



**Association des Anesthésiologistes du Québec**

Des médecins spécialistes en soins péri-opératoires,  
réanimation et traitement de la douleur

# ERAS: UN NOUVEAU PROGRAMME DE CONGÉ PRÉCOCE EN CHIRURGIE DIGESTIVE; DÉFIS ET DIFFICULTÉS

Congrès annuel

AAQ

Avril 2013

Margaret Henri MD

Louis-Philippe Fortier MD, MSc



**Hôpital Maisonneuve-Rosemont**  
Centre affilié à l'Université de Montréal

# Divulgation

- ◎ Dr Henri: EST PRO ERAS!
  
- ◎ Dr. Fortier:
  - Consultant scientifique pour Merck Canada
    - Étude RECITE
    - Gestion du bloc opératoire

# Retour vers le futur

## ⦿ En 2005

- Cadre: Journée d'éducation médicale continue
  - Débat sur la stratégie liquidienne lors d'interventions majeures
    - JF Latulippe et LP Fortier

## ⦿ En 2013

- Invité comme conférencier
  - Gestion périopératoire des solutions de remplacement volémique

# Une opportunité

## ◎ Mai 2012

- Dans le cadre des présentations sur :
  - Approche multidisciplinaire de la médecine périopératoire
    - Présentation sur la gestion des solutions de remplacement
    - Éléments :
      - Jeûne
      - Types et quantité de solutions
      - Monitoring de la volémie

# Ce qui nous amène

- ◎ Aujourd'hui
  - Révision de toute la trajectoire périopératoire
- ◎ ERAS
  - Pré opératoire
  - Per opératoire
  - Post opératoire

 ERAS<sup>®</sup> Society

**1<sup>st</sup> ERAS Congress**

Cannes • France • 5-7 October 2012

JW Marriott Hotel

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

# ERAS

- ◎ Pourquoi s'intéresser aux études
  - Diminution de la mortalité/morbidité
  - Diminution de la durée d'hospitalisation
  - Diminution des coûts

Vlug et al Ann Surg 2011

Varadhan et al Clin Nutr 2010

Spanjersberg et al Cochrane 2011

# ERAS

## Jeûne

- Préadmission
  - Conditionnement Physique
  - Conseil: alcool, tabac
  - Préparation intestinale
  - Jeûne
  - Prémédication
  - Prophylaxie anti bactérienne

Analgésie: épidurale  
coanalgésie

- Protocole anesthésique standardisé
  - TIVA vs Halogénés
  - Évaluation de la profondeur de l'anesthésie
  - Analgésie: épidurale, coanalgésie
  - Prophylaxie NVPO
  - Hypothermie
  - Mesure de la réponse aux solutions de remplissage
  - Contrôle glycémique

Prophylaxie NVPO

- Post opératoire
  - LSC vs Chx ouverte
  - Levine
  - Nutrition
  - Mobilisation

Mesure de la réponse  
aux solutions  
de remplissage



# Le jeûne préopératoire

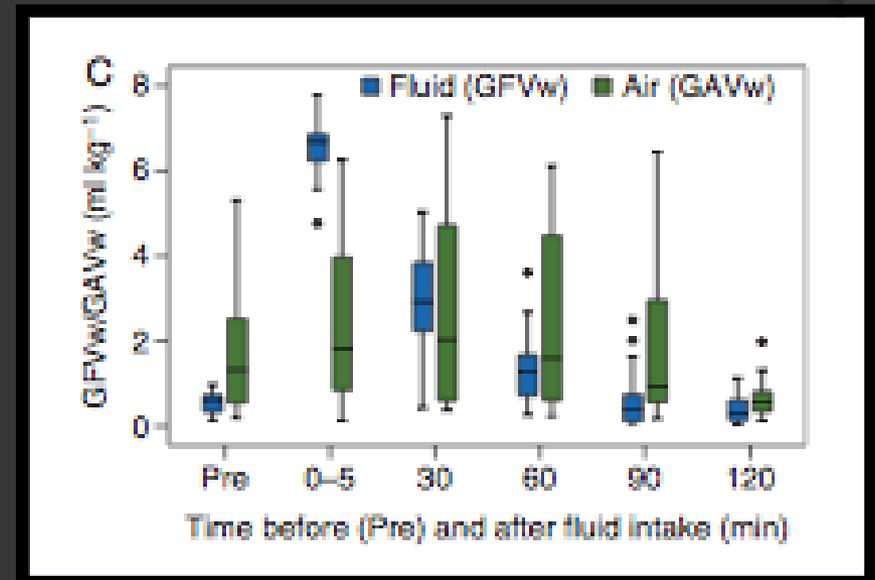
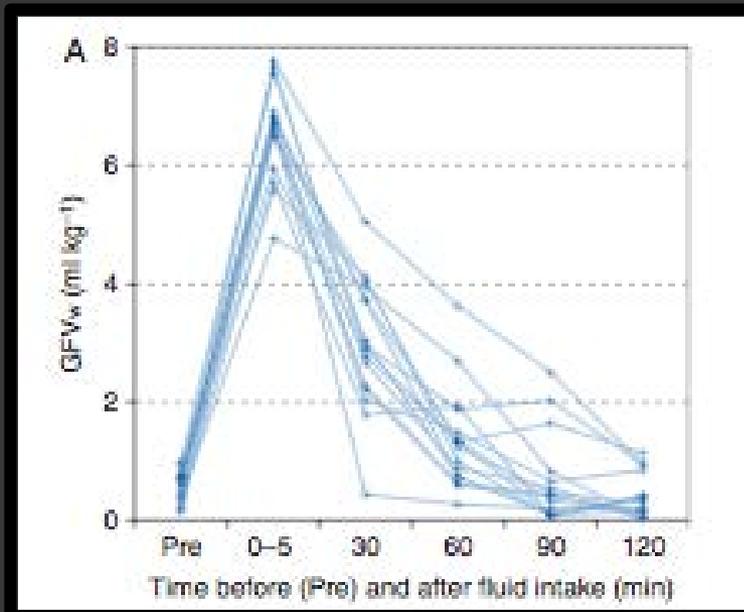
## ➤ Mythes

- Le jeûne complet est la meilleure façon de prévenir l'aspiration durant l'anesthésie
- La vidange gastrique est la même pour tout ce qui n'est pas un liquide clair
- La consommation de liquides clairs jusqu'à 2 heures avant la chirurgie augmente le risque de vomissements et de pneumonie d'aspiration

## ➤ Études

- Incidence d'aspiration:
  - 1946: 0.15% vs 2002: 0.006%

# Le jeûne préopératoire



Schmitz et al. Br. J. Anaesth. 2011

Ingesta; 7 mL/kg, jus de framboise

# Le jeûne préopératoire

- Effets bénéfiques des boissons aux hydrates de carbone et électrolytes
  - Application
    - Comment s'assurer que la chirurgie ne sera pas annulée?
    - Besoin d'un lieu protégé
    - Trousse préopératoire

# Jeûne pré-opératoire: recommandations

- ⊙ Pas de jeûne
  - Solides jusqu'à 6h pré-op
  - Liquides clairs ad 2h
- ⊙ Liquides hyperglucidiques pour tous
- ⊙ Chez pts DB, à administrer avec Rx hypoglycémiante

# Jeûne pré-opératoire: recommandations

- Pas de jeûne

- Solides ad 6h pré-op
- Liquides clairs ad 2h



- Liquides hyperglucidiques pour tous



- (Chez pts DB, à administrer avec Rx hypoglycémiante?)



# Liquides hyperglucidiques

## ⊙ Avantages:

- Pas d'état de « famine » péri-op
- Diminue
  - Faim, Soif
  - Stress
  - **Résistance à l'insuline en post op**
- Moins de pertes azotée/ protéines
- **Maintient masse musculaire et force musculaire**
- **Récupération plus rapide post-op**

# Analgesie: epidurale, coanalgesie

## ⊙ Intra operatoire

- Perfusion d'opioïdes vs bolus
- Utilisation d'analgésie loco-régionale
  - Epidurale
    - Rétention urinaire
      - Basse et al. Reg. Anesth. Pain Med.2000,25(48)
        - (9%)
  - Morphine intrathécale
  - Perfusion pré péritonéale
  - TAP bloc

# Analgesie: epidurale, coanalgesie

## ○ Epidurale et Anticoagulothérapie

- Développement de nouvelles molécules
  - Xarelto, Rivaroxaban; Inhibiteur direct du Xa
- Héparine tid

## ○ Coordination avec SAPO

- Heure de la prochaine dose d'anticoagulant
  - Vs
- Retrait d'un cathéter

# Analgésie: épidurale, coanalgésie

- ⊙ Besoins d'un protocole particulier
  - Prescriptions typiques pour ERAS
    - Péridurale pour 48 heures
    - Coanalgésie optimale
      - Devenir des anastomoses

# NVPO



# NVPO

- ⦿ Facteurs de risques
- ⦿ Échec thérapeutique antérieur
- ⦿ Nouvelle classe pharmacologique



# NVPO

## Facteurs de risque

### ▣ Le patient

- Femme
- Non fumeur
- Hx NVPO, Mal des transports
- Jeune
- +/- Statut émotionnel, personnalité

### ▣ Pharmaco

- Agent halogénés
- Opioïdes post-op
- N2O
- Néostigmine

### ▣ Autres

- Type/durée de Chx
- Douleur
- Tube naso-gastrique
- **Mouvements postop.**
- **Remplacement volémique**

# NVPO

## Facteurs de risque

### ▣ Le patient

- ▣ Femme
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### ▣ Autres

- ▣ Type/durée de Chx
- ▣ Douleur
- ▣ Tube naso-gastrique
- ▣ **Mouvements postop.**
- ▣ **Remplacement volémique**

# NVPO

## □ Prophylaxie

- ▣ # Facteurs 0-1
  - Non indiquée
- ▣ # Facteurs 2-4
  - 5-HT3 + DEX
  - Alt. :  
diphenhydramine/DHB

## □ Thérapie

- ▣ # Facteurs 0-1
  - 5-HT3+ DHB
  - Ou diphenhydramine
- ▣ # Facteurs 2-4
  - Tous médicament non utilisé, sauf DEX

# NVPO

## □ Conclusions

- Traitement du vomissement plus efficace que les nausées
- Ondansetron = NK1 = Droperidol (butyrophénones)
  - Toutes combinaison possibles, mieux: les trois
- Évite
  - Volatiles
  - Opioides post-opératoires
- Fait
  - TIVA Propofol

# NVPO

Society for Ambulatory Anesthesiology

Section Editor: Peter S. A. Glass

## **Rolapitant for the Prevention of Postoperative Nausea and Vomiting: A Prospective, Double-Blinded, Placebo-Controlled Randomized Trial**

Tong J. Gan, MD, FRCA, MHS,\* Jiezhun Gu, PhD,† Neil Singla, MD,‡ Frances Chung, FRCPC,§  
Michael H. Pearman, MD,|| Sergio D. Bergese, MD,# Ashraf S. Habib, MB, BCh, MSc, FRCA,¶  
Keith A. Candiotti, MD,\*\* Yi Mo, PhD,†† Susan Huyck, DrPH,‡‡ Mary R. Creed, MSN,‡‡  
and Marc Cantillon, MD,†† for the Rolapitant Investigation group§§

Anesth. & Analg. 2011, 112(4)

# NVPO

## ⊙ Facteurs de risques

### • Besoins de triple thérapie

#### ○ Principes

- Respecter les caractéristiques précoces/tardives
- Respecter les principes pharmacologiques
  - Dose vs classes

### • Besoins de quadruple thérapie

#### ○ Introduire une nouvelle classe

- Anti-neurokinine-1(NK1)

## ⊙ Échec

### • Quadruple thérapie vs Perfusion de propofol

# Fluides



# Fluides

## ⊙ Types de solutions

- Colloïdes vs Cristalloïdes
  - Chirurgie élektive vs sepsis sévère
    - Cochrane Review, Schortgen, VISEP, CRYSTMAS, CHEST et 6S
      - Vacuolisation (néphrose osmotique)
      - Phase initiale
- Maïs vs patate
  - Jamnicki et al Anaesthesia;1998

## ⊙ Monitoring

- Swan-Ganz, TVC
- Non-invasif
  - Doppler transoesophagien
  - Delta up/down
  - Bioréactance
  - etc...

# Fluides

- ⊙ Types de solutions
    - Colloïdes vs Cristalloïdes
- Équation de Starling

$$J_v = K \{ (P_c - P_i) - \sigma(\pi_c - \pi_i) \}$$

# Fluides

- Types de solutions
  - Colloïdes vs Cristalloïdes

Équation de Starling

$$J_v = K \{ (P_c - P_i) - \sigma(\pi_c - \pi_i) \}$$

Flux transcapillaire

Coefficient de  
filtration

Coefficient  
de réflexion

# Fluides

- ⦿ Types de solutions
    - Colloïdes vs Cristalloïdes
- Équation de Starling

$$J_v = K \{ (P_c - P_i) - \sigma(\pi_c - \pi_i) \}$$

$\sigma$  : Intégrité de la paroi capillaire

# Fluides

## ⊙ Types de solutions

### • Colloïdes vs Cristalloïdes

#### ○ **Le coefficient de réflexion ( $\sigma$ )**

- Zikria et al. (1989) A biophysical approach to capillary permeability. *Surgery* 105(5): 625
  - Étude expérimentale sur des rats
  - Mesure de fuite d'albumine marquée
  - Colloïdes comme substance de colmatage

# Fluides

## ◎ Sigma Values      Mean $\pm$ SD

Solutions	Pre-scald	30 min. post-scald
HES ( $F_M$ )	0.95 $\pm$ 0.04	0.82 $\pm$ 0.05
Ringer	0.93 $\pm$ 0.02	0.39 $\pm$ 0.11
Albumin	0.94 $\pm$ 0.02	0.58 $\pm$ 0.05
HES ( $F_L$ )	0.95 $\pm$ 0.02	0.51 $\pm$ 0.12
HES ( $F_S$ )	0.96 $\pm$ 0.03	0.61 $\pm$ 0.08

# Fluides

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# Fluides

- ⦿ Types de solutions
  - Colloïdes vs Cristalloïdes
    - Avantages proposé
      - Maintien de l'intégrité capillaire

# Fluides

## Types de solutions

### Colloïdes vs Cristalloïdes

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JOURNAL OF SURGICAL RESEARCH XXX (2013) 1–7

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**SciVerse ScienceDirect**  
journal homepage: [www.JournalofSurgicalResearch.com](http://www.JournalofSurgicalResearch.com)



**The effect of fluid overload in the presence of an epidural on the strength of colonic anastomoses**

Carolyn Nessim, MD, FRCSC,<sup>a,\*</sup> Lucas Sid ris, MD, FRCSC,<sup>a</sup>  
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Annie-Claude Lapostole, MD, FRCSC,<sup>a</sup> St phanie Simard, MD, FRCSC,<sup>a</sup>  
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Epidural  
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Crystalloid  
Colloid  
Colonic anastomoses  
Fluid balance  
Sympathetic block  
Euvolemia

**ABSTRACT**

**Background:** Despite the beneficial effects of epidurals in intra-abdominal surgery, the incidence of anastomotic leak remains controversial when used. Moreover, studies have also shown that fluid overload may be deleterious to anastomoses. The purpose of this paper is to evaluate the effects of varying intraoperative fluid protocols, in the presence of an epidural, on the burst pressure strength of colonic anastomoses.

**Methods:** An epidural was installed in 18 rabbits, divided into three groups. Group 1 received 30 mL/kg/h Ringer's lactate, Group 2 received 100 mL/kg/h Ringer's lactate, and Group 3 received 30 mL/kg/h Pentaspan. Two colo-colonic anastomoses were performed per rabbit. On postoperative day 7 the anastomoses were resected and their burst pressures measured as a surrogate for anastomotic leak.

**Result:** When comparing the average burst pressures of all three groups, there was a significant difference ( $P = 0.04$ ). The anastomoses in the 100 mL/kg/h Ringer's lactate group were shown to be the weakest, with 64% of the anastomoses having burst under 120 mm Hg. The rabbits hydrated with Pentaspan had the highest strength, with no anastomoses bursting under 120 mm Hg. This translated into significant burst pressure differences ( $P = 0.02$ ) between Group 2 and Group 3.

**Conclusion:** These results suggest that fluid overload with a crystalloid, in the presence of an epidural, may be deleterious to the healing of colonic anastomoses, creating a higher risk of anastomotic leak. Intraoperative resuscitation should thus focus on goal-directed euvolemia with appropriate amounts of colloids and/or crystalloids to prevent the risk of weakening anastomoses, especially in patients with epidurals.

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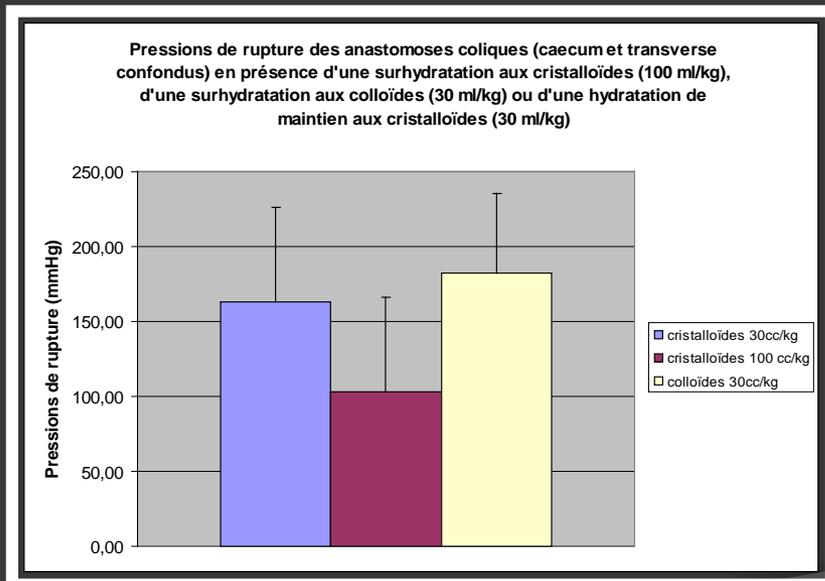
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# Fluides

## Types de solutions

### Colloïdes vs Cristalloïdes



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**ELSEVIER**

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# Fluides

- Monitoring
  - Invasif
    - Swan-Ganz

J Clin Monit Comput (2012) 26:341–345  
DOI 10.1007/s10877-012-9389-2

INVITED REVIEW

## **The pulmonary artery catheter**

Jean-Louis Vincent

## **Pulmonary artery catheters: Evolving rates and reasons for use\***

Karen K. Y. Koo, MD; Jack C. J. Sun, MD, MSc; Qi Zhou, PhD; Gordan Guyatt, MD, MSc;  
Deborah J. Cook, MD, MSc; Stephen D. Walter, PhD; Maureen O. Meade, MD, MSc

Crit Care Med 2011 Vol. 39, No. 7

# Fluides

## Monitoring Invasive

### The NEW ENGLAND JOURNAL of MEDICINE

#### A Randomized, Controlled Trial of the Use of Pulmonary-Artery Catheters in High-Risk Surgical Patients

James Dean Sandham, M.D., Russell Douglas Hull, M.B., B.S., Rollin Frederick Brant, Ph.D., Linda Knox, R.N., Graham Frederick Pineo, M.D., Christopher J. Doig, M.D., Denny P. Laporta, M.D., Sidney Viner, M.D., Louise Passerelli, M.D., Hugh Devitt, M.D., Ann Kirby, M.D., and Michael Jacka, M.D., for the Canadian Critical Care Clinical Trials Group\*

#### BACKGROUND

Some observational studies suggest that the use of pulmonary-artery catheters to guide therapy is associated with increased mortality.

#### METHODS

We performed a randomized trial comparing goal-directed therapy guided by a pulmonary-artery catheter with standard care without the use of a pulmonary-artery catheter. The subjects were high-risk patients 60 years of age or older, with American Society of Anesthesiologists (ASA) class III or IV risk, who were scheduled for urgent or elective major surgery, followed by a stay in an intensive care unit. Outcomes were adjudicated by observers who were unaware of the treatment-group assignments. The primary outcome was in-hospital mortality from any cause.

#### RESULTS

Of 3803 eligible patients, 1994 (52.4 percent) underwent randomization. The baseline characteristics of the two treatment groups were similar. A total of 77 of 997 patients who underwent surgery without the use of a pulmonary-artery catheter (7.7 percent) died in the hospital, as compared with 78 of 997 patients in whom a pulmonary-artery catheter was used (7.8 percent)—a difference of 0.1 percentage point (95 percent confidence interval, -2.3 to 2.5). There was a higher rate of pulmonary embolism in the catheter group than in the standard-care group (8 events vs. 0 events,  $P=0.004$ ). The survival rates at 6 months among patients in the standard-care and catheter groups were 88.1 and 87.4 percent, respectively (difference, -0.7 percentage point [95 percent confidence interval, -3.6 to 2.2]); negative survival differences favor standard care; at 12 months, the rates were 83.2 and 83.0 percent, respectively (difference, -0.9 percentage point [95 percent confidence interval, -4.3 to 2.4]). The median hospital stay was 10 days in each group.

#### CONCLUSIONS

We found no benefit to therapy directed by pulmonary-artery catheter over standard care in elderly, high-risk surgical patients requiring intensive care.

N ENGL J MED 363:1 www.n engl j med 363:1 JANUARY 3, 2011

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Available online <http://dx.doi.org/10.1056/NEJMoa1003538>

### Review Evidence-based review of the use of the pulmonary artery impact data and complications

Mehrnaz Hadian and Michael R Pinsky

Department of Critical Care Medicine, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania, USA

Corresponding author: Michael R Pinsky, [pinsky@pitt.edu](mailto:pinsky@pitt.edu)

Published: 27 November 2008  
This article is online at <http://dx.doi.org/10.1056/NEJMoa1003538>  
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Critical Care 2006, 10(Suppl 3):S8

#### Abstract

The pulmonary artery catheter (PAC) was introduced in 1971 for the assessment of heart function at the bedside. Since then it has generated much enthusiasm and controversy regarding the benefits and potential harms caused by this invasive form of hemodynamic monitoring. This review discusses all clinical studies conducted during the past 30 years, in intensive care unit settings or post mortem, on the impact of the PAC on outcomes and complications resulting from the procedure. Although most of the historical observational studies and randomized clinical trials also looked at PAC-related complications among their end-points, we opted to review the data under two main topics: the impact of PAC on clinical outcomes and cost-effectiveness, and the major complications related to the use of the PAC.

was simply assumed. Or monitoring in the USA [7] than 1.2 million PACs were costs of over US\$2 billion

This review describes complications of PAC of clinical studies findings of each exclude studies for operating room, I used to eliminate trauma and aggressive a consider sit package o illness th

#### Impac Obser During patient first t ing Ca 3' 6'

#### 1. Introduction

The ability to assess intravascular volume is an essential part of perioperative care and the management of perioperative hemodynamic instability. Insufficient intravascular volume can result in decreased oxygen delivery to tissues and organ dysfunction, while fluid overload states can contribute to the development of edema and organ dysfunction, including respiratory failure. The injudicious use of vasopressors and inotropes in the hypovolemic patient can be hazardous and increase the risk of a poor outcome.

Two concepts are relevant to assessments of fluid status in perioperative and critical care. Euvolemia describes a state of normal body fluid volume that allows adequate filling of the cardiac chambers and, in turn, makes it possible for the heart to produce a cardiac output that can meet the organism's oxygen demand. In the setting of euvolemia, the Frank-Starling relationship is necessary. Fluid responsiveness describes the ability of the heart to respond to fluid volume variations, modifying its stroke volume and cardiac output. Fluid responsiveness is necessary for the heart to respond to fluid volume variations, modifying its stroke volume and cardiac output. Fluid responsiveness determines the need for inotropes or vasopressors. An understanding of the Frank-Starling relationship is necessary for the management of the hypovolemic patient, reduce the risk of the injudicious use of vasopressors and inotropes, and improve clinical outcomes, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

the need for inotropes or vasopressors. An understanding of both concepts derives from the Frank-Starling relationship describing the changes in cardiac stroke volume in response to changes in cardiac preload. The ascending portion of the Frank-Starling curve will correspond to the fluid responsive phase of resuscitation, as seen with an increase in the cardiac output any further; it may lead to the adverse effects related to fluid overloading, such as hydrostatic pulmonary edema. In a broad sense, if euvolemia is the goal of fluid use in resuscitation, then fluid responsiveness is the goal of fluid use in working toward establishing euvolemia. In the presence of contrast techniques for analyzing fluid euvolemia and its relationship to fluid overloading, such as hydrostatic pulmonary edema, weakness and to the adverse effects related to fluid overloading, such as hydrostatic pulmonary edema.

### Review Article Perioperative Intravascular Fluid Assessment and Monitoring: A Narrative Review of Established and Emerging Techniques

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Accurate assessments of intravascular fluid status are an essential part of perioperative care and necessary in the management of the hemodynamically unstable patient. Goal-directed fluid management can facilitate resuscitation of the hypovolemic patient, reduce the risk of fluid overload, reduce the risk of the injudicious use of vasopressors and inotropes, and improve clinical outcomes, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

# Fluides

## Temperature of the Great Toe as an Indication of the Severity of Shock

By HENRI R. JOLY, M.D., AND MAX HARRY WEIL, M.D., PH.D.

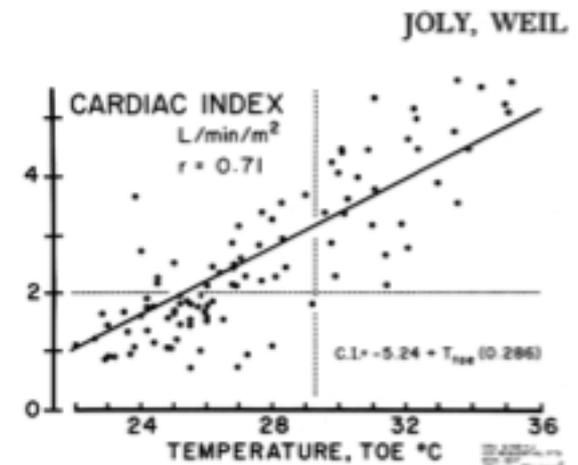


Figure 5

Correlation between cardiac index and toe temperature (3 hours after admission).

Joly and Weil, Circulation 1969

# Fluides

## ➤ TVC

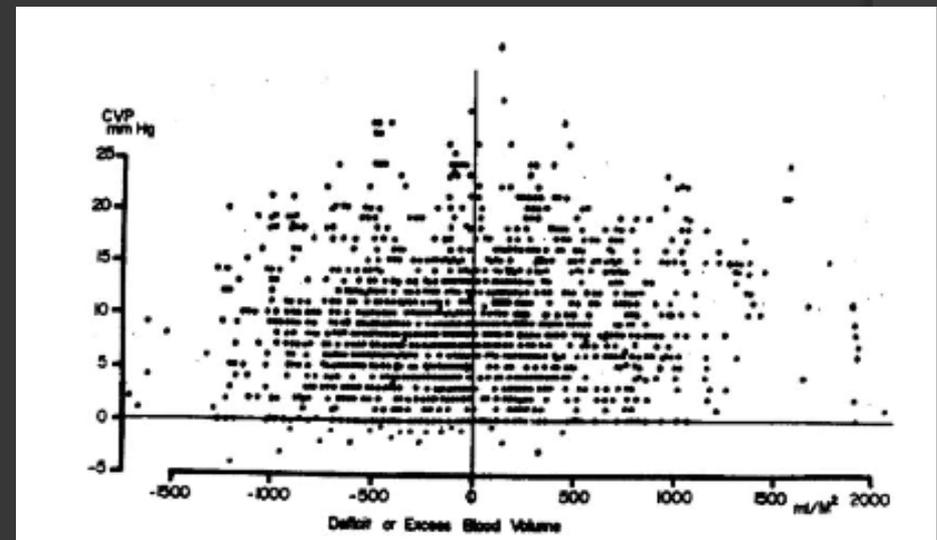
● Une des études revues dans:

● CHEST 2008, Marik et al.

○ 188 pts

○ 1500 mesures

○ Vol. Sang. / TVC



Shippy et al. Crit Care Med 1984

# Fluides

- Monitoring
  - Invasif
    - TVC



# Fluides

## ⊙ Monitoring

### • Invasif

- TVC
- Pool de 5 études
- Capacité de  $\Delta$ PVC de prédire la réponse aux bolus
- Coefficient de corrélation groupé:
  - 0,16 (95% CI, 0,03-0,28)

# Fluides

## Monitoring

- Non invasif

- Delta up/down

- Besoin d'une canule
- Limitations
  - FA, MPOC sévère

- Doppler transoesophagien

- Patient sous AG
- Lésions a/n du nez, base du crâne
- Présence d'un tube naso-gastrique, sonde de T°

# Fluides

## Monitoring

- Non invasif

- Bioréactance

- I; ampl./freq. Mesure; resist.(impédance)
- $\Delta$  qté sang dans thor.  $\Delta$  amplitude +capacitance/induction  
→ bioreactance (freq)

- Limitations

- Prothèses aortiques
- Gros anévrysmes aortiques, dissection aortique
- Valeurs extrêmes pour l'hématocrite, pression pulmonaires
- Extrêmes de morphométrie
- Hyper hydratation, déshydratation

# Fluides

- Monitoring
- Non invasive

Anaesthesia, 2008, 63, pages 44-51  
doi:10.1111/j.1365-2044.2007.05233.x

## REVIEW ARTICLE Systematic review of the literature for the use of oesophageal Doppler monitor for fluid replacement in major abdominal surgery

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<sup>1</sup> Senior Registrar, <sup>2</sup> Assistant Professor and Consultant, Department of Surgery, Midland Hospital, University of Auckland, Auckland, New Zealand

### Summary

The use of intra-operative Doppler oesophageal probes provides continuous monitoring of cardiac output. This enables optimisation of intravascular volume and tissue perfusion in major abdominal surgery, which is thought to reduce postoperative complications and shorten hospital stay. Medicine and EMBASE were searched using the standard methodology of the Cochrane collaboration for fluid replacement in patients undergoing major elective abdominal surgery. Data from randomized controlled trials were entered and analysed in Meta-view in Rev-Stats 4.2 (Nordic, Denmark). We included five studies that recruited 420 patients undergoing major abdominal surgery who were randomly allocated to receive either intravenous fluid treatment according to conventional practice or guided by monitoring ventricular filling using oesophageal Doppler monitor or fluid administration guided by monitoring ventricular parameters. Pooled analysis showed a reduced hospital stay in the intervention group. There were fewer complications and ICU admissions, and less requirement for inotropes in the intervention group. Return of normal gastro-intestinal function was also significantly faster in the intervention group. Oesophageal Doppler use for monitoring and optimisation of flow-related haemodynamic variables improves short-term outcome in patients undergoing major abdominal surgery.

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Accepted: 2 July 2007

### Background

Major abdominal surgery is often performed in elderly patients who suffer from multiple comorbidities [1, 2]. Such patients require careful peri-operative care including optimal fluid management. Occult hypovolaemia commonly occurs during major surgery and is thought to result in impaired tissue perfusion, decreased oxygen delivery and increased postoperative complications. This form of hypovolaemia is not detected by the usual monitoring of heart rate and blood pressure, which remains unchanged due to normal homeostatic mechanisms [3].

Frequently, large quantities of fluids are administered during major surgical procedures [4]. Peri-operative optimisation of patients admitted for elective major

surgery by aggressive fluid resuscitation results in a significant reduction in cardiac output using doppler monitoring. This is thought to be due to increasing tissue oxygen delivery by maintaining SV and optimisation of SV patterns by such improved cardiac output. However, this principle for such improved tissue oxygen delivery [5] is not supported by recent evidence of increased morbidity [7]. However, the use of the low morbidity Doppler monitoring method with invasive fluid administration to optimise fluid balance and to investigate the role of utilising intra-operative

## COLLECTIVE REVIEW

### Improving Perioperative Outcomes: Fluid Optimization with the Esophageal Doppler Monitor, a Metaanalysis and Review

Tuong D Phan, MBBS, FRCA, Hilmy Ismail, MD, FRCGS(D), FRCA FANZCA, Alexander G Heriot, MD, FRCS, FRACS, Kwok M Ho, MPH, FANZCA, FJFICM

Optimizing intravascular volume status in patients undergoing major surgery is essential to reduce the risk of complications and poor outcomes.<sup>1</sup> Evidence suggests that using conventional physiologic signs such as heart rate and blood pressure may not be able to detect sub-clinical hypovolemia, contributing to an increase in morbidity and complications including postoperative gastrointestinal dysfunction.<sup>2,3</sup> Recent evidence showed that some forms of invasive intravascular hemodynamic monitoring, such as central venous oxygen saturation, may be very useful in improving outcomes in patients undergoing major operations<sup>4</sup> or those with severe sepsis.<sup>5</sup> But central venous and pulmonary artery catheterization are invasive,<sup>6</sup> and not all studies have consistently shown that they are beneficial.<sup>7</sup>

An esophageal Doppler monitor (ODM) is a cardiac output monitoring device that measures the descending aortic blood flow using transesophageal Doppler ultrasound.<sup>8</sup> Cardiac output and stroke volume are estimated using the descending thoracic aortic blood flow velocity integral and a nomogram using age, height, and weight. ODM is used as a continuous cardiac output or stroke volume monitor and as such, intravascular volume status or preload of the left ventricle can be optimized by titrating IV fluid boluses (usually 250 mL of colloid fluid) to a flow chart based in large part on the Frank-Starling principle. Because the ODM is much smaller than an ordinary transesophageal echocardiographic probe, it is less invasive and has a very good safety record. Specifically, there have been no case reports of esophageal perforation and only reports of minor complications such as mucosal trauma and endobronchial placement, which is readily identified and repositioned. We hypothesized that using intraoperative ODM to

guide IV fluid therapy will optimize patient's intravascular volume status or preload and may improve perioperative outcomes. A number of studies have been published suggesting that this device may be useful to improve perioperative outcomes.<sup>9-12</sup> These studies were, however, their small sample size and their assessment of a specific subgroup of surgical patients.<sup>10,12</sup> As such, we analyzed the existing randomized controlled trials to quantify the potential benefits of ODM and to determine whether its benefits are generalizable to a wider range of surgical patients.

### METHODS

#### Search criteria

Because the technique and first clinical trial were described in 1971,<sup>13</sup> we searched Medline (1966 to week 5) and EMBASE (1980 to present) using the following MeSH terms with the following controlled terms: *transesophageal Doppler*, *oesophageal Doppler*. We also searched all potentially eligible studies to avoid missing any randomized controlled trials.

#### Inclusion criteria

In this metaanalysis, we included randomized controlled trials that had a primary objective of perioperative IV fluid therapy to optimize intravascular volume status and the perioperative ser-

#### Exclusion criteria

The review was restricted to English language studies. We also excluded studies that did not report on fluid to optimize intravascular volume.

#### Data extraction

Two assessors independently and

#### Disclosure Information: Nothing to disclose.

Received June 4, 2008; Revised August 1, 2008; Accepted August 4, 2008. From the Department of Anaesthesia (Phan), St Vincent's Hospital Melbourne, Melbourne; Department of Surgical Oncology (Ismail, Heriot), Peter MacCallum Cancer Centre, Melbourne; and Departments of Intensive Care (Ho), Royal Perth Hospital and School of Population Health, University of Western Australia, Australia. Correspondence address: Dr Tuong D Phan, Department of Anaesthesia, St Vincent's Hospital Melbourne, PO Box 2900, Fitzroy, Victoria 3065, Australia. e-mail: tuong.phan@whm.org.au

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## Systematic review of the clinical effectiveness and cost-effectiveness of oesophageal Doppler monitoring in critically ill and high-risk surgical patients

G Mowatt, G Houston, R Hernández, R de Verteuil, C Fraser, B Cuthbertson and L Vale

January 2009  
DOI: 10.3310/hta13070

Health Technology Assessment  
NIHR HTA Programme  
www.hta.ac.uk



# Contrôle glycémique

- Pas de préparation côlon
- Diminuer jeûne
- Éviter hypervolémie post-op
- Mobilisation précoce
- Épidurale
- Prophylaxie no-vo
- Éviter hypervolémie
- AINS

**Chirurgie**

**Anesthésie**

# Nutrition post-opératoire

- ⊙ Boisson et aliments permis dès 4h post-op
  - Ensure en PO# 0
  - Diète selon tolérance PO# 0
  - Consommation spontanée 1200-1500 kcal
- ⊙ ↓ des risques d'infection
- ⊙ ↓ du séjour hospitalier
- ⊙ Pas plus de fuite anastomotique

# Mobilisation précoce

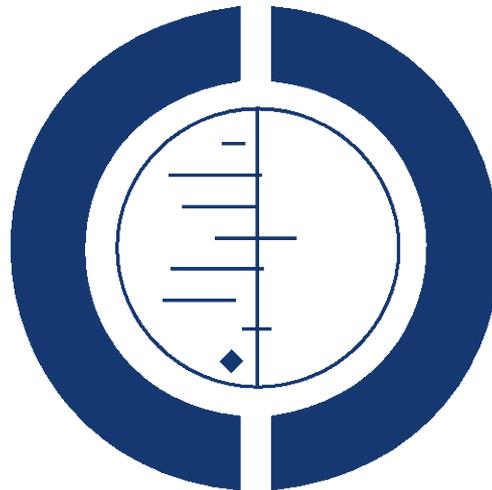
- ⊙ Diminution de la perte musculaire si combiné à nutrition
- ⊙ Lit prolongé: augmente pneumonie, faiblesse musculaire, résistance à l'insuline
- ⊙ Pas de lien entre mobilisation précoce et résultats à long terme
- ⊙ Directement associé à réussite ERAS

# Résultats

(Est-ce que ça fonctionne  
?)

# **Fast track surgery versus conventional recovery strategies for colorectal surgery (Review)**

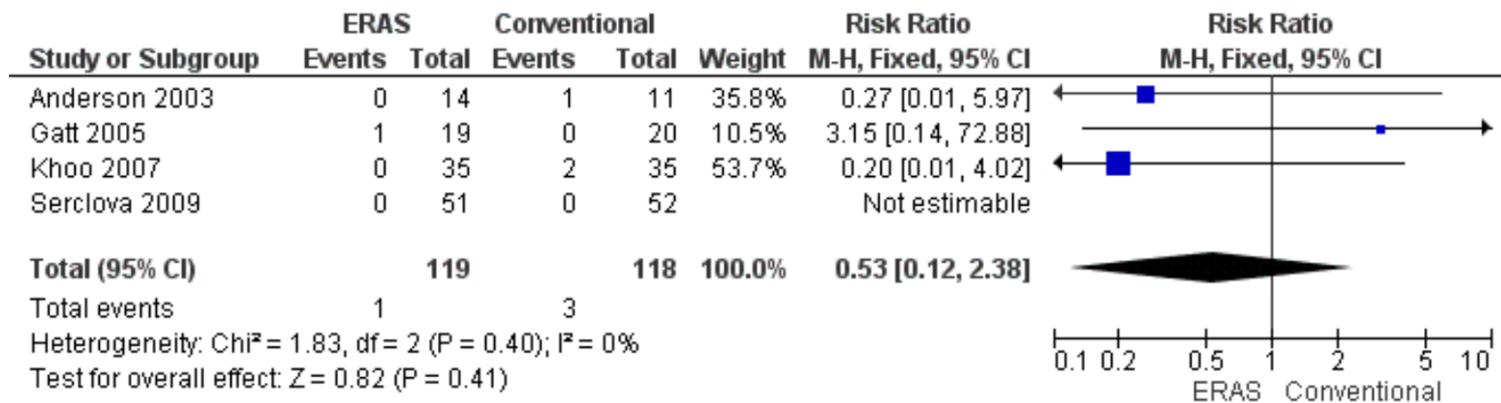
**Spanjersberg WR, Reurings J, Keus F, van Laarhoven C.J.H.M**



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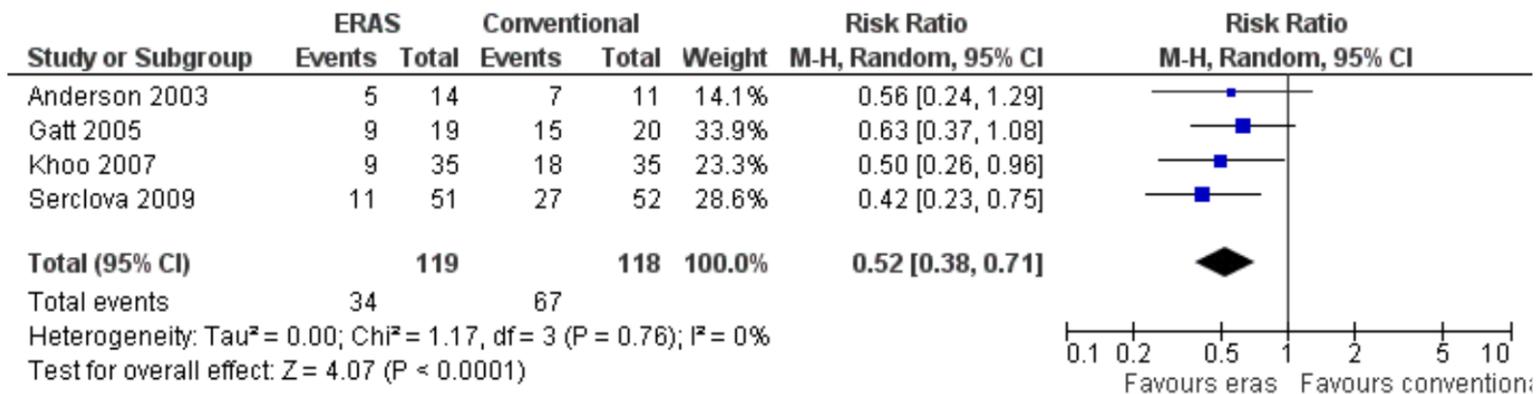
# Mortalité

**Figure 4. Forest plot of comparison: 1 Primary analyses ERAS versus conventional, outcome: 1.1 Mortality.**



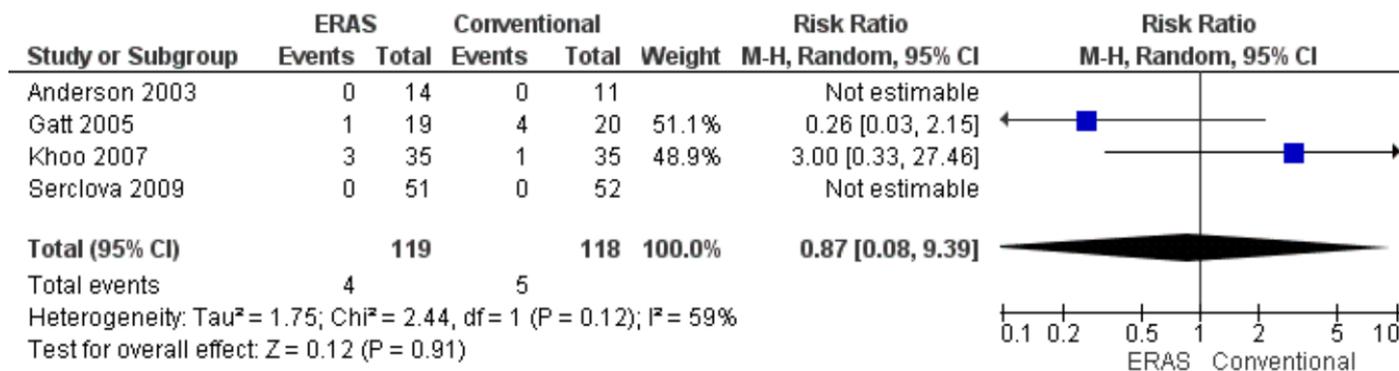
# Complications

**Figure 5. Forest plot of comparison: 1 Primary analyses ERAS versus conventional, outcome: 1.2 All complications.**



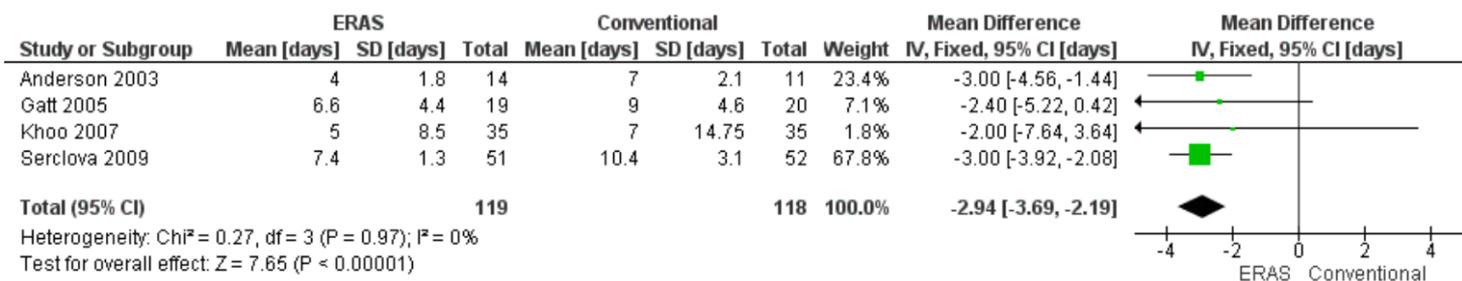
# Réadmissions

**Figure 9. Forest plot of comparison: 1 Primary analyses ERAS versus conventional, outcome: 1.6 Readmissions.**



# Durée de séjour

**Figure 10. Forest plot of comparison: 1 Primary analyses ERAS versus conventional, outcome: 1.7 hospital stay [days].**



## Which fast track elements predict early recovery after colon cancer surgery?

**M. S. Vlug\***, **S. A. L. Bartels\***, **J. Wind\***, **D. T. Ubbink†**, **M. W. Hollmann‡** and **W. A. Bemelman\*** on behalf of the collaborative LAFA study group<sup>1</sup>

\*Department of Surgery, Academic Medical Center, Amsterdam, The Netherlands, †Department of Quality Assurance and Process Innovation, Academic Medical Center, Amsterdam, The Netherlands and ‡Department of Anesthesiology, Academic Medical Center, Amsterdam, The Netherlands

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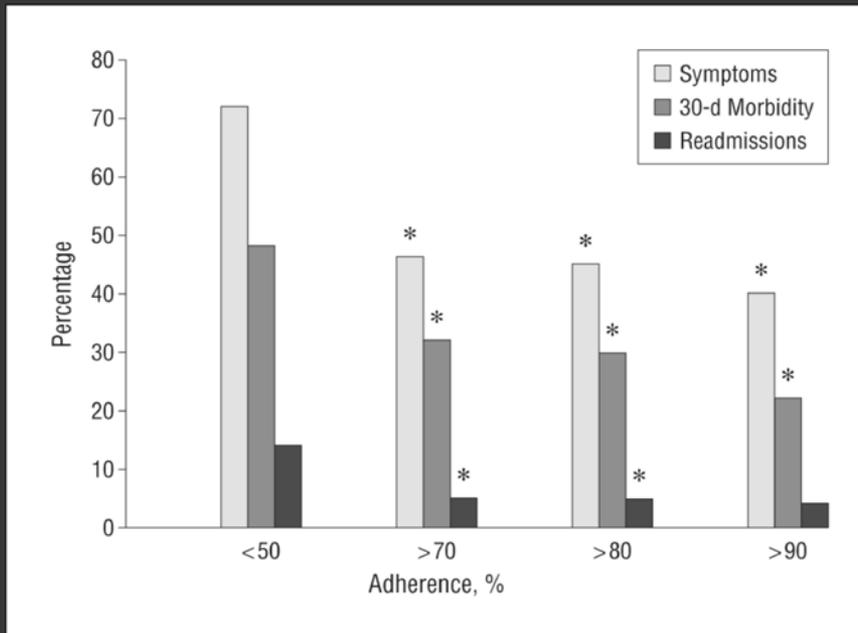
### ◎ 400 patients

- Sexe féminin ( $p=0.010$ )
- Laparoscopie ( $p=0.009$ )
- Diète normale PO # 1-2-3 9 ( $p<0.001$ )
- Mobilisation > 540 min PO #1-2-3 ( $p<0.001$ )

ONLINE FIRST

# Adherence to the Enhanced Recovery After Surgery Protocol and Outcomes After Colorectal Cancer Surgery

Ulf O. Gustafsson, MD, PhD; Jonatan Hausel, MD; Anders Thorell, MD, PhD; Olle Ljungqvist, MD, PhD; Mattias Soop, MD, PhD; Jonas Nygren, MD, PhD; for the Enhanced Recovery After Surgery Study Group



- Liquides IV per-opératoires
- Liquides hyperglucidiques

## Figure Legend:

Association between adherence to the enhanced recovery after surgery protocol and postoperative outcomes. \*Statistically significant at  $P < .05$ .

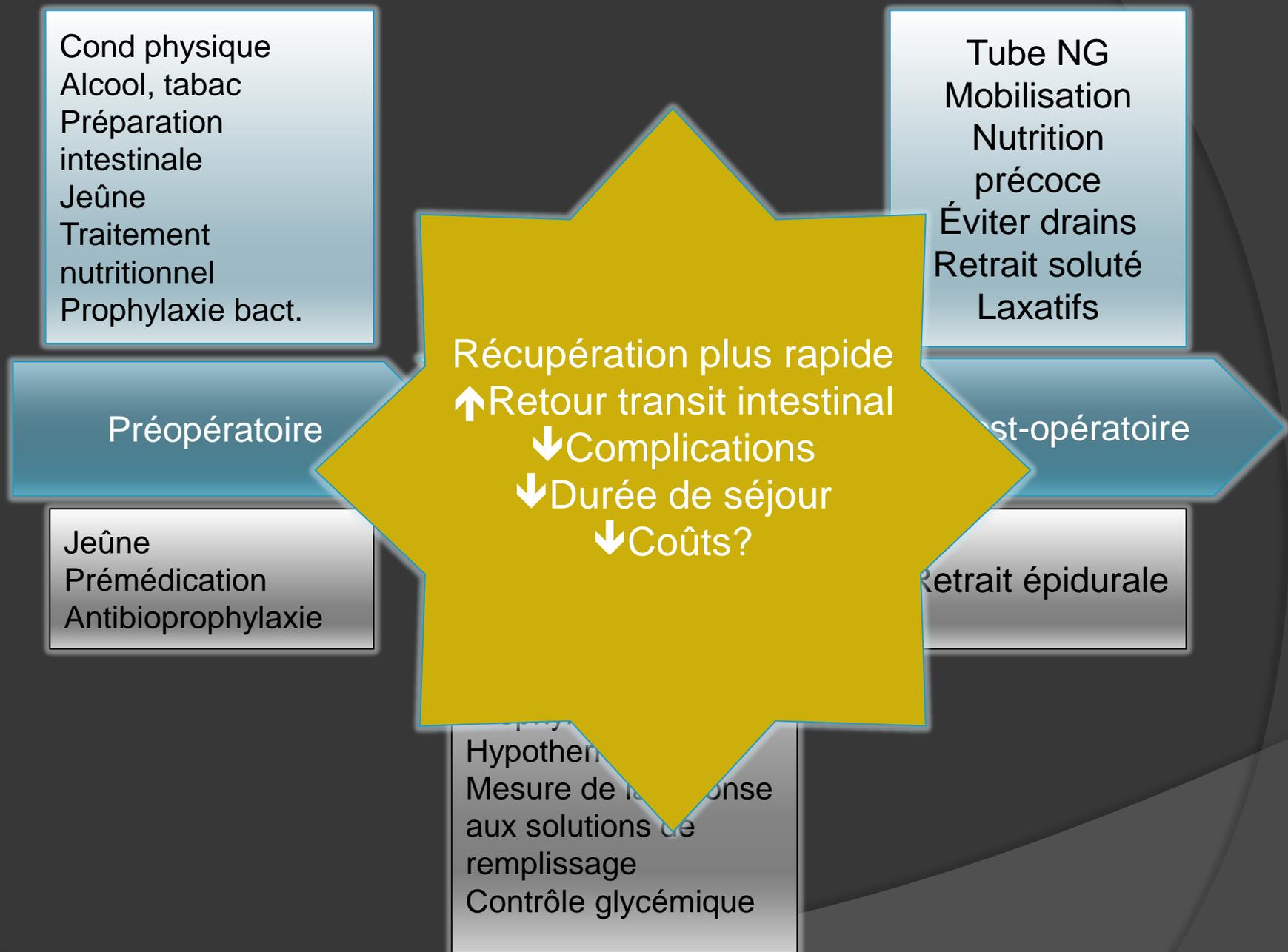
## **A Fast-Track Program Reduces Complications and Length of Hospital Stay After Open Colonic Surgery**

SVEN MULLER,<sup>\*,‡</sup> MARCO P. ZALUNARDO,<sup>§</sup> MARTIN HUBNER,<sup>‡</sup> PIERRE A. CLAVIEN,<sup>\*</sup> NICOLAS DEMARTINES,<sup>\*,‡</sup> and the Zurich Fast Track Study Group

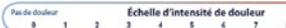
- ◎ **Facteurs d'échec (complications/séjour)**
  - Liquides excessifs (OR:4.198, p=0.002)
  - Épidurale non-fonctionnelle (OR: 3.365, p=0.008)

# Coûts

- ◎ King et al, Colrectal Dis 2006
  - 60 pts ERAS vs 86 pts
  - Pas de differences de couts à 3 mois
- ◎ Sammour et al, N Z Med J 2010
  - 50 patients ERAS avec groupe contrôle
  - -4200 € par patients à 30 jours
- ◎ Adamina et al, Surgery 2011
  - - 200\$ par patients



## Un jour après la chirurgie



**Douleur** Si votre douleur dépasse le 4 sur l'échelle de douleur, dites-le à votre infirmière.

### Activités



- Votre tube urinaire sera enlevé ce matin.
- Une fois que le tube urinaire aura été enlevé, allez uriner à la toilette.
- Avec de l'aide, levez-vous et marchez le long du couloir.
- Il est important d'alterner lit et chaise régulièrement.
- Asseyez-vous sur la chaise pour prendre tous vos repas.
- Faites vos exercices de respiration au moins 3 fois par jour.

### Repas



- Continuez à boire des liquides et les boissons riches en protéines.
- Si tout va bien, vous pourrez manger de la nourriture solide (vous pourriez avoir certaines restrictions alimentaires).
- Mâchez de la gomme pendant 30 minutes, 3 fois par jour.

Planifiez de retourner à la maison dans 2 jours.

## Après la chirurgie

### Deux jours après la chirurgie

#### Douleur

- Si les pilules contrôlent votre douleur, le cathéter épidural sera enlevé.
- Si vous avez une pompe ACP, elle sera enlevée et vous prendrez des pilules au besoin pour contrôler la douleur.
- Si vous avez une épidural, nous ferons un test d'arrêt de dosage nécessaire pour contrôler la douleur.
  - La pompe sera fermée, mais le cathéter épidural ne sera pas enlevé.
  - Votre infirmière vous donnera votre première dose de médicament pour la douleur.
  - SVP aviser votre infirmière si votre douleur est plus élevée que d'habitude.

#### Activités



- Marchez le long du couloir au moins 3 fois par jour, marchez plus longtemps chaque jour.
- Il est important d'alterner lit et chaise régulièrement.
- Asseyez-vous sur la chaise pour prendre tous vos repas.
- Levez-vous et marchez pour aller uriner à la toilette.
- Continuez à faire les exercices de respiration à toutes les heures.
- Si vous passez des gaz ou si vous allez à la selle, dites-le à votre infirmière.

#### Repas

- Mangez de la nourriture solide (vous pourriez avoir certaines restrictions alimentaires).
- Continuez à boire des liquides.
- Continuez à mâcher de la gomme pendant 30 minutes, 3 fois par jour.



Assurez-vous que quelqu'un viendra vous chercher demain matin.

## Après la chirurgie

### Trois jours après la chirurgie: Le retour à la maison

#### Activités

Le troisième jour après la chirurgie, vous devez continuer à faire les mêmes activités qu'hier et les augmenter si possible.

#### Planifiez de rentrer à la maison aujourd'hui avant 11 heures

Si vous ne pouvez pas quitter l'hôpital avant 11 heures, vous pouvez vous rendre à l'une des salles d'attente réservées aux patients qui sont situées sur chaque étage. Nous devons préparer votre chambre pour l'arrivée du prochain patient.

Avant votre départ, on vous donnera un rendez-vous pour un suivi avec votre chirurgien(ne).

Nom du(de la) chirurgien(ne): \_\_\_\_\_  
Date et heure du rendez-vous: \_\_\_\_\_



### Résumé

Des études démontrent qu'en faisant vos exercices de respiration, en mâchant de la gomme, en ayant une bonne alimentation, en sortant du lit et en marchant de façon régulière, vous guérirez plus rapidement. Vous risquez moins d'avoir des infections pulmonaires ou des problèmes de circulation et vos intestins deviendront stables plus rapidement. En évitant tous ces problèmes, vous augmentez vos chances de rentrer à la maison plus tôt et de vous sentir mieux plus rapidement.

# Défis: adhésion

- ⦿ Changement de culture
- ⦿ Susciter intérêt/implication
  - Chirurgiens
  - Anesthésiologistes
- ⦿ Soutien de l'administration

# Défis: implantation

- ⊙ Formation intensive
  - Infirmières pré-op
  - Infirmières étages
  - PAB
- ⊙ Lourdeurs administratives
  - Protocoles pour uniformiser pratiques
  - Formulaires / OIP
- ⊙ Bien informer/accompagner patients
- ⊙ Éliminer variabilités pratiques

# Défis: maintien

- ⊙ Engager infirmière responsable
  - Données
  - Respect du protocole
  
- ⊙ Audit
  - Suivi des résultats locaux
  - Mesurer compliance
  - Diffuser information aux intervenants

# Défis: coût

- ⊙ Infirmière responsable
  - Suivi des patients
  - Suivi avec MD/ résidents
  - Collection des données
  
- ⊙ Inscription à ERAS

# Conclusion

## ⦿ ERAS

- Revoir nos pratiques
  - Jeûne, Analgésie, Gestion des fluides et contrôle des nausées/vomissements
- Adopter le protocole dans son ensemble
- Avoir toute l'équipe abord
- Convaincre la direction d'investir les ressources

# Fin

