Top Five Modifiable Preoperative Risk Factors

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Improving Surgical Care and Recovery Collaborative
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Disclosures

Funding
- Research support from Deltex, LIDCO, Fresenius & B Braun, Merck for RCTs
- Loan equipment from LIDCO, Deltex, Niccomo, Cheetah, APC cardiovascular
- Advisory Board: Edwards Lifescience, Baxter, Merck

Positions Held
- ERAS Society Executive Committee & ERAS Guidelines
- Chair ERAS Society Education Committee
- President Elect ERAS USA
- UK National Clinical Advisor for Enhanced Recovery
- UK National Lead in ER for Upper GI Surgery
- UK Resuscitation Council ALS & ILS Editorial Board
- European Resuscitation Council ALS & ILS Editorial Board
- WHO Lifebox Committee

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Aims of Talk

- Discuss Preoperative Optimization
- Overview of the 5 preoperative interventions to actually effect improved surgical outcomes
- Hands on implementationexperience from an US Health System

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Aim of Preoperative Assessment is to improve outcomes

Outcomes:

- Faster recovery
- Less complications
- Improved post operative function

Resulting in:

- Reduced Costs
- Positive return on up front investment of money and time

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- Less complications
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Resulting in:

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Major Surgery is becoming increasingly recognized as a moment that Patients will change lifestyle to benefit their future health

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Outcomes:

- Faster recovery
- Less complications
- Improved post operative function

Resulting in:

- Reduced Costs
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INFORMED DECISION MAKING

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Impact of Surgery on Functional Status

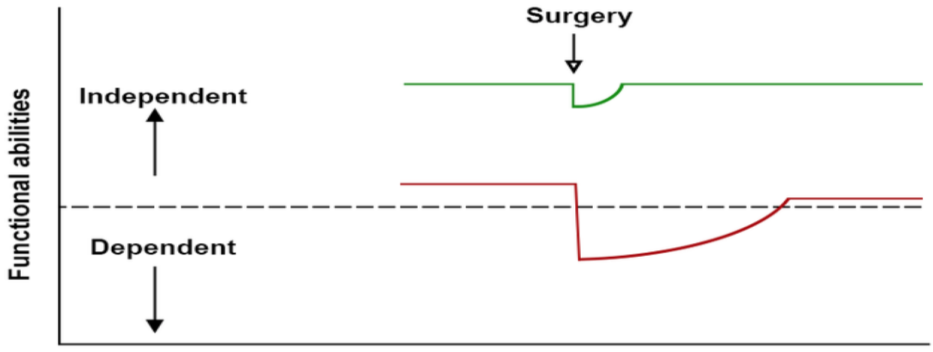

Figure 1: An acute stressor event (surgery) results in poorer functional status and return to homeostasis in the frail patient (red line) compared to the non-frail patient (green line). (Adapted from [4])

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Impact of Surgery on Functional Status

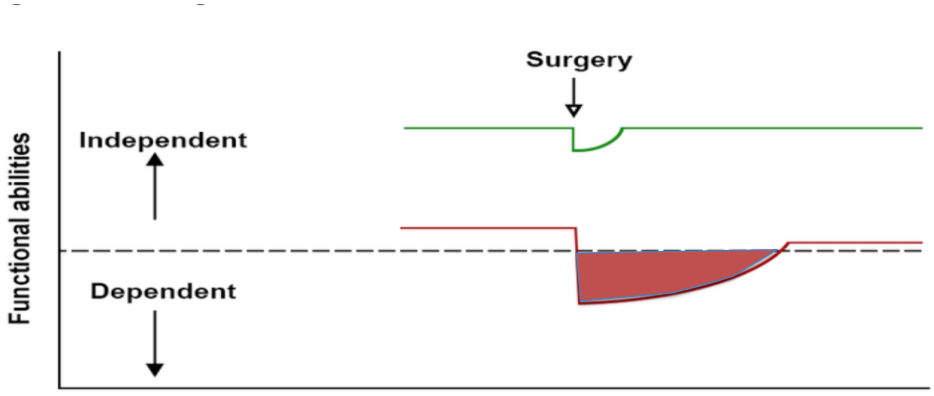

Figure 1: An acute stressor event (surgery) results in poorer functional status and return to homeostasis in the frail patient (red line) compared to the non-frail patient (green line). (Adapted from [4])

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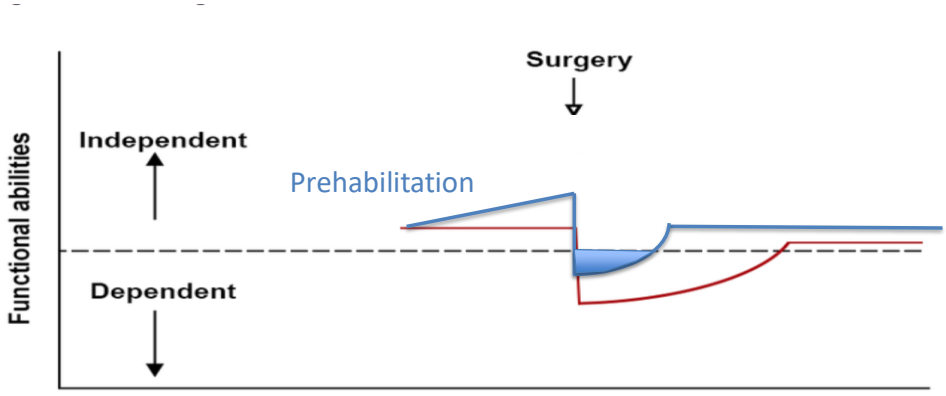
Impact of Prehabilitation and Optimization of Health Status on Recovery After Surgery



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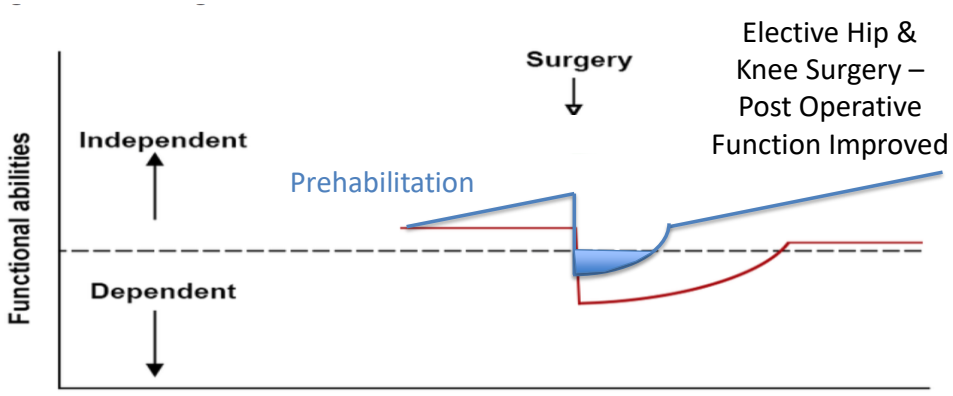
Impact of Prehabilitation and Optimization of Health Status on Recovery After Surgery



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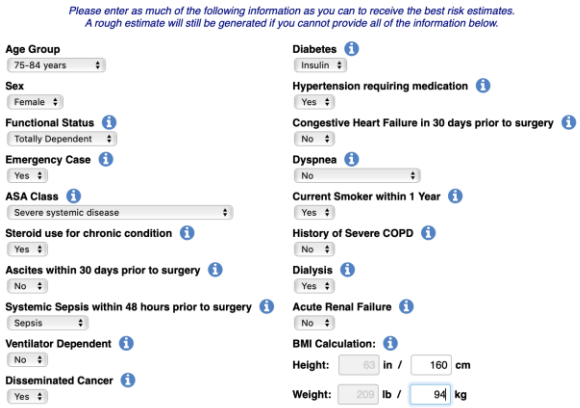
NSQIP

- Black box calculation on large population data



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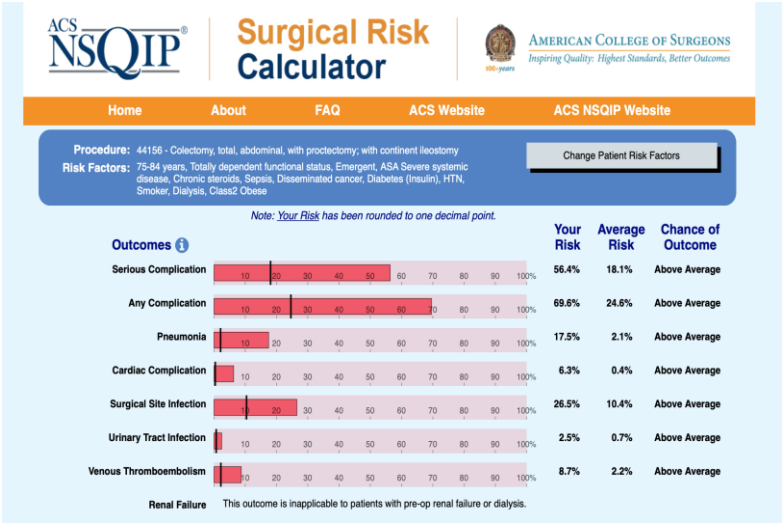

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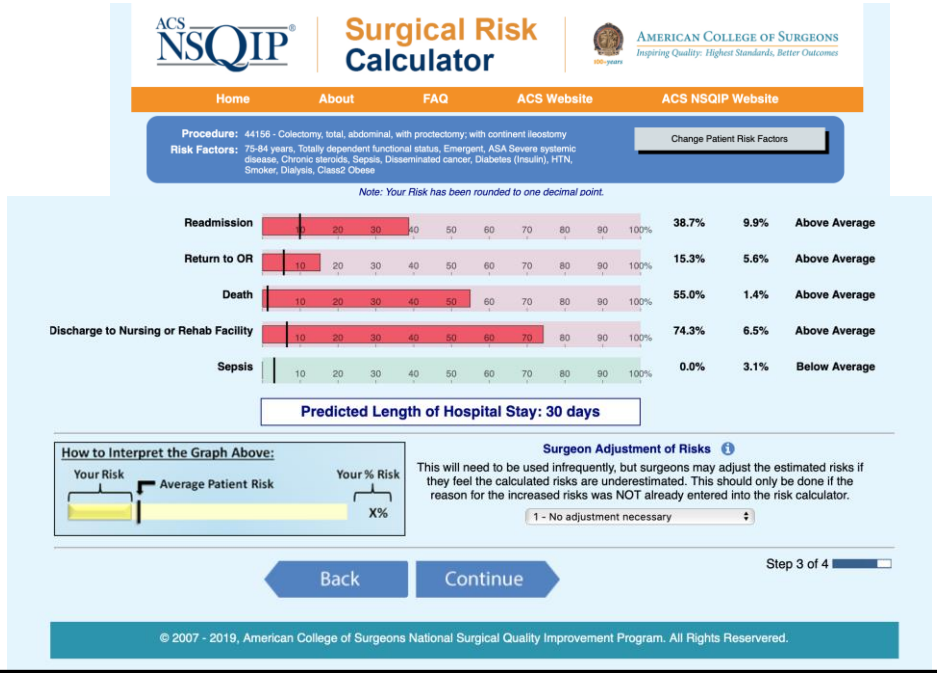

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Commonest Postop Complications

- Surgical Site Infection
- Pulmonary – Infection / reintubation
- Sepsis
- Delirium
- Acute kidney Injury
- Cardiac – surprising low

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Fleisher and Linde-Zwirble *Perioperative Medicine* 2014, **3**:7
http://www.perioperativemedicinejournal.com/content/3/1/7

Perioperative Medicine

RESEARCH Open Access

Incidence, outcome, and attributable resource use associated with pulmonary and cardiac complications after major small and large bowel procedures

Lee A Fleisher[1*] and Walter T Linde-Zwirble[2]

Results: Postoperative pulmonary complications (PPC) or postoperative cardiac complications (PCC) were present in 22% of cases; PPC alone was most common (19.0%), followed by PPC and PCC (1.8%) and PCC alone (1.2%). The incremental cost of PPC is large ($25,498). In comparison, PCC alone only added $7,307 to the total cost.

Conclusions: The current study demonstrates that postoperative pulmonary complications represent a significant source of morbidity and incremental cost after major small intestinal and colon surgery and have greater incidence and costs than cardiac complications alone. Therefore, strategies to reduce the incidence of these complications should be targeted as means of improving health and bending the cost curve in health care.

Post operative Pulmonary Complications – 19%
Post operative Cardiac Complications – 1.2%
Incremental Cost - $25,498

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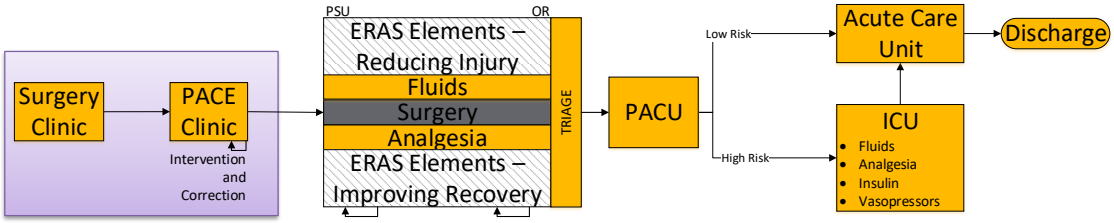
VCU ERAS Care Pathway



Registries and Audit Systems

Patient Education – Expectation Setting – Patient Reported Outcomes – Long Term Outcomes

Care Management Across the Continuum

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Optimization Before Surgery

Pre-op
Patient optimization

Element	Parameters
Glycemic Management	Target blood glucose level – 140 – 180 Treat with insulin – 200+, attending review
Anemia	Hb > 13 → proceed to surgery Hb 10 – 12.9 → consider IV iron before surgery Hb 7 – 10 → IV iron infusion clinic, attending review Hb <7 → Notify surgeon, IV iron clinic, consider transfusion, attending review
Smoking and alcohol cessation/ reduction	Decrease usage prior to surgery; ideally, quit at least 4 weeks prior to surgery Smoking - measure compliance with Cotinine test if needed, consider inhaled steroids Refer to pulmonary clinic for respiratory function test
Incentive spirometry	Train patient on use Send patient home with incentive spirometer
Nutrition	If indicated, prescribe 5 days of immunonutrition
BMI	BMI > 40, STOP-BANG score and refer to attending
Carbohydrate loading	800 mL night before surgery 400 mL morning of surgery
Exercise	Give patient "Fit 4 Surgery" materials
Patient Education	Give patient "Smart 4 Surgery" materials and patient diary
Chronic Pain	If opioid intake exceeds 50 ME (morphine equivalents) refer to Chronic Pain Clinic
Discharge planning	Identify discharge location (SNF, etc.) and post-discharge support needs
Decolonization	Give decolonization kit (includes skin, oral and nasal) and instructions

The Big Five

1. Anemia
2. Glycemic Management
3. Nutrition/ Hydration / Carbohydrate Loading
4. Pulmonary
5. Chronic pain

- Hard stops
- Interventions

CHANGE OUTCOMES

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VCU Health PACE (Preoperative) Clinic

ELEMENT	OPTIMIZATION / OUTPUT
Glycemic Management	Target blood glucose level – 140 – 180 Treat with insulin – 200+, attending review
Anemia	Hb > 13 → proceed to surgery Hb 10 – 12.9 → consider IV iron before surgery Hb 7 – 10 → IV iron infusion clinic, attending review Hb <7 → Notify surgeon, IV iron clinic, consider transfusion, attending review
Smoking and alcohol cessation/ reduction	Decrease usage prior to surgery; ideally, quit at least 4 weeks prior to surgery Smoking - measure compliance with Cotinine test if needed, consider inhaled steroids Refer to pulmonary clinic for respiratory function test Aim for abstinence from alcohol for >2 weeks
Incentive spirometry	Train patient on use Send patient home with incentive spirometer
Nutrition	If indicated, prescribe 5 days of immunonutrition
BMI	BMI > 40, STOP-BANG score and refer to attending
Carbohydrate loading	800 mL night before surgery 400 mL morning of surgery
Exercise	Give patient "Fit 4 Surgery" materials
Patient Education	Give patient "Smart 4 Surgery" materials and patient diary
Chronic Opioid Use	If opioid intake exceeds 50 ME (morphine equivalents) refer to Chronic Pain Clinic
Decolonization	Give decolonization kit (includes skin, oral and nasal) and instructions for appropriate operations
Discharge planning	Identify discharge location (SNF, etc.) and post-discharge support needs Frailty Score if appropriate

PACE Staff

QI Implementation team
Clinical Effectiveness

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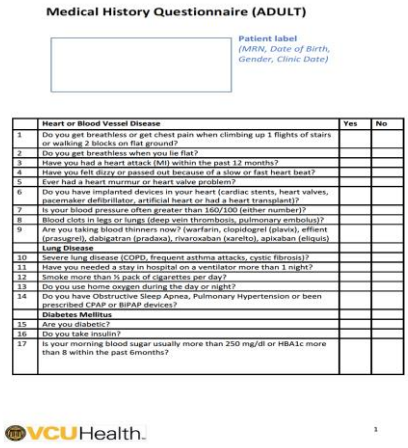
Screening – Vetter Questionnaire



Medical History Questionnaire (ADULT)

Patient label
(MRN, Date of Birth, Gender, Clinic Date)

	Heart or Blood Vessel Disease	Yes	No
1	Do you get breathless or get chest pain when climbing up 1 flights of stairs or walking 2 blocks on flat ground?		
2	Do you get breathless when you lie flat?		
3	Have you had a heart attack (MI) within the past 12 months?		
4	Have you felt dizzy or passed out because of a slow or fast heart beat?		
5	Ever had a heart murmur or heart valve problem?		
6	Do you have implanted devices in your heart (cardiac stents, heart valves, pacemaker defibrillator, artificial heart or had a heart transplant)?		
7	Is your blood pressure often greater than 160/100 (either number)?		
8	Blood clots in legs or lungs (deep vein thrombosis, pulmonary embolus)?		
9	Are you taking blood thinners now? (warfarin, clopidogrel (plavix), effient (prasugrel), dabigatran (pradaxa), rivaroxaban (xarelto), apixaban (eliquis)		
	Lung Disease		
10	Severe lung disease (COPD, frequent asthma attacks, cystic fibrosis)?		
11	Have you needed a stay in hospital on a ventilator more than 1 night?		
12	Smoke more than ½ pack of cigarettes per day?		
13	Do you use home oxygen during the day or night?		
14	Do you have Obstructive Sleep Apnea, Pulmonary Hypertension or been prescribed CPAP or BIPAP devices?		
	Diabetes Mellitus		
15	Are you diabetic?		
16	Do you take insulin?		
17	Is your morning blood sugar usually more than 250 mg/dl or HBA1c more than 8 within the past 6months?		

VCUHealth

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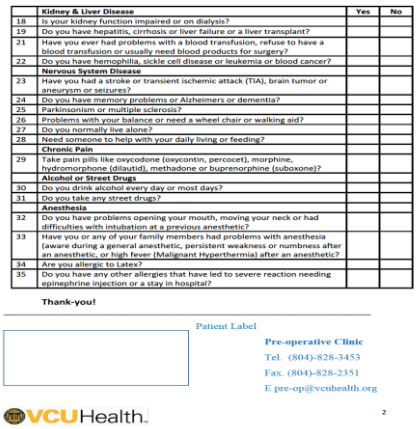

	Kidney & Liver Disease	Yes	No
18	Is your kidney function impaired or on dialysis?		
19	Do you have hepatitis, cirrhosis or liver failure or a liver transplant?		
21	Have you ever had problems with a blood transfusion, refuse to have a blood transfusion or usually need blood products for surgery?		
22	Do you have hemophilia, sickle cell disease or leukemia or blood cancer?		
	Nervous System Disease		
23	Have you had a stroke or transient ischemic attack (TIA), brain tumor or aneurysm or seizures?		
24	Do you have memory problems or Alzheimers or dementia?		
25	Parkinsonism or multiple sclerosis?		
26	Problems with your balance or need a wheel chair or walking aid?		
27	Do you normally live alone?		
28	Need someone to help with your daily living or feeding?		
	Chronic Pain		
29	Take pain pills like oxycodone (oxycontin, percocet), morphine, hydromorphone (dilaudid), methadone or buprenorphine (suboxone)?		
	Alcohol or Street Drugs		
30	Do you drink alcohol every day or most days?		
31	Do you take any street drugs?		
	Anesthesia		
32	Do you have problems opening your mouth, moving your neck or had difficulties with intubation at a previous anesthetic?		
33	Have you or any of your family members had problems with anesthesia (aware during a general anesthetic, persistent weakness or numbness after an anesthetic, or high fever (Malignant Hyperthermia) after an anesthetic?		
34	Are you allergic to Latex?		
35	Do you have any other allergies that have led to severe reaction needing epinephrine injection or a stay in hospital?		

Thank-you!

Patient Label

Pre-operative Clinic
Tel. (804)-828-3453
Fax. (804)-828-2351
E pre-op@vcuhealth.org

VCUHealth

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Phone call or visit to pre-assessment unit
If Major surgery – always a visit so Optimization can be done

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Laboratory Tests

Test	ASA 1	ASA 2	ASA 3 or ASA 4
MINOR SURGERY (examples: excising skin lesion; draining breast abscess)			
Full blood count	Not routinely	Not routinely	Not routinely
Haemostasis	Not routinely	Not routinely	Not routinely
Kidney function	Not routinely	Not routinely	Consider in people at risk of Acute Kidney Injury
ECG	Not routinely	Not routinely	Consider if no ECG results available from past 12 months
Lung function/arterial blood gas	Not routinely	Not routinely	Not routinely
INTERMEDIATE SURGERY (examples: primary repair of inguinal hernia; tonsillectomy or knee arthroscopy)			
Full blood count	Not routinely	Not routinely	Consider for people with cardiovascular or renal disease if any symptoms not recently investigated
Haemostasis	Not routinely	Not routinely	Consider in people with chronic liver disease • If people taking anticoagulants need modification of their treatment regimen, make an individualised plan in line with local guidance • If clotting status needs to be tested before surgery (depending on local guidance) use point-of-care testing
Kidney function	Not routinely	Consider in people at risk of AKI	Yes
ECG	Not routinely	Consider for people with cardiovascular, renal or diabetes comorbidities	Yes
Lung function/arterial blood gas	Not routinely	Not routinely	Consider seeking advice from a senior anaesthesiologist as soon as possible after assessment for people who are ASA grade 3 or 4 due to known or suspected respiratory disease
MAJOR OR COMPLEX SURGERY (examples: total abdominal hysterectomy; endoscopic resection of prostate; lumbar discectomy; thyroidectomy; total joint replacement; lung operations; colonic resection; radical neck dissection)			
Full blood count	Yes	Yes	Yes
Haemostasis	Not routinely	Not routinely	Consider in people with chronic liver disease • If people taking anticoagulants need modification of their treatment regimen, make an individualised plan in line with local guidance • If clotting status needs to be tested before surgery (depending on local guidance) use point of care testing
Kidney function	Consider in people at risk of AKI	Yes	Yes
ECG	Consider for people aged over 65 if no ECG results available from past 12 months	Yes	Yes
Lung function/ arterial blood gas	Not routinely	Not routinely	Consider seeking advice from a senior anaesthesiologist as soon as possible after assessment for people who are ASA grade 3 or 4 due to known or suspected respiratory disease

- Targeted labs, EKG and CXR according to:
- ASA of Patient
- Risk of Surgery
- Based on UK NICE Guidance
- 80% of complications are in the High risk patients

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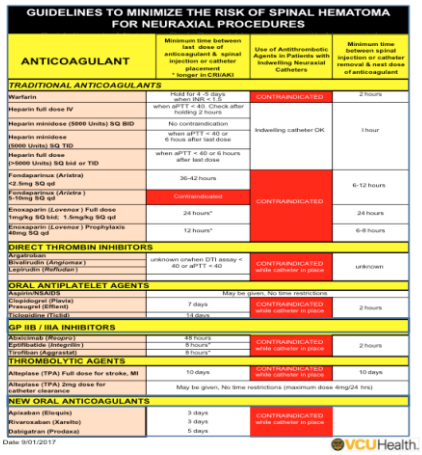
Anticoagulants / Antiplatelets



GUIDELINES TO MINIMIZE THE RISK OF SPINAL HEMATOMA FOR NEURAXIAL PROCEDURES

ANTICOAGULANT	Minimum time between last dose of anticoagulant & spinal injection or catheter placement * longer in CRI/AKI	Use of Antithrombotic Agents in Patients with Indwelling Neuraxial Catheters	Minimum time between spinal injection or catheter removal & next dose of anticoagulant
TRADITIONAL ANTICOAGULANTS			
Warfarin	Hold for 4 -5 days when INR < 1.5	CONTRAINDICATED	2 hours
Heparin full dose IV	when aPTT < 40. Check after holding 2 hours	Indwelling catheter OK	1 hour
Heparin minidose (5000 Units) SQ BID	No contraindication		
Heparin minidose (5000 Units) SQ TID	when aPTT < 40 or 6 hous after last dose		
Heparin full dose (>5000 Units) SQ bid or TID	when aPTT < 40 or 6 hours after last dose		
Fondaparinux (Arixtra) <2.5mg SQ qd	36-42 hours	CONTRAINDICATED	6-12 hours
Fondaparinux (Arixtra) 5-10mg SQ qd	Contraindicated		
Enoxaparin (Lovenox) Full dose 1mg/kg SQ bid, 1.5mg/kg SQ qd	24 hours*		24 hours
Enoxaparin (Lovenox) Prophylaxis 40mg SQ qd	12 hours*		6-8 hours
DIRECT THROMBIN INHIBITORS			
Argatroban Bivalirudin (Angiomax) Lepirudin (Refludan)	unknown orwhen DTI assay < 40 or aPTT < 40	CONTRAINDICATED while catheter in place	unknown
ORAL ANTIPLATELET AGENTS			
Aspirin/NSAIDS	May be given, No time restrictions		
Clopidogrel (Plavix) Prasugrel (Effient)	7 days	CONTRAINDICATED while catheter in place	2 hours
Ticlopidine (Ticlid)	14 days		
GP IIB / IIIA INHIBITORS			
Abciximab (Reopro)	48 hours	CONTRAINDICATED while catheter in place	2 hours
Eptifibatide (Integrilin)	8 hours*		
Tirofiban (Aggrastat)	8 hours*		
THROMBOLYTIC AGENTS			
Alteplase (TPA) Full dose for stroke, MI	10 days	CONTRAINDICATED while catheter in place	10 days
Alteplase (TPA) 2mg dose for catheter clearance	May be given, No time restrictions (maximum dose 4mg/24 hrs)		
NEW ORAL ANTICOAGULANTS			
Apixaban (Eliquis) Rivaroxaban (Xarelto) Dabigatran (Pradaxa)	3 days 3 days 5 days	CONTRAINDICATED while catheter in place	

Date 9/01/2017

VCUHealth

Adjust / stop at appropriate time for:

- Type of surgery
- If regional anesthesia
- Can be complicated in patients with Drug eluting stents
- Often need to discuss with primary cardiologist / physician

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NUTRITION

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American Society for Enhanced Recovery and Perioperative Quality Initiative Joint Consensus Statement on Nutrition Screening and Therapy Within a Surgical Enhanced Recovery Pathway

Paul E. Wischmeyer, MD, EDIC,* Franco Carli, MD, MPhil,† David C. Evans, MD, FACS,‡
Sarah Guilbert, RD, LDN, CNSC,§ Rosemary Kozar, MD, PhD,‖ Aurora Pryor, MD, FACS,¶
Robert H. Thiele, MD,# Sotiria Everett, EdD, RD,**
Mike Grocott, BSc, MBBS, MD, FRCA, FRCP, FFICM,††‡‡§§‖‖ Tong J. Gan, MD, MHS, FRCA,¶¶
Andrew D. Shaw, MB, FRCA, FCCM, FFICM,##*** Julie K. M. Thacker, MD,†††
and Timothy E. Miller, MB, ChB, FRCA,‡‡‡ for the Perioperative Quality Initiative (POQI) 2 Workgroup

ANESTHESIA & ANALGESIA

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ANESTHESIA & ANALGESIA

IARS International Anesthesia Research Society

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Paul E. Wischmeyer, Franco Carli, David C. Evans, Sarah Guilbert, Rosemary Kozar, Aurora Pryor, Robert H. Thiele, Sotiria Everett, Mike Grocott, Tong J Gan, Andrew D. Shaw, Julie KM Thacker, Timothy E. Miller and For the Perioperative Quality Initiative (POQI-2) Workgroup

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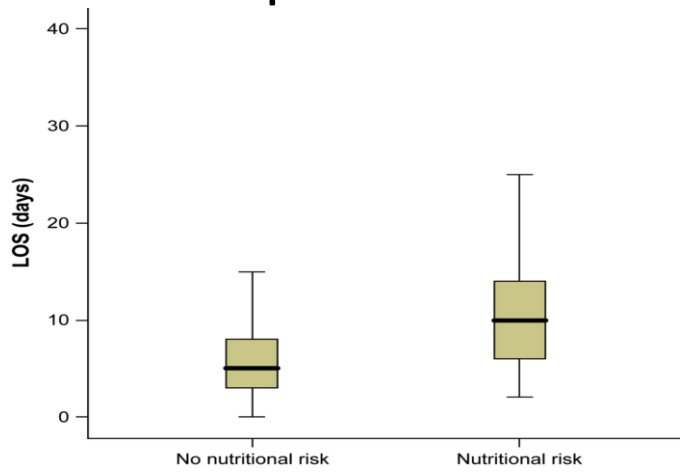
Length of Stay – Impact of Nutritional Risk



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Perioperative Use of Arginine-supplemented Diets: A Systematic Review of the Evidence

John W Drover, MD, FRCSC, Rupinder Dhaliwal, RD, Lindsay Weitzel, PhD, Paul E Wischmeyer, MD, Juan B Ochoa, MD, FACS, Daren K Heyland, MD, FRCPC, MSC

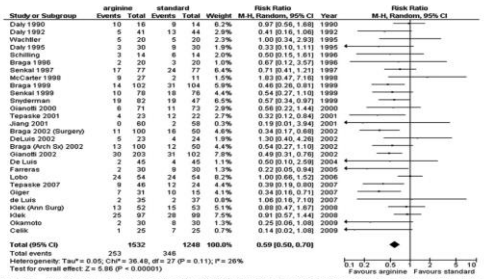

Figure 1. Effect of arginine-supplemented diets on infections. Events, number of patients with infections; Total, total number of patients in group; M-H, Random, Mantzel-Haenzel Random effects.

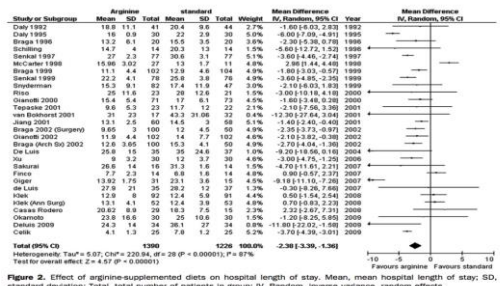

Figure 2. Effect of arginine-supplemented diets on hospital length of stay. Mean, mean hospital length of stay; SD, standard deviation; Total, total number of patients in group; IV, Random, Inverse variance, random effects.

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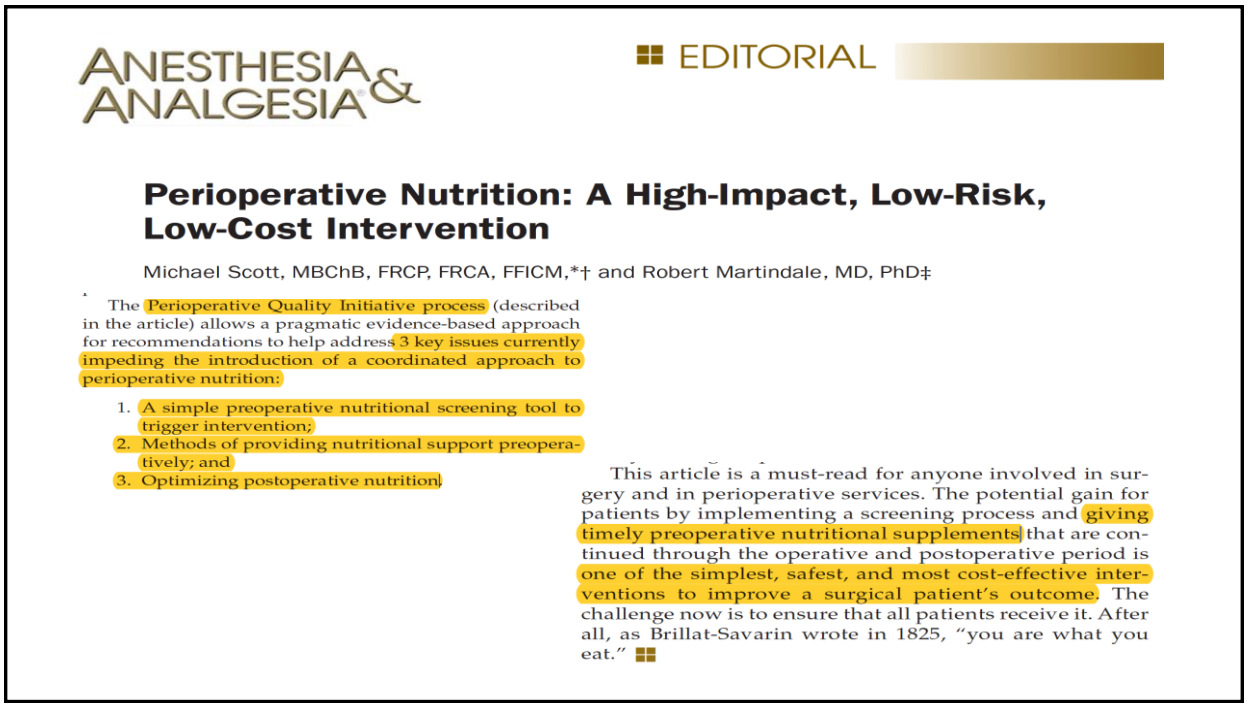

ANESTHESIA & ANALGESIA

EDITORIAL

Perioperative Nutrition: A High-Impact, Low-Risk, Low-Cost Intervention

Michael Scott, MBChB, FRCP, FRCA, FFICM,*† and Robert Martindale, MD, PhD‡

The Perioperative Quality Initiative process (described in the article) allows a pragmatic evidence-based approach for recommendations to help address 3 key issues currently impeding the introduction of a coordinated approach to perioperative nutrition:

1. A simple preoperative nutritional screening tool to trigger intervention;
2. Methods of providing nutritional support preoperatively; and
3. Optimizing postoperative nutrition.

This article is a must-read for anyone involved in surgery and in perioperative services. The potential gain for patients by implementing a screening process and giving timely preoperative nutritional supplements that are continued through the operative and postoperative period is one of the simplest, safest, and most cost-effective interventions to improve a surgical patient's outcome. The challenge now is to ensure that all patients receive it. After all, as Brillat-Savarin wrote in 1825, "you are what you eat."

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Recommendations - Screening

- We propose the PONS questions for clinic-based perioperative nutrition screening
- - Does the patient have a low BMI <18.5 kg/m2 (<20 in >65 y of age)?
- - Has the patient experienced a weight loss >10% in past 6 mo?
- - Has the patient had a reduced oral intake by >50% in the past week? (and/or)
- - Does the patient have a preoperative serum albumin <3.0 g/dL?

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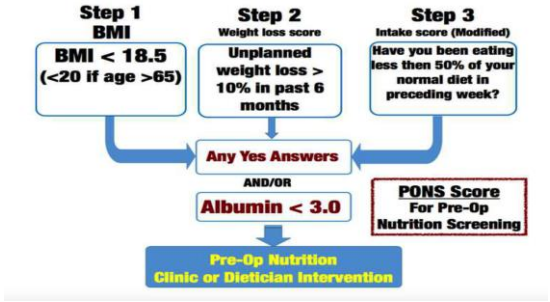

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Recommendations - 2

- We recommend reaching an overall protein intake goal is more important than achieving a total calorie intake in the preoperative period with a recommended protein goal >1.2 g/kg/d.
- We recommend that patients who are screened as being at nutritional risk before major surgery receive preoperative ONSs for a period of at least 7 d. This may be achieved with either of the following:
- - IMN formulas (containing arginine and fish oil)
- - High-protein ONS (2–3Å~ a day, minimum of 18 g protein/dose)

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ANESTHESIA & ANALGESIA

Recommendations - 3

- In patients undergoing surgery who are considered to have minimal specific risk of aspiration, we encourage unrestricted access to solids for up to 8 h before anesthesia and clear fluids for oral intake up to 2 h before the induction of anesthesia.
- We recommend a preoperative carbohydrate drink containing at least 45 g of carbohydrate to improve insulin sensitivity (except in type I diabetics due to their insulin deficiency state). We suggest that complex carbohydrate (eg, maltodextrin) be used when available

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PULMONARY

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Pulmonary Optimization

- Incentive Spirometry for all
- Inspiratory muscle training
- COPD optimization
- Antibiotics / Steroids in severe chest disease
- Operate when weather good!

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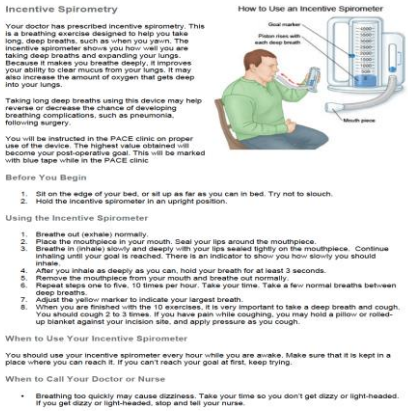
Incentive Spirometry



Incentive Spirometry

Your doctor has prescribed incentive spirometry. This is a breathing exercise designed to help you take long, deep breaths, such as when you yawn. The incentive spirometer shows you how well you are taking deep breaths and expanding your lungs. Because it makes you breathe deeply, it improves your ability to clear mucus from your lungs. It may also increase the amount of oxygen that gets deep into your lungs.

Taking long deep breaths using this device may help reverse or decrease the chance of developing breathing complications, such as pneumonia, following surgery.

You will be instructed in the PACE clinic on proper use of the device. The highest value obtained will become your post-operative goal. This will be marked with blue tape while in the PACE clinic

How to Use an Incentive Spirometer

Goal marker

Piston rises with each deep breath

Mouth piece

Before You Begin

1. Sit on the edge of your bed, or sit up as far as you can in bed. Try not to slouch.
2. Hold the incentive spirometer in an upright position.

Using the Incentive Spirometer

1. Breathe out (exhale) normally.
2. Place the mouthpiece in your mouth. Seal your lips around the mouthpiece.
3. Breathe in (inhale) slowly and deeply with your lips sealed tightly on the mouthpiece. Continue inhaling until your goal is reached. There is an indicator to show you how slowly you should inhale.
4. After you inhale as deeply as you can, hold your breath for at least 3 seconds.
5. Remove the mouthpiece from your mouth and breathe out normally.
6. Repeat steps one to five, 10 times per hour. Take your time. Take a few normal breaths between deep breaths.
7. Adjust the yellow marker to indicate your largest breath.
8. When you are finished with the 10 exercises, it is very important to take a deep breath and cough. You should cough 2 to 3 times. If you have pain while coughing, you may hold a pillow or rolled-up blanket against your incision site, and apply pressure as you cough.

When to Use Your Incentive Spirometer

You should use your incentive spirometer every hour while you are awake. Make sure that it is kept in a place where you can reach it. If you can't reach your goal at first, keep trying.

When to Call Your Doctor or Nurse

- Breathing too quickly may cause dizziness. Take your time so you don't get dizzy or light-headed. If you get dizzy or light-headed, stop and tell your nurse.

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REVIEW ARTICLE

Inspiratory muscle training is effective to reduce postoperative pulmonary complications and length of hospital stay: a systematic review and meta-analysis

Filipa Kendall[a,b,c], José Oliveira[c], Bárbara Peleteiro[d,e], Paulo Pinho[a] and Pedro Teixeira Bastos[a]

[a]Department of Cardiothoracic Surgery, Centro Hospitalar de São João, Porto, Portugal; [b]Polytechnic Health Institute of the North, CESPU, Gandra, Paredes, Portugal; [c]Research Center in Physical Activity, Health and Leisure (CIAFEL), Faculty of Sport, University of Porto, Porto, Portugal; [d]EPIUnit – Institute of Public Health, University of Porto, Porto, Portugal; [e]Department of Clinical Epidemiology, Predictive Medicine and Public Health, Faculty of Medicine, University of Porto, Porto, Portugal

DISABILITY AND REHABILITATION, 2017
http://dx.doi.org/10.1080/09638288.2016.1277396

ABSTRACT

Purpose: This study systematically review and meta-analyse the effectiveness of inspiratory muscle training (IMT) to reduce postoperative pulmonary complications (PPC) and length of hospital stay (LOS), both in the preoperative and/or postoperative periods of cardiac, pulmonary, and abdominal surgical patients. Sensitive analysis was performed to examine which patients benefit more from IMT according to methodological features (quality of studies and sample size), patient's characteristics (pulmonary risk stratification, age, and body mass index), type of surgery, period of training, and training protocols (training doses and level of supervision).

Methods: The literature search was made in the electronic databases PubMed®, EBSCO, Web of Science®, PEDro and Scopus®. Only randomized controlled trials were included. Data extraction, quality assessment and meta-analysis were performed.

Results: We included 17 randomized controlled trials in the systematic review, of which, 12 were included for the PPC meta-analysis and 11 for the LOS meta-analysis. IMT significantly reduced the risk of PPC (Risk Ratio (RR) = 0.50, 95%CI: 0.39, 0.64, $I^2 = 0.0\%$), and a decrease in LOS (Mean Difference = −1.41, 95%CI: −2.07, −0.75, $I^2 = 0.0\%$).

Conclusion: IMT is effective to reduce PPC and LOS in patients undergoing surgery.

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DISABILITY AND REHABILITATION, 2017
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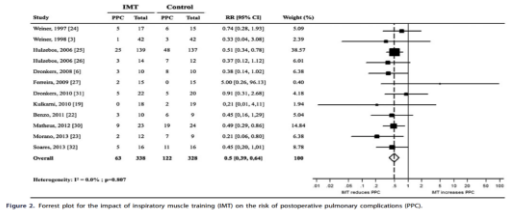

Figure 2. Forrest plot for the impact of inspiratory muscle training (IMT) on the risk of postoperative pulmonary complications (PPC).

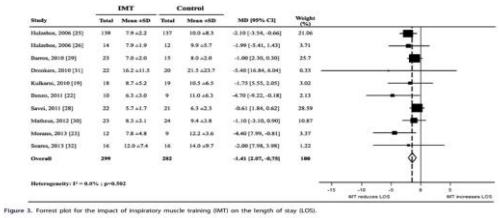

Figure 3. Forrest plot for the impact of inspiratory muscle training (IMT) on the length of stay (LOS).

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Inspiratory Muscle Training – LOS reduction

Study	IMT Total	IMT Mean ±SD	Control Total	Control Mean ±SD	MD [95% CI]	Weight (%)
Hulzebos, 2006 [25]	139	7.9 ±2.2	137	10.0 ±8.3	-2.10 [-3.54, -0.66]	21.06
Hulzebos, 2006 [26]	14	7.9 ±1.9	12	9.9 ±5.7	-1.99 [-5.41, 1.43]	3.71
Barros, 2010 [29]	23	7.0 ±2.0	15	8.0 ±2.0	-1.00 [2.30, 0.30]	25.7
Dronkers, 2010 [31]	22	16.2 ±11.5	20	21.5 ±23.7	-5.40 [16.84, 6.04]	0.33
Kulkarni, 2010 [19]	18	8.7 ±5.2	19	10.5 ±6.5	-1.75 [5.55, 2.05]	3.02
Benzo, 2011 [22]	10	6.3 ±3.0	9	11.0 ±6.3	-4.70 [-9.22, -0.18]	2.13
Savci, 2011 [28]	22	5.7 ±1.7	21	6.3 ±2.3	-0.61 [1.84, 0.62]	28.59
Matheus, 2012 [30]	23	8.3 ±3.1	24	9.4 ±3.8	-1.10 [-3.10, 0.90]	10.87
Morano, 2013 [23]	12	7.8 ±4.8	9	12.2 ±3.6	-4.40 [7.99, -0.81]	3.37
Soares, 2013 [32]	16	12.0 ±7.4	16	14.0 ±9.7	-2.00 [7.98, 3.98]	1.22
Overall	**299**		**282**		**-1.41 [2.07, -0,75]**	**100**

Heterogeneity: $I^2 = 0.0\%$; p=0.502

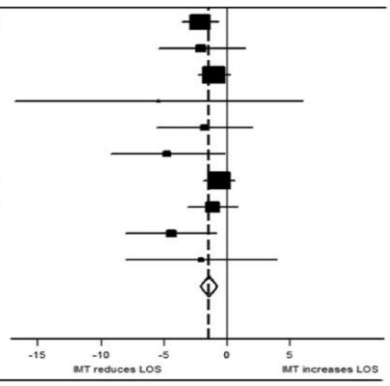

Figure 3. Forrest plot for the impact of inspiratory muscle training (IMT) on the length of stay (LOS).

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Inspiratory Muscle Training – Reduction in Pulmonary Complications

Study	IMT PPC	IMT Total	Control PPC	Control Total	RR [95% CI]	Weight (%)
Weiner, 1997 [24]	5	17	6	15	0.74 [0.28, 1.93]	5.09
Weiner, 1998 [3]	1	42	3	42	0.33 [0.04, 3.08]	2.39
Hulzebos, 2006 [25]	25	139	48	137	0.51 [0.34, 0.78]	38.57
Hulzebos, 2006 [26]	3	14	7	12	0.37 [0.12, 1.12]	6.01
Dronkers, 2008 [6]	3	10	8	10	0.38 [0.14, 1.02]	6.38
Ferreira, 2009 [27]	2	15	0	15	5.00 [0.26, 96.13]	0.40
Dronkers, 2010 [31]	5	22	5	20	0.91 [0.31, 2.68]	4.18
Kulkarni, 2010 [19]	0	18	2	19	0,21 [0,01, 4,11]	1.94
Benzo, 2011 [22]	3	10	6	9	0.45 [0,16, 1,29]	5.04
Matheus, 2012 [30]	9	23	19	24	0.49 [0.29, 0.86]	14.84
Morano, 2013 [23]	2	12	7	9	0.21 [0.06, 0.80]	6.38
Soares, 2013 [32]	5	16	11	16	0.45 [0,20, 1,01]	8.78
Overall	**63**	**338**	**122**	**328**	**0.5 [0,39, 0,64]**	**100**

Heterogeneity: $I^2 = 0.0\%$; p=0.807

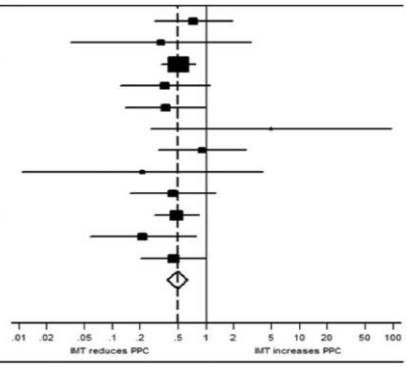

Figure 2. Forrest plot for the impact of inspiratory muscle training (IMT) on the risk of postoperative pulmonary complications (PPC).

40

REVIEW ARTICLE

Inspiratory muscle training is effective to reduce postoperative pulmonary complications and length of hospital stay: a systematic review and meta-analysis

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http://dx.doi.org/10.1080/09638288.2016.1277396

➢ IMPLICATIONS FOR REHABILITATION

- Physiotherapy interventions with inspiratory muscle training (IMT) are effective to reduce postoperative pulmonary complications (PPC) and length of hospital stay (LOS) after major surgery, and should start preoperatively.
- Rehabilitation with IMT is beneficial at all ages and risk levels, but older and high-risk patients benefit more, as well as pulmonary surgery patients.
- IMT is more effective if it is supervised, and prescription target at least two-week period, sessions with more than 15 minutes, with imposed load increment, and adding other exercise modes.

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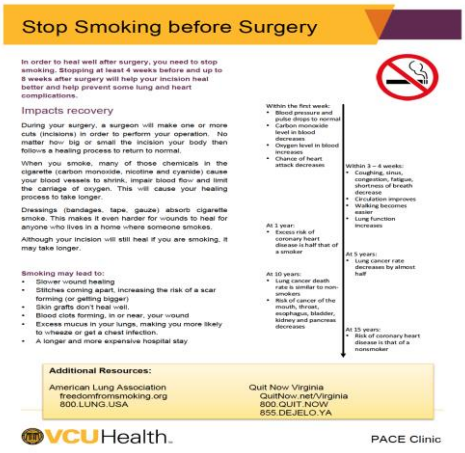
Support for Smoking Cessation



- Education – answer the question Why?
- Wound healing
- Chest infection
- Long term Cancer risk and Coronary / stroke risk
- Nicotine Patches
- Vapor
- Inhaled Steroids
- Bronchodilators

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GLYCEMIC MANAGEMENT

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Perioperative Glucose Control

- Patients affected by diabetes have longer hospital stays
- Poorly controlled diabetes and hyperglycemia in hospitalized patients is associated with poor outcomes: cardiac and non-cardiac surgery, acute MI, pneumonia, subarachnoid hemorrhage, blunt injury and transplant
- Hyperglycemia without a diagnosis of diabetes is commonly untreated or undertreated in the hospital setting
- Acute illness, inconsistent caloric intake, changes from home medications, and limitations regarding the timing of glucose monitoring and insulin administration are all significant obstacles to managing inpatient hyperglycemia.
- The financial benefits of glycemic control are significant in reducing direct hospital costs by reducing length of stay and in decreasing readmission rates

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Hyperglycemia is Common after Major Surgery

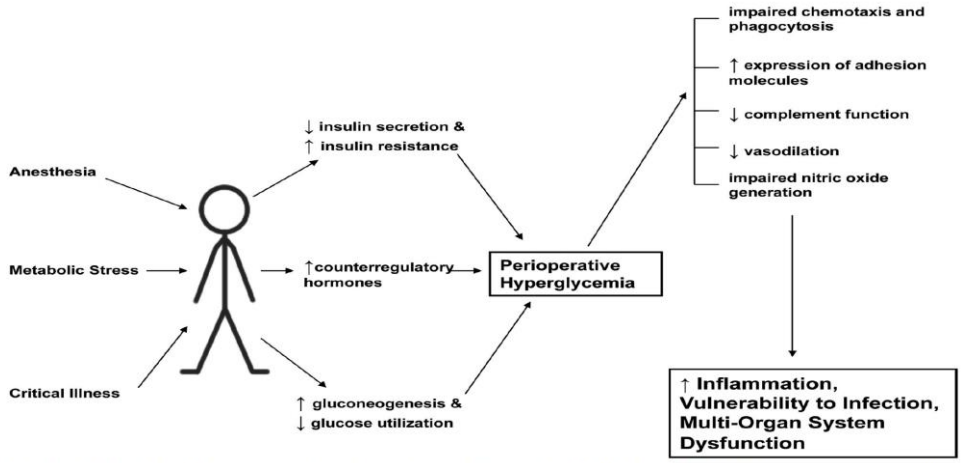

Fig. 1. Pathophysiology of hyperglycemia. Anesthesia, metabolic stress, and critical illness lead to metabolic derangements, resulting in hyperglycemia. Hyperglycemia is associated with increased inflammation, susceptibility to infection, and organ dysfunction.

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Preoperative Glycemic Management

- Hard stops for elective surgery
- HbA1c > 8.0 urgent
- HbA1c > 7.0 elective orthopedic
- Glucose > 250

Blood Glucose Levels

	Hypoglycemia	Excellent		Hyperglycemia			Diabetes			
HbA1C	0.04	0.05	0.06	0.07	0.08	0.09	.10	.11	.12	.13	.14
Mean Blood mg/dL	50	80	115	150	180	215	250	280	315	350	380
Glucose mmol/L	2.6	4.7	6.3	8.2	10.0	11.9	13.7	15.6	17.4	19.3	21.1

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Perioperative Glucose Management

Newer tools to improve compliance

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Implementation

- Screening for all patients – surprising pick up rate in ‘non’ diabetics
- Need to have endocrine involvement
- Direct referral for access
- System to delay surgery according to type and urgency
- Fructosamine useful to indicate short term glucose control

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CHRONIC OPIOID USERS

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Reducing Perioperative Opioid Use

JAMA Surgery | Original Investigation

New Persistent Opioid Use After Minor and Major Surgical Procedures in US Adults

Chad M. Brummett, MD; Jennifer F. Waljee, MD, MPH, MS; Jenna Goesling, PhD; Stephanie Moser, PhD; Paul Lin, MS; Michael J. Englesbe, MD; Amy S. B. Bohnert, PhD, MHS; Sachin Kheterpal, MD, MBA; Brahmajee K. Nallamothu, MD, MPH

JAMA Surg. doi:10.1001/jamasurg.2017.0504
Published online April 12, 2017.

- Opioid addiction after surgery 5.9%-6.5%
- Minor as well as major surgery
- Behavioral and Pain disorders are a risk factor
- Opioid addiction is now the commonest major complication after surgery

RESULTS A total of 36 177 patients met the inclusion criteria, with 29 068 (80.3%) receiving minor surgical procedures and 7109 (19.7%) receiving major procedures. The cohort had a mean (SD) age of 44.6 (11.9) years and was predominately female (23 913 [66.1%]) and white (26 091 [72.1%]). The rates of new persistent opioid use were similar between the 2 groups, ranging from 5.9% to 6.5%. By comparison, the incidence in the nonoperative control cohort was only 0.4%. Risk factors independently associated with new persistent opioid use included preoperative tobacco use (adjusted odds ratio [aOR], 1.35; 95% CI, 1.21-1.49), alcohol and substance abuse disorders (aOR, 1.34; 95% CI, 1.05-1.72), mood disorders (aOR, 1.15; 95% CI, 1.01-1.30), anxiety (aOR, 1.25; 95% CI, 1.10-1.42), and preoperative pain disorders (back pain: aOR, 1.57; 95% CI, 1.42-1.75; neck pain: aOR, 1.22; 95% CI, 1.07-1.39; arthritis: aOR, 1.56; 95% CI, 1.40-1.73; and centralized pain: aOR, 1.39; 95% CI, 1.26-1.54).

CONCLUSIONS AND RELEVANCE New persistent opioid use after surgery is common and is not significantly different between minor and major surgical procedures but rather associated with behavioral and pain disorders. This suggests its use is not due to surgical pain but addressable patient-level predictors. New persistent opioid use represents a common but previously underappreciated surgical complication that warrants increased awareness.

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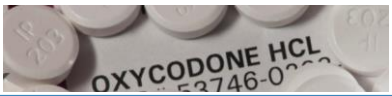
Reducing Perioperative Opioid Use

JAMA Surgery | Original Investigation

New Persistent Opioid Use After Minor and Major Surgical Procedures in US Adults

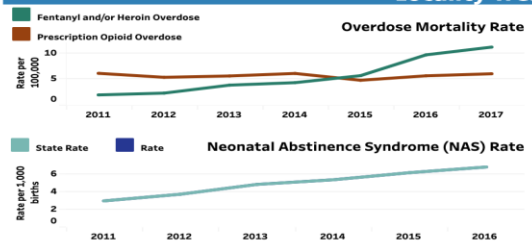


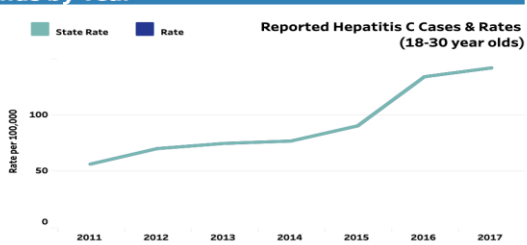
2017 Virginia State Summary

Fentanyl and/or Heroin Overdose	Prescription Opioid Overdose	ED Heroin Overdose	ED Opioid Overdose	EMS Narcan	Reported Hepatitis C (18-30 year olds)	Diagnosed HIV
Deaths	Deaths	Visits	Visits	Administrations	New Cases	New Cases
938	507	1,586	8,578	4,533	2,141	894
Mortality Rate	Mortality Rate	Visit Rate	Visit Rate	Administration Rate	New Case Rate	New Case Rate
11.0	5.9	18.9	102.0	53.9	140.9	10.6

Rates are calculated as per 100,000 Virginia residents, except for Neonatal Abstinence Syndrome (NAS), which is calculated as per 1,000 live births.

Locality Trends by Year





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Perioperative Issues with Chronic Opioid Users

Affect
Engagement
Infections
IV access

Analgesia issues – higher dosing often needed , especially breakthrough pain
Behavioural issues affecting other patients
Drug seeking behaviour even after pain should be down regulated

Longer length of stay
Increased readmission rate
Increased costs
Higher likelihood of not getting renumeration for episode cost

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Implementation

Liaise with Chronic Pain
Have referral system in place
Hard stops for elective surgery

Choose a MME dose (we choose 60) = morphine equivalents per day
Aim to reduce use prior to surgery

Suboxone – different approach
Aim to Half the dose before surgery, don't try and stop

Liase with Acute Pain Team so that on day of surgery:
Neuroxial and truncal block are used
Ketamine, dexmeditomidine and lidocaine infusions can be used

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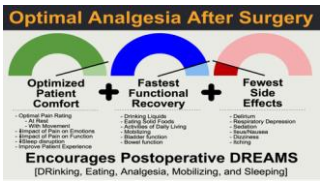
PeriOperative Quality Improvement POQI Group: Analgesia within a Colorectal Surgery ERP

CONSENSUS Open Access

American Society for Enhanced Recovery (ASER) and Perioperative Quality Initiative (POQI) joint consensus statement on optimal analgesia within an enhanced recovery pathway for colorectal surgery: part 1—from the preoperative period to PACU

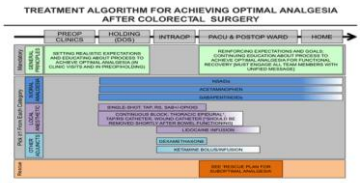
Matthew D. McEvoy[1†], Michael J. Scott[2,3,4†], Debra B. Gordon[5], Stuart A. Grant[6], Julie K. M. Thacker[7], Christopher L. Wu[8], Tong J. Gan[9], Monty G. Mythen[10], Andrew D. Shaw[11], Timothy E. Miller[12*] and For the Perioperative Quality Initiative (POQI) I Workgroup



CONSENSUS Open Access

American Society for Enhanced Recovery (ASER) and Perioperative Quality Initiative (POQI) Joint Consensus Statement on Optimal Analgesia within an Enhanced Recovery Pathway for Colorectal Surgery: Part 2—From PACU to the Transition Home

Michael J. Scott[1,2†], Matthew D. McEvoy[3,4†], Debra B. Gordon[5], Stuart A. Grant[6], Julie K. M. Thacker[7], Christopher L. Wu[8], Tong J. Gan[9], Monty G. Mythen[10], Andrew D. Shaw[11], Timothy E. Miller[12*] and For the Perioperative Quality Initiative (POQI) I Workgroup



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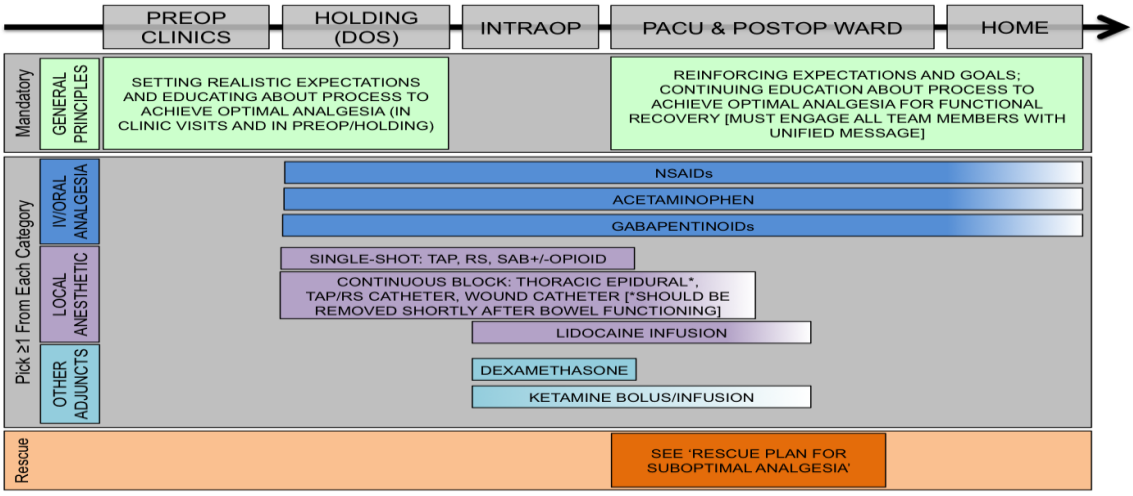
TREATMENT ALGORITHM FOR ACHIEVING OPTIMAL ANALGESIA AFTER COLORECTAL SURGERY



Scott / McEvoy DUKE POQI Group, Perioperative Medicine

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ANEMIA

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Anemia and Surgical Outcome

1. Data from large series now suggest that anemia is an independent risk associated with poor outcome in both cardiac and non-cardiac surgery.
2. Blood transfusion does not appear to ameliorate this risk, and in fact may increase the risk of postoperative complications and hospital length of stay.

Spahn DR. Anemia and patient blood management in hip and knee surgery: a systematic review of the literature. *Anesthesiology* 2010; 113: 482–95.

Musallam KM, Tamim HM, Richards T, et al. Preoperative anaemia and postoperative outcomes in non-cardiac sur- gery: a retrospective cohort study. *Lancet* 2011; 378: 1396–407.

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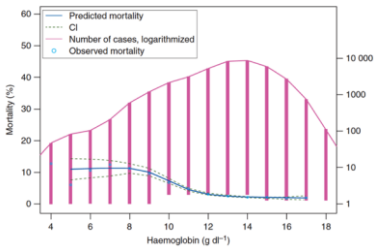
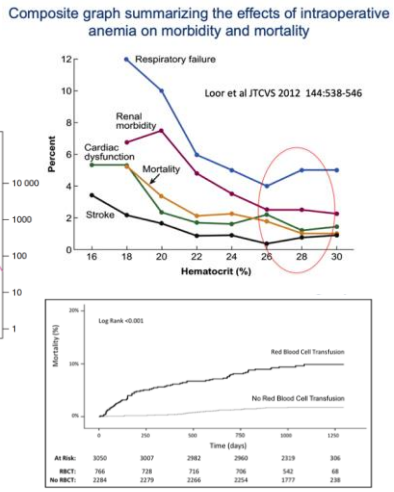
Anaemia

Present in around 1/3 of surgical patients
42% of women with Hb<12g/dl are iron deficient

Increases all complications
AKI
MI
SSI
Length of Stay
Blood Use
Hospital Costs

Blood Transfusion increases:
Sepsis – 10 fold increase
SSI
Cancer Recurrence
Life Expectancy – even non cancer





The American Journal of Medicine 2016 129, 315-323.e2DOI: (10.1016/j.amjmed.2015.10.012)

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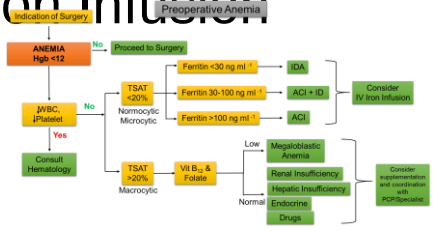
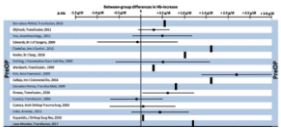
Anaemia – Preoperative Treatment with Iron Infusion



NARRATIVE REVIEW ARTICLE

Intravenous Iron for Treatment of Anemia in the 3 Perisurgical Phases: A Review and Analysis of the Current Literature

Frank Peters, MD,* Ines Ellermann, PHARM,† and Andrea U. Steinbicker, MD, MPH*



Relative Risks

Blood Transfusion
- Allergic reaction 1 in 333
- DHTR – 1 in 5400
- Increased risk of Sepsis/ SSI
- Poorer cancer survival
- Reduced life expectancy even in elective orthopedic surgery

Newer Iron Sucrose Infusions
- Nanoparticle Reaction Common
- Anaphylaxis <10 in 1 000 000
- 1g a week improvement in Hb
- Overcomes Functional Iron Deficiency / Anemia of Chronic Disease

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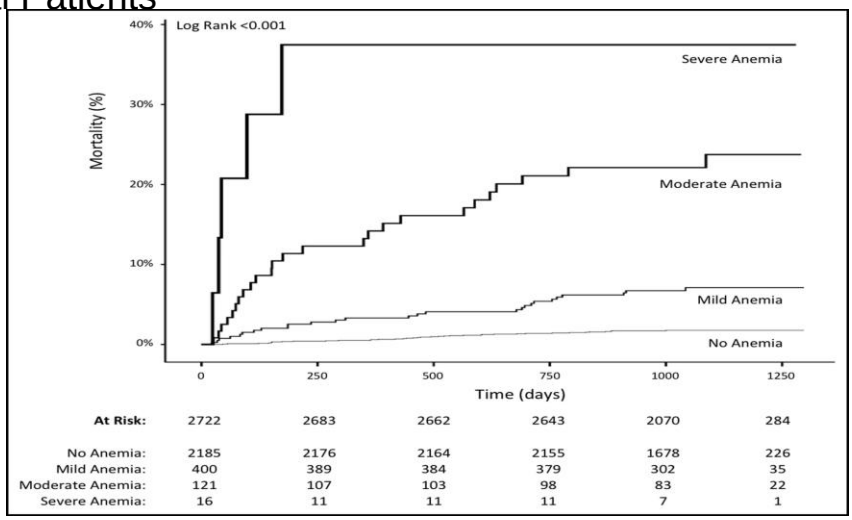
Impact of Anemia and Mortality in Non-cardiac Surgical Patients



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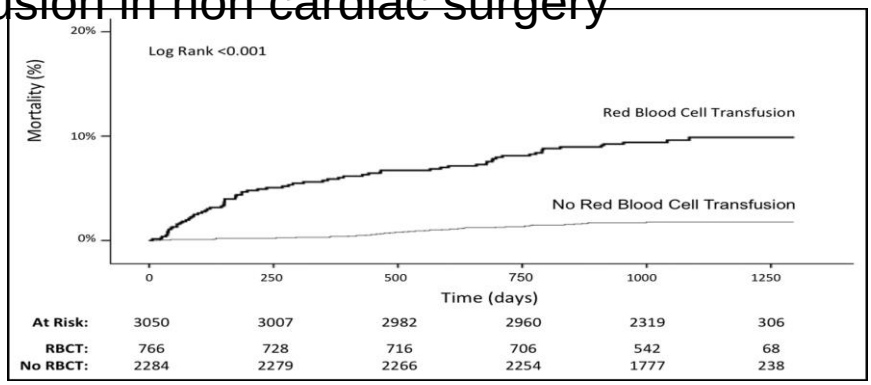
Association between mortality and red cell transfusion in non cardiac surgery



The American Journal of Medicine 2016 129, 315-323.e2DOI: (10.1016/j.amjmed.2015.10.012)

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Rationale – Why Optimize Preoperative Hb?

Anemia increases all cause risk for patients
Anemia increases costs and resource allocation
Blood transfusion does not fix this – downstream risks
An optimal Perioperative pathway screens and optimizes Hb and iron stores prior to surgery

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PREOPERATIVE SCREENING & OPTIMIZATION OF HEMOGLOBIN

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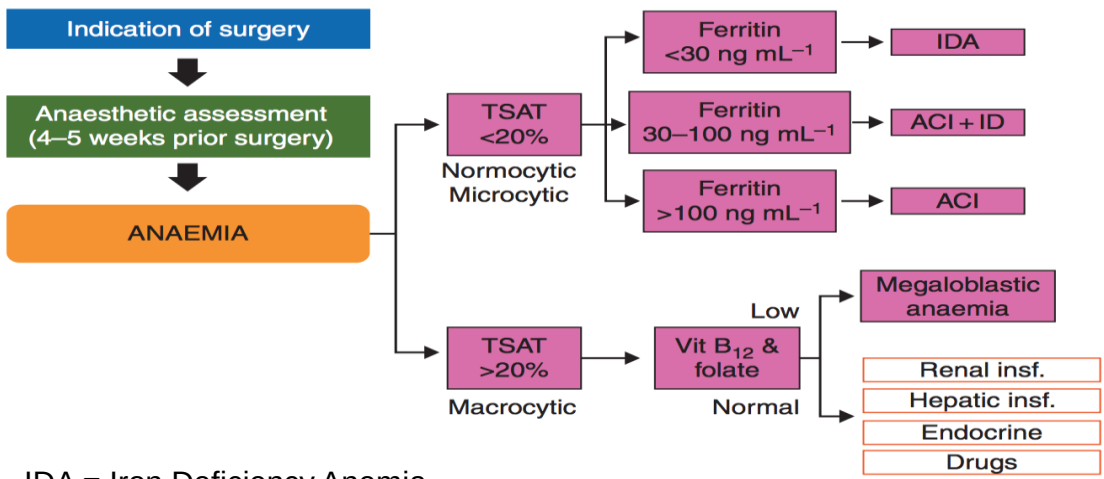
REVIEW ARTICLES

'Fit to fly': overcoming barriers to preoperative haemoglobin optimization in surgical patients†

M. Muñoz[1,*], S. Gómez-Ramírez[3], S. Kozek-Langeneker[4], A. Shander[5], T. Richards[6], J. Pavía[2], H. Kehlet[7], A. G. Acheson[8], C. Evans[9], R. Raobaikady[10], M. Javidroozi[5] and M. Auerbach[11]

British Journal of Anaesthesia 115 (1): 15–24 (2015)
doi: 10.1093/bja/aev165
Review Articles
BJA



IDA = Iron Deficiency Anemia,
ACI = Anemia of Chronic Illness

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Which Lab Tests and when?

CBC – look at all cell lines (to exclude hematological issue)
Creat/ eGFR
Ferritin
Fe
TIBC
TSAT
B12 / Folate
CRP

If Hb unknown - do we do them all in the first sitting? – or screen with a point of care test and then draw the labs after this?

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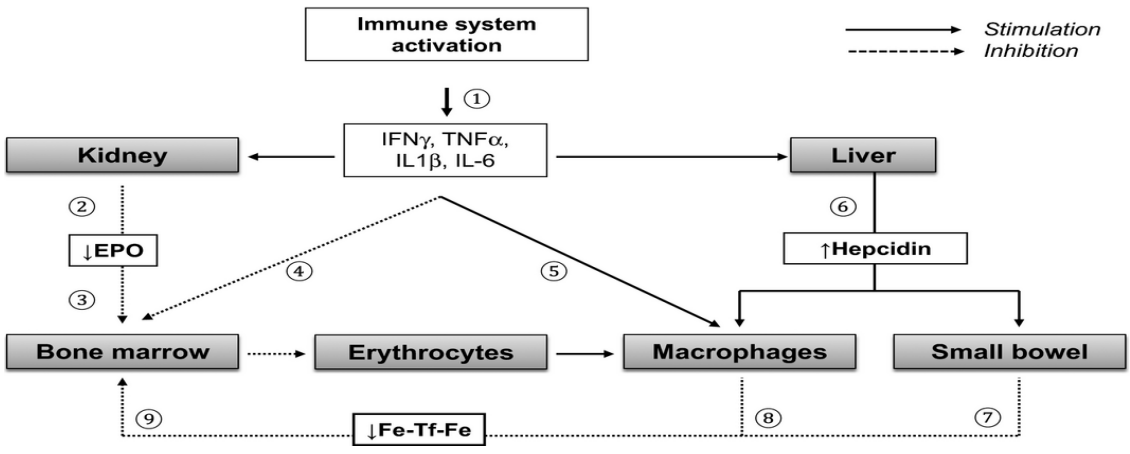
Anaemia of Chronic Disease



Anaesthesia
Volume 72, Issue 2, pages 233-247, 20 DEC 2016 DOI: 10.1111/anae.13773
http://onlinelibrary.wiley.com/doi/10.1111/anae.13773/full#

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Anemia of Chronic Disease - Why Oral Iron May Not Work

Chronic disease can cause a state of functional iron deficiency leading to anemia.

The key iron regulatory protein hepcidin is activated in response to inflammation and inhibits absorption of iron from the gastrointestinal tract and reduces bioavailability of iron stores for red cell production in the marrow.

Although iron stores (predominantly ferritin) may be normal, the transport of iron either from the gastrointestinal tract or iron stores to the bone marrow is inhibited, leading to a state of ‘ functional’ iron deficiency and subsequent anemia.

Since absorption from the gastrointestinal tract is blocked, increasing oral iron intake is ineffective

Munoz et al, Anaesthesia 2017, 72,233-247

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Intravenous Iron

Replenishes iron stores and increases Hb in anemia due to iron deficiency with or without inflammation

Dosing may be calculated from the baseline and target Hb and patient’ s body weight, adding 500 mg for iron stores

Low incidence of reactions

1000– 1500 mg is sufficient in most surgical patients

Given by slow infusion over less than 1 h in one sitting or in two – three divided doses over 2-3 weeks

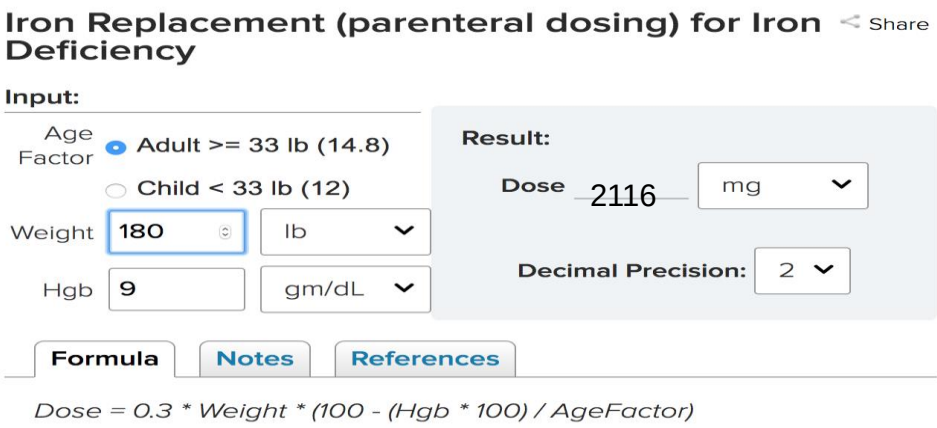
Most patients feel better in 3 days with a rapid Hb response (50% at 5 days, 75% at 10–14 days, maximal at 3 weeks)

Munoz M, García-Erce JA, Remacha AF. Disorders of iron metabolism. Part II: iron deficiency and iron overload. Journal of Clinical Pathology 2011; 64: 287–96

Goodnough LT, Skikne B, Brugnara C. Erythropoietin, iron, and erythropoiesis. Blood 2000; 96: 823–33

68

Calculating Iron Deficit



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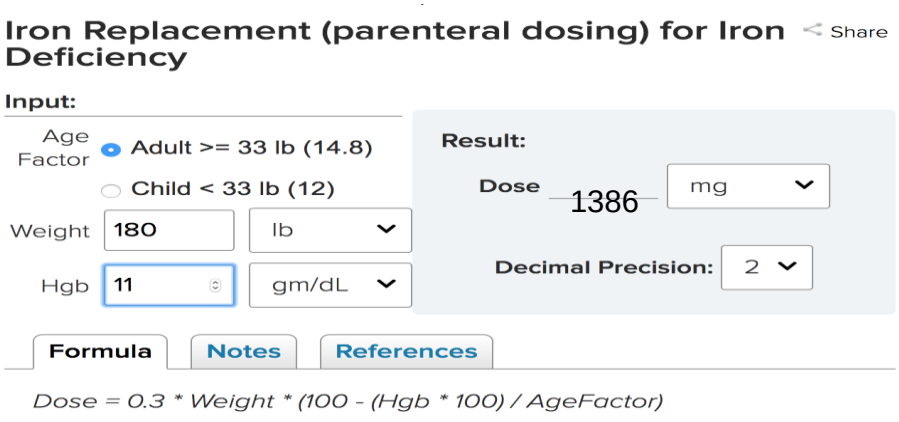
Calculating Iron Deficit



70

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Intravenous Iron Preparations – Absolute rates of life-threatening ADEs

Chertow et al. Nephrol Dial Transplant (2006) 21: 378–382
doi:10.1093/ndt/gfi253

Table 3. Major ADEs by preparation and comparison, 2001 through 2003

ADE	Ferrlecit® (n = 11 973 800)	Dexferrum® (n = 2 563 000)	InFed® (n = 6 690 000)	Venofer® (n = 8 837 000)	OR Dexferrum® *vs* InFed®	OR Ferrlecit® *vs* InFed®	OR Venofer® *vs* InFed®	OR Venofer® *vs* Ferrlecit®
Death	3	2	5	1	1.0 (0.2–4.6)	0.3 (0.1–1.3)	0.2 (0.1–1.0)	0.5 (0.1–3.2)
Cardiac arrest	3	8	5	0	4.2 (1.4–12)	0.3 (0.1–1.3)	0.0 (0.0–0.6)	0.0 (0.0–1.7)
Coma	1	13	6	4	5.7 (2.2–14)	0.1 (0.0–0.6)	0.5 (0.2–1.7)	5.4 (0.8–36)
Anaphylactoid reaction	4	6	6	0	2.6 (0.9–7.7)	0.4 (0.1–1.3)	0.0 (0.0–0.5)	0.0 (0.0–1.3)
Dyspnea[a]	9	44	28	10	4.1 (2.6–6.6)	0.2 (0.1–0.4)	0.3 (0.1–0.5)	0.9 (0.3–2.4)
Allergic reaction[b]	23	22	25	18	2.4 (1.4–4.2)	0.5 (0.3–0.9)	0.5 (0.3–1.0)	0.9 (0.5–1.8)
Abdominal pain	10	2	3	5	1.7 (0.3–8.7)	1.8 (0.5–6.3)	1.3 (0.3–4.8)	0.7 (0.2–1.9)
Back pain	7	28	8	4	9.1 (4.2–20)	0.5 (0.2–1.3)	0.3 (0.1–1.0)	0.6 (0.2–2.1)
Chest pain	8	32	16	9	5.2 (2.9–9.4)	0.3 (0.1–0.6)	0.4 (0.2–0.9)	1.5 (0.5–3.5)
Hypotension	20	26	12	12	5.7 (2.9–11)	0.9 (0.4–1.8)	0.8 (0.3–1.7)	0.8 (0.4–1.6)
Nausea	11	8	10	10	2.1 (0.9–5.1)	0.5 (0.2–1.2)	0.8 (0.3–1.8)	1.5 (0.6–3.6)
Vomiting	13	6	7	3	2.4 (0.8–6.3)	1.0 (0.4–2.5)	0.3 (0.1–1.2)	0.3 (0.1–1.1)
Sweating	4	15	4	3	9.8 (3.4–28)	0.4 (0.1–1.7)	0.6 (0.1–2.3)	1.3 (0.3–5.9)
Total	232	331	269	175	3.2 (2.7–3.8)	0.5 (0.4–0.6)	0.5 (0.4–0.6)	1.0 (0.8–1.2)
Life-threatening	11	29	22	5	3.4 (2.0–5.9)	0.3 (0.1–0.7)	0.2 (0.1–0.4)	0.6 (0.2–1.7)

[a]Includes respiratory depression and bronchospasm.

The absolute rates of life-threatening ADEs were:

0.6 per million for Venofer,
0.9 per million for Ferrlecit,
3.3 per million for InFed
11.3 per million for Dexferrum

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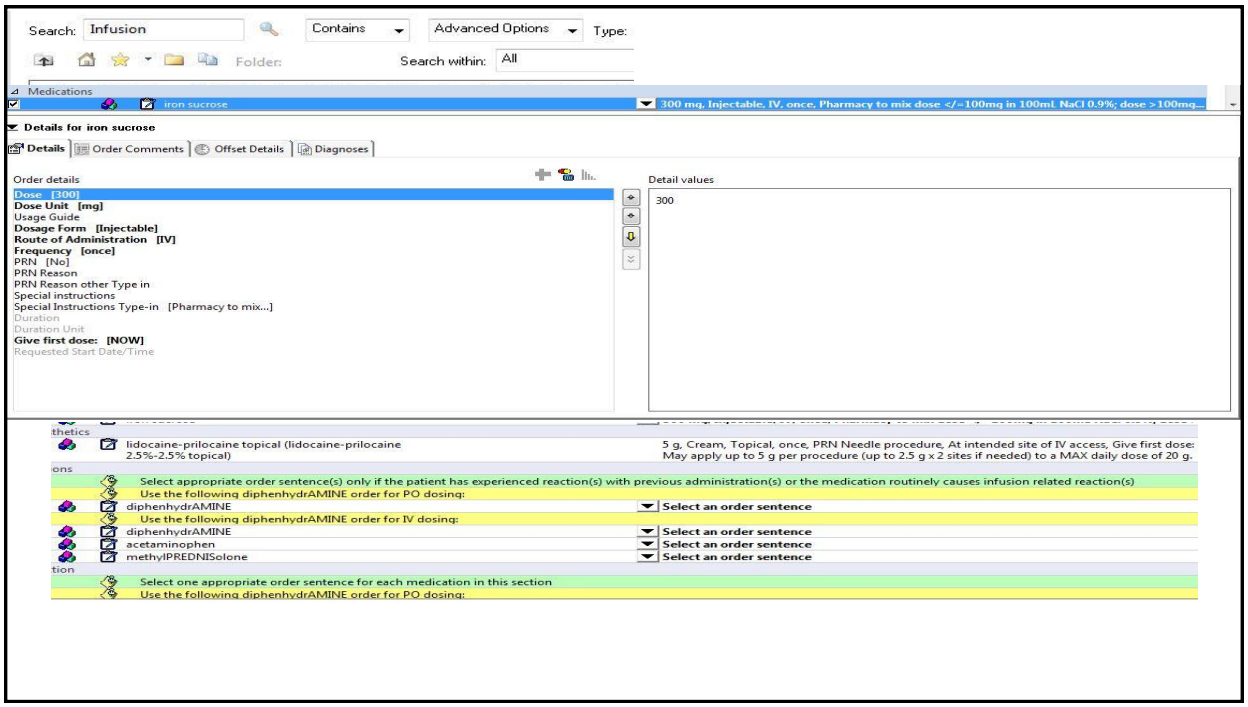

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Relative Risks

Blood Transfusion

- Allergic reaction 1 in 333
- DHTR – 1 in 5400
- Increased risk of Sepsis/ SSI
- Poorer cancer survival
- Reduced life expectancy

Newer Iron Sucrose Infusions

- Nanoparticle Reaction Common
- Anaphylaxis <10 in 1 000 000
- 1g a week improvement in Hb
- Overcomes Functional Iron Deficiency / Anemia of Chronic Disease

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Cost Benefit of IV Iron versus Oral Iron

Colorectal Surgery - Direct and indirect costs for acquisition and administration of iron product and RBC concentrates as well as hospitalization costs, were included in the cost model.

Ferric carboxymaltose reduced hospital stay by 2.3 days

Iron sucrose reduced hospital stay by 2.6 days

(compared with oral iron)

Cost savings of £ 437 (485€ , $532) and £ 245 (274€ , $300) per patient, respectively.

Calvet X, Gene E, Ruiz MA, et al. Cost-minimization analysis favours intravenous ferric carboxymaltose over ferric sucrose or oral iron as preoperative treatment in patients with colon cancer and iron deficiency anaemia. Technology and Health Care 2016; 24: 111–20.

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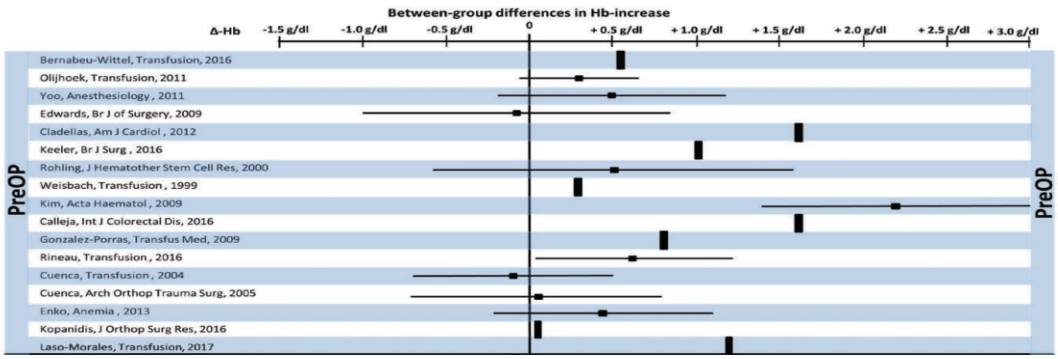
NARRATIVE REVIEW ARTICLE

Intravenous Iron for Treatment of Anemia in the 3 Perisurgical Phases: A Review and Analysis of the Current Literature

Frank Peters, MD,* Ines Ellermann, PHARM,† and Andrea U. Steinbicker, MD, MPH*



April 2018 • Volume 126 • Number 4

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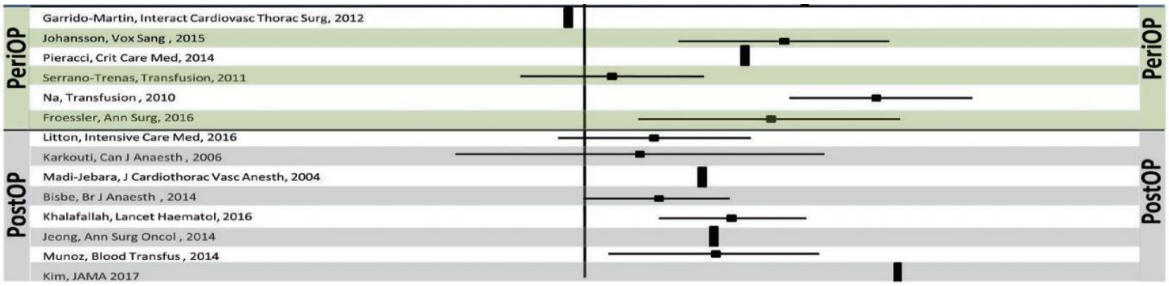

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What level of Hb is Threshold for Transfusion?

This effectively fixes your 'target preoperative Hb' in urgent cases
Tolerate Hb 7.0 to 9.0 g/dl (ASA Guidelines)
Individualized: Cardiac and Respiratory Patients – higher target
? Elderly should have higher target
Rate of change of Hb – ie bleeding also a significant factor in giving blood
However evidence supports maintaining HCT >28-30% to minimize complications

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Which preoperative Hb target?

1. Elective Surgery – Hard stops for normal Hb
2. Urgent Surgery - individualize

Work out blood volume on ideal body weight
Work out predicted blood loss
Work out likely nadir hematocrit for patient to get complications
Calculate necessary starting Hb to not hit nadir hematocrit if average blood loss occurs
Preoperative ongoing blood loss? How fast?

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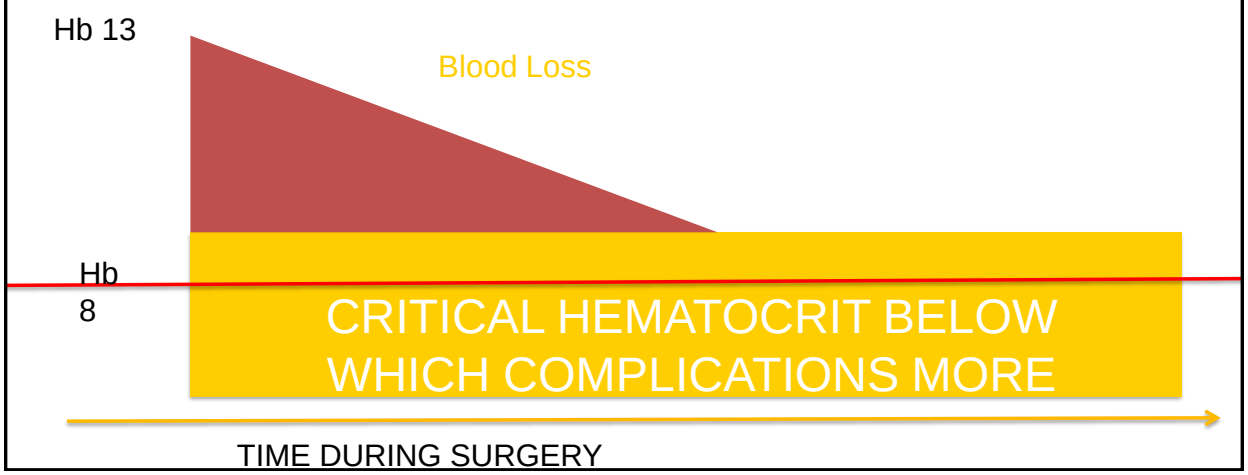
Nadir / Critical Hematocrit



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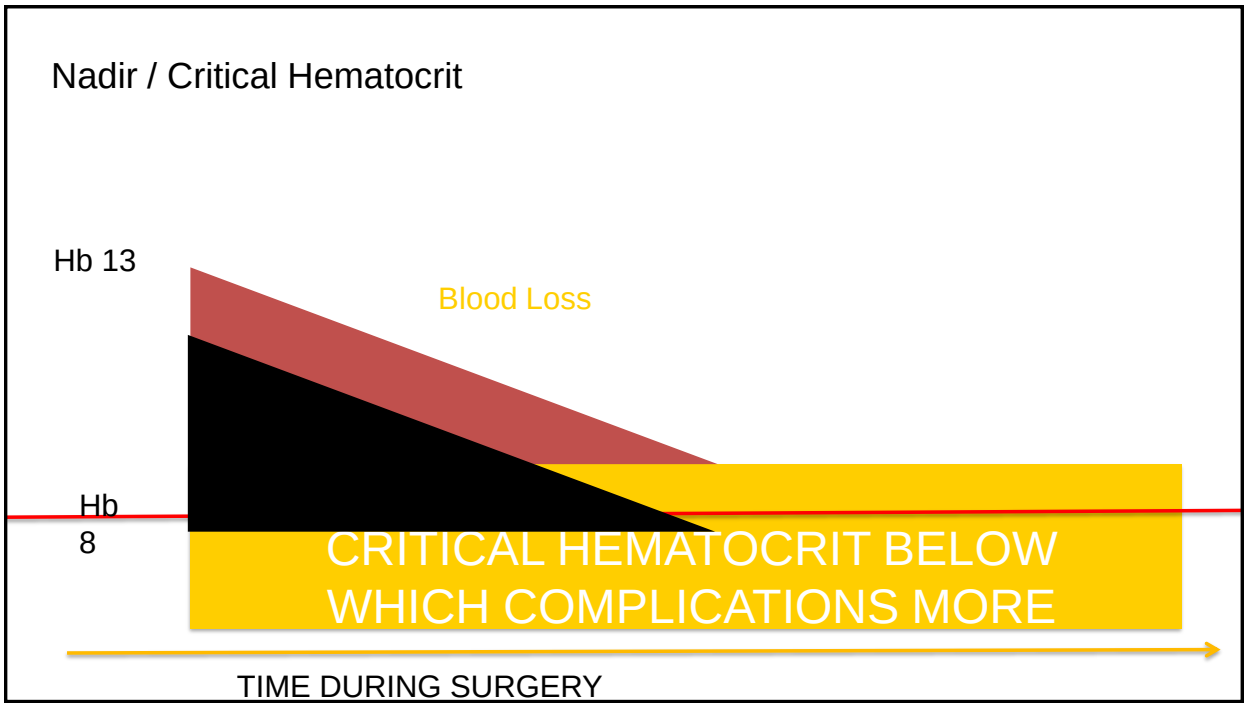
Nadir / Critical Hematocrit
Hb 13
Blood Loss
Hb
8
CRITICAL HEMATOCRIT BELOW
WHICH COMPLICATIONS MORE
TIME DURING SURGERY

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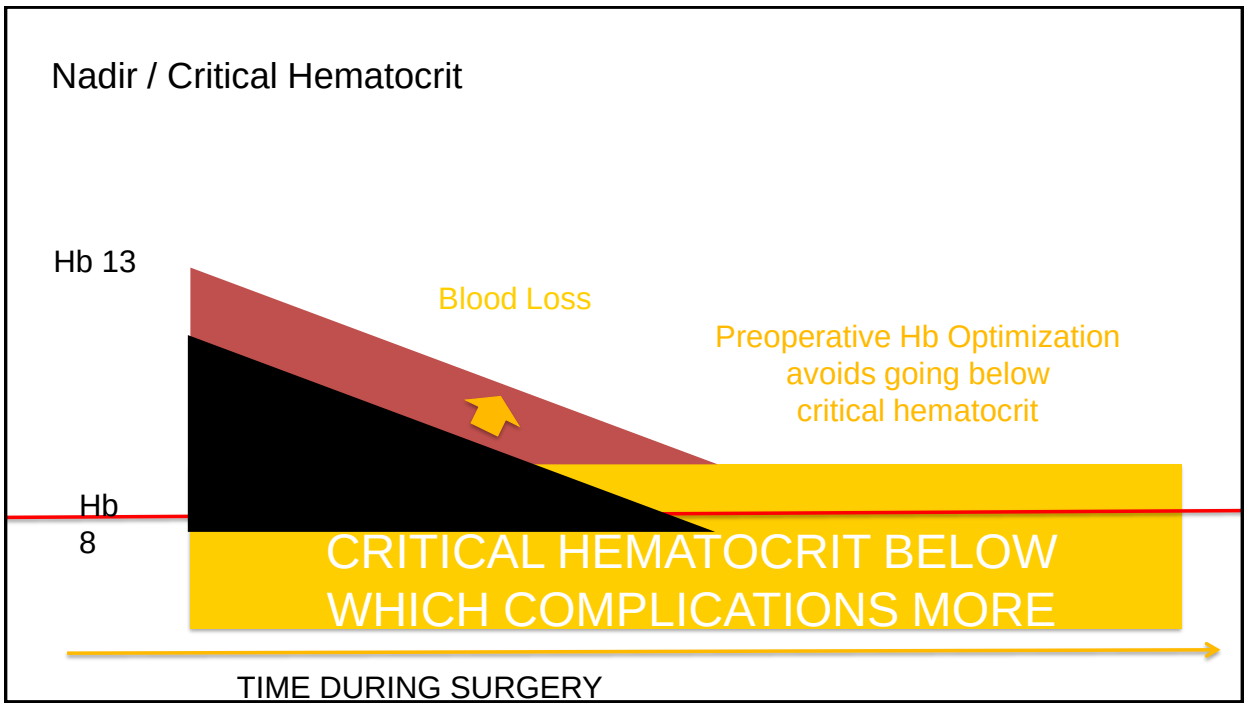
Nadir / Critical Hematocrit
Hb 13
Blood Loss
Preoperative Hb Optimization
avoids going below
critical hematocrit
Hb
8
CRITICAL HEMATOCRIT BELOW
WHICH COMPLICATIONS MORE
TIME DURING SURGERY

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Anemia Clinic - Practical Tips

Run in conjunction with Preoperative Anesthesia Clinic – other optimization opportunities
Screening – do not just rely on ferritin
Fe; TIBC; TSAT all needed
Need to exclude cause of anemia – cancer until proved otherwise
Hematological and internal medicine 'buy in'
Referral process for difficult diagnosis
Oral supplements (Iron, Folate, B12)

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Anemia Clinic - Practical Tips

Infusion clinic – set up powerplan for IV Iron
Ideally 1 infusion but may need 2 or 3
? Need to measure efficacy – CBC
Liaise with Infusion Clinics who give chemotherapy – allows IV iron infusion to be given in satellite sites

Close liaison with surgeon for urgent cases or where blood loss is ongoing
Expect around 1g per week rise in Hb
Need to have a means of logging patients for iron therapy – virtual clinic
Funding – Medicare v Insured

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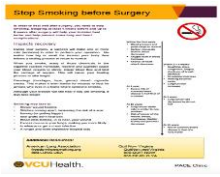
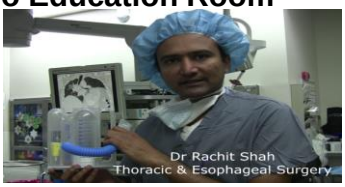
Preoperative Information



Patient Video Education Room



Information and Bag to take home

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What to tell the Surgeons

Optimization Timeline

Category	Elective Surgery	Urgent Surgery	Notes
Nutrition supplement	5 – 7 days minimum	5 days	Prescribed by PACE for patients at risk or who score
Opioid tolerance	7 – 14 days	*Try to get patient to reduce opioid intake by 20%*	Suboxone buprenorphine naltrexone all need specialist advice PACE will refer to Dr. Chapman at NOW; May be needed to reduce dependency and cut opioids by 20%. Advice may be email or clinic visit
Hb 10 – 12 IV iron infusions *Follow PACE Anemia Algorithm*	10 – 14 days Allows for 2 infusions	1 infusion as soon as logistically possible; more if timescale permits	**Elective surgeries:** End Stage Renal Failure needs EPO as well; PACE will refer to renal physician for action; unexplained anemia may need referral to Dr. Fang **Urgent surgeries:** continue IV iron infusion post-operatively
Hb 8 – <10 IV iron infusions *Follow PACE Anemia Algorithm*	14 – 21 days Allows for 2 – 3 infusions	1 infusion if possible; more if timescale permits	**Urgent surgeries:** • Continue IV iron infusion post-operatively • If Hb < 8 admit for blood transfusion (discussion between PACE and surgeon)
Exercise	7 days minimum 28 days ideal	Encourage up to day of surgery as tolerated	• Aerobic to target cardiopulmonary fitness. Resistance Exercise helpful. Diet important. • Data shows 1 week provides improvement and a plateau after 4 weeks
Glycemic management			**Elective surgeries:** Ideal Hb A1c < 7.5 **Urgent surgeries:** If glucose is unstable, referif Hb A1c > 8 to endocrine team
Oral carbohydrate preload	1 day - Evening before and morning of surgery	1 day - Evening before and morning of surgery	

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Summary

1. Enhanced Recovery after Surgery (ERAS) Pathways require preoperative assessment and optimization of modifiable risk factors
2. In the USA the most important of which are:

- Anemia
- Nutrition
- Glycemic control
- Chronic Opioid use
- Pulmonary

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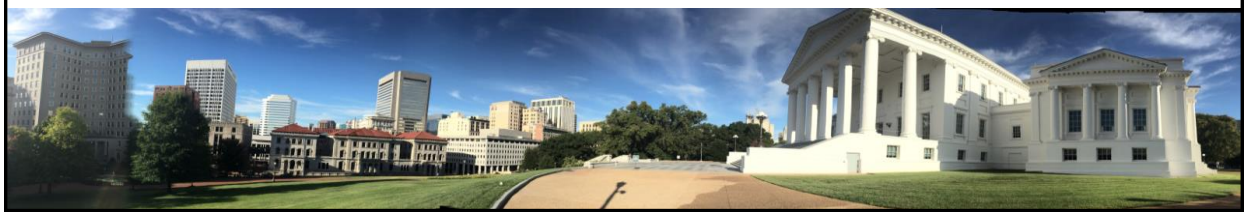

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