SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA
Azienda Ospedaliero - Universitaria di Ferrara
Azienda Unità Sanitaria Locale di Ferrara
DIPARTIMENTO INTERAZIENDALE DI CHIRURGIA
Unità Operativa di Chirurgia Generale Provinciale
Direttore: Prof. Carlo Feo

Università degli Studi di Ferrara

Quali Cure Perioperaorie nella Chirurgia Complessa dell'Anziano? Un Approccio Basato sull'Evidenza

Carlo Feo

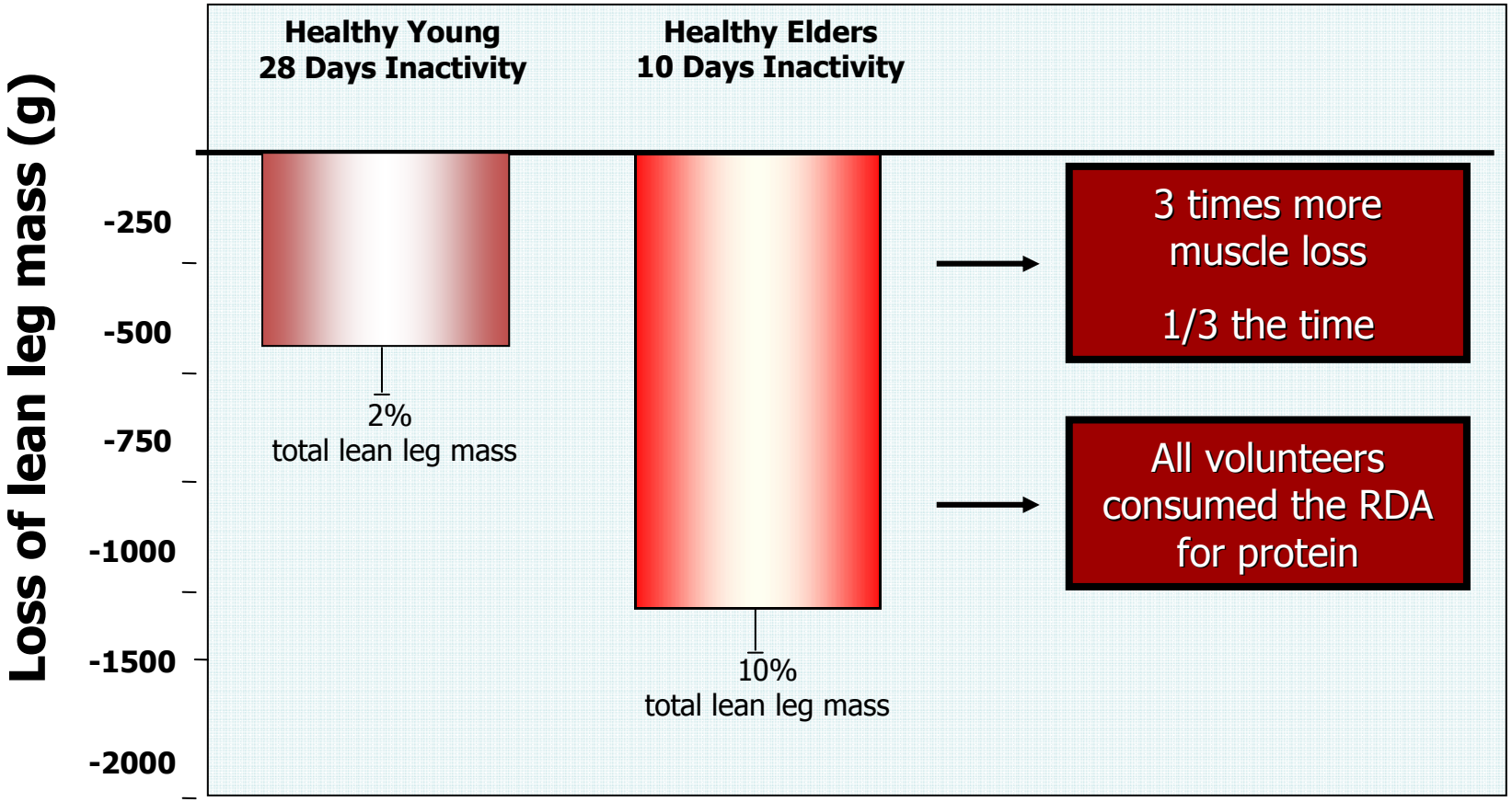
Ferrara, 7 aprile 2018

Società Medico Chirurgica di Ferrara

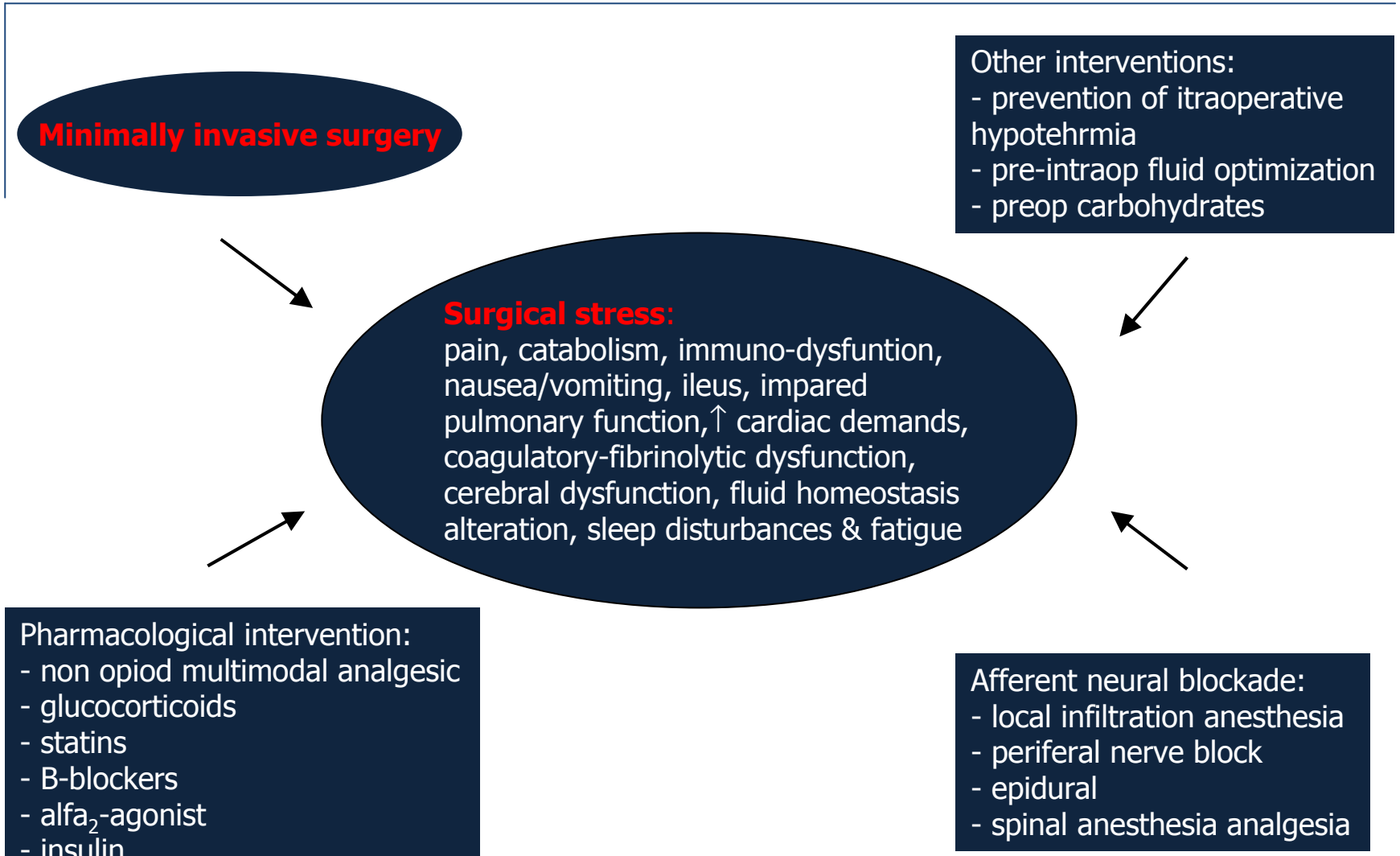
Outline

- Surgical stress and enhanced recovery after surgery (ERAS) programs
- Results of ERAS program implemention in Ferrara
- ERAS in the elderly
- Future perspectives: Prehabilitaition

Bed rest and protein catabolism in the elderly

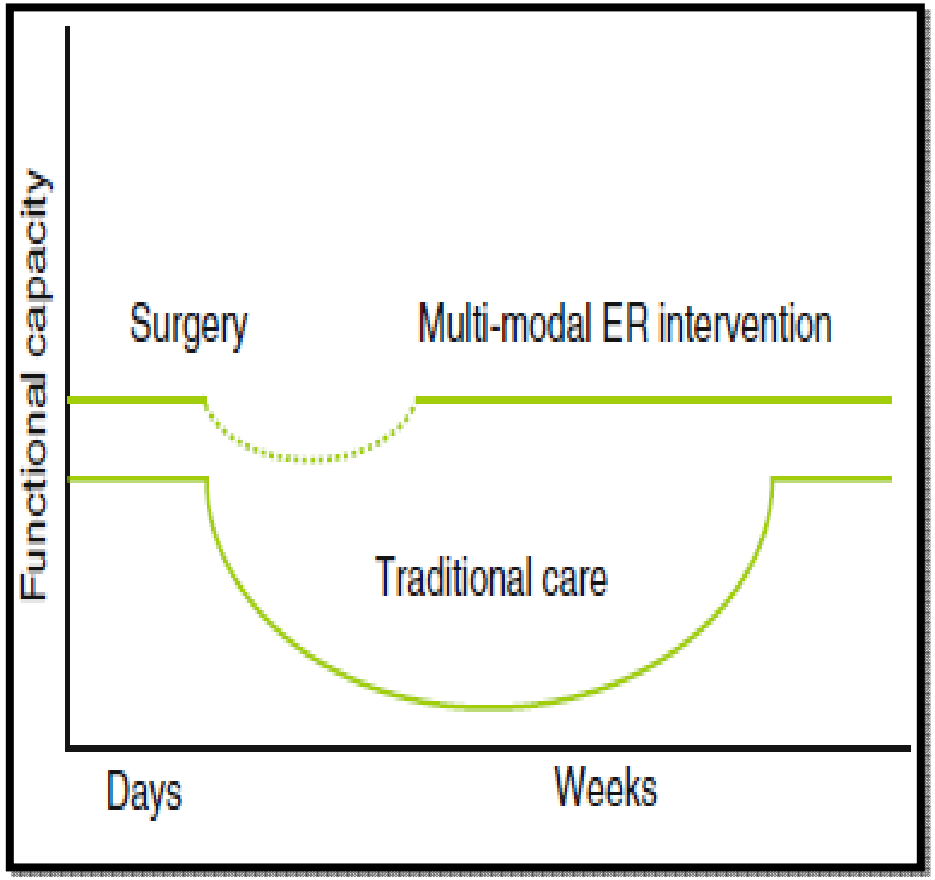


Paddon-Jones et al. *Am J Physiol Endocrinol Metab* 2004
Kortebein et al. *JAMA* 2007



Kehlet H, Wilmore DW. *Ann Surg* 2008

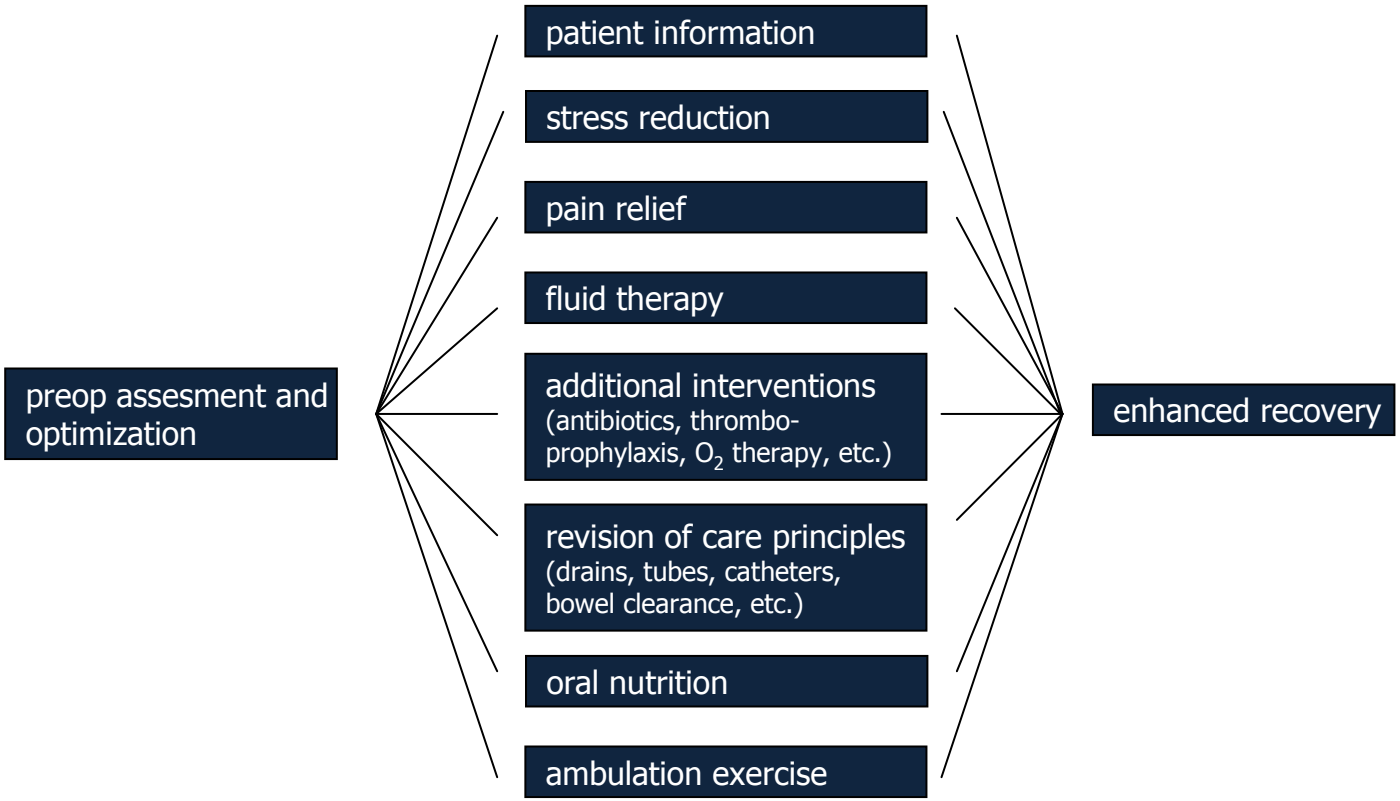
Postoperative recovery



ERAS: Key elements

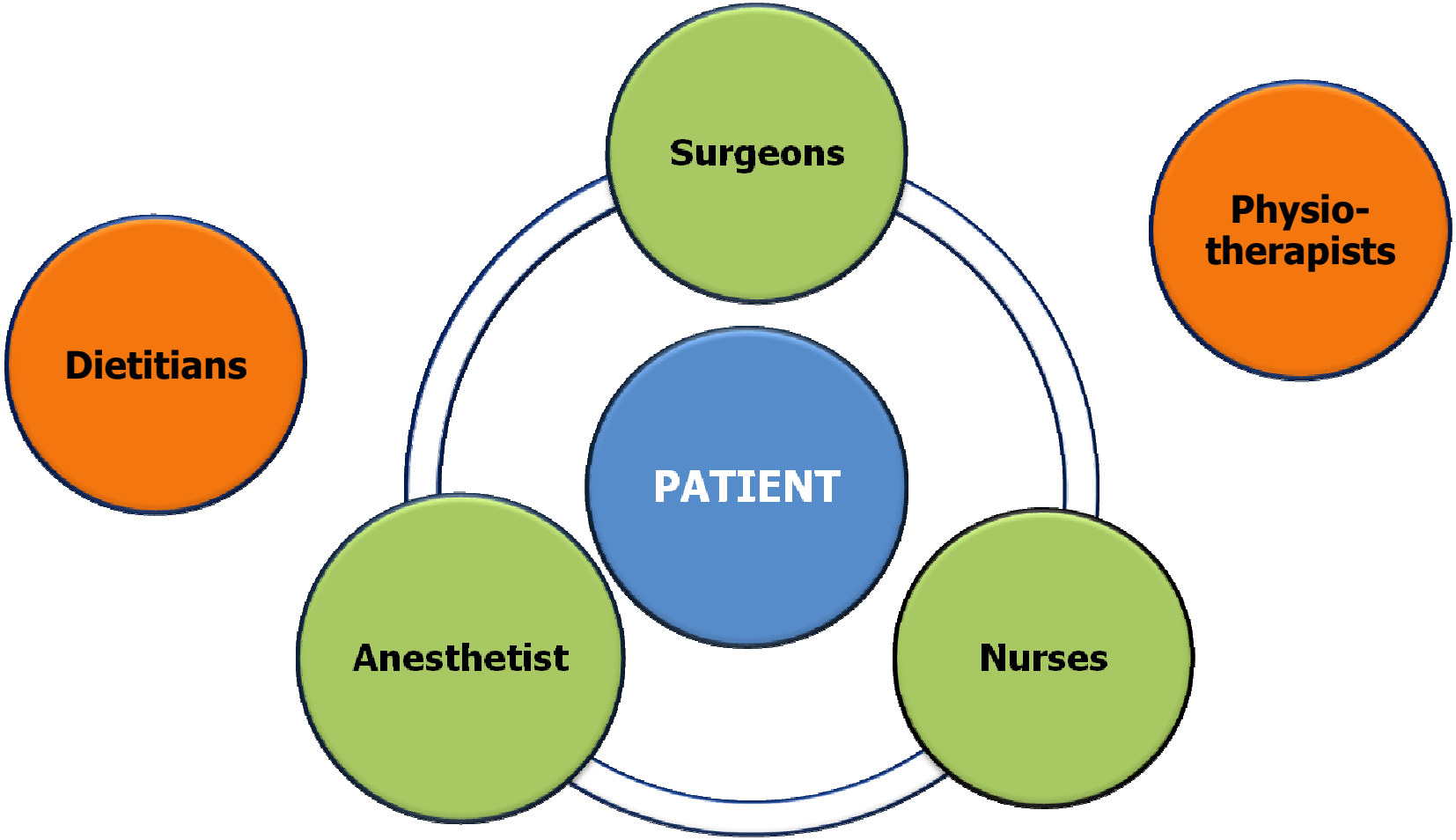
- Multimodal
- Evidence-based
- Multidisciplinary and inter-professional
- Enhance postoperative recovery

Multimodal, evidence based



Kehlet H, Wilmore DW. *Ann Surg* 2008

Multidisciplinary team

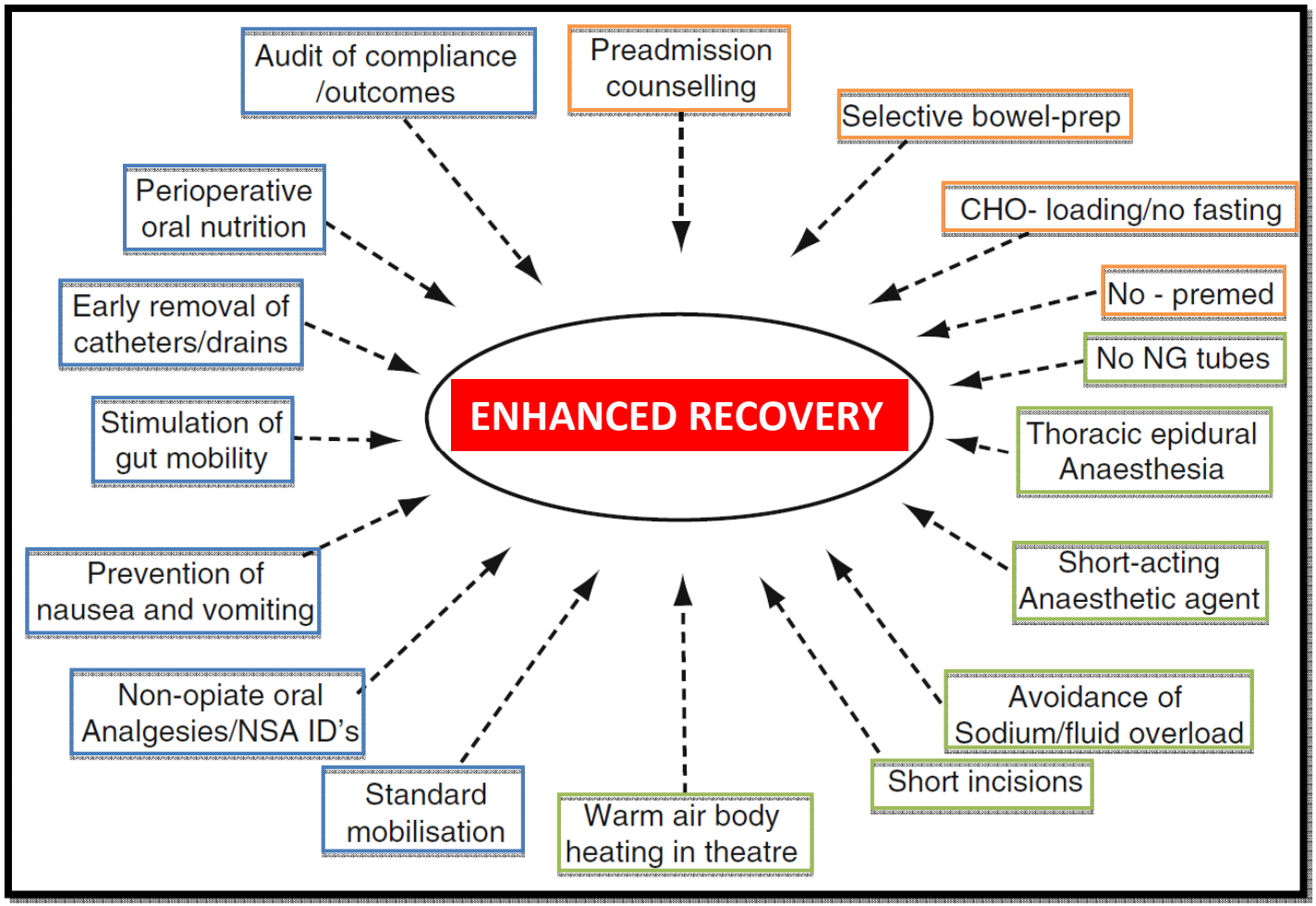


ERAS care team in Ferrara

- Surgeons
  - Carlo Feo, Simona Ascanelli, Mattia Portinari
- Anaestesists
  - Carlo Alberto Volta, Marco Verri, Stefano Camerani
- Nurse
  - Elisabete Maria Dos Santos Valgode

- Dietician – Simona Colombari
- Sport doctors – Giovanni Grazzi, Gianni Mazzoni
- Geriatrician – Stefano Volpato
- Psycho-oncologists – Maria G. Nanni, R. Caruso

Enhanced recovery protocol



Preoperative elements
Intraoperative elements
Postoperative elements

Aims & Study design

- To evalute the impact of a colorectal ERAS program on **clinical outcomes** and **institutional costs** in an Italian University Hospital

- **Inclusion criteria**: Elective colorectal resection

- **Exclusion criteria**: Age >80 yo; ASA IV, TNM stage IV, IBD, rectal cancer

- Prospective **ERAS group** 2013-2016 *versus* retrospective **traditional group** 2009-2011

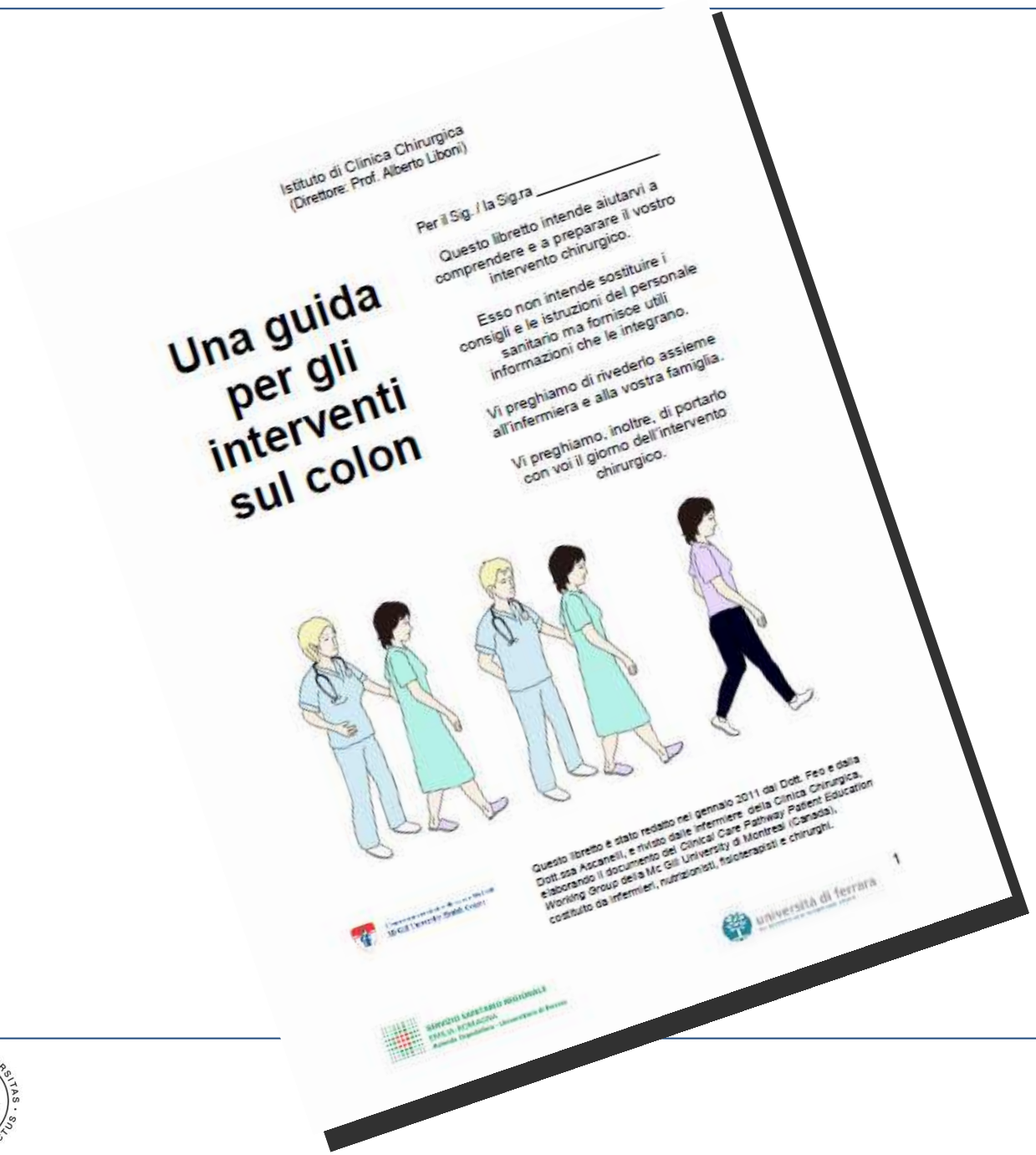
Study funded by
Ministero della Salute

Feo CV et al. *Int J Surg* 2018

ERAS element	Traditional group	ERAS group
Preoperative counseling	Informed consent	Extensive w/ booklet
Preoperative fasting	Since midnight	No
Preoperative CHO load	No	Yes
Preoperative bowel prep.	Yes	No
Anesthesia	Long-acting opioid based ± thoracic epidural	Blended (short-acting drugs w/thoracic epidural)
Intraoperative (i.v.) fluids	Liberal	Avoid overhydratation
Postoperative pain control	Thoracic epidural or i.v. opioids	POD† 0-2 Thoracic epidural POD ≥3 NSAIDs + paracetamol
Removal of gastric tube	Intestinal activity	In the operating room
Start of liquid diet	Intestinal activity	POD 0-1
Start of solid food	Bowel movements	POD 1
i.v. fluids abolition	Bowel movements	POD 1-2
Removal of Foley catheter	Bowel movements	POD 2
Mobilization	No structured plan	POD 0-1

*CHO – Carbohydrate
†POD – Post-Operative Day

Preoperative elements
Intraoperative elements
Postoperative elements


Istituto di Clinica Chirurgica
(Direttore: Prof. Alberto Liboni)
Per il Sig. / la Sig.ra _____
Una guida per gli interventi sul colon
Questo libretto intende aiutarvi a comprendere e a preparare il vostro intervento chirurgico.
Esso non intende sostituire i consigli e le istruzioni del personale sanitario ma fornisce utili informazioni che le integrano.
Vi preghiamo di rivederlo assieme all'infermiera e alla vostra famiglia.
Vi preghiamo, inoltre, di portarlo con voi il giorno dell'intervento chirurgico.
Questo libretto è stato redatto nel gennaio 2011 dal Dott. Feo e dalla Dott.ssa Ascanelli, e rivisto dalle infermiere della Clinica Chirurgica, elaborando il documento del Clinical Care Pathway Patient Education Working Group della Mc Gill University di Montreal (Canada), costituito da infermieri, nutrizionisti, fisioterapisti e chirurghi.
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università di ferrara

BASELINE CHARACTERISTICS	Traditional Group (N=100)	ERAS Group (N=100)	p
Gender			0,321
Male	42	50	
Female	58	50	
Age (years)			0,320
< 65	33	42	
65-74	36	35	
≥ 75	31	23	
Body Mass Index (Kg/m^2)			0,621
< 25	47	45	
25-29.9	40	38	
≥ 30	12	17	
American Society of Anaesthesia score			0,026
I	9	2	
II	50	65	
III	41	33	

Mann-Whitney test
Chi square test

INTRAOPERATIVE CHARACTERISTICS	Traditional Group (N=100)	ERAS Group (N=100)	p
Disease			0,361
Cancer	85	84	
Benign tumor	15	14	
Diverticular disease	0	2	
Type of operation			0,087
Right colectomy	47	50	
Left colectomy	13	15	
Transverse colon resection	5	4	
Sigmoid resection	26	13	
Rectosigmoid resection	3	13	
Segmental resection	5	4	
Sub-total colectomy	1	1	
Surgical approach			**< 0,001**
Laparotomy	58	5	
Laparoscopy	30	89	
Laparoscopy with conversion	12	6	
Length of procedure (min)*	197,5 (165,0-224,8)	190,0 (165,8-230,0)	0,925

*Median (IQR 25-75)
Chi square, Log-rank tests

Results

POSTOPERATIVE OUTCOMES	Traditional Group (N=100)	ERAS Group (N=100)	p
Positioning of			
Central venous catheter	77	5	**< 0,001**
Epidural catheter	43	91	**< 0,001**
Nasogastric tube (NGT)	98	5	**< 0,001**
Drainage	93	57	**< 0,001**
Vomiting ≤ 24 h	5	10	0,283
Vomiting > 24 h	9	14	0,376
Re-insertion of NGT	6	7	1,000
Resumption of i.v. fluids	5	7	0,767

Chi square test

Results

POSTOPERATIVE OUTCOMES	Traditional Group (N=100)	ERAS Group (N=100)	p
Time to liquid diet (days)	3 (2-4)	1 (1-1)	**< 0,001**
Time to solid food (days)	5 (5-7)	3 (2-3)	**< 0,001**
Time to intestinal activity (days)	4 (3-4)	2 (1-2)	**< 0,001**
Time to bowel movements (days)	5 (4-6)	3 (2-4)	**< 0,001**
Pain control on oral analgesic (days)	4 (3-5)	3 (3-4)	**< 0,001**
Postoperative day fit for discharge (days)	7 (6-8)	4 (4-5)	**< 0,001**
Hospital length of stay (days)	8 (7-9)	4 (4-5)	**< 0,001**

Median (IQR 25-75)
Log-rank test

Results

POSTOPERATIVE OUTCOMES	Traditioal Group (N=100)	ERAS Group (N=100)	p
Postoperative complications (Clavien-Dindo)			0,663
Grade I	3	7	
Grade II	22	26	
Grade IIIa	1	1	
Grade IIIb	1	1	
In hospital mortality	0	0	
30 days re-admission	6	3	0,498
30 days mortality	0	0	

Chi square test

	PROLONGED HOSPITAL LENGTH OF STAY			
	Unadjusted Model		Full Adjusted Model	
Variable	**HR (95% CI)**	**p**	**HR (95% CI)**	**p**
Gender (ref: female)				
male	0,99 (0,76-1,32)	0,993	0,89 (0,66-1,19)	0,420
Age (ref: < 65 y)				
65-74	0,81 (0,59-1,13)	0,215	0,80 (0,56-1,12)	0,193
≥ 75	0,72 (0,50-1,02)	0,065	0,75 (0,51-1,10)	0,139
BMI (ref: < 25 Kg/m^2)				
25-29,9	1,01 (0,74-1,36)	0,997	1,04 (0,76-1,43)	0,813
≥ 30	1,19 (0,79-1,82)	0,408	1,44 (0,92-2,23)	0,108
ASA score (ref: I)				
II	1,11 (0,60-2,07)	0,735	0,93 (0,47-1,83)	0,833
III	0,80 (0,42-1,51)	0,489	0,77 (0,38-1,53)	0,449
Surgical approach (ref: laparoscopy)				
laparotomy/ laparoscopy with conversion	0,61 (0,46-0,82)	**0,001**	0,96 (0,66-1,38)	0,811
Perioperative protocol (ref: ERAS)				
traditional	0,43 (0,32-0,58)	**< 0,001**	0,43 (0,29-0,62)	**< 0,001**

Direct cost analysis

- Costs for:
  - Implementation of the program
  - Preoperative counseling
  - Surgical operation (OR, instruments)
  - Hospitalization (drugs, exams, visits)
  - Re-hospitalization

Variables	Traditional Group (N=100)	ERAS Group (N=100)	P
Total direct costs per patient (euros)	**6.796,76** ± 1.381,34	**5.339,05** ± 1.909,24	**< 0,001**

Conclusions

- Implementing an ERAS program in elective colorectal surgery:
  - Reduced time to functional recovery and postoperative length of hospital stay
  - With no increase in morbidity, mortality, and 30-day readmission rate
  - Decreasing in-hospital direct costs and nursing workload
- Being on a traditional perioperative care protocol was the only factor associated to prolonged length of hospital stay

Feo CV et al. *Int J Surg* 2018

ERAS Colectomy

A systematic review of enhanced recovery care after colorectal surgery in elderly patients

N. M. Bagnall*, G. Malietzis*†, R. H. Kennedy*†, T. Athanasiou*, O. Faiz*† and A. Darzi*

*Department of Surgery and Cancer, Imperial College London, St Mary's Hospital, Paddington, London, UK and †St Marks Hospital and Academic Institute, Northwick Park NHS Trust, Harrow, Middlesex, UK

- 2000-2013: 2 RCTs, 14 cohort studies, 3 case series
- RCTs (N = 78; 233) show ↓ length of hospital stay (-2,5 days) and complication rate with ERAS
- The majority of observational studies do not show differences in length of hospital stay, morbidity, and mortality rates
- Further studies are needed to evaluate adherence and efficacy in elderly patients

Bagnall NM et al. *Colorectal Dis* 2014

Enhanced recovery care after colorectal surgery in elderly patients. Compliance and outcomes of a multicenter study from the Spanish working group on ERAS

Variable	$n = 188$	
Age (years)[a]	79	[70–93]
Male	109	58 %
Female	79	42 %
POSSUM score (morbidity)[a]	29.3 %	[6.9–80.5]
POSSUM score (mortality)[a]	5.3 %	[1.3–26.8]
Comorbidities		
Diabetes	52	28 %
Anticoagulant treatments	36	19 %
Surgical technique		
Colon surgery	145	77.1 %
Laparoscopic colon surgery	58	40.0 %
Rectal surgery	43	22.9 %
Laparoscopic rectal surgery	25	58.1 %
Total laparoscopic surgery	83	44.1 %
Surgical procedure		
Right colectomy	80	42.6 %
Left colectomy	15	8.0 %
Sigmoidectomy	50	26.6 %
Low anterior resection	34	18.1 %
Hartmann	7	3.7 %
Abdominoperineal resections	2	1.1 %
Stoma (temporary or definitive)	25	13.3 %

[a] Median [range]

Gonzalez-Ayora S et al. *Int J Colorectal Dis* 2014

Compliance with ERAS

Variable	*n* (%)
No drainage[a]	81 (43.0)
Epidural anesthesia[a]	116 (61.7)
Early intake	173 (92.0)
Early suspension of intravenous fluids	138 (73.4)
Early mobilization	169 (89.9)
Early urinary catheter removal	122 (64.9)
Global compliance	105 (56.0)

Variable	Global compliance (%)	X^2 *p* value
Laparoscopic surgery	59.0	0.43
Open surgery	53.3	
Colon surgery	60.0	0.03
Rectal surgery	41.9	
Without stoma[b]	58.9	0.03
With stoma[b]	36.0	

[a] ERAS interventions not included in the global compliance

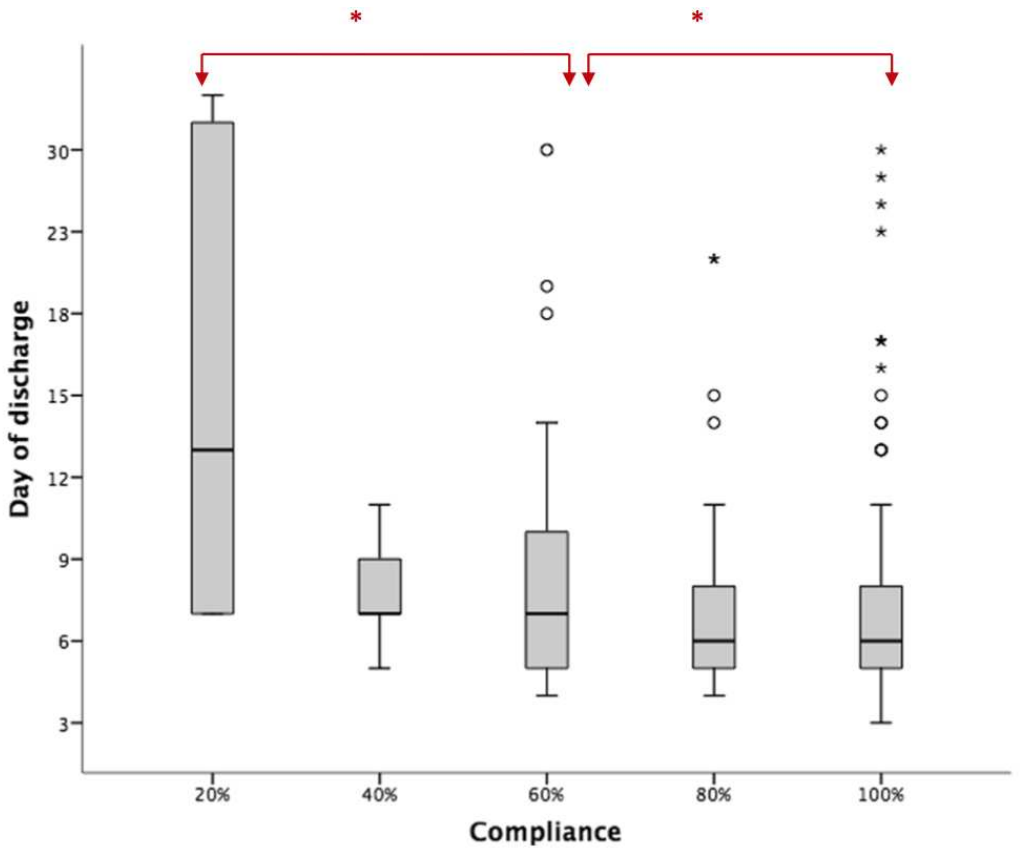
[b] Temporary or definitive stoma

Gonzalez-Ayora S et al. *Int J Colorectal Dis* 2014

Postoperative complications	*n* (%)	X^2 *p* value
No complications	117 (62.2)	
Dindo-Clavien grades I–II	46 (24.5) with GC 30 without GC 20	0.32
Dindo-Clavien grades III–V	25 (13.3) with GC 13.4 without GC 13.2	0.34
Postoperative ileus	44 (23.4) with GC 21.0 without GC 26.5	0.37
Anastomotic leakage	15 (8.0) with GC 7.6 without GC 8.4	0.83
Mortality	3 (1.6)	
Reoperations	16 (8.5)	
Anastomotic leakage	10 (5.3)	
Bowel ischemia	2 (1.0)	
Hemoperitoneum	1 (0.5)	
Internal hernia	1 (0.5)	
Urinary tract injury	1 (0.5)	
Hospital length of stay[a]	6.0 [3–51] with GC 6 [3–30] without GC 7 [4–51]	0.03
Readmissions	12 (6.4)	
Abdominal abscess	3 (1.6)	
Wound infection	3 (1.6)	
Late anastomotic leakage	2 (1.0)	
Dehydration	3(1.0)	

[a] Median [range]

Compliance and length of stay

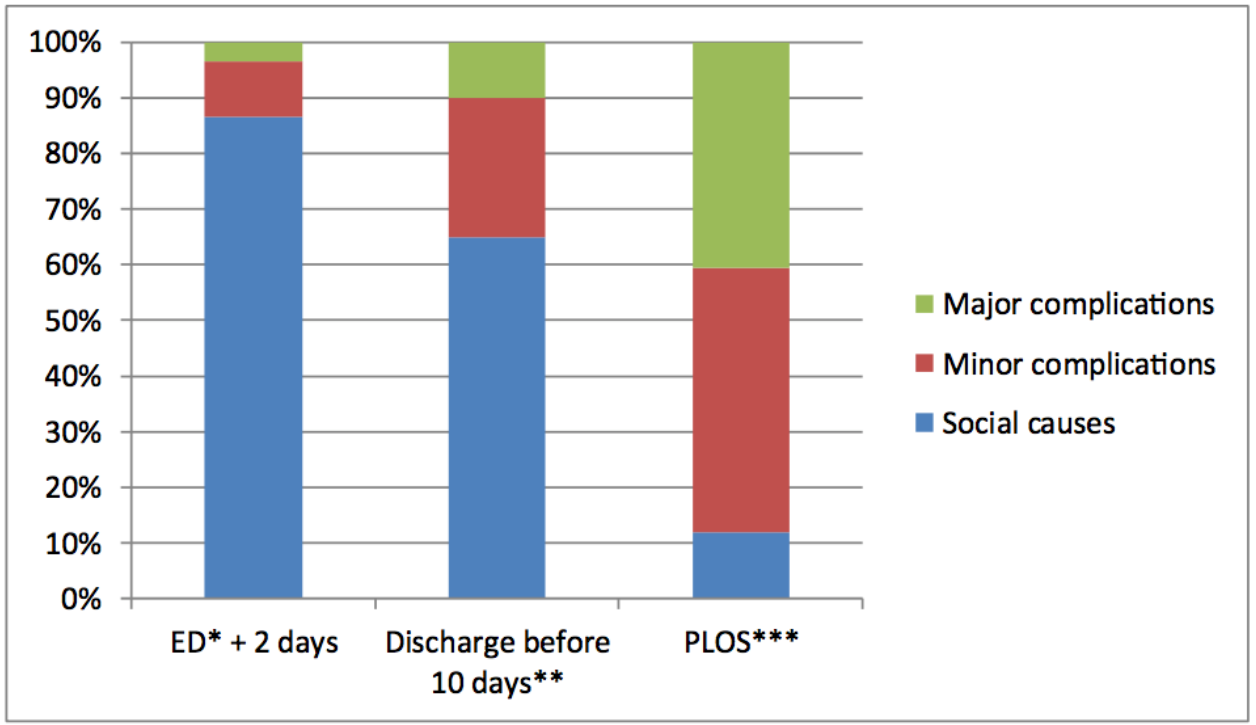


* p<0.05

< 50% of GC LOS: 7.5 days [5-51] vs. >50% of GC LOS: 6 days [3-30]; p=0.004

Gonzalez-Ayora S et al. *Int J Colorectal Dis* 2014

Delayed discharge



* Estimated discharge in ERAS protocol.

** Discharge before 10 days excluding ED / ED + 1 / ED + 2.

*** Prolonged length of stay (discharge ≥ 10 days).

Gonzalez-Ayora S et al. *Int J Colorectal Dis* 2014

Enhanced recovery ERAS for elderly: a safe and beneficial pathway in colorectal surgery

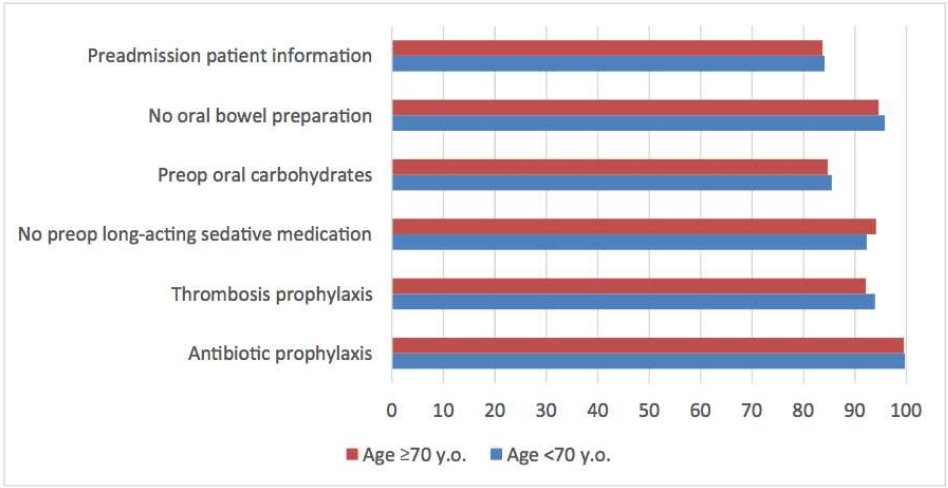
	Age <70 y *n* = 311	Age ≥70 y *n* = 202	*p* value
Age years (IQR)	55 (46–64)	77 (74–83)	<0.001*
Gender (M/F)	182/129	94/108	0.009*
Body mass index (kg/m2)	24.8 (21.9–28.7)	25.2 (22–28.1)	0.984
ASA score			<0.001 *
1–2, *n* (%)	257 (82.9 %)	120 (59.4 %)	
3–4, *n* (%)	53 (17.1 %)	82 (40.6 %)	
WHO score			0.054
1–2, *n* (%)	288 (93.2 %)	176 (88 %)	
3–4, *n* (%)	21 (6.8 %)	24 (12 %)	
Diabetes, *n* (%)	23 (7.5 %)	33 (16.3 %)	0.005*
Cardiac history, *n* (%)	73 (23.5 %)	118 (58.4 %)	<0.001*
Respiratory history, *n* (%)	34 (10.9 %)	38 (17.9 %)	0.044*
Presence of malignancy, *n* (%)	108 (34.8 %)	124 (61.7 %)	<0.001*
Smoker, *n* (%)	86 (27.8 %)	17 (8.4 %)	<0.001*

ASA American Society of Anesthesiologists score, *WHO* World Health Organization score.

**p* value <0.05

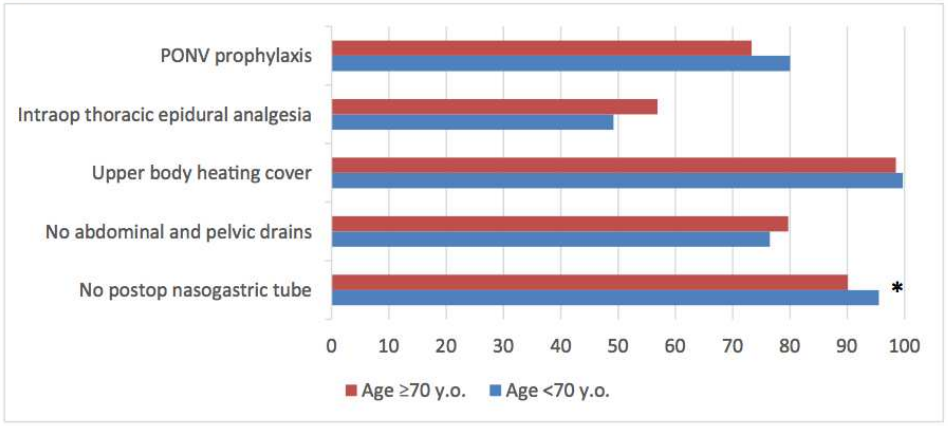
Slieker J et al. *Int J Colorectal Dis* 2017

a



x-axis: adherence in percentages

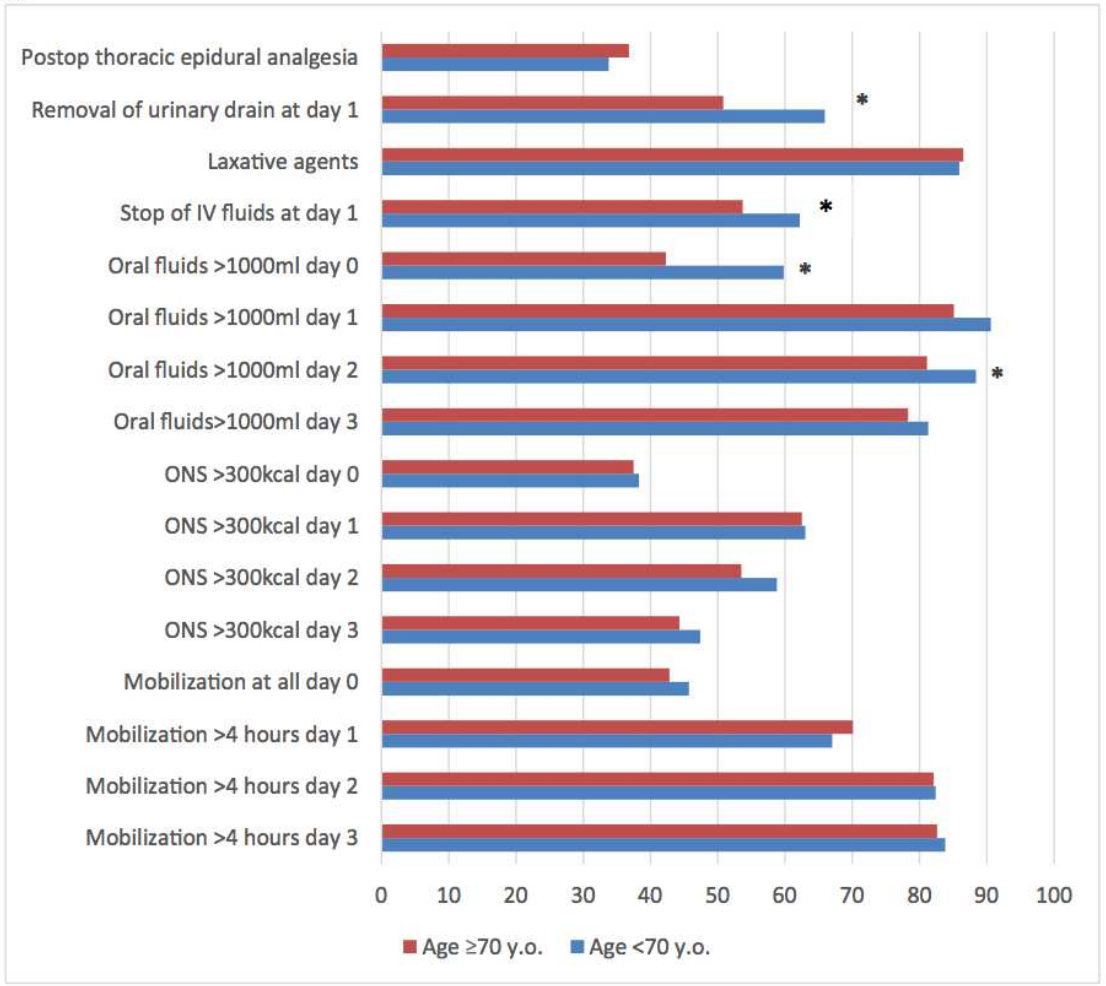
b



x-axis: adherence in percentages
PONV: Postoperative Nausea and Vomiting
*: p-value <0.05

Slieker J et al. *Int J Colorectal Dis* 2017

c



x-axis: adherence in percentages
ONS: Oral Nutritional Supplements
*: p-value <0.05

Slieker J et al. *Int J Colorectal Dis* 2017

Postoperative complications

	Age <70 y *n* = 311	Age ≥70 y *n* = 202	*p* value
Complications during hospitalization, *n* (%)	145 (46.6 %)	104 (51.5 %)	0.320
Severe complications: Clavien III-IV, *n* (%)	47 (15.1 %)	29 (14.4 %)	0.899
Surgical complications, *n* (%)	50 (16.1 %)	37 (18.3 %)	0.548
Anastomotic leaks, *n* (%)	13 (4.2 %)	7 (3.5 %)	0.817
Surgical site infections, *n* (%)	19 (6.1 %)	18 (8.9 %)	0.295
Cardiovascular complications, *n* (%)	12 (3.9 %)	21 (10.4 %)	0.005*
Respiratory complications, *n* (%)	24 (7.7 %)	25 (12.4 %)	0.092
Infectious non-surgical complications, *n* (%)	50 (16.1 %)	44 (21.8 %)	0.129
Urinary retentions, *n* (%)	34 (11 %)	27 (13.4 %)	0.485
Complications after discharge, *n* (%)	30 (11.8 %)	19 (12 %)	1.000
Reoperation, *n* (%)	41 (13.2 %)	25 (12.4 %)	0.893
Readmission, *n* (%)	17 (5.5 %)	6 (3 %)	0.199
Mortality, *n* (%)	2 (0.6 %)	6 (3 %)	0.062

**p* value <0.05

Slieker J et al. *Int J Colorectal Dis* 2017

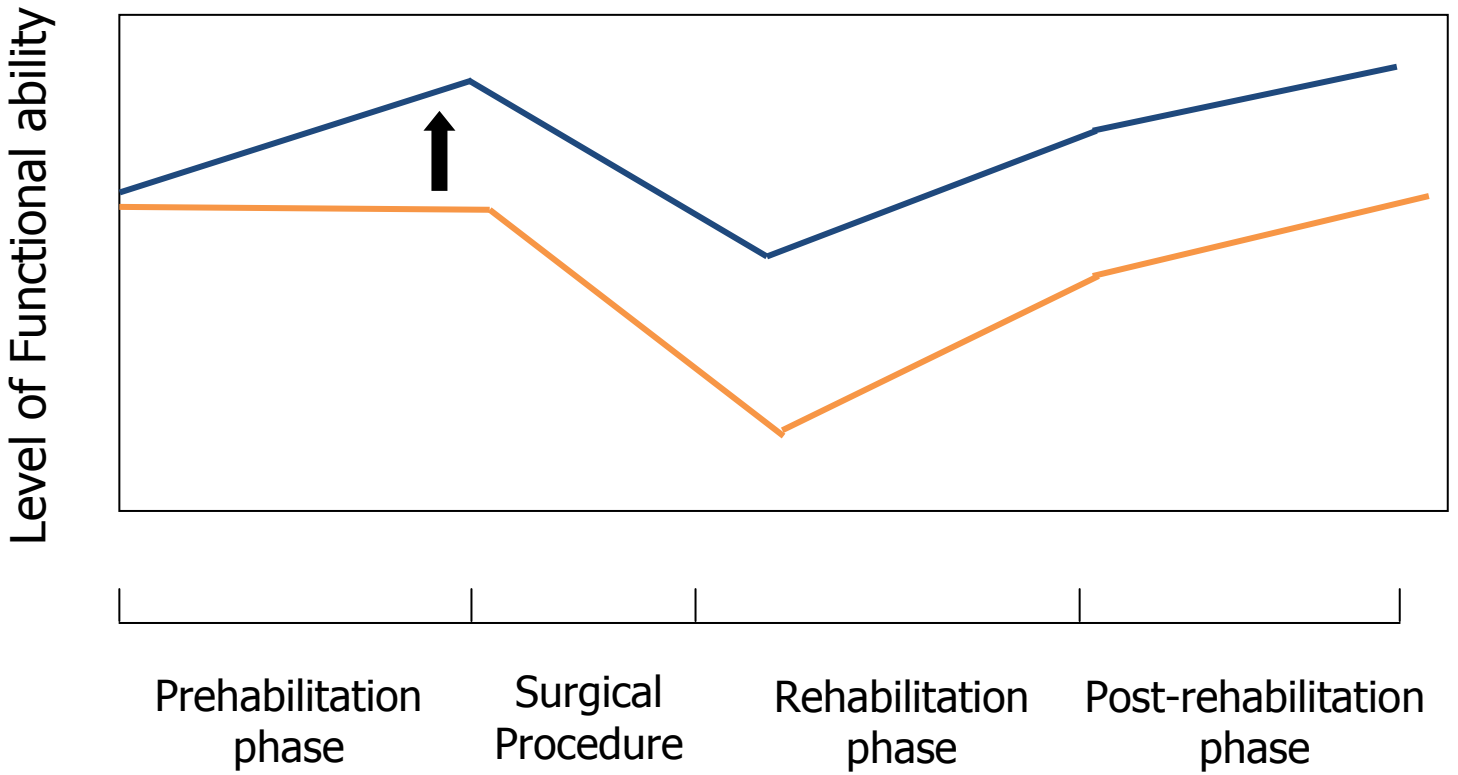
Risk factors for prolonged recovery after major abdominal surgery in elderly

	Odds ratio	95% CI	p value
Serious complication	**0.61**	**0.39-0.96**	**0.03**
Physical performance status*	**1.20**	**1.02-1.41**	**0.02**
Geriatric Depression Scale	**0.95**	**0.92-0.98**	**0.003**
Folstein Mini-Mental State	1.04	0.98-1.11	0.22
Creatinine>133 umol/L	0.83	0.47-1.47	0.52
Albumin <30 g/L	0.63	0.15-2.66	0.53
CHF on CXR	0.94	0.46-1.92	0.87
Male	1.25	0.8-1.87	0.29
Age,y	1.0	0.97-1.02	0.80

*score combining Timed Up and Go, Functional Reach, and Hand Grip Strength using Components Analysis

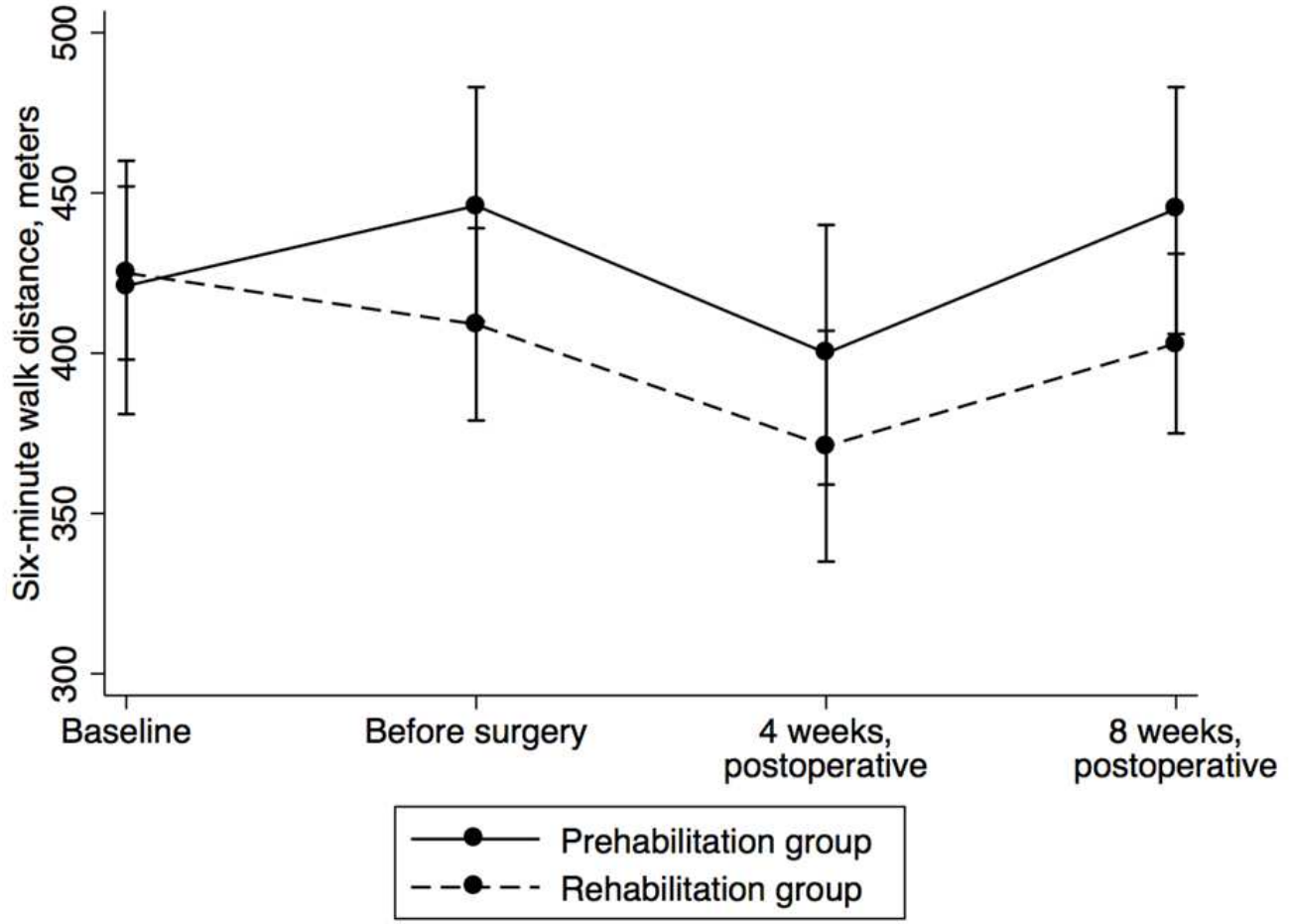
Lawrence et al. *JACS* 2004

Functional ability throughout the surgical process



Carli F, Zavorsly G. 2005

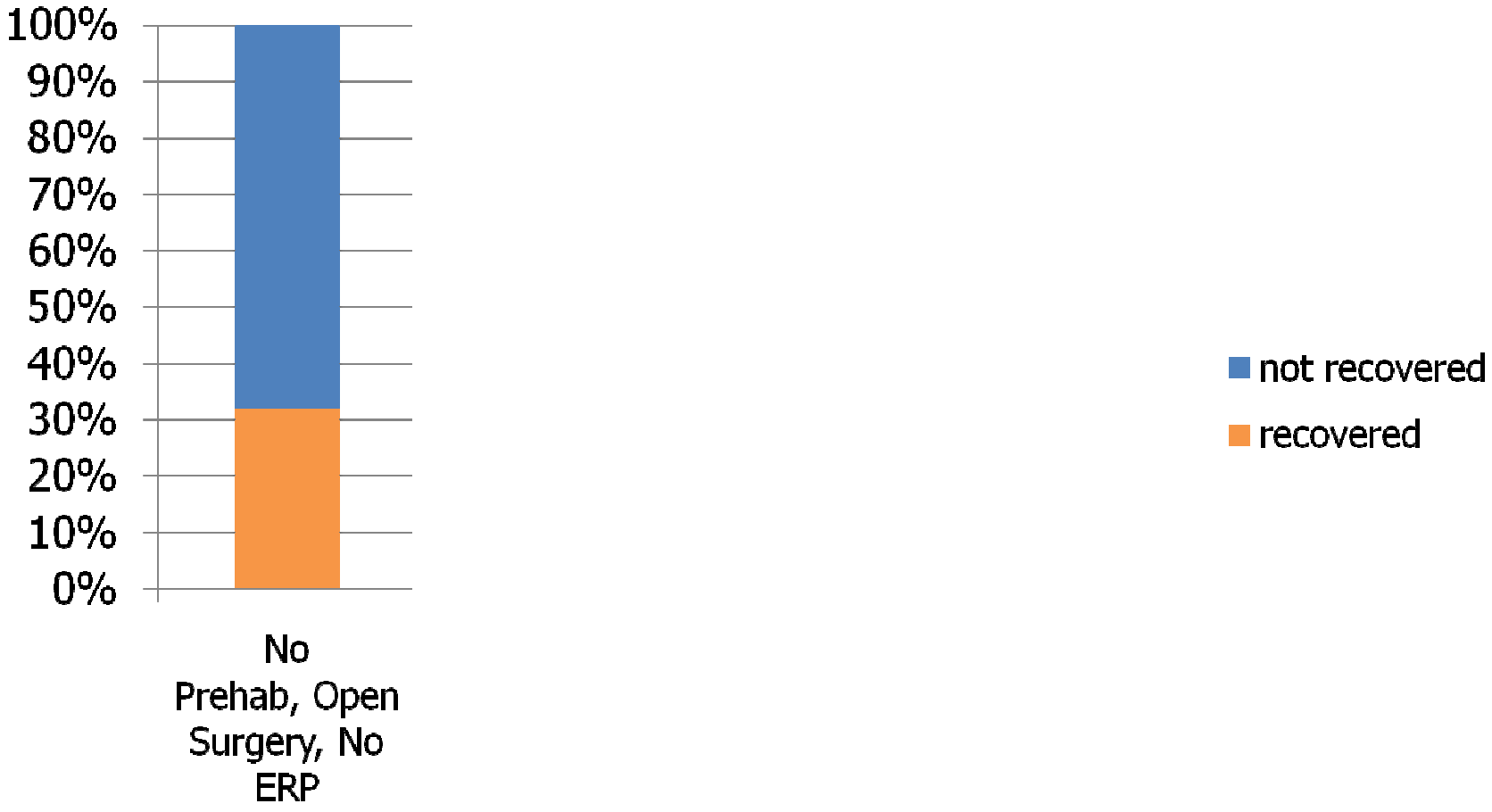
Multimodal Prehab vs Rehab: RCT



p<0.01

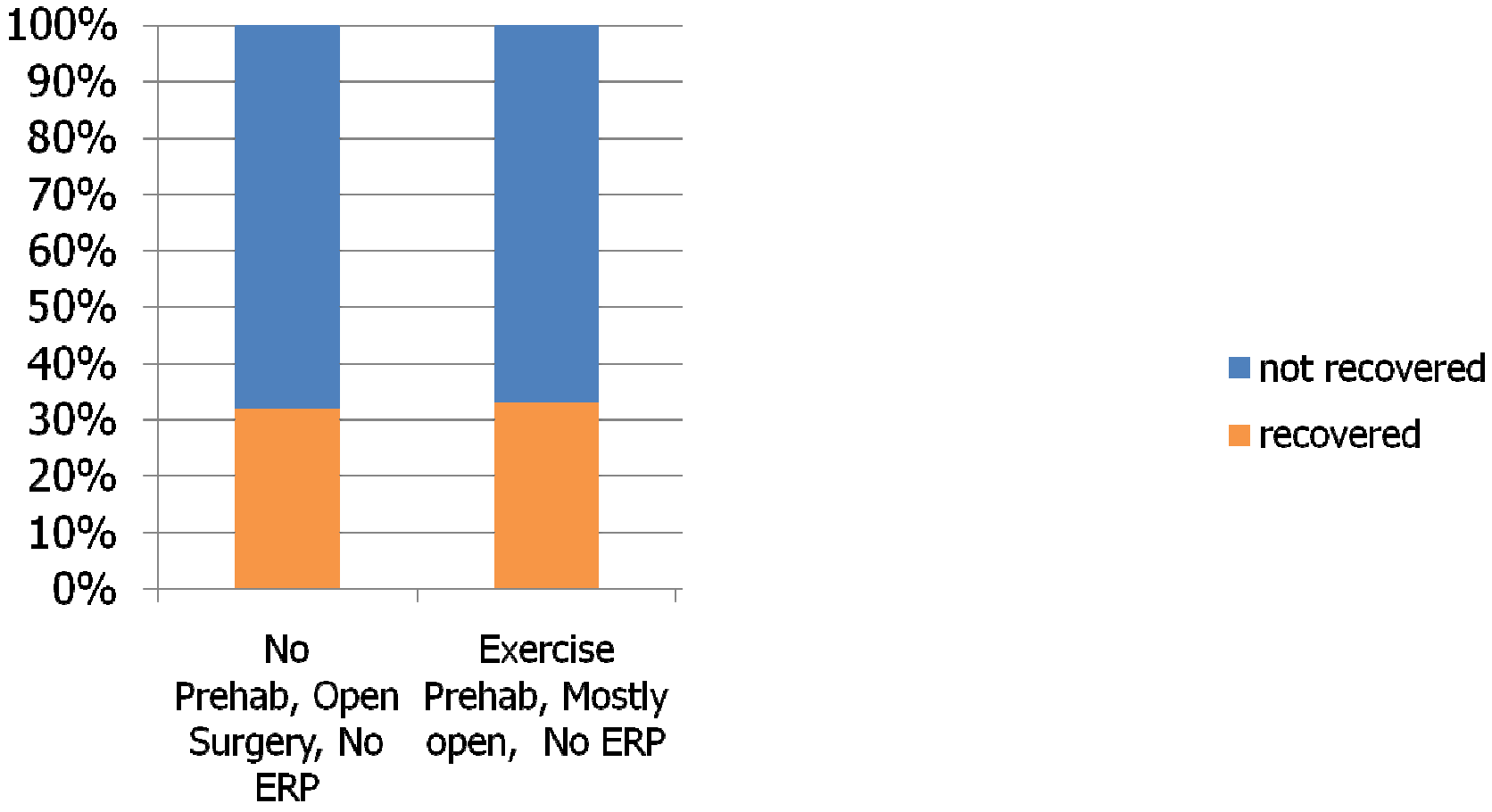
Gillis C et al. *Anethesiology* 2014

%Recovered to baseline functional walking capacity (6MWT ± 20m) at 5-9 weeks



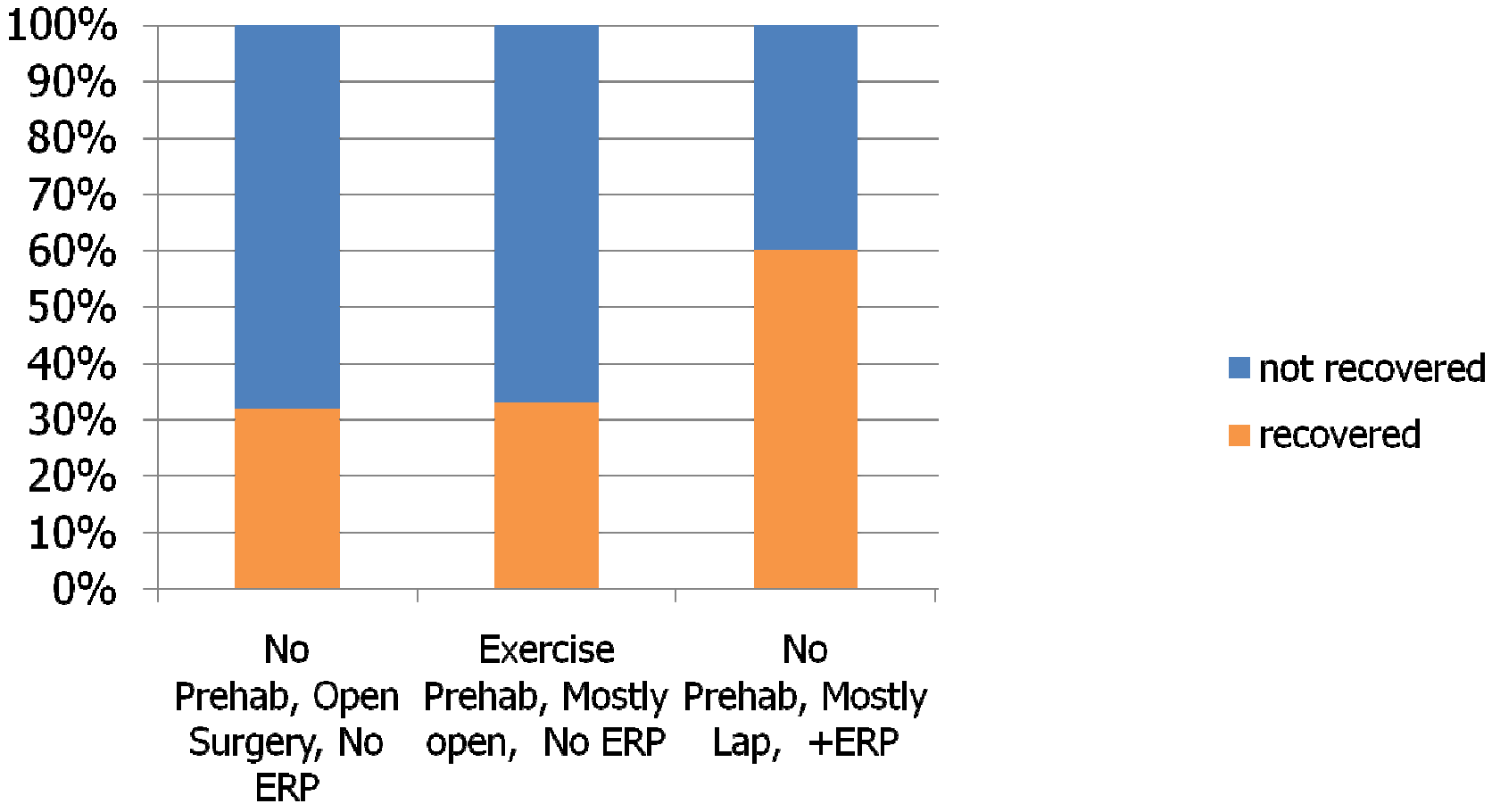
Moriello C et al. *Arch Phys Med Rehab* 2008

%Recovered to baseline functional walking capacity (6MWT ± 20m) at 5-9 weeks



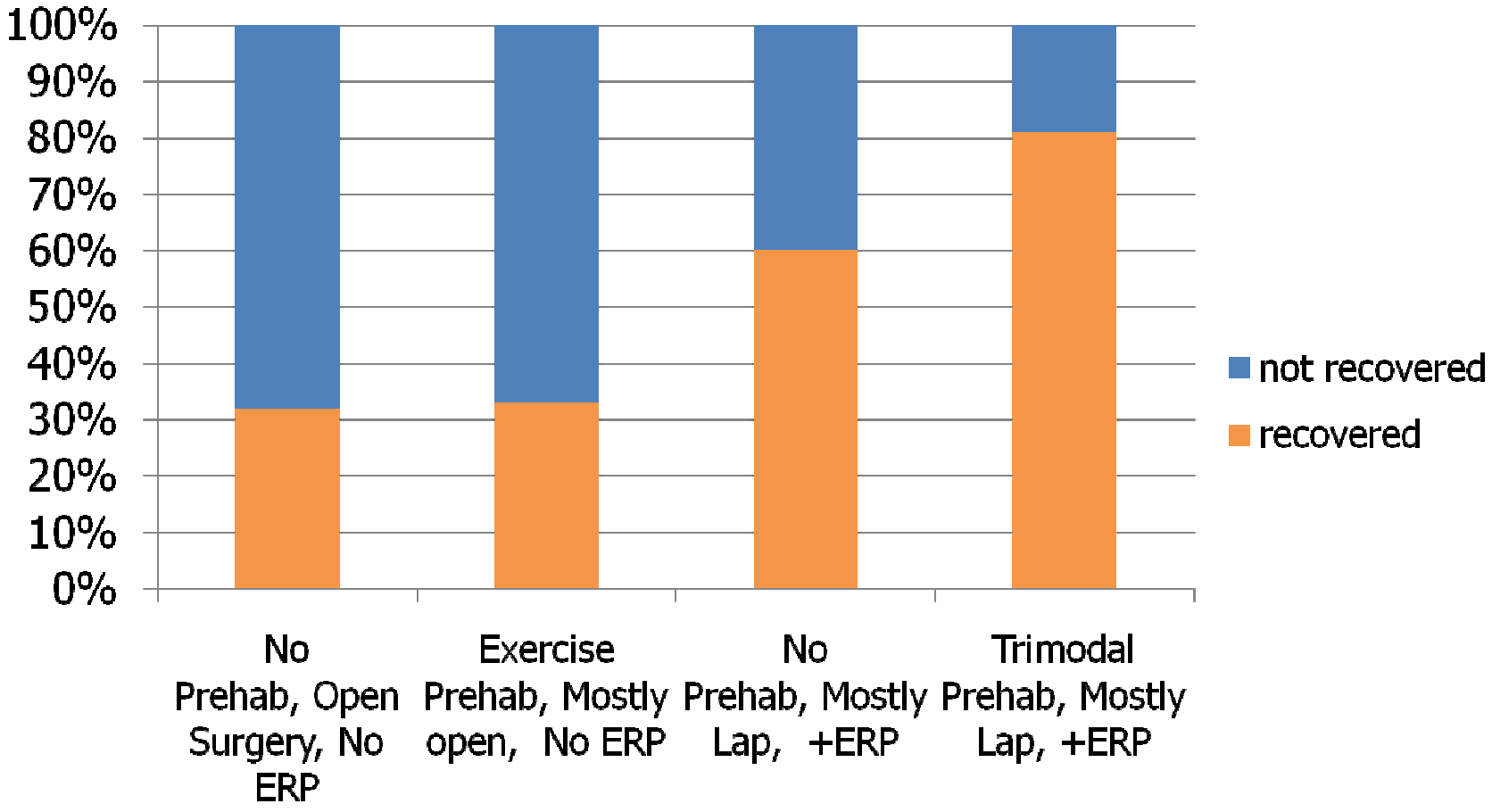
Moriello C et al. *Arch Phys Med Rehab* 2008
Carli F et al. *BJS* 2010

%Recovered to baseline functional walking capacity (6MWT ± 20m) at 5-9 weeks



Moriello C et al. *Arch Phys Med Rehab* 2008
Carli F et al. *BJS* 2010
Li C et al. *Surg Endosc* 2013

%Recovered to baseline functional walking capacity (6MWT ± 20m) at 5-9 weeks



Moriello C et al. *Arch Phys Med Rehab* 2008
Carli F et al. *BJS* 2010
Li C et al. *Surg Endosc* 2013

Consortium Agreement

10690

PREHAB: Multimodal prehabilitation in colorectal cancer patients to improve functional capacity and reduce postoperative complications. Fit to fight.

Conclusions

- ERAS programs improve postoperative functional recovery, decreasing hospital length of stay and costs, with no increase in readmissions, morbidity and mortality

- ERAS methodology is safe, feasable and efficacious also in elderly patients

- Prehabilitation strategies combined with ERAS programs seems the best strategy for perioperative care in fragile patients

Grazie per l'attenzione