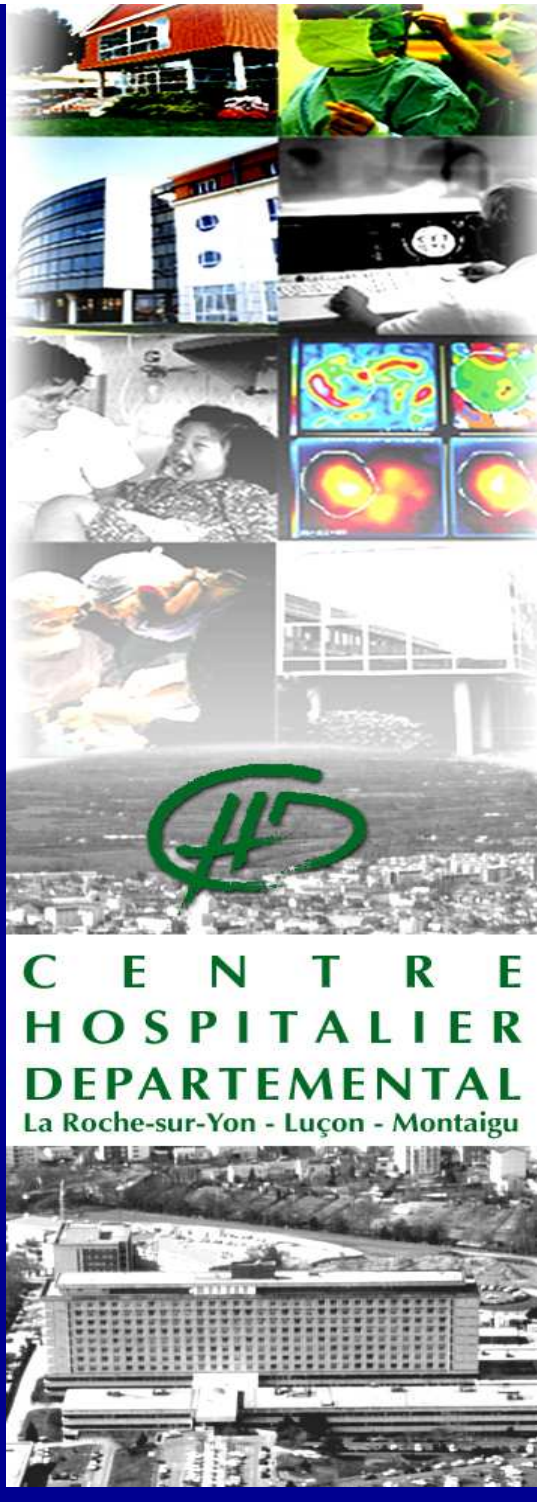
Société
de Réanimation
de Langue Française

Gestion du résidu gastrique en réanimation

Jean Reignier, M.D.
Service de réanimation
CHD de la Vendée
La Roche sur Yon



- **Déclaration d'intérêts de M. Jean REIGNIER**

➢ **Activités de conseil, fonctions de gouvernance, rédaction de rapports**
Non

➢ **Essais cliniques, autres travaux, communications de promotion**
Non

➢ **Intérêts financiers (actions, obligations)**
Non

➢ **Liens avec des personnes ayant des intérêts financiers ou impliquées dans la gouvernance**
Non

➢ **Réception de dons sur une association dont je suis responsable**
Non

➢ **Perception de fonds d'une association dont je suis responsable et qui a reçu un don**
Non

➢ **Détention d'un brevet, rédaction d'un ouvrage utilisé par l'industrie**
Non

Canadian Clinical Practice Guidelines for Nutrition Support in Mechanically Ventilated, Critically Ill Adult Patients*

Daren K. Heyland, MD, FRCPC, MSc*; Rupinder Dhaliwal, RD*; John W. Drover, MD, FRCSC, FACS†; Leah Gramlich, MD, FRCPC‡; Peter Dodek, MD, MHSc§; and the Canadian Critical Care Clinical Practice Guidelines Committee

JOURNAL OF PARENTERAL AND ENTERAL NUTRITION

ESPEN Guidelines on Enteral Nutrition: Intensive care ☆

K.G. Kreymann[a,*], M.M. Berger[b], N.E.P. Deutz[c], M. Hiesmayr[d], P. Jolliet[e], G. Kazandjiev[f], G. Nitenberg[g], G. van den Berghe[h], J. Wernerman[i], DGEM: ☆☆ C. Ebner, W. Hartl, C. Heymann, C. Spies

Clinical Nutrition (2006) 25, 210–223

aspen Clinical Guidelines

Guidelines for the Provision and Assessment of Nutrition Support Therapy in the Adult Critically Ill Patient:

Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.)

Stephen A. McClave, MD; Robert G. Martindale, MD, PhD; Vincent W. Vanek, MD; Mary McCarthy, RN, PhD; Pamela Roberts, MD; Beth Taylor, RD; Juan B. Ochoa, MD; Lena Napolitano, MD; Gail Cresci, RD; the A.S.P.E.N. Board of Directors; and the American College of Critical Care Medicine

Journal of Parenteral and Enteral Nutrition
Volume 33 Number 3
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10.1177/0148607109335234
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http://online.sagepub.com

- **EN** is the preferred route of feeding over parenteral nutrition for the critically ill patient who requires nutrition support therapy.
- Enteral feeding should be started early within the first **24-48 hours following admission**.

Delayed gastric emptying in ventilated critically ill patients: Measurement by ^{13}C-octanoic acid breath test

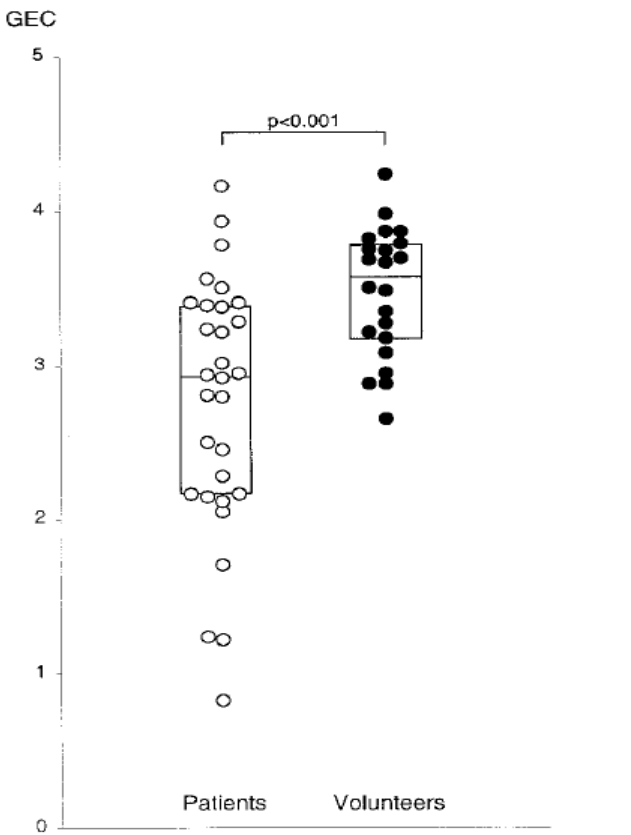
Marc A. Ritz, MD; Rob Fraser, MD, PhD; Nick Edwards, MD; Addolorata C. Di Matteo, BSc (Hons); Marianne Chapman, MD; Ross Butler, MD, PhD; Patricia Cmielewski, BSc; Jean-Pierre Tournadre, MD; Geoff Davidson, MD, PhD; John Dent, MD, PhD

Crit Care Med 2001

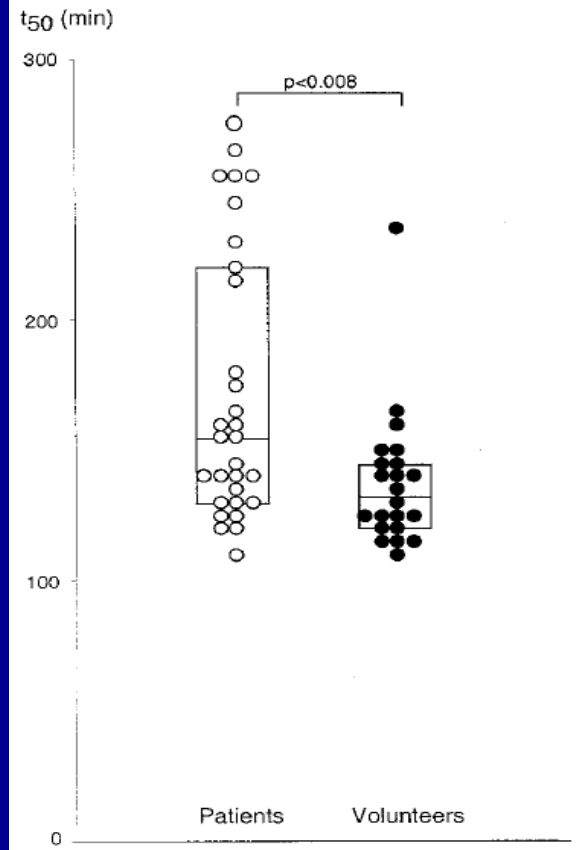
- 30 patients treated with mechanical ventilation
- 23 healthy volunteers

➢ Assessment of gastric emptying with a noninvasive breath test after intragastric infusion of a liquid meal labeled with 13C-octanoic acid

Gastric emptying coefficient



Gastric half emptying time



→ slow gastric emptying in 40% to 45% of the patients

Upper digestive intolerance during enteral nutrition in critically ill patients: Frequency, risk factors, and complications

Hervé Mentec, MD; Hervé Dupont, MD; Maria Bocchetti, RN; Pascale Cani, RN; Frédérique Ponche, RN; Gérard Bleichner, MD

Crit Care Med 2001

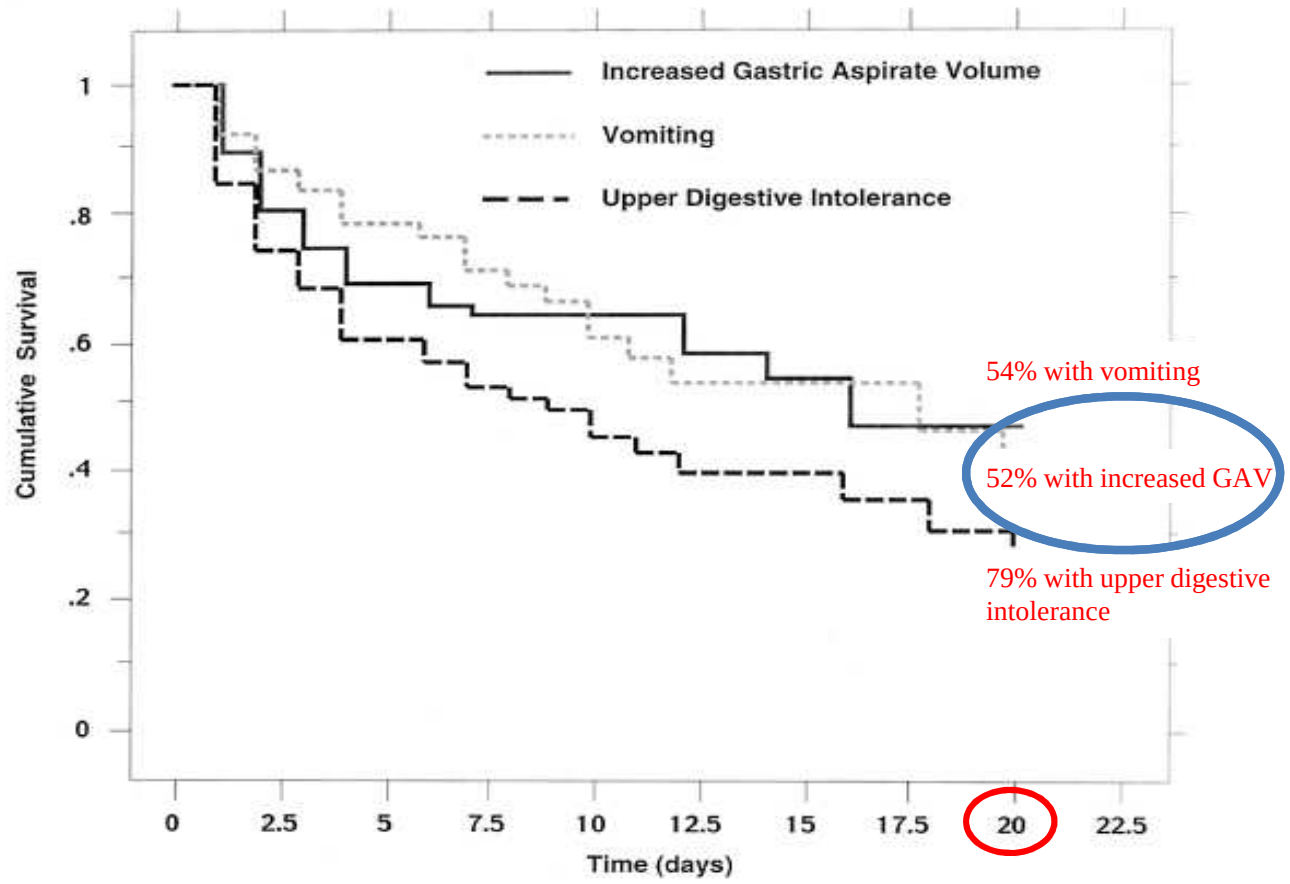


Figure 2. Cumulative survival without feeding intolerance during enteral nutrition in 153 intensive care unit patients.

-Prospective observational study
-153 patients
-Nasogastric feeding

70 (46%) patients intolerant to enteral nutrition

Causes of inadequate delivery of enteral nutrition in ICU

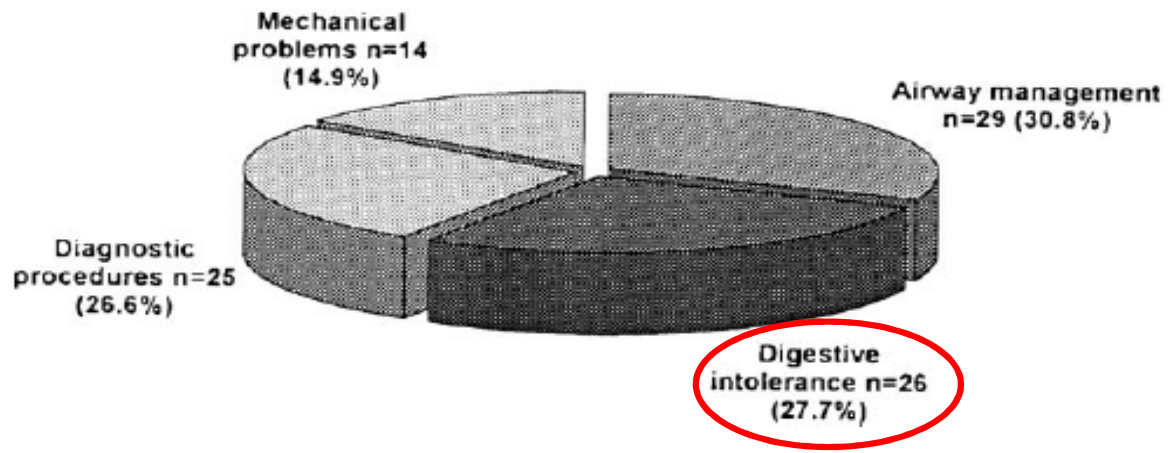
A prospective survey of nutritional support practices in intensive care unit patients: What is prescribed? What is delivered?

Bernard De Jonghe, MD; Corinne Appere-De-Vechi, MD; Muriel Fournier; Beatrice Tran, MD; Jacques Merrer, MD; Jean-Claude Melchior, MD, PhD; Herve Outin, MD

Crit Care Med 2001

-Prospective cohort study
-51 patients
-Single ICU

Reasons for difference between prescription and delivery during enteral feeding



Digestive intolerance is a major cause of inadequate delivery of enteral nutrition

Mean daily wasted volume due to digestive intolerance = 641 ± 301 mL

Upper digestive intolerance during enteral nutrition in critically ill patients: Frequency, risk factors, and complications

Mentec Crit Care Med 2001

Intolerance to enteral nutrition and risk of nosocomial pneumonia

	Normal GAV (n = 104)	Increased GAV (n = 49)	*p*
Mean caloric intake, kcal/kg/day	20 ± 8	15 ± 8	.0005
Diarrhea (%)	26 (25)	10 (20)	.53
Vomiting during survey (%)	21 (20)	19 (39)	.02
Vomiting after start of EN (%)	24 (23)	26 (53)	.0002
Pneumonia after start of EN (%)	30 (29)	20 (41)	.14
ICU length of stay, days	17 ± 20	22 ± 16	.09
ICU mortality (%)	30 (29)	20 (41)	.14
Hospital mortality (%)	44 (42)	27 (55)	.14

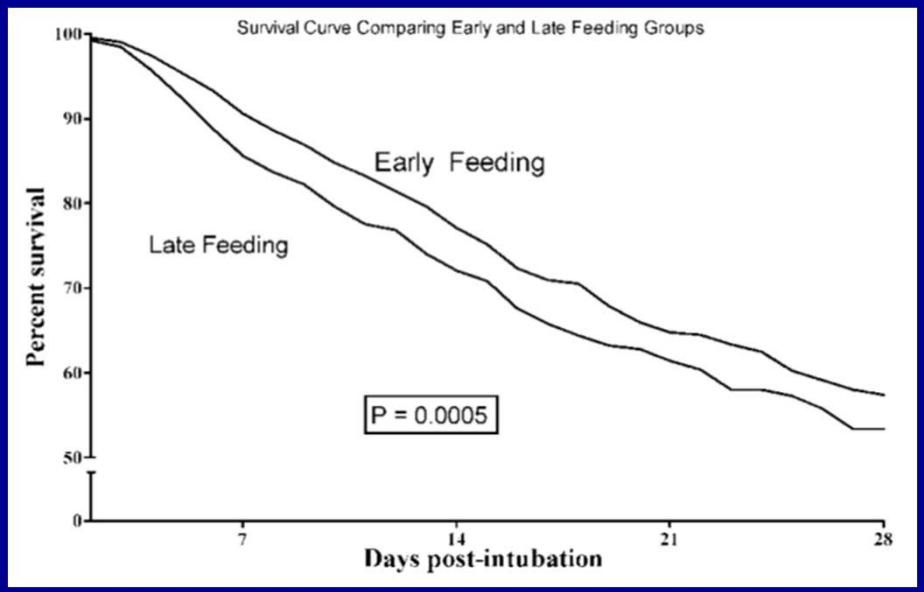
As compared to patients with normal GV, more patients with increased GV had VAP.

As compared to patients without VAP, more patients with VAP vomited during the survey.

	No Pneumonia After Start of EN (n = 103)	Pneumonia After Start of EN (n = 50)	*p*
Maximum SOFA score	7 ± 4	8 ± 4	.07
% Days with sedation	33 ± 42	49 ± 43	.03
% Days with prone position	4 ± 17	7 ± 20	.46
Increased GAV during survey (%)	29 (28)	20 (40)	.14
Vomiting during survey (%)	22 (21)	18 (36)	.05
UDI during survey (%)	40 (39)	30 (60)	.01

Effects of Early Enteral Feeding on the Outcome of Critically Ill Mechanically Ventilated Medical Patients*

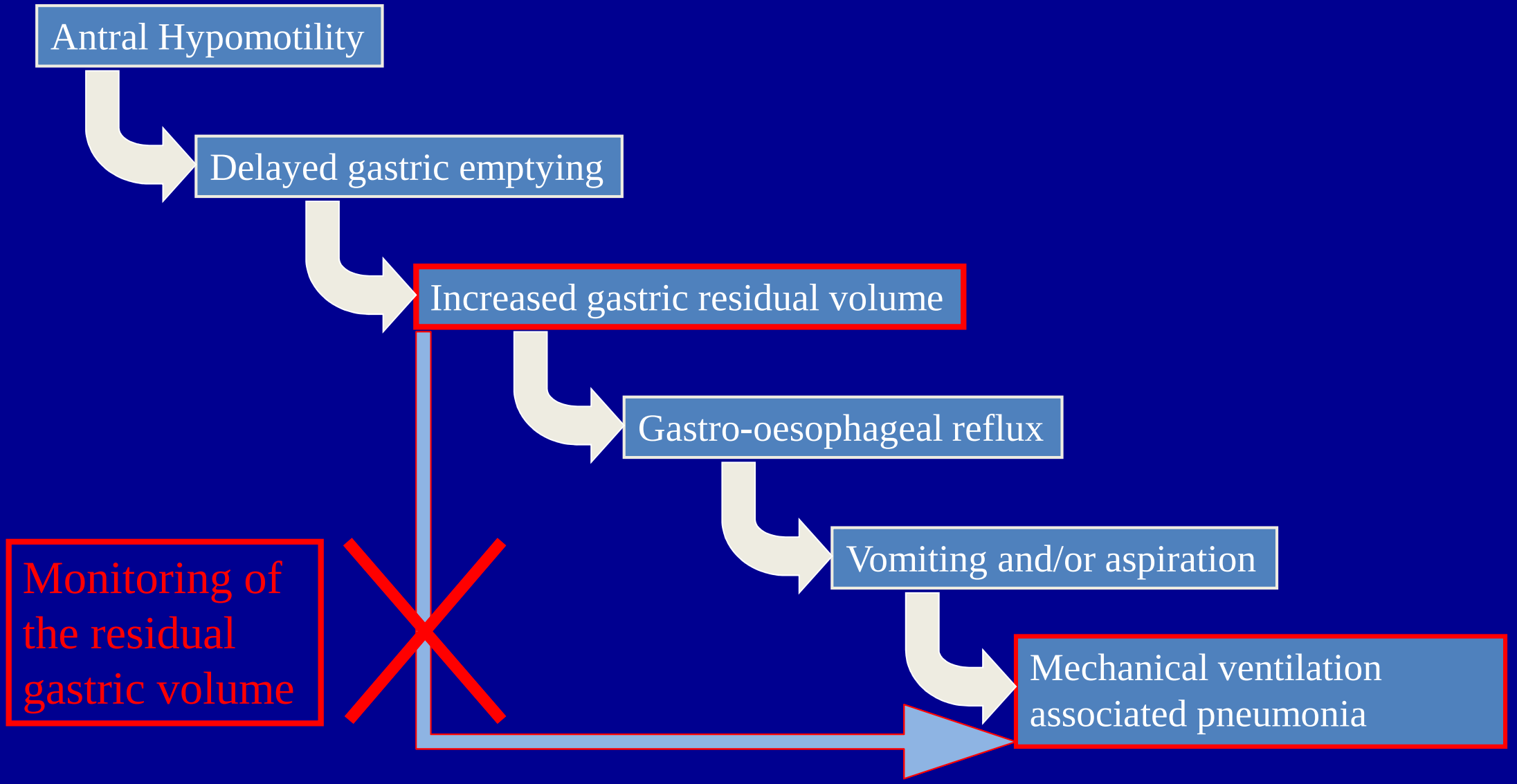
Artinian Chest 2006.



4049 patients treated with mechanical ventilation
Retrospective analysis of a database
Comparison of early and late enteral feeding

Characteristics	Early Feeding Group (n = 1,264)	Late Feeding Group (n = 1,264)	p Value
ICU mortality	222 (17.6)	268 (21.3)	0.02
Hospital mortality	349 (27.8)	431 (34.2)	0.0005
VAP	163 (12.9)	120 (9.5)	0.007
ICU length of stay, d	11.2 ± 8.2	10.4 ± 8.0	0.006
Ventilator-free days, No.†	16.8 ± 8.9	16.8 ± 9.9	0.84

From gastric hypomotility to nosocomial pneumonia



Guidelines and residual gastric volume

« Chez l'adulte, à la phase initiale, la survenue d'une intolérance digestive haute doit être recherchée par la mesure du volume résiduel gastrique toutes les 4 à 6 h, sans nécessité d'interrompre la nutrition [*A.faible*]. Le seuil définissant l'intolérance gastrique, le plus souvent retenu « à dire d'expert » est de 150 à 300 ml [*A.faible*]».

Thuong. Recommandations des experts de la Société de Réanimation de Langue Française. Nutrition entérale en réanimation. *Réanimation 2003*

« Administration of metoclopramide or erythromycin should be considered in patients with intolerance to enteral feeding e.g. with high gastric residuals (C) ».

Kreyman. ESPEN Guidelines on Enteral Nutrition: Intensive care. *Clinical Nutrition 2006*

« Gastric residual volumes in the range of 200-500 mL should raise concern and lead to the implementation of measures to reduce risk of aspiration, but automatic cessation of feeding should not occur for gastric residual volumes <500 mL in the absence of other signs of intolerance».

McClave. Guidelines for nutrition support therapy in the adult critically ill patient. JPEN 2009

However …

The myth of the gastric residual volume*

Gary O. Zaloga, Crit Care Med 2005

The measurement of residual gastric volume is not standardized

The measurement of residual gastric volume is not standardized

Values of gastric residuals obtained may vary with:

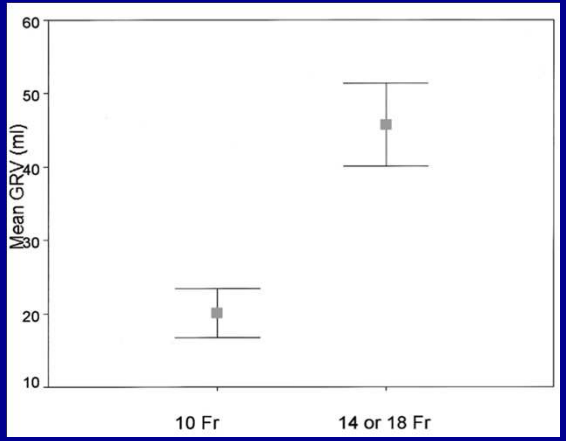
- Properties of the tube (diameter, obstruction of the tube lumen, number of tube openings)
- Physical properties of the gastric fluid
- Level of aspiration
- Patients positioning
- The position of the tube in the stomach
- Training of the care giver performing the aspiration

Effect of Feeding-Tube Properties on Residual Volume Measurements in Tube-Fed Patients

Norma A. Metheny, RN, PhD, FAAN*; Jena Stewart, RN, MSN*; Gretel Nuetzel, RN, BSN*;
Dana Oliver, MPH†; and Ray E. Clouse, MD‡

Journal of Parenteral and Enteral Nutrition, 2005

Comparisons of GRV measurements from 10-Fr tubes (n = 645) and 14-Fr or 18-Fr sump tubes (n = 645) in 62 critically ill patients.



GRVs obtained from large-diameter sump tubes are about 1.5 times greater than those obtained from 10-Fr tubes.

Examination of accuracy in the assessment of gastric residual volume: a simulated, controlled study.

Bartlett Ellis, Journal of Parenteral and Enteral Nutrition, 2014

RGV were underestimated (19% average).
Values obtained varied with:

- Aspiration (level, continuous or intermittent…)
- Viscosity of the fluid
- Diameter of the tube

Definition, prevalence, and outcome of feeding intolerance in intensive care: a systematic review and meta-analysis

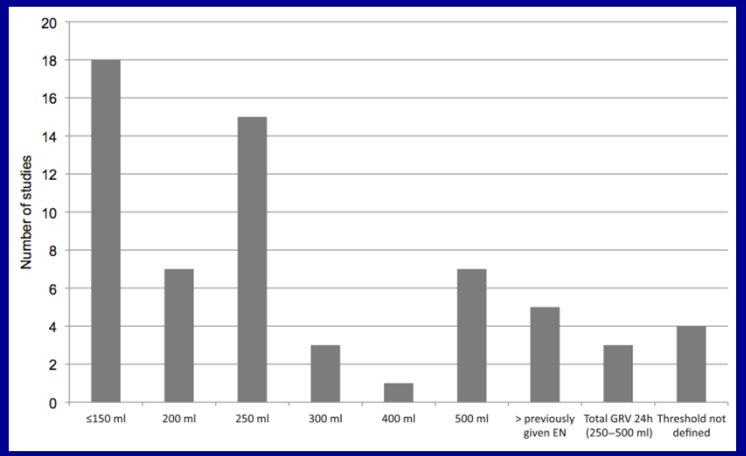
A. Reintam Blaser[1], J. Starkopf[1,2], Ü. Kirsimägi[3] and A. M. Deane[4,5]

Acta Anaesthesiol Scand 2014

72 studies → 43 different definitions of feeding intolerance.

Definitions from 31 studies could be classified into four categories:
1.presence of GI symptoms and/or large GRV: 17 studies (3227 patients)
2.'large' gastric residual volumes (GRVs): 110 studies (3227 patients)
3.presence of GI symptoms (diarrhea or vomiting): 3 studies (322 patients)
4.inadequate delivery of EN (<80% of target or <750ml/24h): 2 studies (172 patients)

The median GRV threshold considered to be large was 250 ml
More than 8 different threshold values: range 75 to 500 ml.
No threshold values in 4 studies



No consensus on the RGV cut-off value

« Chez l'adulte, à la phase initiale, la survenue d'une intolérance digestive haute doit être recherchée par la mesure du volume résiduel gastrique toutes les 4 à 6 h, sans nécessité d'interrompre la nutrition [A.faible]. Le seuil définissant l'intolérance gastrique, le plus souvent retenu « à dire d'expert » est de **150 à 300 ml** [A.faible]».

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« Gastric residual volumes in the range of **200-500 mL** should raise concern and lead to the implementation of measures to reduce risk of aspiration, but automatic cessation of feeding should not occur for gastric residual volumes <500 mL in the absence of other signs of intolerance».

McClave. Guidelines for nutrition support therapy in the adult critically ill patient. JPEN 2009

Residual gastric volume and risk of aspiration and/or VAP

Poor validity of residual volumes as a marker for risk of aspiration in critically ill patients*

Mc Clave Crit Care Med 2005

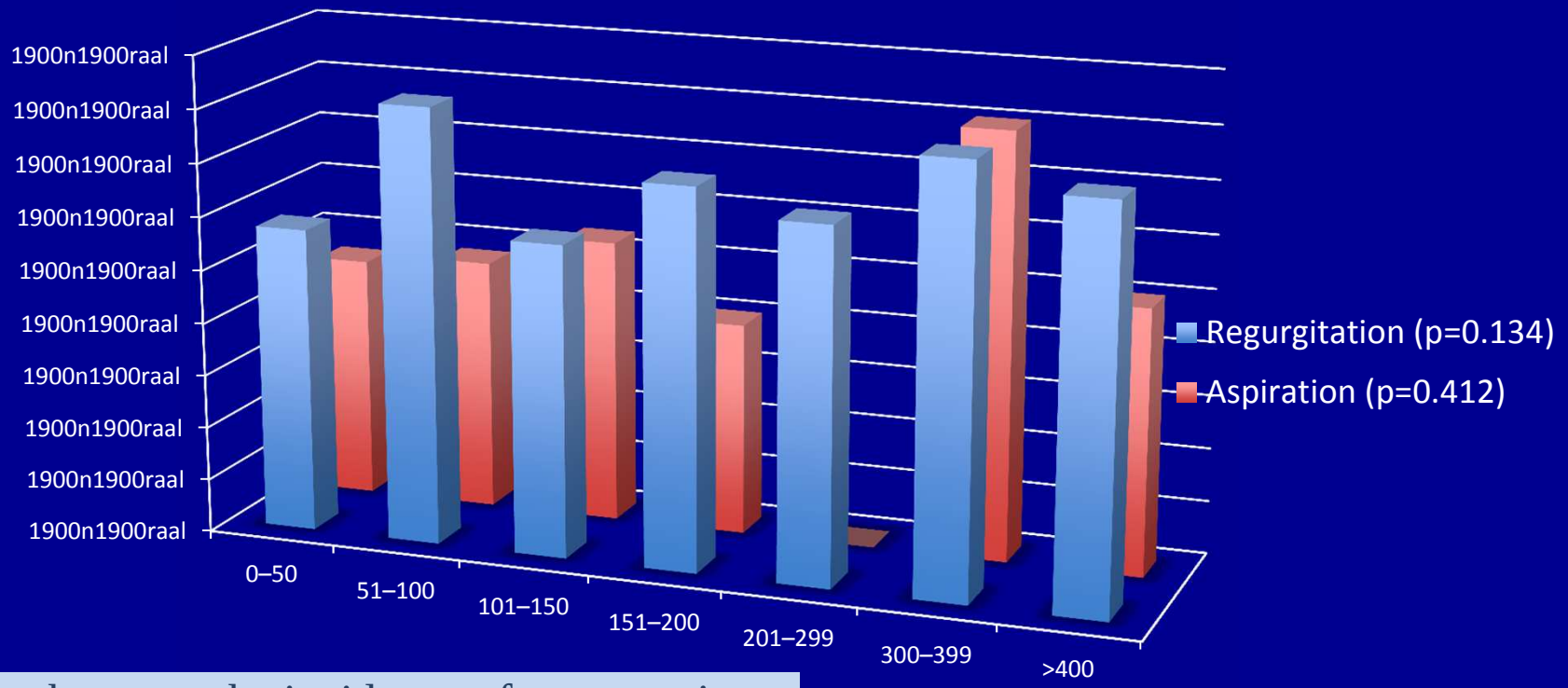
40 patients treated with invasive mechanical ventilation receiving EN (25 kcal/kg/day)

EN solution labelled with yellow microscopic colorimetric microspheres

Regurgitation and aspiration assessed by evaluating pharyngeal and trachal samples by colorimetric fluorometry

RGV measured every 4 hrs during 3 days

No correlation between RGV values and rates of aspiration or pneumonia.



There was no correlation between the incidence of pneumonia and the frequency of regurgitation or aspiration.

Poor validity of residual volumes as a marker for risk of aspiration in critically ill patients*

Mc Clave Crit Care Med 2005

Residual Volume Cutoff	Sensitivity (133 Events)	Specificity (454 Nonevents)	Predictive Value Positive[a]	Predictive Value Negative[b]
150	0.045	0.941	0.182 (33+)	0.771 (554−)
200	0.030	0.958	0.174 (23+)	0.771 (564−)
300	0.023	0.982	0.273 (11+)	0.774 (576−)
400	0.015	0.987	0.250 (8+)	0.774 (579−)

- Extremely low sensitivity of RV to detect aspiration (not improved significantly by reducing the cutoff value from 400 to 150 mL).
- Poor positive predictive values.

J. C. Montejo
E. Miñambres
L. Bordejé
A. Mesejo
J. Acosta
A. Heras
M. Ferré
F. Fernandez-Ortega
C. I. Vaquerizo
R. Manzanedo

Gastric residual volume during enteral nutrition in ICU patients: the REGANE study

Intensive Care Med 2009

- Multicenter RCT (28 ICU)
- GRV: 200 ml vs 500ml
- 322 patients with mechanical ventilation and indication for EN for at least 5 days

	Control (GRV: 200)	Study (GRV: 500)	*P*
Mechanical ventilation (days)	14.7 ± 13.1	15.6 ± 13.6	0.36
ICU stay (days)	19.8 ± 15.8	20.7 ± 16.2	0.50
Pneumonia[a]	27.3%	28.0%	0.88
Ventilator-free days	5.1 ± 6.4	5.1 ± 8.0	0.28
SOFA day 5	6.3 ± 3.3	6.2 ± 3.2	0.48
SOFA day 10	5.0 ± 3.2	5.3 ± 3.0	0.75
ICU mortality[a]	15.7%	19.8%	0.28
Hospital mortality[a]	33.6%	33.9%	0.53

The stomach is not the main reservoir for VAP pathogens

- Torres A. **Gastric and pharyngeal flora in nosocomial pneumonia acquired during mechanical ventilation.** *Am Rev Respir Dis. 1993.*
- Bonten MJ. **The stomach is not a source for colonization of the upper respiratory tract and pneumonia in ICU patients**. *Chest. 1994.*
- Pingleton SK. Enteral nutrition in patients receiving mechanical ventilation: **multiple sources of tracheal colonization** include the stomach. *Am J Med. 1986.*
- M. Garrouste-Orgeas. **Oropharyngeal or Gastric Colonization and Nosocomial Pneumonia in Adult Intensive Care Unit Patients A Prospective Study Based on Genomic DNA Analysis.** *Am J Respir Crit Care Med 1997.*
- Bonten MJ. **Ventilator-associated Pneumonia and the Gastropulmonary Route of Infection A Pendulum.** *Am J Respir Crit Care Med 2011*

Residual gastric volume and risk of inadequate feeding

Increased gastric residual volume

↓

Cessation of enteral feeding

Enteral tube feeding in the intensive care unit: Factors impeding adequate delivery *McClave. Crit Care Med 1999*

44 patients
339 days with enteral feeding

Reasons for Cessation	Procedures	RV	Tube	Diag	Nurs	Other
Patients affected (%)	39	45	41	27	30	32
Infusion time lost (%)	6.4	2.8	1.4	0.8	0.3	6.6
Cessation time (%)	34.99	15.14	7.66	4.62	1.43	36.15
Avoidable (%)	80.13	69.79	66.52	51.82	99.21	51.77

RV, residual volume; Tube, tube displacement; Diag, diagnostic tests; Nurs, nursing care.

An increased residual gastric volume was the first reason for cessation of enteral nutrition delivery

Increased gastric residual volume

↓

Cessation of enteral feeding

↓

Decreased caloric intake

	Normal GAV (n = 104)	Increased GAV (n = 49)	*p*
Mean caloric intake, kcal/kg/day	20 ± 8	15 ± 8	.0005
Diarrhea (%)	26 (25)	10 (20)	.53
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Hospital mortality (%)	44 (42)	27 (55)	.14

Mentec. Crit Care Med 2001

Bedside adherence to clinical practice guidelines for enteral nutrition in critically ill patients receiving mechanical ventilation: a prospective, multi-centre, observational study

Jean-Pierre Quenot[1*], Gaetan Plantefeve[2], Jean-Luc Baudel[3], Isabelle Camilatto[4], Emmanuelle Bertholet[5], Romain Cailliod[6], Jean Reignier[7], Jean-Philippe Rigaud[8]

CRITICAL CARE 2010

Table 3 Variables influencing the total ratio of delivered to prescribed calories over the seven-day study period by univariate analysis

Variable	Number of patients	% prescribed/required	*P* value	% delivered/prescribed	*P* value
Hospital type			0.91		0.67
Academic	89	70 (59-78)		86 (79-97)	
Community	114	72 (63-80)		87 (80-97)	
Local protocol			0.38		0.94
Yes	137	73 (65-79)		88 (81-100)	
No	66	66 (59-73)		84 (79-98)	
Sedation			0.86		0.03
Yes	150	66 (58-78)		89 (82-101)	
No	53	62 (54-71)		80 (71-87)	
Vasoactive drugs			0.32		0.77
Yes	102	70 (59-79)		88 (81-99)	
No	101	72 (61-80)		86 (79-92)	
GRV measured			0.002		0.01
Yes	135	68 (59-77)		83 (76-89)	
No	68	77 (69-84)		95 (90-104)	
Number of interruptions					
<5	180	71 (63-79)	0.42	71 (66-78)	0.08
>5	23	69 (58-75)		65 (59-72)	

Monitoring of RGV = 38% increase in the risk of having a low ratio of delivered/prescribed calories.

The myth of the gastric residual volume*

Gary O. Zaloga, Crit Care Med 2005

Measurement not standardized
No validated cut off value ("normal" value ?)
Unreliable for predicting aspiration
No clear relationship between gastric colonization and VAP
Monitoring associated with decreased caloric intake
Increased work load

Clinical utility of residual gastric volume monitoring to prevent VAP ?

Original Communications

Impact of Not Measuring Residual Gastric Volume in Mechanically Ventilated Patients Receiving Early Enteral Feeding: A Prospective Before–After Study

Poulard Fanny[1]; Jerome Dimet, PharmD[2]; Laurent Martin-Lefevre, MD[1]; Frederic Bontemps, MD[1]; Maud Fiancette, MD[1]; Eva Clementi, MD[1]; Christine Lebert, MD[3]; Benoit Renard, MD[1]; and Jean Reignier, MD, PhD[1,4]

Journal of Parenteral and Enteral Nutrition
Volume XX Number X
Month XXXX xx-xx

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http://jpen.sagepub.com
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http://online.sagepub.com

	RGV monitoring (n = 102)	No RGV (n = 103)	*P* Value
Enteral nutrition (mL/d)[a]	1381 [1151–1591]	1489 [1349–1647]	.002
Intolerance to enteral nutrition, n (%)	47 (46.1)	27 (26.2)	.004
Vomiting, n (%)	25 (24.5)	27 (26.2)	.87
Ventilation-associated pneumonia, n (%)	20 (19.6)	19 (18.4)	.86

Jean Reignier, MD, PhD
Emmanuelle Mercier, MD
Amelie Le Gouge, MSc
Thierry Boulain, MD
Arnaud Desachy, MD
Frederic Bellec, MD
Marc Clavel, MD
Jean-Pierre Frat, MD
Gaetan Plantefeve, MD
Jean-Pierre Quenot, MD
Jean-Baptiste Lascarrou, MD
for the Clinical Research in Intensive Care and Sepsis (CRICS) Group

CARING FOR THE CRITICALLY ILL PATIENT

Effect of Not Monitoring Residual Gastric Volume on Risk of Ventilator-Associated Pneumonia in Adults Receiving Mechanical Ventilation and Early Enteral Feeding

A Randomized Controlled Trial

JAMA 2013

- Multicenter, noninferiority trial NUTRIREA 1

- To test the hypothesis that absence of residual gastric volume monitoring is not associated with an increased incidence of VAP compared with routine residual gastric volume monitoring in patients receiving invasive mechanical ventilation and early enteral nutrition.

CARING FOR THE CRITICALLY ILL PATIENT

Effect of Not Monitoring Residual Gastric Volume on Risk of Ventilator-Associated Pneumonia in Adults Receiving Mechanical Ventilation and Early Enteral Feeding
A Randomized Controlled Trial

Participants

Inclusion criteria:

- Adults (aged >18 years)
- expected to require more than 48 hours of invasive mechanical ventilation
- started on enteral nutrition via a nasogastric tube within 36 hours after intubation.

Exclusion criteria:

- abdominal surgery within the past month
- history of esophageal, duodenal, pancreatic, or gastric surgery
- bleeding from the esophagus, stomach, or bowel
- contraindications to prokinetic agents
- enteral nutrition via a jejunostomy or gastrostomy
- pregnancy
- treatment-limitation decisions
- current inclusion in a trial of VAP prevention, enteral nutrition tolerance, or both.

CARING FOR THE CRITICALLY ILL PATIENT

Effect of Not Monitoring Residual Gastric Volume on Risk of Ventilator-Associated Pneumonia in Adults Receiving Mechanical Ventilation and Early Enteral Feeding

A Randomized Controlled Trial

Randomization

Intervention group
= No monitoring of RGV

- Intolerance to EN based on vomiting or regurgitation

Control group
= Measurement of RGV/6hrs

- Intolerance to EN based on:
  - vomiting or regurgitation
  - or RGV > 250ml/6 hrs

Primary outcome : Proportion of patients with at least one episode of VAP within 90 days after randomization

- VAP assessed by an adjudication committee.
- 10% prestated non inferiority margin

CARING FOR THE CRITICALLY ILL PATIENT

Effect of Not Monitoring Residual Gastric Volume on Risk of Ventilator-Associated Pneumonia in Adults Receiving Mechanical Ventilation and Early Enteral Feeding
A Randomized Controlled Trial

Enteral nutrition protocol

- Enteral nutrition:
  - initiated as soon as possible, *within 36 hrs after intubation (inclusion criteria)*.
  - delivered continuously over the 24-hour cycle
  - started at the flow rate required to achieve 100% of the daily target on day 1
  - injected into a 14F nasogastric tube (chest radiograph to check that the tip of the tube was in the stomach).
- Calorie targets: 20-25Kcal/Kg/day during the first week of mechanical ventilation and 25-30 Kcal/Kg/day thereafter.
- Polymeric, isosmotic and isocaloric enteral nutrition solution until day 7 (free thereafter).
- Patients positioned in semi-recumbent position (30° et 45°).

CARING FOR THE CRITICALLY ILL PATIENT

Effect of Not Monitoring Residual Gastric Volume on Risk of Ventilator-Associated Pneumonia in Adults Receiving Mechanical Ventilation and Early Enteral Feeding
A Randomized Controlled Trial

Management of intolerance to enteral nutrition

Intervention group

➢ Intolerance to EN based on vomiting or regurgitation

Control group

➢ Intolerance to EN based on:
- vomiting or regurgitation
- or RGV > 250ml

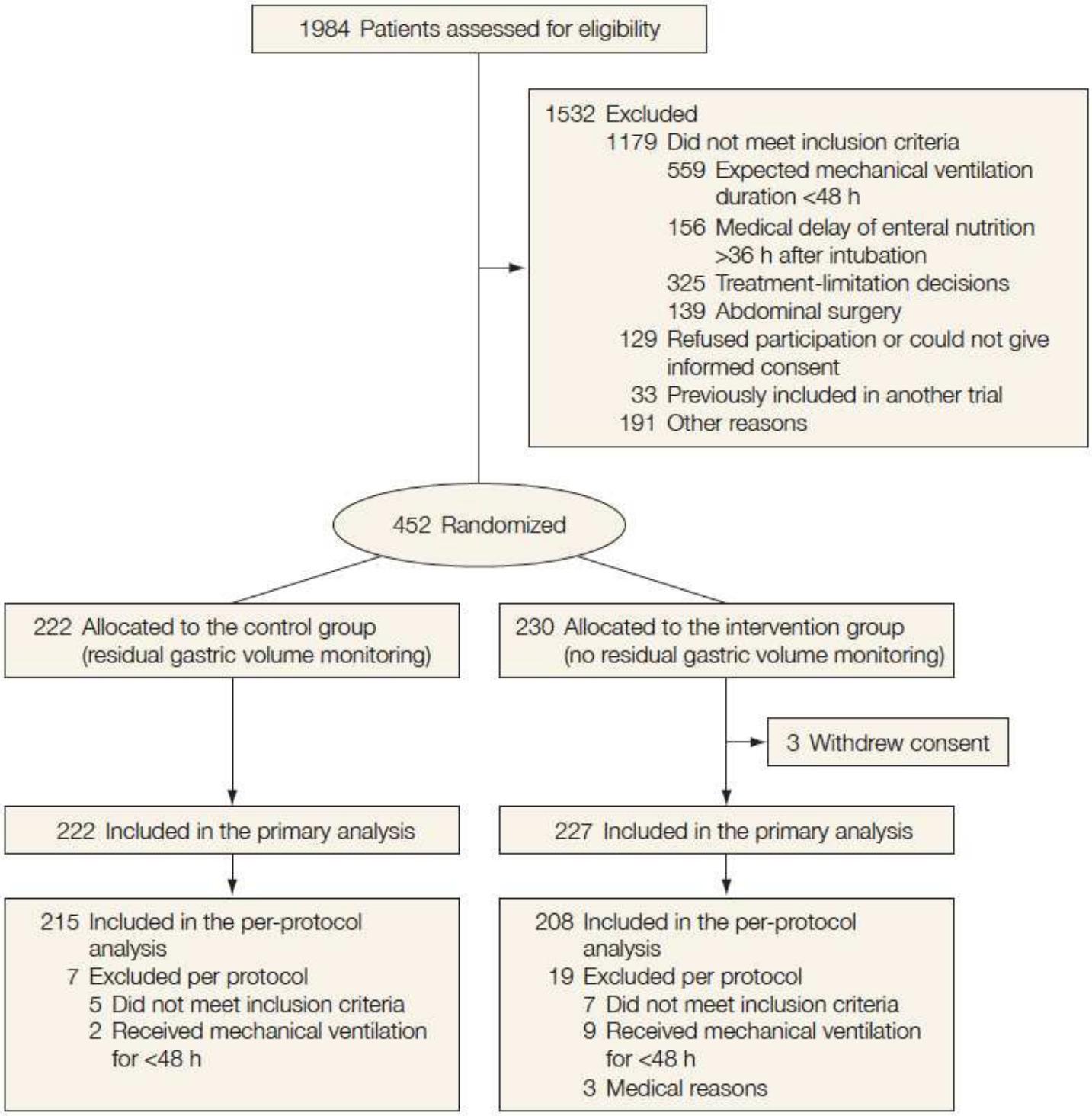
(aspirates <250ml returned to the patient)

- Discard gastric aspirate and start gastric prokinetic drug (given for 48hours)
- If intolerance persists during the 48-h period, reduce EN flow rate by 25ml/h.
- If EN flow rate <25 ml/h, stop EN and aspirate gastric content during 6 hrs.

CARING FOR THE CRITICALLY ILL PATIENT

Effect of Not Monitoring Residual Gastric Volume on Risk of Ventilator-Associated Pneumonia in Adults Receiving Mechanical Ventilation and Early Enteral Feeding

A Randomized Controlled Trial



CARING FOR THE CRITICALLY ILL PATIENT

Effect of Not Monitoring Residual Gastric Volume on Risk of Ventilator-Associated Pneumonia in Adults Receiving Mechanical Ventilation and Early Enteral Feeding
A Randomized Controlled Trial

Baseline characteristics

	Control group (RGV +) (n=222)	Intervention group (RGV -) (n=227)
Age (yrs)	62 ± 14	61 ± 15
Gender (male/female)	156/66	159/68
Weight (kg)	79±21.7	77.2±19.7
IMC (kg/m2) (mean+/- SD)	27.8±7.1	27.3±6.5
SAPS II (mean+/- SD)	51±16	49±17
SOFA at baseline (mean+/- SD)	8±3	8±4
Medical diagnosis at admission, n (%)	212 (95.5)	205 (90.3)
Diagnosis at ICU admission, n (%)		
Cardiac arrest	16 (7.2)	14 (6.1)
Acute heart failure	16 (7.2)	7 (3)
Acute central nervous failure	40 (18)	27 (11.8)
Acute respiratory failure	101 (45.5)	116 (51.5)
Sepsis	22 (9.9)	33 (14.5)
Miscellaneous	27 (12.1)	30 (13.2)
Diabetes mellitus, n (%)	48 (21.6)	42 (18.5)
Treatments, n (%)		
Vasoactive drugs	124 (55.8)	115 (50.6)
Sedative agents	192 (86.4)	188 (82.8)
Dialysis	12 (5.4)	8 (3.5)

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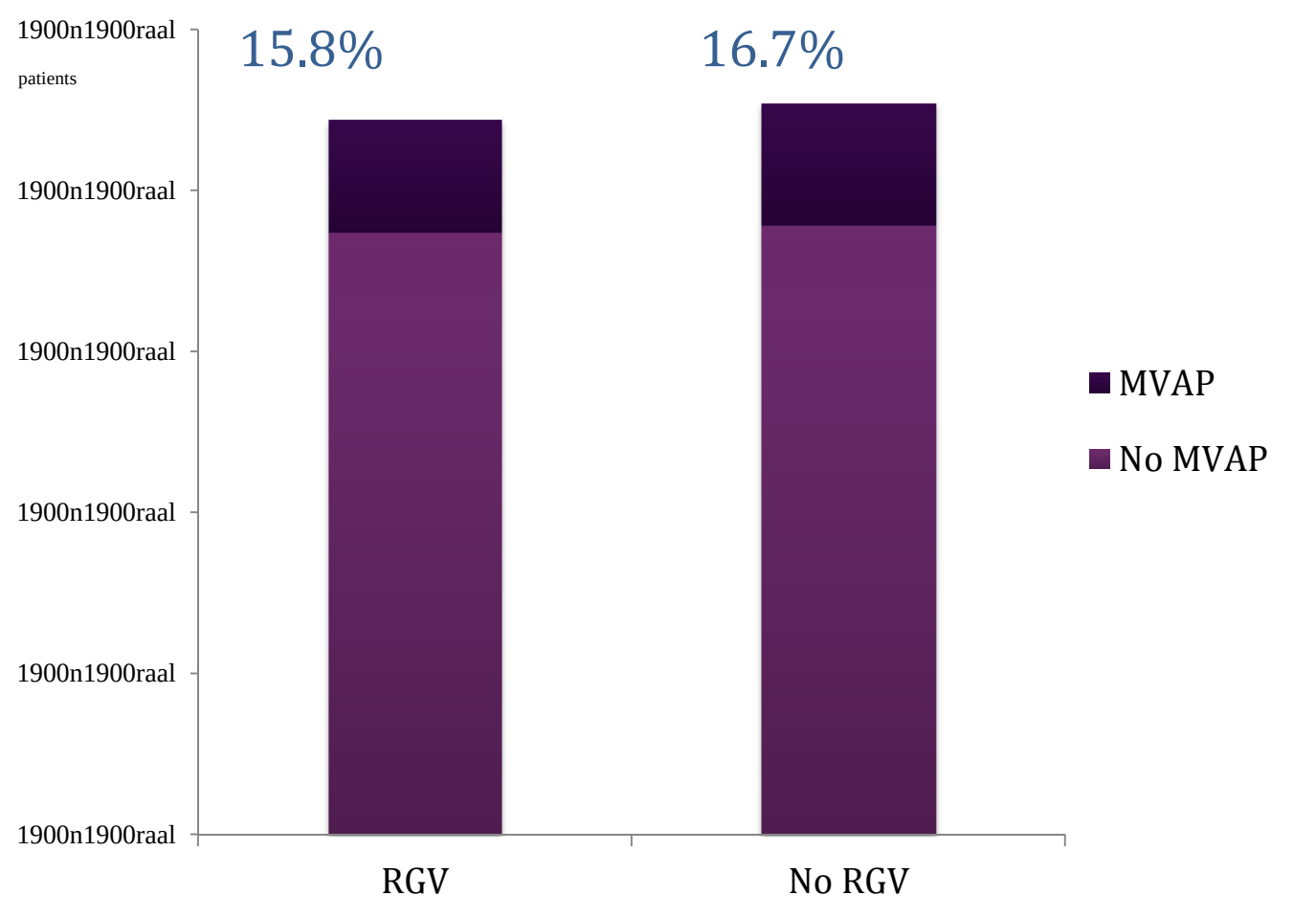
Proportion of patients with at least one episode of VAP (primary outcome)



Difference, 0.9%; 90% CI -4.8% to 6.7%

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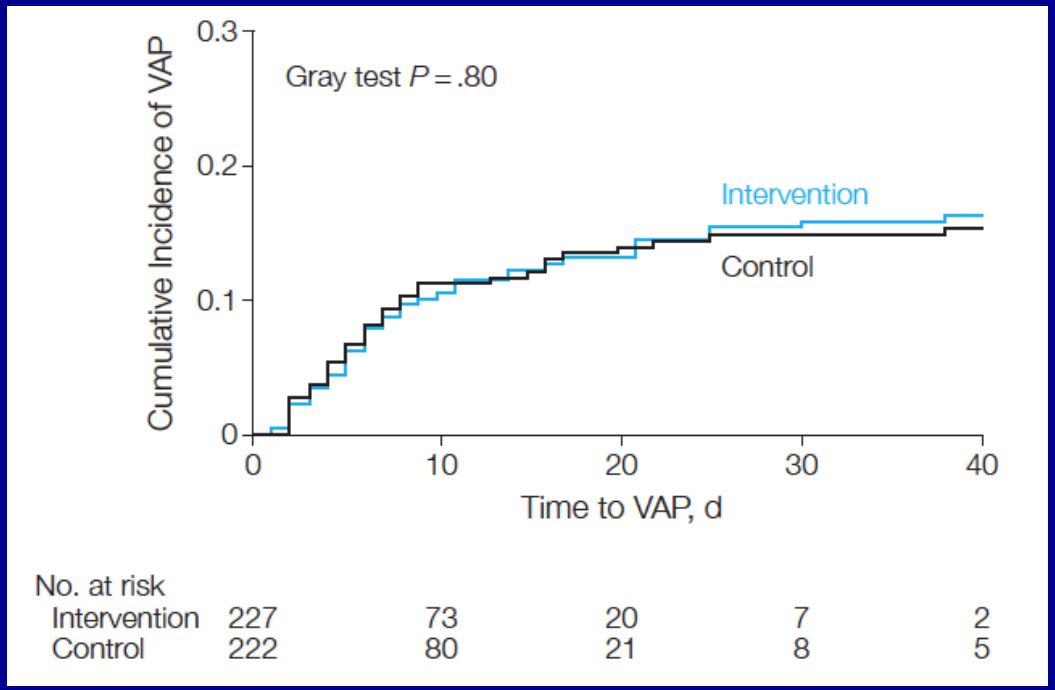
Incidence of VAP



Cumulative incidence of VAP

Total number of VAP episodes

	No-RGV group (N=227)	RGV group (N=222)
VAP episodes per patient		
0 - No. of patients (%)	189 (83.2)	187 (84.2)
1 - No. of patients (%)	33 (14.5)	29 (13.0)
2 - No. of patients (%)	5 (2.2)	5 (2.2)
4 - No. of patients (%)	0	1 (0.4)
OR (90%CI)	0.98 (0.66 to 1.43)	
P value	0.92	

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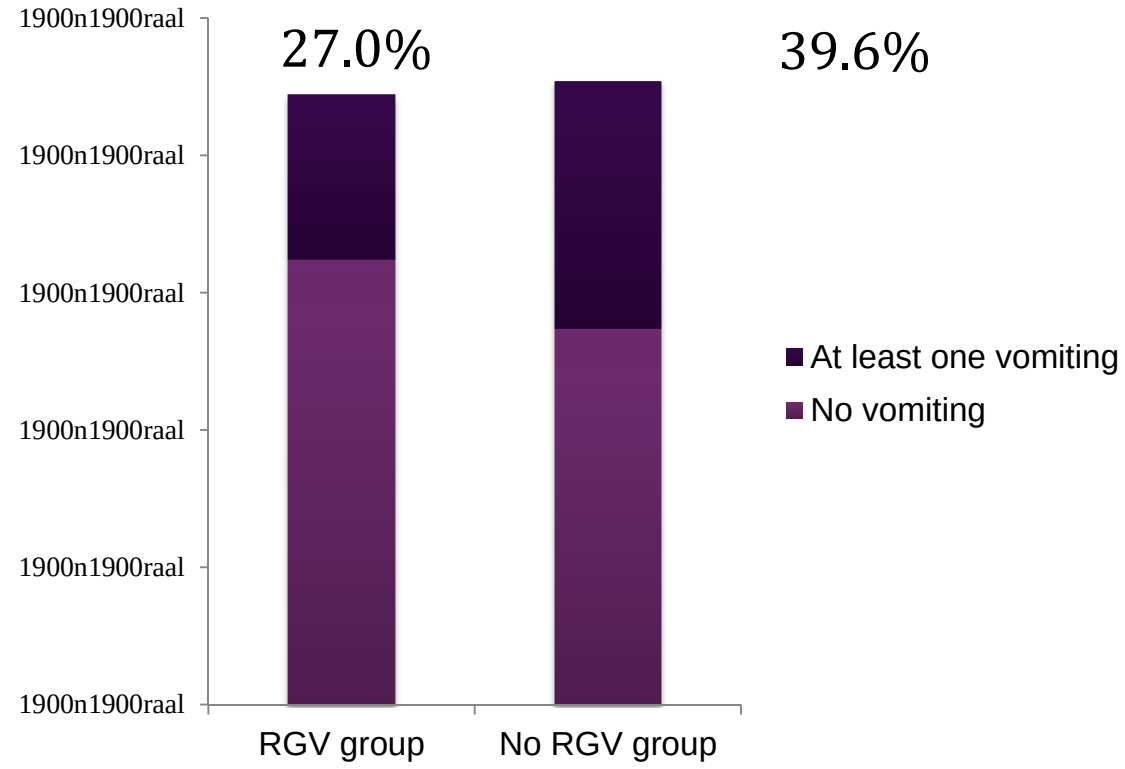
Vomiting

Proportions of patients who vomited



Vomiting episodes

	No-RGV group (N=227)	RGV group (N=222)
Vomiting episodes per patient		
0- No. of patients (%)	137 (60.3)	162 (73.0)
1- No. of patients (%)	41 (18.1)	26 (11.7)
2- No. of patients (%)	19 (8.4)	16 (7.2)
3- No. of patients (%)	8 (3.5)	4 (1.8)
4- No. of patients (%)	6 (2.6)	6 (2.7)
5- No. of patients (%)	4 (1.8)	3 (1.3)
6- No. of patients (%)	3 (1.3)	3 (1.3)
7- No. of patients (%)	3 (1.3)	1 (0.4)
8- No. of patients (%)	0 (0.0)	1 (0.4)
9- No. of patients (%)	2 (0.9)	0 (0.0)
14- No. of patients (%)	2 (0.9)	0 (0.0)
17- No. of patients (%)	1 (0.4)	0 (0.0)
21- No. of patients (%)	1 (0.4)	0 (0.0)
OR (90%CI)	1.86 [1.32; 2.61]	
P value	0.003	

Difference, 12.6%; 90% CI 5.4% to 19.9%

1.86 [1.32; 2.61], p = 0.0030

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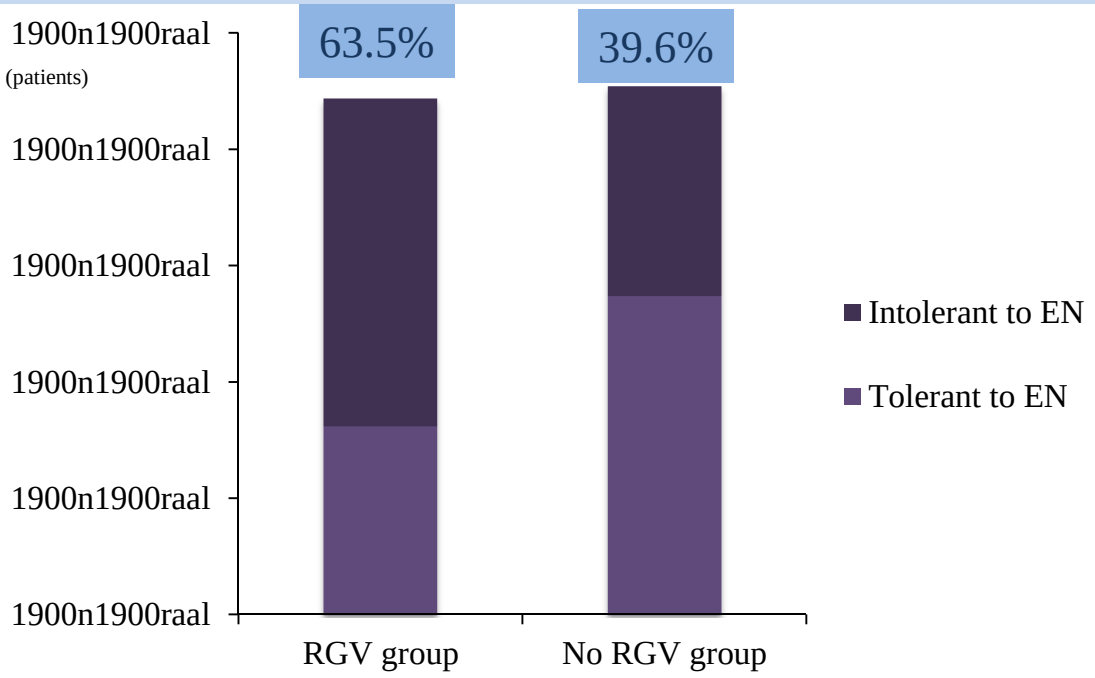
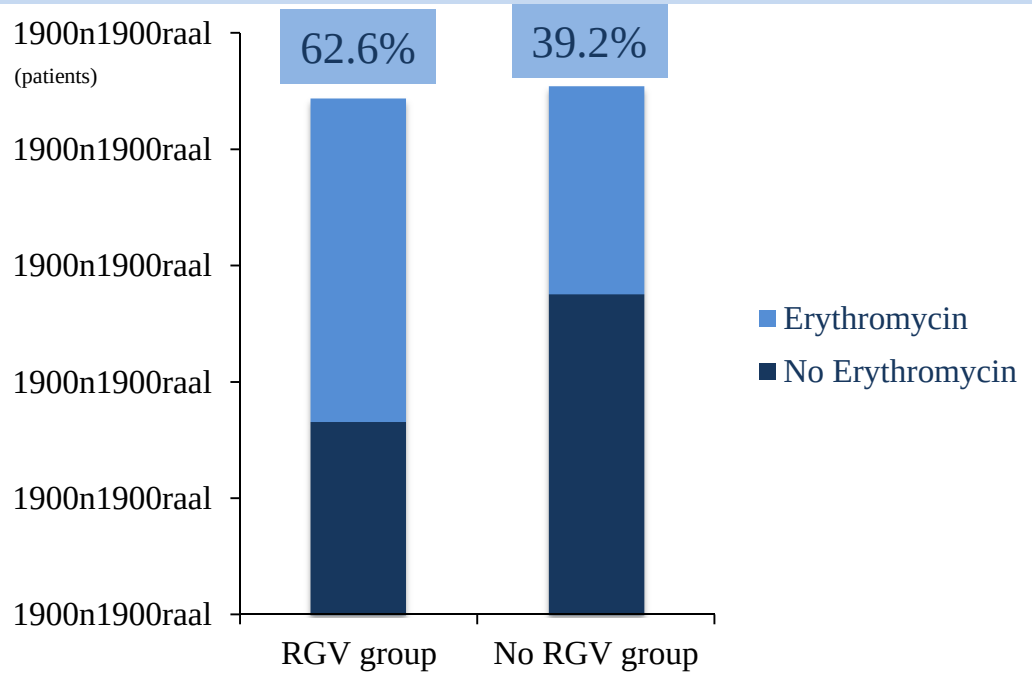
Intolerance to EN

Patients intolerant to EN



Patients treated with Erythromycin



Difference, -23.4% (IC à 90% (-31% ; -15.9%)

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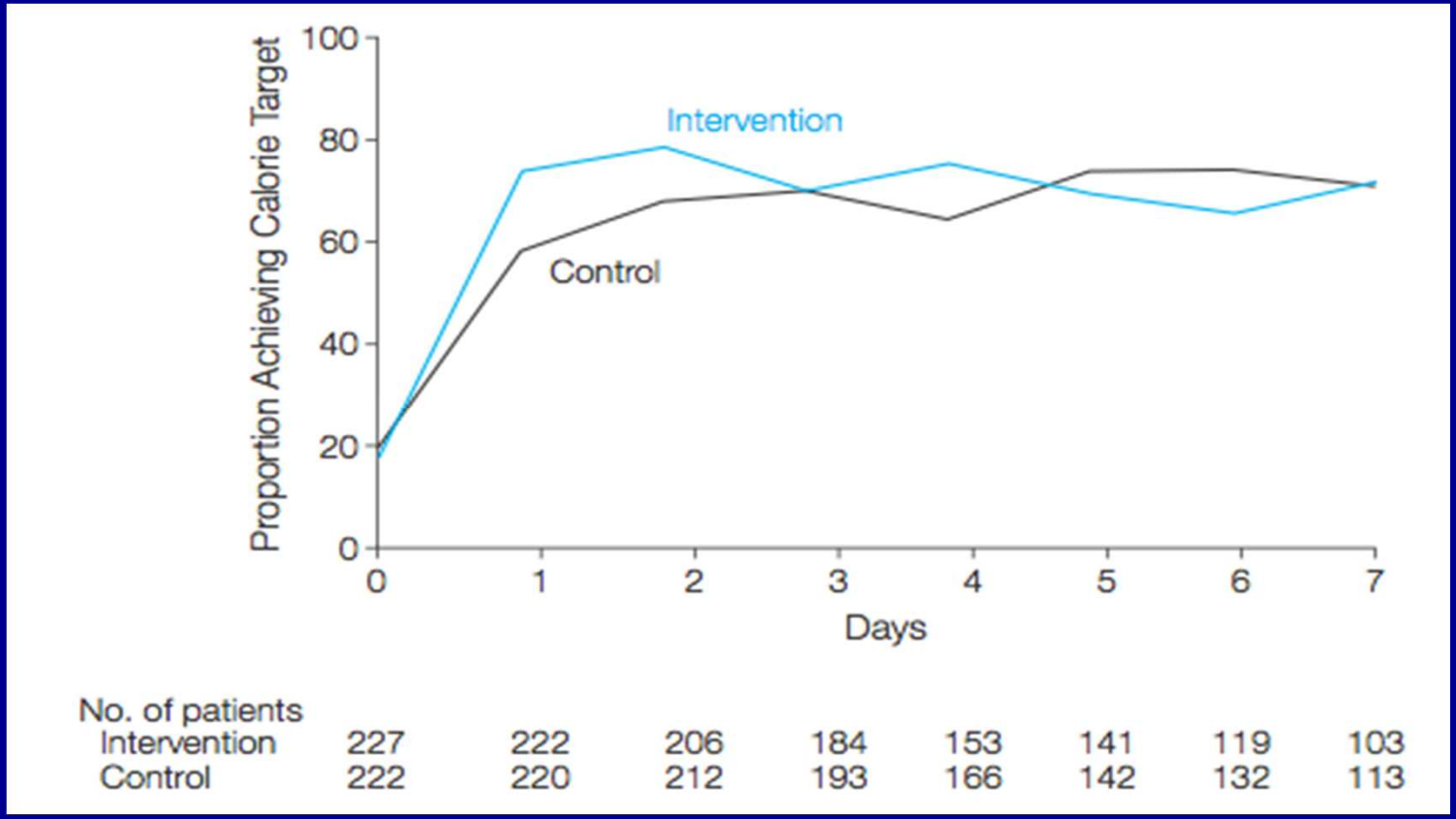
Proportions of Patients Who Achieved Their Calorie Target During the First Week

Control: with RGV monitoring

Intervention: without RGV monitoring



OR, 4.13; 90% CI, 2.20-7.69; *P*<0.001

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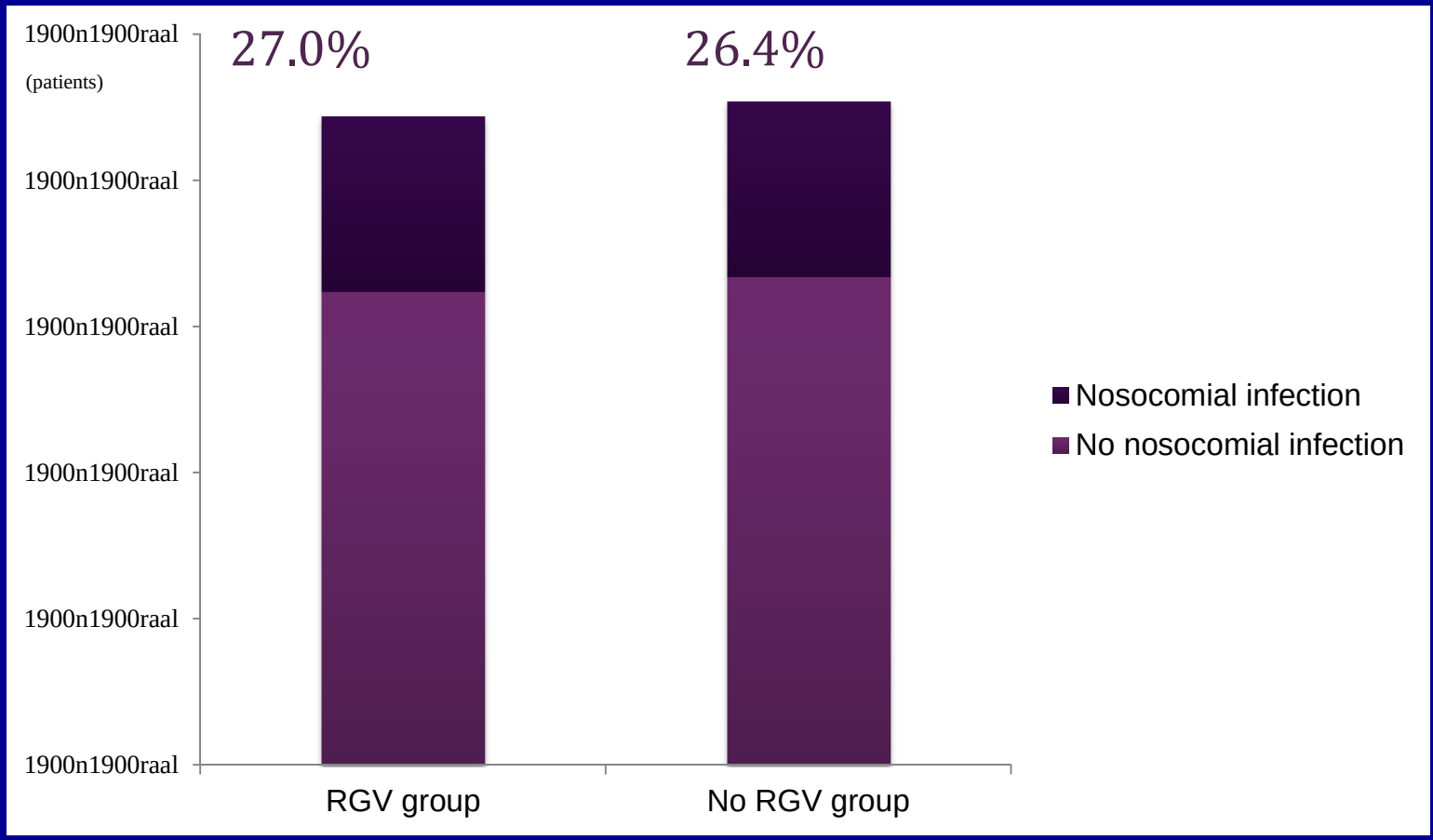
ICU-acquired infections



Difference, -0.6%; 90% CI -7.5% to 6.3%

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ICU-acquired infections

	No-RGV group (N=227)	RGV group (N=222)
Any ICU-acquired infection		
No. of patients (%)	60 (26.4)	60 (27.0)
Percentage difference (90%CI)	-0.6 (-7.5 to 6.3)	
Ventilator-associated pneumonia		
No. of patients (%)	38 (16.7)	35 (15.8)
Percentage difference (90%CI)	0.9 (-4.8 to 6.7)	
Bloodstream infection		
No. of patients (%)	17 (7.5)	9 (4.1)
Percentage difference (90%CI)	3.4 (-0.2 to 7.0)	
Urinary tract infection		
No. of patients (%)	13 (5.7)	16 (7.2)
Percentage difference (90%CI)	-1.5 (-5.3 to 2.3)	
Central venous catheter infection		
No. of patients (%)	15 (8.2)	18 (9.6)
Percentage difference (90%CI)	-1.4 (-6.3 to 3.5)	
Other infection		
No. of patients (%)	7 (3.1)	11 (5.0)
Percentage difference (90%CI)	-1.9 (-4.9 to 1.2)	

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Diarrhea

	Control group (RGV +) (n=222)	Intervention group (RGV -) (n=227)	% difference (90% CI)
Diarrhea	51 (23)	51 (22.5)	-0.5 (-7.0 to 6.0)
Clostridium difficile	2	2	

Diarrhea was defined as liquid stools exceeding 300 mL per day or more than four loose stools per day.

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Other outcomes

	Control group (RGV +) (n=222)	**Intervention group (RGV -) (n=227)**	% or Median Difference (90% CI)
Duration of MV (d)	7 (5-13)	7 (4-13)	0 (-1 to 0)
ICU length of stay (d)	10 (7-17)	10 (6-17)	-1 (-2 to 0)
Hospital length of stay (d)	19 (10-32)	17 (9-31)	-1 (-3 to 1)

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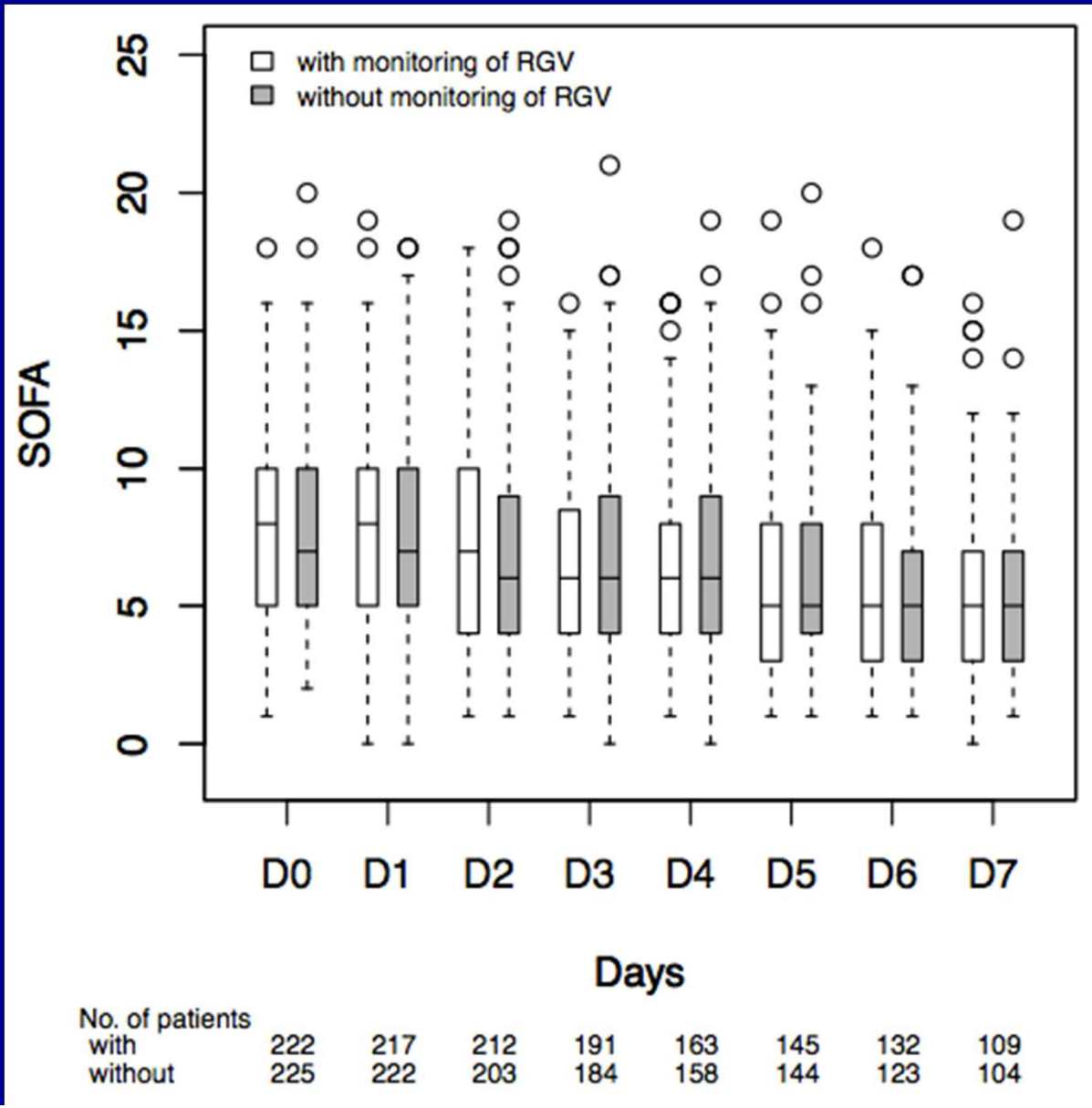
SOFA score

SOFA score variations during the first week of enteral nutrition

Mean SOFA score differences between the intervention group and the control group : -0.21; 90% CI, -0.80 to 0.38; *P*=0.56.



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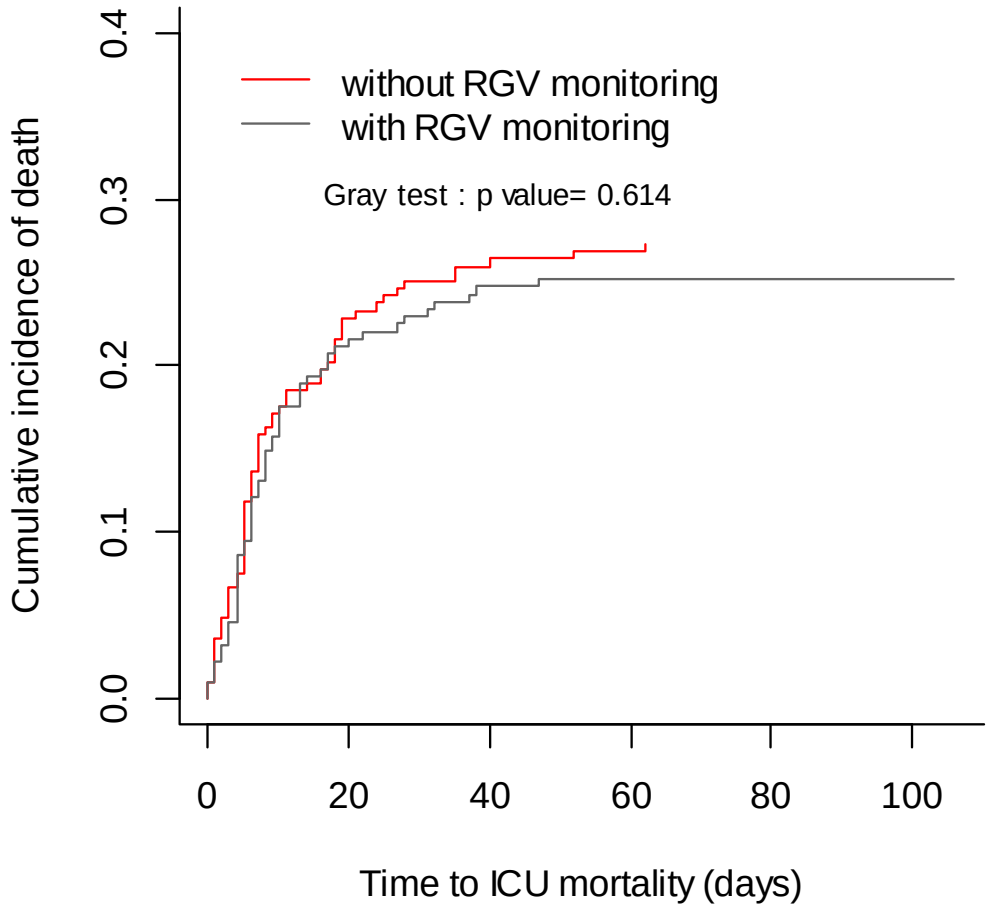
Mortality



Day 28:

- Control (n=222): 27.5%
- Intervention (n=227): 27.8%

(Difference, 0.3%; 90% CI -6.7% to 7.2%)

Day 90:

- Control (n=222): 34.2%
- Intervention (n=227): 36.3%

(Difference, 2.1%; 90% CI -5.4% to 9.5%)

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Conclusion

- L'absence de surveillance du volume gastrique résiduel n'est pas associée à un risque accru de PAVM.
- La surveillance du résidu gastrique prévient les vomissements au prix d'une consommation accru de prokinétique et d'une réduction des apports nutritionnels.
- Malgré une fréquence plus élevée de vomissements, l'absence de surveillance du résidu gastrique n'est pas associée à un risque accru d'infections nosocomiales, de défaillance d'organe, de décès ou d'allongement du séjour en réanimation.
- La surveillance systématique du volume gastrique résiduel peut être retirée des recommandations et protocoles de nutrition entérale chez le patient ventilé.

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Protocole de nutrition entérale et gestion de l'intolérance digestive

PATIENTS EN DV

- Prokinetique systématique dès le 1er DV sur prescription médicale
- Arrêt 6h après dernier DV

PRESCRIPTION MEDICALE DE LA NUTRITION ENTERALE

IMPERATIF :

Contrôle Radiologique de la position médiogastrique de la sonde avant chaque début d'alimentation entérale, puis systématiquement à chaque changement ou repositionnement de sonde.

DEBUT DE NUTRITION ENTERALE

Le plus précocement possible (<24 heures après l'intubation)

Débit max d'emblée selon objectif prescrit

SURVEILLANCE DE LA TOLERANCE DIGESTIVE

✂**VOMISSEMENTS/REGURGITATIONS**

Significatifs en dehors des soins et mobilisations

NON

VOMISSEMENTS REGURGITATIONS

OUI

I ère mesure

Débuter PROKINETIQUE sur prescription médicale jusqu'à 48h de tolérance au débit prescrit

Reprise au **Débit prescrit**

NON

VOMISSEMENTS REGURGITATIONS

OUI

II ème mesure

Modification du débit de la nutrition entérale

Débit ! 25 ml/h

NON

DIMINUER le débit de 25 ml/h

Dextro /h pendant 2h

OUI

ARRÊT Alimentation **Pendant 6 Heures** SNG mise en aspiration

Prévenir Le Médecin

SI INSULINOTHERAPIE

Contrôle Glycémie capillaire /heure jusqu'à reprise de nutrition

Je vous remercie pour votre attention