

Atrial stunning: basics and clinical considerations

Ijaz A Khan 1Affiliations PMID: 14659842

• DOI: [10.1016/s0167-5273\(03\)00107-4](https://doi.org/10.1016/s0167-5273(03)00107-4)

Abstract

Conversion of atrial fibrillation and flutter to sinus rhythm results in a transient mechanical dysfunction of atrium and atrial appendage, termed atrial stunning. Atrial stunning has been reported with all modes of conversion of atrial fibrillation and flutter to sinus rhythm including both transthoracic and low energy internal electrical, pharmacological, and spontaneous cardioversion, and conversion by overdrive pacing and by radiofrequency ablation. Atrial stunning is a function of the underlying arrhythmia becoming apparent at the restoration of sinus rhythm, not the function of the mode of conversion, and does not develop after the unsuccessful attempts of cardioversion or the delivery of electric current to the heart during rhythms other than atrial fibrillation or flutter. Tachycardia-induced atrial cardiomyopathy, cytosolic calcium accumulation, and atrial hibernation are the suggested mechanisms of atrial stunning. Atrial stunning is at

maximum immediately after cardioversion and improves progressively with a complete resolution within a few minutes to 4-6 weeks depending on the duration of the preceding atrial fibrillation, atrial size, and structural heart disease. Atrial stunning causes post cardioversion thromboembolism despite restoration of sinus rhythm. Duration of anticoagulation therapy after successful cardioversion should depend on the duration of atrial stunning. Lack of improvement in cardiac output and functional recovery of patients immediately after cardioversion is attributed to the atrial stunning. Verapamil, acetyl strophanthidin, isoproterenol, and dofetilide have been reported to protect from atrial stunning in animal and small human studies. The right atrium stunning is less marked and improves earlier than that of left atrium, resulting in a differential atrial stunning explaining the rare occurrence of pulmonary edema after cardioversion.


Circulation Volume 108, Issue 16, 21 October 2003 Pages 1976-1984
<https://doi.org/10.1161/01.CIR.0000091408.45747.04>

CLINICAL INVESTIGATION AND REPORTS

Reversal of Atrial Mechanical Dysfunction After Cardioversion of Atrial Fibrillation
Implications for the Mechanisms of Tachycardia -Mediated Atrial Cardiomyopathy

Prashanthan Sanders, MBBs, Joseph B Morton, MBBs, Peter M Kistler, MBBs, Jitendra K Vohra, MD, Jonathan M. Kalman, MBBs, PhD, and Paul B. Sparks, MBBs, PhD

In this prospective clinical study, we used TEE to determine the effect of atrial stimulation rates and isoproterenol on the mechanical performance of the atria in humans with atrial mechanical stunning after the cardioversion of AF. We studied patients with AF either for 1 to 6 months or persisting for ≥ 3 years to evaluate the contribution of the chronicity of the arrhythmia to the atrial mechanical response to these maneuvers.


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New Findings:

1. Pacing the atrium at rates higher than SR results in an improvement in atrial mechanical function and reversal of mechanical stunning.
2. Isoproterenol led to a marked increase in LAAEV and a significant reduction in LASEC.
3. AF of short duration, despite marked impairment of atrial mechanical function after cardioversion to SR, immediate and significant improvement in mechanical function could also be demonstrated by the effect of the first postpacing pause beat, providing further evidence for the presence of an intact contractile apparatus.
4. AF of long duration (57.7 ± 8.7 months) demonstrated significantly greater impairment of atrial mechanical function both during AF and after the development of atrial mechanical stunning in SR. These patients demonstrated a significantly attenuated response to an increase in the atrial rate and the postpacing pause and a lack of response to isoproterenol over the effect seen with rate alone.

5. Single dose of iv Calcium improves atrial mechanical function

Conclusions:

Atrial pacing at increased rates and isoproterenol can reverse atrial mechanical stunning associated with short-duration AF. In contrast, long-duration AF is associated with an attenuated response to these maneuvers. These findings suggest a functional contractile apparatus in the mechanically remodeled atrium caused by AF; however, with longer durations of AF, additional factors may determine atrial mechanical function.

JOURNAL ARTICLE

P1695

Atrial stunning was frequently observed just after electrical cardioversion in the patients with atrial fibrillation: who is more susceptible?

Y. Ito, M. Igarashi, M. Igawa, A. Nogami, K. Aonuma

EP Europace, Volume 19, Issue suppl_3, June 2017, Page iii364, <https://doi.org/10.1093/ehjci/eux161.005>

Published:

20 June 2017

Methods: Thirty-five patients who underwent radiofrequency catheter ablation for AF were included in this study (average age: 65.1 ±9.5 years old, paroxysmal/persistent=10/25). In all patients, sinus rhythm was restored by internal electrical cardioversion just before ablation. The left atrial appendage emptying velocities (LAAEV) was assessed using intra-cardiac echocardiography (ICE) before and just after cardioversion. Atrial-stunning was defined as 20% reduction of LAAEC after cardioversion.

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Conclusions:

Atrial stunning was observed in 71% of AF patients after electrical cardioversion. The left ventricular dysfunction left atrial dilation and persistent AF may be associated with atrial-stunning.

We revealed that even paroxysmal atrial fibrillation had risk of thrombo-embolism caused by atrial-stunning just after cardioversion.

2019 May 29;10:659.

doi: 10.3389/fphys.2019.00659#Collection2019.

Post-cardioversion Improvement in LV Function Defined by 4D Flow Patterns and Energetics in Patients With Atrial Fibrillation

[Lars Olof Karlsson](#)¹, [Hanna Erixon](#)^{2,3}, [Tino Ebbers](#)^{2,3}, [Ann Bolger](#)⁴, [Carl-Johan Carlhäll](#)^{1,2,3,5}

Affiliations

• PMID: [31191353](#)

• PMCID: [PMC6549517](#)

• DOI: [10.3389/fphys.2019.00659](#)

Conclusion: Post-cardioversion recovery of LA function was associated with improvements in conventional and 4D CMR markers of LV function. Flow-specific measures demonstrate the negative but potentially reversible impact of LA dysfunction on volume and energetic aspects of LV function.

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謝謝各位同仁發言參加討論，收穫很大。

-The end





**Dr. John Zhong
(2023 CASA Photo Competition)**

《宿石邑山中》

唐代：韩翃

浮云不共此山齐，山霭苍苍望转迷。
晓月暂飞高树里，秋河隔在数峰西。

ANESTHESIA NEWS

曲歌医生整理

July 17, 2023

ASA News Release

Innovative infection prevention program reduces surgical site infections, results in reduced hospital stays and cost

An innovative anesthesiologist-led infection prevention program helped reduce the number of surgical site infections (SSIs) in colorectal patients by 50%, the number of days in the hospital by 46%, and led to significant cost savings over a two-year period by \$540,000, according to research presented at the virtual American Society of Anesthesiologists' Anesthesia Quality and Patient Safety Meeting.

SSIs are related to additional antibiotic treatments, interventional procedures or even re-operation. SSIs can lead to major complications, including death, as well as significantly increase the cost of care. The SSI incidence rate in colorectal surgery is higher than many other procedures.

Under the umbrella of the ERAS program, UT Southwestern's infection prevention initiative implemented a number of interventions, each targeted at evidence-based causes of SSIs, including:

- Giving oral antibiotics with the patient's mechanical bowel preparation
- Identifying the best antibiotic to use, as well as optimal timing and redosing for colorectal surgery
- Using chlorhexidine baths prior to the surgery and wipes to the abdomen immediately prior to the operating room to decrease bacteria on the skin
- Improving access to critical medications by storing the antibiotics directly in each operating room's "pyxis" machines
- Requiring the surgical team and their assistants to change their gowns and gloves when the surgery was completed, and they were about to close the wound
- Actively warming patients both prior to and during the surgery
- Increasing patient mobility as soon as possible after surgery, for example sitting up in a chair the day of surgery and walking in the hallways up to three times as soon as possible.

This program may serve as a useful model for other academic or major medical centers seeking to improve their SSI outcomes.

October 2, 2023

Anesthesiology News

Hard Times: Watchbands Harbor Bacteria

According to a new study (Adv Infect Dis 2023;13[2]:193-209), Leather, plastic and other band materials were more likely to be contaminated with bacteria than metal bands.

Bacteria found in the study typically were Staphylococcus (85%), Pseudomonas (30%), and E. Coli, which were prevalent on 85%, 30% and 60% of the wristband.

Researchers from Florida Atlantic University's Charles E. Schmidt College of Science, in Boca Raton, tested wristbands made of various materials to determine their risk for harboring potentially harmful pathogenic bacteria.

Using standard microbiological assays, the researchers looked at bacterial counts, type of bacteria and their distribution on the wristband surfaces. They also conducted a bacteria susceptibility assay study screening the effectiveness of three different disinfectant solutions: Lysol Disinfectant Spray (Reckitt Benckiser); 70% ethanol, commonly used in hospitals and alcohol wipes; and a more natural solution, apple cider vinegar.

The results suggest people might want to wear metal bands, particularly in a hospital or medical setting. Nearly all wristbands (95%) were contaminated. However, rubber and plastic wristbands had higher bacterial counts than metal ones, which had little or no bacteria. The most important predictor of wristband bacteria load was the texture of wristband material and activity of the person when the bands were sampled. Gym-goers showed the highest staphylococcal counts.

Findings from the study showed that Lysol Disinfectant Spray and 70% ethanol were highly effective regardless of the wristband material, with a 99.99% kill rate within 30 seconds. Apple cider vinegar was not as potent and required a full two-minute exposure to reduce bacterial counts.



CASA NEWS

蒋天宇医生整理

NEW CASA MEMBER

祝贺 CASA 基金会终身会员新成员！ .

胡辉-湾区，加州

胡丹青-麻醉疼痛，亚特兰大， Georgia

申建成-Kaiser Permanente, California

李宏杰-Yale New Haven Hospital, Connecticut

江天- San Francisco, CA

魏华锋- 气道麻醉， Upenn,, Pesylvania

张海峻-麻醉镇痛， 纽约/新泽西

ACHIEVEMENT

- Congratulations to Dr. Jiapeng Huang who is elected as Vice President of Kentucky Medical Association!

ARTICLES AND BOOK PUBLISHING

Dr. Haobo Ma published Intraoperative use of phenylephrine versus ephedrine and postoperative delirium: A multicenter retrospective cohort study in Anesthesiology.



Dr. John Zhong published Continued challenges in pediatric anesthesia during COVID-19 in 2022: An international survey from the pediatric anesthesia COVID-19 collaborative in Pediatric Anaesthesia

> Paediatr Anaesth. 2023 Sep 21. doi: 10.1111/pan.14762. Online ahead of print.


Continued challenges in pediatric anesthesia during COVID-19 in 2022: An international survey from the pediatric anesthesia COVID-19 collaborative

John Zhong ¹, Victoria Bradford ², Allison M Fernandez ³, Andrew Infosino ⁴, Codruta N Soneru ⁵, Steven J Staffa ⁶, Vidya T Raman ⁷, Joseph Cravero ⁶, David Zurakowski ⁶, Petra M Meier ⁶; Pediatric Anesthesia COVID-19 Collaborative

Affiliations + expand

PMID: 37732382 DOI: 10.1111/pan.14762

Dr. Jinlei Li published Yale University School of Medicine Team Proposes Oral Format Patient-Controlled Analgesia in ASA Monitor



The Pulse

Yale University School of Medicine Team Proposes Oral Format Patient-Controlled Analgesia

Jinlei Li, MD, PhD, FASA Daniel Wiznia, MD, FAAOS Claudia See, BS Kim Sumrak


A team at Yale University has discovered a method for patients to self-administer oral opioid medication in a way that decreases consumption and depletes reserves in the community, thus slowing the epidemic.

Annually, 100 million surgeries take place in the United States. With most requiring postoperative pain medication,



patient completes the treatment. It has inherent safety features to minimize overdose, limit diversion, and decrease nursing workload. The PCDD relies on the PCA pump to work, so the "brains" of the device are already in place with the PCA programming. Physicians and nurses are already familiar with how it works.

However, PCA pumps are designed to administer medicine in many nonoral



Jinlei Li, MD, PhD, FASA
 Vice Chair, ASA Committee on Regional Anesthesia and Acute Pain Medicine, Associate Professor of Anesthesiology, Program Director of RAAPM Fellowship, Yale University, Director of Regional Anesthesia Service, Yale New Haven Health, New Haven, Connecticut.
 @jinlei_li

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ASA ANNUAL MEETING (2023) PRESENTATIONSYan Hu

- MCC: “Optimizing Pain Management for the Treatment of Postoperative Delirium in a Patient with End-Stage Renal Disease (ESRD) “

Jeff Huang

- Medically Challenging Case Report
Anesthesia Management for a patient with Rosai-Dorfman Disease, Cowden Syndrome, and Lhermitte-Duclos Disease: A Extremely Rare Disease Combination.

Fenghua Li

- MCC PP session
Anesthetic management of neurotrauma in left ventricular assisted-device patient

Jinlei Li

- Session Number: PN103
Session Title: Regional Anesthesia in Trauma: Emerging Techniques and Approaches
- Session Number: PC303
Session Title: DOs and DO NOTs in Ambulatory Total Knee Arthroplasty Workshop
- Session Title: High yield peripheral nerve block for every anesthesiologist

Henry Liu

Moderator:

- Oral Presentation Clinical Circulation I
- Oral Presentation experimental Circulation I

Haobo Ma

- Education exhibit on 3D print in Airway

Yonggang Peng

- PBLD-Minimally Invasive with Substantial Challenge in Mitraclip Procedure
- Moderator-Clinical Circulation Oral Presentation
- Medically Challenging Case Report
 - ❖ Vyas K and Peng YG, Unexpected Acute ST Elevation During Aortic Root Abscess Surgery
 - ❖ Qu G and Peng YG, Minimal invasive and substantial challenge Pulmonary hypertension in mitral clip procedure

- ❖ Walker E and Peng YG, Dynamic Mitral Regurgitation as A Rare Preinduction Complication Prior Elective Non-Cardiac Surgery
- ❖ Bashir A and Peng YG, Alteration of bilateral lung transplant approach for patient with intracardiac shunt and pulmonary hypertension
- ❖ Kerr E and Peng YG, Obstructive Thyroid Mass Requiring Extracorporeal Membrane Oxygenation Cannulation and Initial Intraoperative Evaluation
- ❖ Bromwell J and Peng YG, Urgent surgical intervention of infective endocarditis involving aortic root abscess and leaflet perforation.

Zheng (Jimmy) Xie

- Session Number: PN406
Session Title: Wake up and smell coffee! Exploring the evolving evidence for perioperative caffeine administration

Jeff Xu

Workshop

Session Title: Regional Anesthetic Techniques for Neuroanesthesiologists

Jinping Wang

- Moderation session x 1
- Posters presentation x3

Hong Wang

- POC-US part 2 workshop Faculty

Mi Wang

- Panel speaker on “Advanced airway managing the NORA environment.”
- Moderator- equipment, monitoring, and engineering

Yang Zhang:

- MCC facilitator





Dr. Henry Liu
(2023 CASA Photo Competition)



Dr. Mi Wang
(2023 CASA Photo Competition)

中华医学会麻醉学分会(CSA)会议隆重召开

李金蕾 医生报道

中华医学会麻醉学分会第 28 届年会在湖南省长沙市于 2023 年 9 月 21-24 日隆重召开。这是自新冠以来的中华医学会麻醉学分会 (CSA) 第一次线下年会，海内外翘首以待，注册参会人数过万。

会议期间美国 ASA president Dr. Michael Chapeau 和中国 CSA 主席俞卫锋签署了 Memorandum of Understanding 的相互支持合作意向书。此外，比利时、塞尔维亚、韩国、日本、台湾麻醉学会主席或代表也纷纷来到美丽的湘城参与多项学术交流活动。

CASA 派出了一个强大的阵容，由主席彭勇刚带队，刘恒意、黄佳鹏、李金蕾、仲巍、王景平、许连君、李锋华等医生参与的海外华人专场反响热烈。CASA 团队不仅有传统的讲课，更是与国内专家共同主持了国内麻醉同行尚不熟悉的 PBLD (Problem-Based Learning Discussion) 的讨论。

基于王景平医师的建议，今年 CASA 的课题围绕着手术室外麻醉，包括了李锋华医师的急性缺血性卒中病人的血栓切除术麻醉，王景平医师的 ECT, REI to endoscopy, 仲巍医生的儿科麻醉，许连君医生的门诊脊柱手术，以及刘恒意医生的创伤麻醉管理。彭勇刚和黄佳鹏教授还参与了超声版块的心脏麻醉的学术交流。蒋延东医生陪同 ASA president Dr. Michael Chapeau 前往长沙并对 ASA 困难气道指南进行了精彩解析。

CASA 候任会长李金蕾教授利用会议期间积极筹措，成功地筹集了 CASA 下一年的活动基金。

这次 CASA 代表团的 CSA 年会长沙之行无论是学术交流亦或是国际交往均可谓硕果累累。



ASA 花絮

2023 ASA Annual Meeting Pickleball Tournament

Jianhong Huang, MD

Pickleball has emerged as the fastest-growing sport in the United States, with a growing number of anesthesiologists taking up this exciting game. Consequently, we have introduced the Pickleball tournament as a new feature of the ASA Annual Meeting. This addition aims to provide meeting participants with a delightful opportunity to unwind and enjoy their time in San Francisco.

The first-ever ASA Annual Meeting Pickleball Tournament was held successfully on October 15, 2023. This exciting event brought together 17 ASA (American Society of Anesthesiologists) members.

The tournament took place at the prestigious Goldman Tennis Center. The tournament was structured using a Round Robin format, ensuring that each player had the opportunity to compete with different partners and face various opponents during each game. This dynamic approach added an extra layer of challenge and excitement to the games.

After two hours of intense competition and spirited games, we proudly crowned the winners in two distinct categories: the Advanced Group and the Intermediate Group. The winners in each category received gold and silver medals in recognition of their outstanding performance and sportsmanship. Additionally, every participant in the tournament was awarded a medal to acknowledge their enthusiastic participation and commitment to the event. These medals served as tokens of appreciation for their dedication.



This remarkable event was meticulously planned and organized by Dr. Jeffrey Huang, MD, FASA. The Pickleball tournament also received support from the annual meeting organizers, adding to the seamless execution of this inaugural event.

In conclusion, the ASA Annual Meeting Pickleball Tournament on October 15, 2023, was a resounding success. Participants had a fantastic time, enjoying not only the thrilling competition but also the beautiful San Francisco weather and the stunning park surroundings. This event marked a memorable addition to the ASA's annual meeting and will surely be remembered for years to come.

We look forward to future ASA Annual Meeting Pickleball Tournaments and hope to see even greater participation and enthusiasm in the coming years.





Dr. Helen Chen
(2023 CASA Photo Competition)



Dr. Hong Wang
(2023 CASA Photo Competition)

王海明回忆录（续 3）

4. 麻省医学遇贵人 捷足先跃入临床

麻省州立大学医学院（University of Massachusetts Medical School, UMass）位于波士顿西 35 英里伍斯特市，背山傍河，风景优美。1985 正庆祝建校十年。因为新，所以设备新又高端。王安的计算机公司蓬勃发展（他二战后自上海交大来麻省理工留学，发明计数器后开公司，挤入美国富豪榜）和 Digital 等高科技兴旺发达，麻州税入丰厚。州立大学经费十分充裕。医学院基础部在西侧，附属医院称医学中心，靠东。里面宽广、洁净、明亮。医护们友善热情，敬业。医学院每年学费二千\$，哈佛、塔夫兹和波士顿大学医学院学费每年二万美元。UMass 因为学费低，吸引了许多藤校毕业的好学生。医学中心水平较高，有直升机负责接送患者和医护。

来美前，在北医巧遇生化教研室张倡颖教授。告知他我将去 Worcester。他说：年轻时，他在波士顿留学。自己有汽车曾去过伍斯特。他还从波士顿开车长途旅行到佛罗里达。那时美国的汽油 10 美分一加仑（3800 毫升）。

在波士顿机场，杰姆教授很友好地开车接我到罗伯特教授家。罗伯特教授：年轻、热情、很勤奋。他来自中西部。普外科在约翰霍普金斯医学院；整形外科毕业于耶鲁大学医学院；39 岁已是教授和科主任。他的太太 Laura（劳拉）美丽而温雅。儿子马克、女儿摩根和琳滋均很漂亮又礼貌。我暂住教授家的客房，因为关系好，竟免费食宿三月余，直到张丽 85 年 12 月来团聚，我方含泪告别老师一家。常想起：每日，劳拉想方设法改善晚餐，她将我的旧衣洗好、烘干、喷上香水放置我的床头。我是多么幸运：遇到如此高尚的一家！

初到医学中心，外科行政负责人 Eileen 注意到：王医生春天申请职位时是单身，现在已婚了，是否仍在蜜月？我赶紧答：正是！她接着说：你愿意请你太太来团聚吗？我忙答：非常愿意！她说：我可帮你。我感激地说：衷心感谢！请尽快！拿着新 IAP-66 表，我一路小跑到邮局，又加上一封充满深情厚谊的长信寄去北京！丽很顺利地拿到陪读签证 J-2。恰巧，UMass 整形科又来一位口腔颌面外科葛雷教授（MD, DDS）。我说：我妻 Lily 可帮你做科研。于是，我科又给张丽发去新 IAP-66 表。注明是 Research Associate，薪金每年一万美元。丽喜出望外，到美国大使馆换了 J-1 签证，兴高采烈地飞来波士顿。

周日晚餐桌上，教授的小女儿琳滋突然宣布：“我不认为海明爱我！”全家均愣住了。劳拉缓和地问琳滋：这从何说起？琳滋（6 岁）说：“海明从没有吻过我！”大家均笑了。我向她解释说：在中国，叔叔不吻小女孩。这是中国和美国不同的待人方式。你看，我也不吻你的姐姐摩根（摩根笑笑）。教授说：请不要责怪海明，我理解和尊重他待人处事。我跟着说：我妻子 Lily 就要来了，请教授转达科里男士们：不要吻 Lily，握手即可。教授点点头，劳拉笑出了声。马克和摩根也说：记住了。

来美半年后，教授给我和丽又长年薪五千元（1986 年秋，我和丽年薪已是三万美元）。曾有一大陆来的访问学者说：“若带三万美元回中国。一辈子生活无忧！”

在罗伯特教授的鼓励下，我开始准备考住院医师资格。初考时，偌大的波士顿大学医学院考场，仅我一人来自中国大陆。一年半后，基础医学、临床医学和英语均通过。拿到通知书两周后，大女儿美玲出生了。丽天生具有温柔的母性，很有耐心地抚育孩子。我驱车去纽约 JFK（肯尼迪）国际机场接岳母。在曼哈顿读博士的李刚医生（现在在马里兰工作）介绍我到朱秀轩和邱卫乔家。曼哈顿中城，康奈尔大学医学院的学生宿舍，一套里外间小公寓。我在大楼内一楼等待。见一位靓丽聪慧的女学生、金丝眼镜和淡花连衣裙衬出高雅气质。她主动笑着对我说：你就是海明吧？秀轩知道你来可高兴了。秀轩和卫乔分别在哥大和康奈尔医学院读博士（PhD），卫乔和老师及团队刚在《科学》杂志发表了论文，令我钦敬。秀轩对我考过执照进入临床很有褒赞。他有驾照但暂无汽车，恳请我陪他一起去开车，过把瘾。大学时，我就一直仰慕秀轩的出众才华！英语极棒。后来，他的履历光彩照人：北医、医科院、芝加哥西北大学医学院、哥伦比亚大学医学院、哈佛博士后、内科毕业于耶鲁、肿瘤血液病专科于纽约 Sloan、哈佛大学医学院麻省总院肿瘤科教授……！77 级一班另一学长，朱秀轩同班同学，董永和：大学毕业前考取北医人民医院陆道培教授（曾创建中国骨髓移植库，院士）的研究生、麻省大学医学院博士、哈佛大学医学院麻省总院病理住院医毕业、如今在纽约一顶尖病理机构工作。记得，董学长初到麻省大学医学院时，当夜宿我和丽的小房子，一下子成了好友，为这一天我等了数年！

刚上班，去基础医学部参观。电梯一开，一衣着白衣的秀雅女士热情地对我说：你就是北京来的王医师吧，我是陈立瑞，在生物科工作。我先生叫戴一雄，周末我们请你吃饭。我欣然接受。周末，戴先生来接我去他们家。戴先生是核工程工程师，在波士顿上班。他们均是七几年初，台湾大学毕业后来美留学。陈老师善烹饪，边吃边上新菜。戴先生爱看武侠，有书还有录像带。在戴先生推荐下，我读些好书，最爱原北大校长蒋梦麟所著《西潮》（至今，我仍愿向亲朋们推荐此书，故事栩栩如生，妙笔生花！此书讲述了民国早期中国赴美留学生的故事）。戴、陈二老师有三个孩子，均很优秀。陈老师的父亲是原国军高级将领，在大陆被俘后经改造已特赦。陈老师有个弟弟，留学美国后返台湾，曾任台湾清华校长。所以，陈老师一见我和丽就亲切。三十余年来，我和丽一直珍爱着这师生情谊。

1985 年秋，UMass 医学中心只有我一人来自中国北京。基础医学部有来自南京医学院的卢山同学，刚来读免疫学 PhD，后来他也考过执照进了内科。

本院还有徐家麟（麻醉科医生）和傅美春（化验员）夫妇，多年前从上海移民来美；李坦工程师和妻张惠莉；均时常请我和丽聚会。妇产科有一中年男生物吴博士，寡言，每次见面均微笑。他自己种菜，秋天会给我们罕见的韭菜。据说，他年轻时是台湾保钓骨干。他生于台湾，是台湾本地人。

因为我和丽租房宽敞，节假日，本城的大陆留学生来我们家聚会。一年元旦，大家欢聚合唱了《我的中国心》。在伍斯特时，先后来访的有北医药化班 78 级由国丰、北医卫生系 77 级学长张力萍、北医基础医学 77 级洪峰、北医大研究生院沃唯礼教授带队（郑鸿模和董哲教授）、北医总书记彭瑞聪老师、同学和好友姜晓宇和罗苙一家……时常有同学来电话询问怎样考试入院医规培。张力萍是北医卫生系的老大姐，读书考试超众。她父亲原是教育部副部长。她温文尔雅。一日见她手端鱼盘来我们家，我问为何送鱼？她说：请你帮助我考住院医。我笑言：不必走着来送鱼啊，你是我们尊敬的学长，你有问题我必坦诚相告。不久，她通过了考试，去了芝加哥，做住院医师了。后来，姜众医师（已成病理教授）等也来了……

在整形外科，我和丽做科研。开始练习显微手术。将大白鼠的股动脉切断，再用十个零的缝线吻合好血管。我们有一技术员凯瑟琳，她毕业于纽约州立大学生物系，性情温随，工作敬业，确是难得的好助手。先后研究肠系膜粘膜腹腔植种；将怀孕近分娩的黑色大鼠和白鼠的胎鼠从子宫取出，交换皮瓣后置回子宫，观察分娩后皮瓣的变异；用龙虾壳和其它合成材料造耳鼻；用过大鼠、小鼠、兔子、猴子等。

王大玫教授来信说：她收到美国几个重要会议的请柬，愿意来参加，可三院和北医经费紧张，难于启程。我明白老师所言。我打些电话，为王教授联系到一个医学中心。该院整形外科擅长小儿头颅整形，正符合王教授的专业兴趣。该科为王教授提供往返机票，三个月免费食宿，每月还给千余零用钱。王老师很高兴，夸我能干。我对老师说：因为您非常杰出，而您又太谦逊，不张扬。我只是告诉美国同仁您的成就，他们当然会欢迎您来讲学。

1991年，我们一家四口首次回北京，到北医三院家属楼看望王大玫教授。她乐得喜笑颜开。她本不常烹饪，大热天，坚持去厨房炒了两个菜。她见我如远行的孩子回了家！

当晚，我和丽宿北医外宾招待所（安静，有彩电、冰箱、淋浴、卫生间.....）。次日 5:30Am，有人敲房门。我急忙起床，开门一看竟是王大玫教授，赶紧请进客厅。她说：有一事相求。我紧说：请勿言求，老师有何吩咐？王老师说：你们不知，现在国内搞一刀切。过了一定年龄就催退休。我身体还好，有许多手术需要完成。昨日你说：今日彭瑞聪总书记要会见你和张丽。请你无论如何都要帮我向彭书记求求情，请允许我继续上手术台！说着，她流泪了，我鼻一酸含泪说：王老师：我一定要为您求情。您是北医多年劳模，著名教授，应享特殊待遇！王老师连声说：谢谢，我昨晚想了一夜，还是认为来求你和张丽合适。对不起，打搅你们了。我和丽忙说：没有打搅，老师您太客气了。我们义不容辞为您申言！我们请老师坐一会儿，一起吃早饭。老师说：先谢谢你们了，我还有事。我和丽下午如实地向彭书记讲了。彭书记说：北医会尽量照顾好王大玫教授。

几年后，我们又回北京。王大玫教授搬到城里新居了，房间宽敞、明亮、舒适！我和丽请美玲和美慧一起为王老师小提琴合奏了歌曲《我的祖国》、《北风吹》、和《天鹅湖》选曲。我知王老师爱看芭蕾舞，她会弹钢琴。王大玫教授欢喜地笑了又笑，直夸两个孩子表演的好！

1987年通过住院医师考试

1988年四、五、六三个月普外科见习。七月一号进普外科开始工作。7月2日值夜班，我要负责普外、儿外和神外病房。呼机一响，抓起电话，得知儿外病房一小患者发热。我三步并成两步赶到楼上，先向护士询问、查体、又与护士切磋后下了医嘱。尽管有二线（三年住院医）愿帮忙，可我总要尽职才妥。那两年，日子过的飞快！一有空就读书，需要学的很多。有时，偶有谈聊，我告诉住院医同学们中国外科住院医的典型一日要轻松许多。同事中有人说：那样真好！我知中国文革前北京协和医院、北大医院等住院医师培训也很严格！

1988 - 1990, 麻省大学医学院, 普外科繁忙的规培收获颇丰。因为没有见习足够时间, 也未实习过。上半年普外科起步仍较慢。那时的口号是: 常规操作看一个、做一个、再教 (学生或低年级住院医) 一个! 常常: 4:30 AM 起床, 跑去医学中心, 先自己查负责的十余个病人; 6:00AM, 上级住院医 (第三年的) 带领我们数人讨论后开医嘱、写病程志。接近尾声时, 总住院医师或教授来重点查。接着要进手术室。中午时分, 出手术室, 匆匆吃午饭后送术后病人出院、接收新病人。3:30PM, 三年级住院医带领查房; 4:30PM 总住院医师或教授再重点查。1988 年, 麻省大学医学中心已开始应用计算机查数据和检查报告了。如果值班 (每三日一个夜班), 白日工作, 当晚要忙一夜, 接收一个创伤病人就足够忙一夜。次日, 照常忙一天。待到 6 - 7 PM 返家时, 如同雾中行。回到家, 洗澡, 吃饭, 想看书均难集中精力, 上床便入睡。次日凌晨再起时, 仍觉未睡足! 我同年一位白人女住院医师患了抑郁, 自杀了。那时期, 纽约医院一位女青年患者在急诊室, 因住院医师太忙, 被延误诊治, 意外死亡了。恰她父亲是纽约市知名律师。彻查此案: 的确因为住院医师工作超负荷所致。于是, 住院医师规培限定: 每周工作不许超过 60 小时! 可麻省大学医学中心根本未改。据说, 那时普外最牛的是杜克大学医学中心, 该院普外住院医师每隔一日值一个夜班, 男住院医师的妻子们难耐孤独寂寞, 超半数以上离婚。



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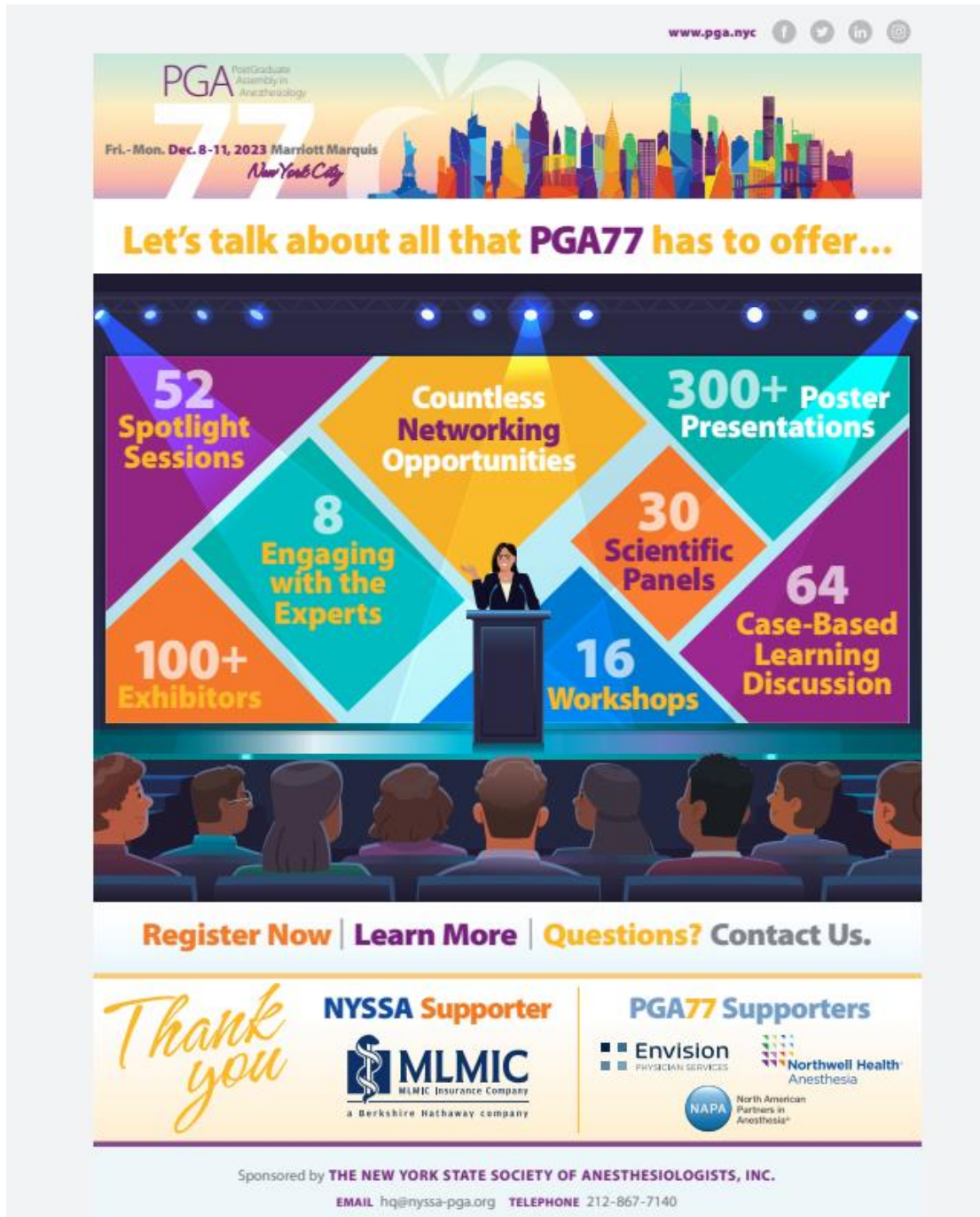
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Dr. Qing Wang
(2023 CASA Photo Competition)

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