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**Forensics of Anesthesia  
What Went Wrong?**

**Peter Strube**

DNAP CRNA MSNA MBA APNP ARNP APRN LTC (Retired) FAANA  
Assistant Professor, Assistant Program Director Newman University  
CEO Trollway Anesthesia and Educational Services

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**Disclaimer; Chronic Cough**

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**Important Notice**

Every attempt has been made to use generic names when possible, at times brand names are used.

I do use the vernacular and most commonly used name

Mentioning a company does not imply endorsement

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**Disclosure;**

I tutor at-risk Nurse Anesthesia Residents for school, SEE, and NCE but have NO financial relationship with the big six review companies.

*I am NOT an item writer!*

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Cell is 608-469-1750

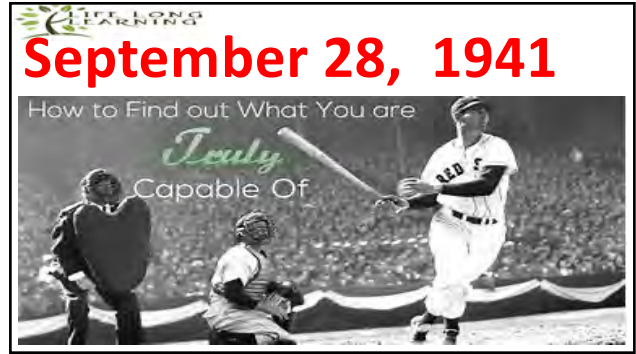
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**STORM ANESTHESIA**  
recert CRNA

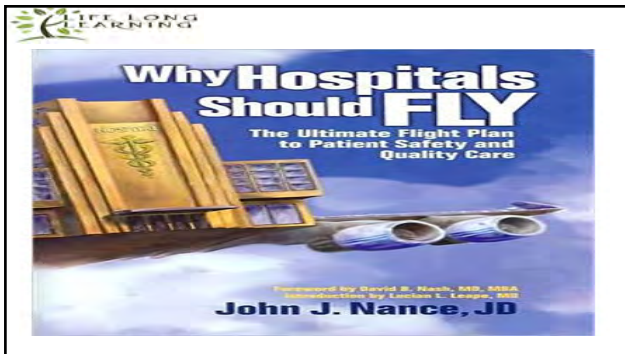
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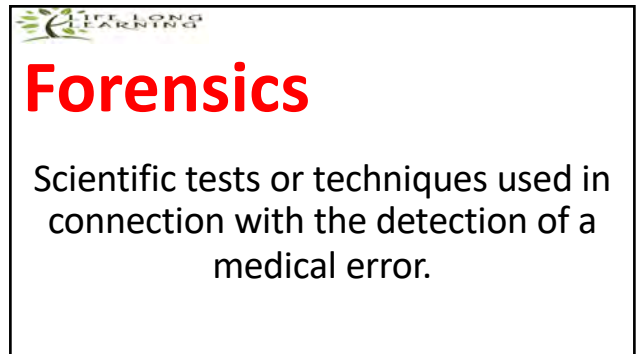
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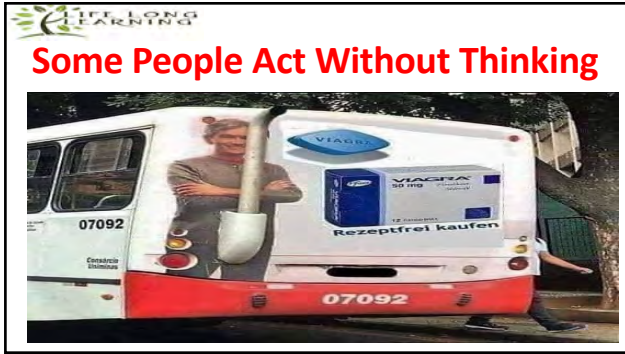
**A Few Vital Principles In Our Investigation**

**Occam's Razor** says that when presented with competing hypotheses that make the same predictions, one should select the solution with the fewest assumptions.

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**A Few Vital Principles In Our Investigation**

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### Some People Act Without Thinking

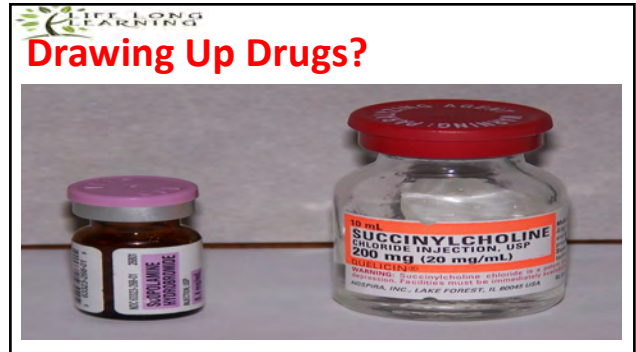
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### Drawing Up Drugs?

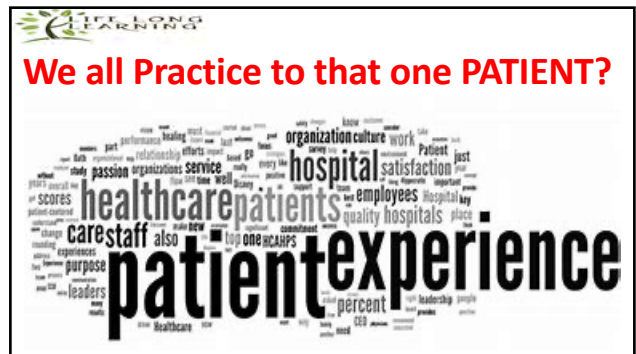
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### Take It For Granted

Still Don't Know The FORCE Required To Go Through The Caps

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### We all Practice to that one PATIENT?

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**Clinically Relevant**

A Venn diagram with two overlapping circles. The left circle is labeled "What you want to say." and the right circle is labeled "What they're interested in." The overlapping area in the center is shaded with blue diagonal lines and has a blue arrow pointing to it from the word "Relevance" written below. The logo "HILL LONG LEARNING" is in the top left corner.

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**Medical Error**  
The Third Leading Cause of Death in the US

BMJ 2016; 353 doi: <https://doi.org/10.1136/bmj.i2139> (Published 03 May 2016). BMJ 2016;353:i2139

An infographic with a dark background. On the left, white text reads: "AVOIDABLE MEDICAL ERRORS ARE THE THIRD LEADING CAUSE OF DEATH IN AMERICA". On the right, a white box contains the title "MEDICAL ERROR THIRD LARGEST KILLER IN US" and a cartoon doctor. Below the doctor, it says "Globally an estimated 1.42 million people died in 2013 from adverse effects of medical treatment." and "A Harvard University study has estimated 43 million medical injuries occurred globally and 2.2 million in the US mentioned in BMJ". A list of causes includes: Health System, Cancer, Medical Errors, CPSD, Suicide, Errors, and Motor Vehicles. At the bottom, it lists "LEADING CAUSES OF DEATH IN 2014" including: HEART DISEASE, COPD, LUNG CANCER, DIABETES, PHARMACEUTICALS, and ALCOHOL. The logo "HILL LONG LEARNING" is in the top left corner.

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**Mistakes!**

How Many Die From Medical Mistakes in U.S. Hospitals?  
<http://www.propublica.org/article/how-many-die-from-medical-mistakes-in-us-hospitals>

**National Focus on Patient Safety**

- Institute of Medicine report – "To Err is Human" (Nov. 1999)
  - + 44,000-98,000 deaths due to medical errors
  - + Annual cost \$17B-\$29B
- Federal Mandate and Regulatory Requirements
  - Presidential directive, The Joint Commission, Centers for Medicare & Medicaid Services
  - State regulations

The logo "HILL LONG LEARNING" is in the top left corner.

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**Deaths Per Year!**

1999, the Institute of Medicine published the famous "To Err is Human" report, which dropped a bombshell on the medical community by reporting that up to 98,000 people a year die because of mistakes in hospitals

(2014) A study in the current issue of the Journal of Patient Safety that says the numbers may be much higher — between 210,000 and 440,000 patients

A graphic with a white airplane on a runway. To the right, a red and yellow banner reads "PROTECTING 5 Million lives". Below the banner, it says "SOME IS NOT A NUMBER. SOME IS NOT A TIME." The logo "HILL LONG LEARNING" is in the top left corner.

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**RES IPSA LOQUITUR**

The logo "HILL LONG LEARNING" is in the top left corner.

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**Crime Scene**

A 3D architectural rendering of a hospital room, showing a bed, desk, chair, and other furniture. The logo "HILL LONG LEARNING" is in the top left corner.

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**Why is the patient having a panic attack?**

**It was just a MAC case .... "crazy patient" or was it something I did?**

<http://www.accessdata.fda.gov>

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**What IV solution to you choose?**

**Panic attacks... oh boy?**

**"Lactate infusions commonly induce feeling of anxiety, and few cases of panic attack have been reported" Package insert**

**Lactate- and isoproterenol-induced panic attacks in panic disorder patients and controls**

**ORBITIC ANESTHESIA**  
Surgical Eye  
Drew J. Berman  
CASE REPORT  
**Panic Attacks and Lactated Ringer's Solution: Is There a Relationship?**  
Lawrence C. Topp, MD, and Sanjay Datta, MD, FRCPC  
Department of Anesthesiology, Harvard Medical School and Brigham & Women's Hospital, Boston, Massachusetts

<http://www.accessdata.fda.gov>

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**Measuring the Safety of Writing on Intravenous Bags**

Question Clark, BSN, RN, Tara Bartsch, BSN, RN, Sheila Cox Sullivan, PhD, RN, Sue Theus, PhD

DOI: <http://dx.doi.org/10.1016/j.ajop.2014.03.005>

**Do you write on your IV or put tape on it?**

ISMP also cautions against writing an expiration date directly on the bag, because volatile chemicals from the ink may leach into the solution.  
<http://www.accessdata.fda.gov/pdr/printer.cfm?id=186>

Labeling IV solutions, pharmacist review, sensitive personnel, medication security; unattended sterile fields

**Can Permanent Marker Leach into IV Infusion Bags?**

November 24th, 2014 | Endocrine Metabolic, Expert Panel Abstracts (Clinical), The Publication Center (Clinical), The 9th Millennium | 3 Comments

By Jessica Rose, PharmD, BCPS, Caring Authors (Pharmacists), (CPE) and Rob Byrner MD

<http://www.accessdata.fda.gov>

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**30 Million Prescription Mistakes per year (100,000 Deaths)**

**4% Stocking Errors.... What is in your top drawer?**

Alshcroft et al. Prospective study of the incidence, nature and causes of dispensing errors in community pharmacies. *Pharmacoepidemiol Drug Saf.* 2005 May;14(5):327-32.

Barker et al. Medication errors observed in 36 health care facilities. *Arch Intern Med.* 2002 Sep 9;162(16):1897-903.

Cina et al. How many hospital pharmacy medication dispensing errors go undetected? *J Comm J Qual Patient Saf.* 2006 Feb;32(2):73-80.

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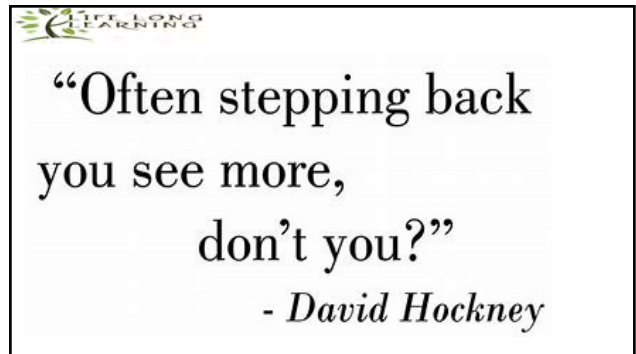
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**Crazy!**

**Beef Anaphylaxis?**

**2009**

**Alpha-Gal**  
**3% of food allergies**



See: <http://dx.doi.org/10.1016/j.jaci.2011.05.001>  
 Invited Commentary: Alpha-Gal Allergy: Tip of the iceberg to a Pivotal Immune Response.  
 Commins SP  
 // Author information

**Abstract**  
 The syndrome of delayed allergic reactions to the carbohydrate galactose alpha 1-3 galactose ("alpha-gal") has become increasingly recognized in allergy and immunology offices regionally throughout the southeastern USA. Due to the increasing awareness of this unique food allergy, cases have been identified in the northeastern and central USA as well as in Central and South America, Europe, Asia, Scandinavia, and Australia. Clinically, alpha-gal allergy is characterized by reactions to non-porcine mammalian meat (e.g., beef, pork, lamb) that occur 2-6 h following exposure. The IgE response to alpha-gal is thought to develop after tick bites and can result in the loss of tolerance to foods that have been safely consumed for years. Although the initial description of alpha-gal allergy in 2005 was limited to red meat, this allergy is now identified in an expanded number of products, medications and foods both labeled and unlabeled. Moreover, we are beginning to recognize that alpha-gal food allergy is the tip of the iceberg for this immune response.

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**Delayed Anaphylaxis to Alpha-gal**

Triggered by an IgE antibody to a sugar (not a protein) **Galactose alpha 1-3 galactose ("alpha gal")** found in meat (beef, pork, lamb, venison, bison but not poultry or fish)

**Cardiovascular symptoms (arrhythmia, blood pressure fall, syncope, shock) – Death**

**Reported in several hundred people across US (Virginia highest)**

Commins SP et al. J Allergy Clin Immunol. 2011 May;127(5):1286-93

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**Gelatin Based Products**

Examples of intravenous medications in which those inactive ingredients are found include insulin, heparin, hydromorphone, haloperidol, recombinant human coagulation factor VII, and albumin.

Some medications that the patient may receive preoperatively are acetaminophen, aspirin, naproxen, lisinopril, hydrocodone/acetaminophen, oxycodone, clonidine, methadone solution, celecoxib, pregabalin, gabapentin, lidocaine patch, gelatin containing vaccines.

Surgical products such as porcine-derived heart valves, gelatin-based hemostatic agents, surgical powder, thrombin, cat-gut suture and biologic mesh are capable of triggering anaphylaxis as well.

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**Alpha-Livetin**

Dunkman WJ, Rycek W, Manning MW. What does a red meat allergy have to do with anaphylaxis? Perioperative management of alpha-gal syndrome. *Anesth Analg.* 2019;129(5):1242-1248. doi:10.1213/ANE.0000000000003460

D'Ercole FJ, Dhandha VH, Levi ML, Todd AB, Kumar PA. Perioperative challenges in patients with alpha-gal allergy. *J Clin Anesth Pain Manag.* 2019;3(1):70-78. doi:10.36959/377/330


Lied GA, Lund KB, Storaa T. Intraoperative anaphylaxis to gelatin-based hemostatic agents: a case report. *J Asthma Allergy.* 2019;12:163-167. doi:10.2147/JAA.S202784

Steinke JW, Platts-Mills TA, Commins SP. The alpha-gal story: lessons learned from connecting the dots. *J Allergy Clin Immunol.* 2015;135(3):589-597. doi:10.1016/j.jaci.2014.12.1947

Platts-Mills TA, Li RL, Keshavaz B, Smith AR, Wilson JM. Diagnosis and management of patients with the alpha-gal syndrome. *J Allergy Clin Immunol Pract.* 2020;8(1):15-23. doi:10.1016/j.jaip.2019.09.017

Sell-Dottin KA, Sola M, Caranacos TG. Impact of newly emerging alpha-gal allergies on cardiac surgery: a case series. *Clin Surg.* 2017;2(1477):1-3. [http://www.clinicsurgery.com/pdfs\\_folder/cis-v2-id1477.pdf](http://www.clinicsurgery.com/pdfs_folder/cis-v2-id1477.pdf). Accessed April 4, 2020.

Muglia C, Kar I, Gong M, Hermes-DeSantis ER, Monteleone C. Anaphylaxis to medications containing meat byproducts in an alpha-gal sensitized individual. *J Allergy Clin Immunol Pract.* 2015;3:796-797. doi:10.1016/j.jaip.2015.04.004



**You Might Be Allergic To Red Meat...Here Are The Symptoms**

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**WOW!**

Alpha-gal Syndrome

Bird Egg Syndrome  
(Alpha-Livetin, Chicken Serum Albumin)

Chicken Allergy  
(can't eat shrimp or poultry) OR most fish

Effects Females more

<http://www.alpha-gal.com/alpha-gal-syndrome>  
<http://allergynow.com/alpha-gal-syndrome/>



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**Alpha-Livetin**

**Bird Egg Syndrome**

Gabapentin  
Omeprazole  
Atorvastatin  
Labetalol  
Meloxicam  
Chlorthalidone  
Aspirin



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**Alpha-Livetin**

Dunkman WJ, Rycek W, Manning MW. What does a red meat allergy have to do with anesthesia? Perioperative management of alpha-gal syndrome. *Anesth Analg.* 2019;129(5):1242-1248. doi:10.1213/ANE.0000000000003460

D'Ercole FJ, Dhandha VH, Levi ML, Todd AB, Kumar PA. Perioperative challenges in patients with alpha-gal allergy. *J Clin Anesth Pain Manag.* 2019;3(1):70-78. doi:10.36959/377/330

Lied GA, Lund KB, Storaa T. Intraoperative anaphylaxis to gelatin-based hemostatic agents: a case report. *J Asthma Allergy.* 2019;12:163-167. doi:10.2147/JAA.S202784

Steinke JW, Platts-Mills TA, Commins SP. The alpha-gal story: lessons learned from connecting the dots. *J Allergy Clin Immunol.* 2015;135(3):589-597. doi:10.1016/j.jaci.2014.12.1947

Platts-Mills TA, Li RL, Keshavaz B, Smith AR, Wilson JM. Diagnosis and management of patients with the alpha-gal syndrome. *J Allergy Clin Immunol Pract.* 2020;8(1):15-23. doi:10.1016/j.jaip.2019.09.017

Sell-Dottin KA, Sola M, Caranacos TG. Impact of newly emerging alpha-gal allergies on cardiac surgery: a case series. *Clin Surg.* 2017;2(1477):1-3. [http://www.clinicsurgery.com/pdfs\\_folder/cis-v2-id1477.pdf](http://www.clinicsurgery.com/pdfs_folder/cis-v2-id1477.pdf). Accessed April 4, 2020.

Muglia C, Kar I, Gong M, Hermes-DeSantis ER, Monteleone C. Anaphylaxis to medications containing meat byproducts in an alpha-gal sensitized individual. *J Allergy Clin Immunol Pract.* 2015;3:796-797. doi:10.1016/j.jaip.2015.04.004

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**Hespan**

**HESPAN® (6% hetastarch in 0.9% sodium chloride injection)**

**L6511** 500 mL  
0264-1945-10 (250 \* CONTAINER)

For intravenous use only.  
Each 500 mL contains: Hetastarch 0.9 g Sodium Chloride USP 0.9 g as base for injection, USP pH adjusted with Sodium Hydroxide, 90 g/g, approximately 8.5 with negligible buffering capacity. Cals: Osmolality: approximately 300 mOsm/L Electrolytes (mEq/L): Sodium 154 Chloride 154

If administration is by pressure infusion, air should be withdrawn or expelled from the line through the medication port prior to infusion.

Normal hemostasis: The body is sensitive to fluid and contains and sends out signals. Single blood coagulation. Diluted infusion solutions. Recommended Storage: Store at room temperature, 20°C (77°F). Avoid excessive heat. Protect from freezing. Usual Dosage: See package insert for complete information.

PHARMACEUTICALS  
B. Braun Medical Inc.  
10000  
10000

Do not receive medication until you have fully received the medical alert at the venous site for ongoing treatment. Please do not use if you are allergic to any of the ingredients. Do not use if you are allergic to any of the ingredients. Do not use if you are allergic to any of the ingredients.


Drug Topics (online). Advantus. 10/24/2018. <http://drugtopics.modernmedicine.com/drugtopics/Top-News/Overview-of-pharmaceutical-exipients-used-in-Injectables/ArticleDetail/1561047>. Accessed August 12, 2021.

FDA's SCOS database; comp starch; Report No. 977050-51-3, 1979; ID Code: 96; <http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfnavision/cfm?pg=scoslisting&id=96>. Accessed August 12, 2021.

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**Corn Allergy Thoughts**

Antibiotics are grown in corn medium  
 Hand sanitizer, ethanol from corn  
 Powdered surgical gloves, cornstarch  
 LR fermented in corn sugar  
 Tongue depressors  
 Anesthesia Circuits should be rinsed before use  
 Local anesthetics preservative corn-based  
 ETT rinse before use  
 Avoid rubber instruments  
 Avoid dissolvable sutures  
 Face Mask should be rinsed before use




Jones, S.C. Magroff, S. Cooke, and H. Sampson. "Immunologic Cross-reactivity among Cereals Grains and Grasses in Children with Food Hypersensitivity." Journal of Allergy and Clinical Immunology 96.3 (1995): 341-51.  
 Guhary, S. R., and M. Barajas. "Probably Anaphylactic Reaction to Corn-Derived Dextrose Solution." Vet Hum Toxicology 33.6 (1992): 609-50.  
 Seggry, J. S., T. P. Mawhinney, J. W. Yunginger, and S. R. Braun. "Anaphylaxis Due to Cornstarch Surgical Glove Powder." Survey of Anesthesiology 35.3 (1991): 308.

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**25-Year-Old Patient, Male, OPEN Appy, ASA 1, 175 lbs., NPO 10 hours. Allergy to Eggs (Hives)-- LMA**

Propofol 200 mg mixed with 60 mg lidocaine

He requires a second dose of 200 mg Propofol mixed with 60 mg lidocaine




**And then.....**

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**And then..**

Saturation drops to 84%, tachycardia, hypotension, cyanosis,  
 You send stat ABG;

Decrease in PCo<sub>2</sub>,  
 Decrease in PO<sub>2</sub>  
 Increase in pH




Patient arrests and CPR and ACLS Started..... What happened?

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**25-Year-Old Patient, Male, OPEN Appy, ASA 1, 175 lbs., NPO 10 hours. Allergy to Eggs (Hives)-- LMA**

Propofol 200 mg mixed with 60 mg lidocaine

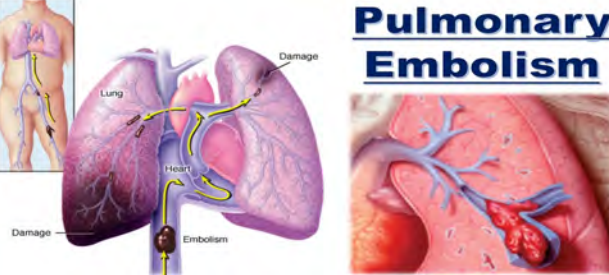
He requires a second dose of 200 mg Propofol mixed with 60 mg lidocaine



**And then.....**

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**Pulmonary Embolism**




Saturation drops to 84%, tachycardia, hypotension, cyanosis,  
 Decrease in PCo<sub>2</sub>, Decrease in PO<sub>2</sub>, Increase in pH

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**Distractor**

**Allergy to Eggs (Hives)-- LMA**

Propofol 200 mg mixed with 60 mg Lidocaine



**Real Clue**

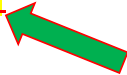


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**Remember Propofol Points!**


*Lilley et al. showed that adding lidocaine to propofol emulsion increased the lipid droplet size and caused an oil droplet to form. **High risk of PE***



Hansrani PK, Davis SS, Groves MI: The preparation and properties of sterile intravenous emulsions. J Parent Sci Technol 1983; 37:145-50; Hansrani, PK, Davis, SS, Groves, MI, Lilley EM, Isart PR, Carasso ML, Kennedy RA: The effect of the addition of lignocaine on propofol emulsion stability. Anaesthesia 1996; 51:815-8; Lilley, EM, Isart, PR, Carasso, ML, Kennedy, RA, Takaki T, Tashiro N, Nishikawa T: Physicochemical compatibility of propofol-lidocaine mixture. Anesth Analg 2003; 97:1046-53; Nishikawa, T, Takaki, M, Nishikawa, T, Miller R, Katzung HG: Local anesthetic, Basic and Clinical Pharmacology. Edited by KatzungHG. New York: McGraw-Hill, 2005, pp 430-434; Miller, R, Katzung, HG: KatzungHG New York McGraw-Hill; Karke M, Simmons GH, Weiss DL, Bivins BA, DeLuca PP: Clearance of 14C-labeled microspheres from blood and distribution in specific organs following intravenous and intrarterial administration in beagle dogs. J Pharm Sci 1980; 69:755-62; Karke, M, Simmons, GH, Weiss, DL, Bivins, BA, DeLuca, PPH, L, Davis, SS: The targeting of drugs parenterally by use of microspheres. J Parent Sci Technol 1982; 36:242-8; Liu, L, Chen, G

49

**Eriksson et al. found that mixing 20 mg of Lidocaine with 200 mg of Propofol increased the dose of Propofol required.**



Eriksson M, Englesson S, Horte I, Hartvig P: The anaesthetic potency of propofol in the rat is reduced by simultaneous intravenous administration of lignocaine. Eur J Anaesthesiol 1999; 16: 315-9.  
Cumings GC, Dixon J, Kay NH, et al. Dose requirements of ICI 35, 868 (propofol, 'Diprivan') in a new formulation for induction of anaesthesia. Anaesthesia 1984; 39: 1168-71.  
Stokes DN, Hutton P: Rate-dependent induction phenomena with propofol: implications for the relative potency of intravenous anaesthetics. Anesth Analg 1991; 72: 578-83.

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**apsf NEWSLETTER**  
THE OFFICIAL JOURNAL OF THE ANESTHESIA PATIENT SAFETY FOUNDATION

Circulation 107,515 • Volume 27, No. 3 • Winter 2013

**The use of blunt plastic tips increases. The incidence of coring was 29% with blunt plastic needles as opposed to only 4% with acutely beveled sharp steel needles.**

**Coring And Fragmentation May Occur With Rubber Cap And Blunt Needles**

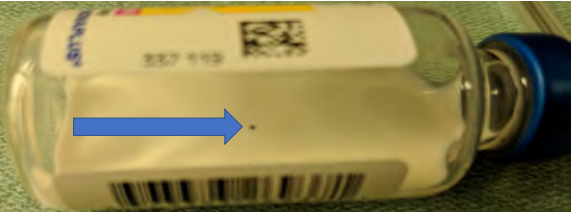
Taraj Chaudhry, MD, Andrew Serdikuk, DO



Wang T, Givens R, Mathews A: Studying incidence of coring in anesthesia practice and difference between blunt and sharp needles. JAMA Netw J 2008; 9:1434-44.  
Lain O, Fuzay M, Makhadmeh N: Cut-off fragments of rubber caps of bottles of contrast material: Foreign bodies in the drip infusion system. Am J Neuroradiol 1983; 2:138-5.  
Kara M, Gering T: Near-embolization of a rubber core from a propofol vial. Anesth Analg 2008; 106:1030-1.  
Vasilev IA, Thurston TA, Kim SH, Tobias JD: Allergic reaction to latex from stopper of a medication vial. Anesth Analg 1993; 97:1027-9.  
Yangtong JW, Jones RT, Kaska JM, Warner MA, Hunt CM, Reed CE: Latex allergen content of medical and consumer rubber products. JAMA 2004; 291:2431-41.  
Scheidt R, Johnson BK: Latex allergy. Am J Health Syst Pharm 1997; 54:1075-9.

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**Blunt Needle Compared to 18 Gauge Sharp**



**Blunt Created a Coring effect and large "Black Chunk"**

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**LETTERS TO THE EDITOR: LETTERS & ANNOUNCEMENTS**

**Near-Embolization of a Rubber Core from a Propofol Vial**

Rishi, Ananthan L, MD (Section Editor), Sabinas, Lawrence | [Author Information](#)

Anesthesia & Analgesia March 2008 Volume 108 Issue 3 p 507  
doi:10.1097/AN.0b013e318162920e

**Rubber Coring of Injectable Medication Vial Stoppers: An Evaluation of Causal Factors**

Philip Chenard | [David Bourdeau](#) | [Quentin Clume](#) | [Catherine Anand](#) | [Alyssa Casseres](#) | [Vera Dolko-Akbar](#) | [Valerie Dubois](#)

Published Online 2015-11-10 | DOI: <https://doi.org/10.1191/0959-2688.f115.0115>

**The incidence of coring and fragmentation of medication vial rubber stoppers**

April 2015 | *Journal of Clinical Anesthesia* 27(5)  
DOI: [10.1016/j.jclinan.2015.01.009](https://doi.org/10.1016/j.jclinan.2015.01.009)  
Source: [Published](#)

**The incidence of coring with blunt versus sharp needles**

© 2015 Elsevier Inc. All rights reserved. | <http://www.elsevier.com/locate/jclinan> | <http://www.sciencedirect.com>

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**PONV Plan**

**45-year-old Female, non-smoker with motion sickness having a GYN procedure with opioids**

**Propofol:** bolus of 1 mg/kg followed by an infusion at 20 mcg/kg/min  
**Propofol:** in small doses (20 mg as needed)

**Decadron 0.15 mg/kg cover PONV and reduce postoperative pain and opioid demand. (DE Olivera 2011)**  
50 mg IM Ephedrine Rothenberg et al. (1991) showed that ephedrine 0.5 mg/kg IM has an antiemetic effect

**Best Combination is 4 mg Zofran prior to induction; 0.15 mg/kg Decadron either hours prior to or right after going to sleep and Haldol 0.5-2.0 mg IV (Haldol takes 60 min to fully work)**



Chenard P, Ananthan L, Sabinas L, Bourdeau D, Clume Q, Anand C, Casseres A, Dolko-Akbar V, Dubois V: Near-embolization of a rubber core from a propofol vial. Anesth Analg 2008; 106:1030-1.  
Chenard P, Ananthan L, Sabinas L, Bourdeau D, Clume Q, Anand C, Casseres A, Dolko-Akbar V, Dubois V: Rubber coring of injectable medication vial stoppers: an evaluation of causal factors. Anesth Analg 2015; 120:1030-1.  
Chenard P, Ananthan L, Sabinas L, Bourdeau D, Clume Q, Anand C, Casseres A, Dolko-Akbar V, Dubois V: Rubber coring of injectable medication vial stoppers: an evaluation of causal factors. Anesth Analg 2015; 120:1030-1.  
Chenard P, Ananthan L, Sabinas L, Bourdeau D, Clume Q, Anand C, Casseres A, Dolko-Akbar V, Dubois V: Rubber coring of injectable medication vial stoppers: an evaluation of causal factors. Anesth Analg 2015; 120:1030-1.

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**Bradycardia**

**Tachycardia**

**INSIDE EVERY OLDER PERSON IS A YOUNGER PERSON WONDERING WHAT THE HELL HAPPENED.**

*—Cora Harvey Armstrong*

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## Dexamethasone Sodium Phosphate

*2008 Journal of Pharmacy and Biological Sciences (2008) 33(8): 478-5*  
 p. 478-504, p. 2007-2114-1516, Volume 8, Issue 2, Part 1, May - Jun, 2016, PP 13-14  
 www.karger.com/journals

Excruciating pain and itching occurring at the administration site after intravenous injection of dexamethasone - a prospective clinical study

The pharmacological mechanism explaining this phenomenon remains poorly understood, but could be related to the phosphate ester of the corticosteroid since perineal irritation has been described with hydrocortisone-21-phosphate sodium and prednisolone phosphate.

Perrow G, Dalziel P, Semman L, Bichard P. Perineal pruritus after iv dexamethasone administration. Canadian Journal of Anaesthesia 2003; 50: 749-50.  
 Froy CT, Ross RH. Epidural and Spinal Anesthetics: Section 5: Special Techniques. In: Chiswick, DR, ed. Obstetric Anesthesia: Principles and Practice. St. Louis: Mosby 1999, 386-406.  
 1018 Journal of Pharmacy and Biological Sciences (2008) 33(8): 478-504, p. 478-504, p. 2007-2114-1516, Volume 8, Issue 2, Part 1, May - Jun, 2016, PP 13-14 www.karger.com/journals  
 Cora Harvey, Cora Dalziel, Cora Semman, Philipp Bichard. Perineal pruritus after iv dexamethasone administration. Canadian Journal of Anaesthesia Canadian Journal of Anaesthesia, 2003, 50: 749-750. doi:10.1007/s00540020722

56



57

## MRI Burn? What could be missed?

**Pulse Oximeter Burn**

• 3<sup>rd</sup> Degree

**EKG Burn**

58

## Tattoo?

June 2008, Volume 174, Number 6  
 On the AJR Website  
 Tattoo-Induced Skin Burn During MR Imaging  
 (Hanan A. Hagar and Marko Stankovic)

Smith (Health). 2011 Sep; 3(5): 431-434.  
 doi: 10.1373/journal.LM.2011.01.01588

PMID: 22610229

Tattoo-Induced Skin "Burn" During Magnetic Resonance Imaging in a Professional Football Player  
 A Case Report  
 Jettara B. Ross, MD and Matthew J. Mattias, MD

**Internal Journal of Environmental Research found burns from MRI as early as 2007 and 2009.**

**MRI complications.** Rarely, tattoos or permanent makeup might cause swelling or burning in the affected areas during magnetic resonance imaging (MRI) exams. In some cases, tattoo pigments can interfere with the quality of the image.

November 2008, Volume 187, Number 5  
 Letters  
 First-Degree Burns on MRI due to Nonferrous Tattoos  
 Tobiasz Pruski, Saba Achmed and Rashed Elmaghrabi

59

# Tattoos

Based on the limited information available, inserting an epidural or spinal needle through a tattoo could cause long-term problems such as arachnoiditis or neuropathy secondary to an inflammatory reaction, but we don't know.

*Canadian Journal of Anesthesia 49:1057-1060 (2002)*

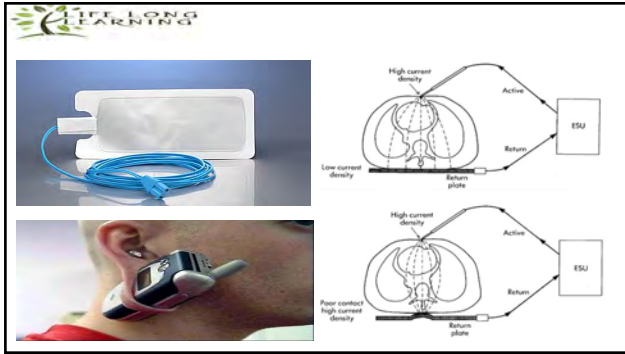
Professional inks may be made from iron oxides

Low Back Tattoos: A Review of the Safety Concerns

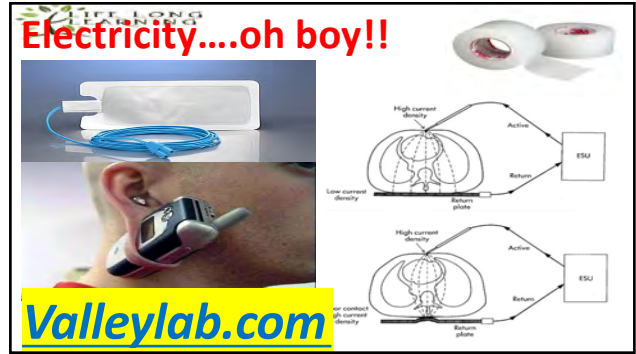
First article for Internal Journal of Environmental Research found burns from MRI as early as 2007 and 2009.

Dawn Welliver, CRNA, MS Mark Welliver, CRNA, DNP  
 Tammy Carroll, CRNA, MSN Peggy James, MD AANA--2010

60



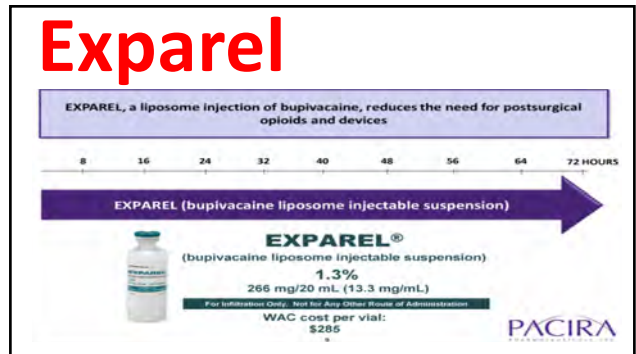
61



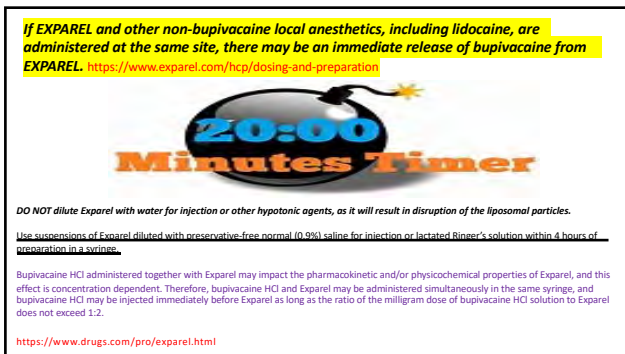
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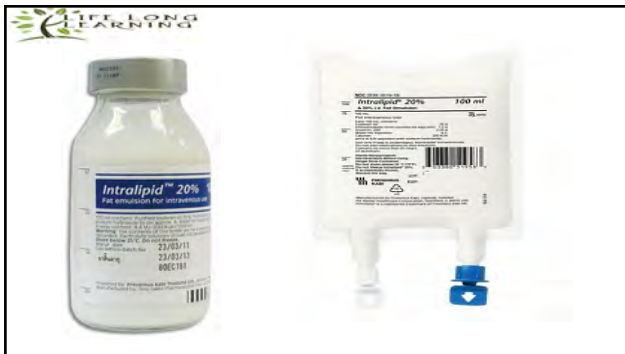
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69

**Sugammadex**

70 kg man  
 2mg/kg dose: 140mg, one 2mL vial = \$84.93  
 4mg/kg dose: 280mg, one 5mL vial = \$155.55  
 16mg/kg dose: 1120mg, two 5mL vials and one 2mL vial = \$396.03

Caveats

- Neostigmine 5 mg and Robinol 1.0 mg = \$300 - \$400
- Uncontracted prices from distributor
- Patient cost usually approximately 3x this cost

Shihata M, Goussardist, MishraUK, Maggart, Adams L, Hennenrot. Dig 2009 Sugammadex, a selective relaxant binding agent for antagonism of prolonged rocuronium induced neuromuscular block. Br J Anaesth 2010; 105: 45-50. Goussardist, MishraUK, Adams L et al. Reversal of rocuronium induced neuromuscular block by the selective relaxant binding agent sugammadex: a dose finding and safety study. Anaesthesia 2010; 65: 254-262. Maggart, Sugammadex another relaxant in clinical neuromuscular pharmacology. Anaesth. 2009; 64(2):171-181. (2009)

70

**Neostigmine, Expensive?**

APSP NEWSLETTER October 2015 PAGE 31

**The Neostigmine Shortage: A Clinical Conundrum with Few Drug Alternatives**

Flamel merged with Avadel Pharmaceuticals in 2017

**FLAMEL technologies**

**Avadel**

Shihata M, MishraUK, Maggart, Adams L, Hennenrot. Dig 2009 Sugammadex, a selective relaxant binding agent for antagonism of prolonged rocuronium induced neuromuscular block. Br J Anaesth 2010; 105: 45-50. Goussardist, MishraUK, Adams L et al. Reversal of rocuronium induced neuromuscular block by the selective relaxant binding agent sugammadex: a dose finding and safety study. Anaesthesia 2010; 65: 254-262. Maggart, Sugammadex another relaxant in clinical neuromuscular pharmacology. Anaesth. 2009; 64(2):171-181. (2009)

71

**Cost of Neostigmine**

**70 kg man – Cost to Patient**

70mcg/kg neostigmine = 4.9mg = \$42.34  
 (\$208.82 to patient)

10mcg/kg glycopyrrolate = 0.7mg = \$19.55  
 (\$122.12 to patient)

Caveat – Approximate prices prorated for amount used from premixed syringes available from pharmacy

72

**Cost Comparisons**

Paton F, et al. Sugammadex compared with neostigmine/glycopyrrolate for routine reversal of neuromuscular block: a systematic review and economic evaluation. *J. Anaesth.* (2010) 105 (5): 558-567. doi: 10.1093/bja/aeq269


Carron M. Sugammadex for reversal of neuromuscular blockade: a retrospective analysis of clinical outcomes and cost-effectiveness in a single center. *Clinicoecon Outcomes Res.* 2016 Feb 18;8:43-52. doi: 10.2147/CEOR.S100921

Georgiou, P, et al. Clinical and cost-effectiveness of sugammadex versus neostigmine reversal of rocuronium-induced neuromuscular block in super obese patients undergoing open laparotomy for bariatric surgery. A randomized controlled trial. *9AP1-7. European Journal of Anaesthesiology.* 2013;30:141.

Insigna R, et al. Hospital budget impact of sugammadex (sugammadex) for reversal of neuromuscular block. *Value in Health.* PND 19. 2015; 18:A281

73

**PTT and PT**



In response to the FDA's requests, four additional studies were conducted examining the impact of sugammadex on coagulation. These investigations demonstrated a slight increase in PT and aPTT that occurred within minutes of administration but resolved within an hour.

In addition, in a large study of patients undergoing hip or knee replacement surgery, no increase in bleeding or transfusion requirements was observed in patients randomized to receive sugammadex.

**BRIDION® (sugammadex) Injection, for intravenous use**  
Initial U.S. Approval: 2015

**INDICATIONS AND USAGE**  
BRIDION is indicated for the reversal of neuromuscular blockade induced by rocuronium bromide and vecuronium bromide in adults undergoing surgery. (1)

Source: Full Prescribing Information, Bridion® (Sugammadex). 2015, Merck Sharpe and Dohme Corp.

74

**Package Insert**

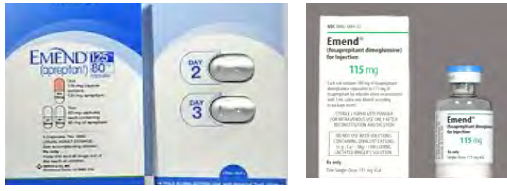
**Merck:**

**7.3 Interaction Potentially Affecting the Efficacy of Hormonal Contraceptives**

In case of non-oral hormonal contraceptives, the patient must use an additional, non-hormonal contraceptive method or back-up method of contraception (such as condoms and spermicides) for the next 7 days.

75

**Emend (Aprepitant) PDNV**



Pasricha P, Yates KP, Sarosiek L, et al. Aprepitant Has Mixed Effects on Nausea and Reduces Other Symptoms in Patients With Gastroperis and Related Disorders. *Gastroenterology.* 2018;216(1):65-76. <http://dx.doi.org/10.1053/j.gastro.2017.08.014>

76


**Birth Control Drug Interaction with Sugammadex (Bridion®) and/or Aprepitant (Emend®): Information for Female Surgery Patients**

During your procedure or surgery on \_\_\_\_\_ you received medications that lower the effectiveness of birth control medications. You need to be aware of this if you are on any type of a hormonal contraceptive (birth control medication):

- Sugammadex (Bridion®) is a medicine that helps to speed up recovery from anesthesia (muscle relaxant) drugs patients receive during surgery. Sugammadex may decrease the effectiveness of your hormonal contraceptive (birth control) for up to 7 days.
  - Use a backup birth control method for up to 7 days after your procedure or surgery.
  - Continue taking your hormonal contraceptive during this period.
- Aprepitant (Emend®) is a medicine that prevents nausea. Aprepitant may decrease the effectiveness of your hormonal contraceptive (birth control) for up to 28 days.
  - Use a backup birth control method for up to 28 days after your

77

**Question?**



The patient presents with hypertension, tachycardia, agitation, and restlessness.

Patient history reveals current treatment with fluoxetine (Prozac), and they also report taking "some alternative medicines for depression."

What syndrome does this patient exhibit and which herbal medicine has potentiated the syndrome?

78

**The patient with hypertension, tachycardia, agitation and restlessness has a serotonin-like syndrome. St. John's wort, often used as a "natural remedy" for depression can produce or potentiate the serotonin-like syndrome.**

Rosen and Flecher, Essence of Anesthesia Practice, 2<sup>nd</sup> ed., 2002, pp.610  
 Demerly, C. E., & Tzourousis, C. (2018). Dietary supplements & herbal medications. In B. G. Katzung (Ed.), Basic and clinical pharmacology, (14th ed., p. 1131-1146). London, UK: McGraw Hill.  
 Luchter, C. (2018). Drugs of abuse. In B. G. Katzung (Ed.), Basic and clinical pharmacology, (14th ed., p. 575-589). London, UK: McGraw Hill.  
 Nagelhout, J. J. (2018). Opioid and non-opioid analgesics. In J. J. Nagelhout & S. Elshah (Eds.) Nurse Anesthesia (6 ed., pp. 128-139). St. Louis, MO: Elsevier Inc.


79

**St John's Wort**

The recommendation as with all herbals and supplements is to stop this drug at least two weeks prior surgery...

If they are using it for mild depression, they may need to stop it sooner so they can do a taper.

Interacts directly with: anticoagulants, oral contraceptives, NSAIDs, antidepressants, anti-seizure medications, and transplant and HIV medications.



Ag Lee MA, Herbal Medicines and Perioperative Care. JAMA. 2001;285(12):1508-1511. doi:10.1001/jama.285.12.1508.  
 Geller R, Himmelfarb J. St John's Wort for Depression. Archives of Internal Medicine. 2003;163(2):152-161. doi:10.1093/ajcp/163.2.152.

80

**LMA Cysto 45-year-old Female on Cymbalta**  
**Surgeon asks for you to give Methylene Blue**

1. Agitation or restlessness
2. Confusion
3. Rapid heart rate and high blood pressure
4. Dilated pupils
5. Loss of muscle coordination or twitching muscles
6. Muscle rigidity
7. Heavy sweating
8. Diarrhea
9. Headache
10. Shivering
11. Goose bumps



81

**Serotonin Syndrome**

Cyproheptadine: (5HT2) Sometimes used to block serotonin production in the body. It has demonstrated effectiveness in reducing the severity of symptoms associated with serotonin syndrome

Tx of serotonin syndrome  
 Cyproheptadine 4 mg up to 0.5 mg/kg/d

Antidepressants	Others	Tricyclics	Drugs of Abuse	Miscellaneous
Adrenergic Oxytocin Inhibitors (MAGs)	MAO-inhibitors	Serotoninergics	Cocaine	Lithium
Tricyclic Antidepressants (TCAs)	Fluorides	Neuroleptics	Amphetamines	Serotonergic agents
Sedative Hypnotics, Benzodiazepines, Anesthetics	Phenothiazines	Zinc/Quin	MDMA (Ecstasy)	Lithium
Serotonin Receptor Agonists, Neuroleptics, Anticholinergics, Opioids	Fluoroquinolones			Hydroxyphenols
St. John's Wort	Stimulants			L-Dopa
Thrombolytics				

An additional agent, methylenetetrahydrofolate, is a high-affinity serotonin drug used for the prophylaxis of difficult-to-treat migraine and cluster headaches.

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**apsf NEWSLETTER**  
 THE OFFICIAL JOURNAL OF THE ANESTHESIA PATIENT SAFETY FOUNDATION

**Methylene Blue and the Risk of Serotonin Toxicity**  
 Adair Locke, MD

**Development of Serotonin Syndrome with 5HT-3 Receptor Antagonist**  
 Tricia A. Meyer, PharmD, MS, FASHP



US Food and Drug Administration. Safety Labeling Changes Approved by FDA Center for Drug Evaluation and Research (CDER). Available at: <http://www.fda.gov/Safety/News/News/Information/ucm418816.htm> (Accessed August 3, 2015)  
 Gollapudi, S, Kumar, V, Dhame, M. A case of serotonin syndrome precipitated by fentanyl and ondansetron in a patient receiving paroxetine, duloxetine, and bupropion. [Letter to editor]. Journal of Clinical Anesthesia 2012; 24:251-260.

83

**Cyproheptadine**

*Initial dose of 12 mg, then 2 mg every two hours until response is seen*




84

**Swelling In the Face Urticaria**

Angiotensin-converting enzyme (ACE) inhibitors, such as enalapril, lisinopril, perindopril and ramipril, which are used to treat high blood pressure

Ibuprofen and other types of NSAID painkillers

Angiotensin-2 receptor blockers (ARBs), such as andesartan, irbesartan, losartan, valsartan and Olmesartan




**Crucially, bradykinin-mediated angioedema does not respond to the same treatment as histamine-mediated angioedema.**

85

**Angiotensin Convertin Enzyme Inhibitors (ACE Inhibitors)**

**Patient has a cough what can I do?**



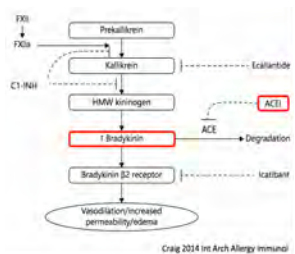
86

**Ace Inhibitor Angioedema**

**Icatibant (FIRAZYR) is a minimal peptide which blocks bradykinin-receptors**

Icatibant 30 mg subcutaneously for ACE inhibitor-induced angioedema.


Icatibant shortened the time to complete the resolution of edema. Unfortunately, the cost of this therapy is \$11,000 US. that



Craig 2014 Int Arch Allergy Immunol

87

**FFP Can Help Angioedema**



FFP contains many proteins, including a protein called C1-inhibitor (C1-INH), which is produced in insufficient amounts in people with non-allergic angioedema.


C1-INH blocks two other proteins, plasma kallikrein, and coagulation factor 12, from producing a different substance called bradykinin.

88

**Hereditary Angioedema, YES Induced – Well Maybe**

Tranexamic acid is used in prophylactic management of hereditary angioedema;

However, evidence for TXA in angiotensin-converting enzyme (ACE) inhibitor-induced angioedema. (ACEI-AE) is limited. The



NDC 0517-0960-01  
**TRANEXAMIC ACID INJECTION**  
1000 mg/10 mL (100 mg/mL)  
FOR INTRAVENOUS USE ONLY  
10 mL SINGLE DOSE VAL  
Rx only AMERICAN REGENT, INC.  
SHREVE, NY 11967

2021 May;43:292.e5-292.e7.  
doi: 10.1016/j.ajem.2020.10.029. Epub 2020 Oct 21.

89

**Crucially, bradykinin-mediated angioedema does not respond to the same treatment as histamine-mediated angioedema.**

90

**Your Called to PACU**

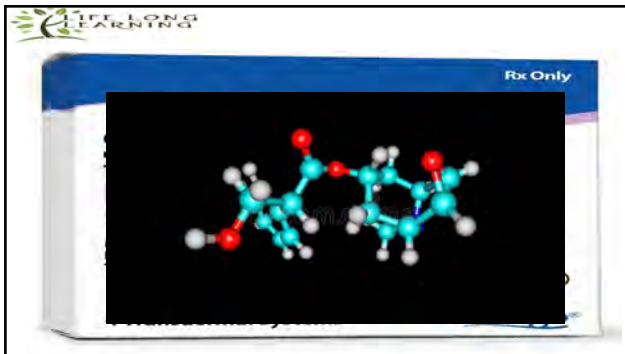
Restlessness, confusion, hallucinations, suppression of sweating and leading to flushing heat intolerance and hyperthermia.

Symptoms include, fever, blurred vision, photophobia, tachycardia, restlessness

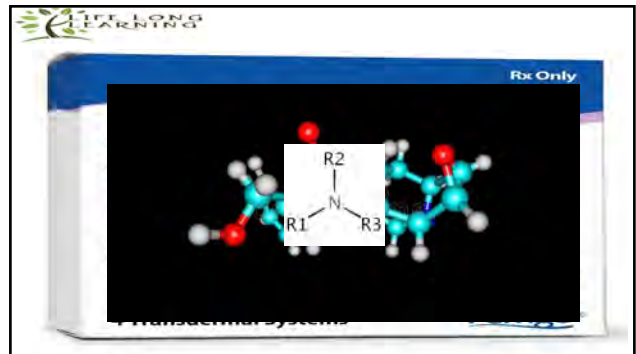
91



92



93



94

**Your Called to PACU**

Restlessness, confusion, hallucinations, suppression of sweating and leading to flushing heat intolerance and hyperthermia.

Symptoms include, fever, blurred vision, photophobia, tachycardia, restlessness

95

**Exam Type Question**

One of the most important side effects of anticholinergic therapy is central-cholinergic syndrome.....

Restlessness, confusion, hallucinations, suppression of sweating and leading to flushing heat intolerance and hyperthermia.

Symptoms include: fever, blurred vision, photophobia, tachycardia, restlessness

**Central anticholinergic syndrome during recovery is essentially a diagnosis of exclusion and can be confirmed only after resolution of symptoms with physostigmine(0.03-0.04mg/kg)**

96



**2006 Case**


**17-year-old developed seizure activity and CV collapse after intentional ingestion.**

Ingested: Bupropion (Antidepressant) and Lamotrigine (Anticonvulsant)

Unsuccessful resuscitation attempts for 70 minutes.

After 1 minute, an effective, sustained pulse was observed. The patient recovered with no major neurologic deficit.

97

**2006 Case** 

**17 year old developed seizure activity and CV collapse after intentional ingestion.**


Ingested: Bupropion (Antidepressant) and Lamotrigine (Anticonvulsant)

Unsuccessful resuscitation attempts for 70 minutes

**100 ml IV bolus of 20% lipid emulsion given**

After 1 minute, an effective sustained pulse was observed. Patient recovered with no major neurologic deficit.


Bupropion (Wellbutrin, Ambril) - treat depression  
Bupropion (Wellbutrin XL) used to treat Seasonal Affective disorder (SAD)  
Bupropion (Zana) used to help people stop smoking  
Lamotrigine (Lamictal) Anticonvulsant to treat seizures.



98

**Many Compounds Inhibit Na Channels**

Ca channel blockers, Beta Blockers  
 $\alpha_2$  agonists, Olanzapine  
 KHAT, Methamphetamine  
 Tricyclic antidepressants  
 Substance P antagonists  
 Many nerve toxins  
 Benadryl  
 Droperidol ????








Med Lett Drugs Ther, 1968 Nov 25;10(24):99-100.

**Innovar injection--a combination of droperidol and fentanyl.**

99

**The Power of an Antidote**

**antidote**

**CLEARANCE**  
What They Lack

**ANTIDOTE**

**CURE**

100


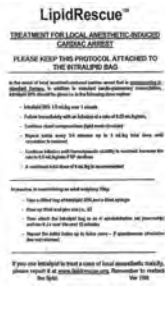
**Lipid Rescue**

**20% lipid solution**

**1.5 ml/kg over 1 minute;**

Follow immediately by a infusion at rate of;  
**0.25ml/kg/min**

[www.lipidrescue.org](http://www.lipidrescue.org)

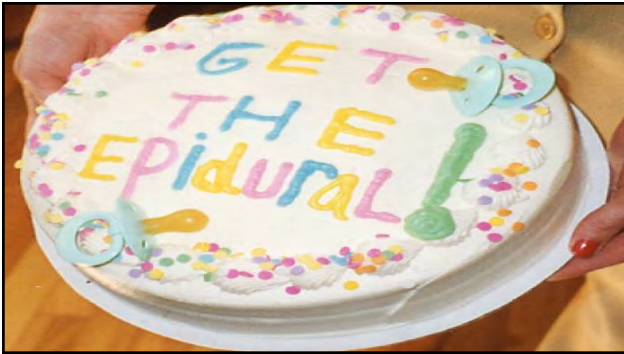
www.googleimages.com

101

**"But I Have Never Heard of That?"**



102



103

**Case Study**

26-year-old female in labor presents for elective epidural

Second baby.. Hx of preterm Labor

**On Fish Oil** ←

104

**Obstetrics Patient in Active Labor**

No allergies, No other medical history  
 Second baby.. Hx of preterm Labor  
 Prenatal Vitamins, Fish Oil ←

**You place the epidural, three pokes, test dose negative, you go home finally at 7 am.**

**Your called at 11 am to tell you mom is taken emergently to surgery.**

105

**Fish Oil- 3000mg Omega 3**

To test the postulated preventive effects of dietary n-3 fatty acids on pre-term delivery, intrauterine growth retardation, and pregnancy induced hypertension

21-33% reduction in Preterm Labor

Randomized clinical trials of fish oil supplementation in high risk pregnancies. Fish Oil Trials In Pregnancy (FOTIP) Team BMDG. 2000 Mar;107(3):382-95

106

**Herbals**

Can have significant perioperative implications:

- Cardiovascular instability (ginseng, ma huang)
- Hypoglycemia (ginseng)
- Immunosuppression (echinacea use for > 8 weeks)
- Increased risk of bleeding (garlic, ginkgo, ginseng)
- Prolongation of anesthesia (kava, St. John's wort, valerian)

**STOP 2 weeks before surgery**

Anesthesia. 2002;27:888-899  
 LMAA. 2002;28:238-242

107

**Is Nitrous Back?**

The position of the American College of Nurse-Midwives that women should have access to a variety of measures to assist them in coping with the challenges of labor. Among these should be nitrous oxide, which is commonly used in many other countries.

**Inhaled**  
 Entonox (50:50 N2O/O2 mixture)  
 Side effects: dizziness, N/V, dysphoria, lack of cooperation  
 Appears to have no effect on hepatic, renal, cardiac or pulmonary function

Lowie NK. The nature of labor pain. Am J Obstet Gynecol 2002;186(5):516-24.  
 Manning TR. First-time labor pain management in the United States: Understanding patterns and the issue of choice. Am J Obstet Gynecol 2002;186:5173-80.  
 Rouse PJ. Nitrous oxide for pain in labor - why not in the United States? Birth 2007;34:5.  
 Rosen MA. Nitrous oxide for relief of labor pain: A systematic review. Am J Obstet Gynecol 2002;186:5110-26  
 Declercq BR, Saleem C, Curry MP, Agalabouni S, Listerink G, Mathen L, Robert F. The Second National U.S. Survey of Women's Childbearing Experiences. New York: Childbirth Connection, October 2006, p. 31.

108

**WILL LONG LEARNING**

### Nitrous Oxide During Labor: Less Pain Relief, High Patient Satisfaction

Share this content:

Despite lower reported effectiveness for labor pain, the degree of patient satisfaction in women who received nitrous oxide is similar to that of women who received neuraxial modalities, according to a study described in *Anesthesia & Analgesia*.

Although physicians in other countries have used nitrous oxide for decades to alleviate labor pain, this option has only recently been adopted in the United States. Previous research regarding its analgesic effectiveness has been largely inconclusive, and few studies have explored patient satisfaction associated with this modality.<sup>2,3</sup> In the current investigation, researchers at Vanderbilt University Medical Center in Nashville, Tennessee, retrospectively examined data collected since their facility began offering self-administered nitrous oxide as an analgesic option in 2011.

**References**

- Richardson MD, Lopez BM, Baysinger CL, Stowell MS, Chestnut DH. Nitrous oxide during labor: maternal satisfaction does not depend exclusively on analgesic effectiveness. *Anesth Analg*. 2017; 124 (2): 548-53. doi: 10.1213/ANE.0000000000001680
- Rosen MA. Nitrous oxide for relief of labor pain: a systematic review. *Am J Obstet Gynecol*. 2002; 186(5 Suppl Nature):S110-26.
- Leak FE, Andrews JC, Collins MR, et al. Nitrous oxide for the management of labor pain: a systematic review. *Anesth Analg*. 2014; 118(3):103-07. doi: 10.1213/ANE.0b013e3182a77f3c
- Hodnett ED. Pain and women's satisfaction with the experience of childbirth: a systematic review. *Am J Obstet Gynecol*. 2002; 186(5 Suppl Nature):S160-72.

109

**WILL LONG LEARNING**

### Not Everything is it Appears? Labor Epidurals Going Away?

Blair et al Patient-controlled analgesia for labor using remifentanyl: a feasibility study?

Remifentanyl PCA with a bolus dose in the range 0.25–0.5 µg/kg and a lockout time of 2 min appears a safe and effective drug for use in labor in patient-controlled analgesia systems



**Remifentanyl**

PCA with IV remifentanyl

- Bolus dose of 0.4 µg/kg with a lockout time of 1 minute
- Continuous infusion of remifentanyl at 0.05 µg/kg/min with a bolus of 25 µg and a lockout time of 5 minutes provides satisfactory labor analgesia.

110

University Hospital Southampton NHS

### Pain relief in labour: epidurals and remifentanyl explained

	Epidural	Remifentanyl PCA
What is it?	A small amount of medicine and pain relief is given continuously to numb the nerves below your waist. This reduces the pain of labor contractions and eases your legs to feel heavy.	Remifentanyl is a powerful painkiller type drug used regularly in anaesthetics. It was introduced for labour pain relief at this hospital in 2011.
How it is used?	A needle is used with local anaesthetic to insert a fine plastic tube between the bones in your back. The anaesthetic infusion gives continuous pain relief. However, you can press a button to give an extra dose if needed.	A drip is inserted into a vein in your arm or hand and attached to a patient-controlled analgesia (PCA) pump. You press the button on the pump and a small dose of remifentanyl is given directly into your vein providing pain relief on demand, reducing the severity of labour pain. This starts working within five minutes of the drip being connected.
How long it stays?	It is important that you sit still while the epidural is being inserted and till the anaesthetic takes effect. It usually takes 20 minutes to set up and 20 minutes to work.	You need to press the button every time you have a contraction because each dose of remifentanyl wears off within a few minutes. So use remifentanyl you must be on labour ward and be in established labour (your doctor has seen you with your midwife). You cannot start remifentanyl if you have had morphine or pethidine in the last four hours.
Additional information	Most women can have an epidural, however if you have had a previous operation on your back or problems with blood clotting it may not be suitable for you. Please discuss this with your anaesthetist.	If you have severe heart disease or an allergy to morphine or pethidine, remifentanyl may not be suitable for you. Please discuss this with your anaesthetist.

Your midwife will discuss the reasons for continuously monitoring your baby's heart rate with you.


You will need a drip in your hand or arm to provide you with fluid and a temporary urinary catheter will enable you to pass urine.

Your blood pressure will be checked regularly as an occasional decrease may cause a temporary drop in your baby's heart rate.

[www.uhs.nhs.uk](http://www.uhs.nhs.uk)

111

### Postoperative Nausea and Vomiting



<https://www.scottol.com>

112

**WILL LONG LEARNING**

# Versed

*Anesthesia and Analgesia* 2016; 122:656

Meta-Analysis of studies from 1974-2014

Drastically reduced PONV, especially with preop and small dose 30 minutes before extubation.

The Effect of Intravenous Midazolam on Postoperative Nausea and Vomiting: A Meta-Analysis.

Grant MC<sup>1</sup>, Kim J, Payne AJ, Hobson D, Wick E, Wu G.




113

**WILL LONG LEARNING**

### The last 30 Minutes Versed

Lee Y, Wang JJ, Yang YL, Chen A, Lai HY. Midazolam vs ondansetron for preventing postoperative nausea and vomiting: a randomized controlled trial. *Anesthesia*. 2007;62(1):18-22.

Conclusion, the results of this study indicated that for patients undergoing surgery, midazolam 2 mg given intravenously 30 minutes before the end of surgery was effective in decreasing the incidence of PONV without increasing recovery time and the level of sedation



114

**BARHEMSYS (Amisulpride) PONV**

The drug, amisulpride, showed a statistically significant reduction in the occurrence of PONV, when used intraoperatively in combination with a standard anti-nausea treatment, in the 24 hours after surgery in high-risk patients.


Journal: Anesthesiology, 2017 Feb; 126(2):268-275. doi: 10.1097/ALN.0000000000001458

**Intravenous Amisulpride for the Prevention of Postoperative Nausea and Vomiting: Two Concurrent, Randomized, Double-blind, Placebo-controlled Trials.**

Gao J, Kozak P, Mirakhor H, Rogosa S, Mohr J, Eberhart L, Lemm D, Nelson D, Chavakis D, Kovac A, Cardot K, Fox G, Demessich P.

In addition, The Patient Protection and Affordable Care Act of 2010 ("Affordable Care Act") in the US has linked quality of care and patient satisfaction to reimbursement. Appropriate management of PONV is key to improving patient satisfaction scores, and therefore BARHEMSYS™ could provide opportunities for reimbursement as well as for reducing healthcare costs.

**D<sub>2</sub>/D<sub>3</sub> antagonist antiemetic**



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**"I Would Never Do That!"**



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**Thank You.**

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**STORM ANESTHESIA**  
recert CRNA

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Can I be excused?  
... my brain is full!

Got Milk?

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There is no financial conflicts with this presentation.

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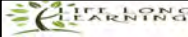
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