«Distal feeding un'opportunità di cura?»

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Classificazione Insufficienza Intestinale

Table 1
Types of intestinal failure.

		Description	Duration	Examples	Goals of management
Type I	Acute IF I	Acute condition. Other organ dysfunction often present. AIF often self-limiting when other organ dysfunction corrected.	Days	Paralytic ileus post-operatively or as a part of MODS	Survival of acute phase. Stabilisation of homeostasis. Resolution of IF.
Type II	Acute IF II	Prolonged acute condition. Continuing metabolic instability.	Weeks to months	Recurrent abdominal sepsis with or without fistulation. Acute phase of short bowel syndrome	Achievement of steady-state without sepsis and with no other organ dysfunction. Resolution of IF or moving to chronic IF.
Type III	Chronic IF	Chronic organ failure without concomitant acute organ dysfunction. Steady-state condition.	Months to years	Short bowel syndrome. Intestinal dysmotility	Maintenance of homeostasis. Optimisation of nutritional and wound status. Restoration of gut integrity where possible.

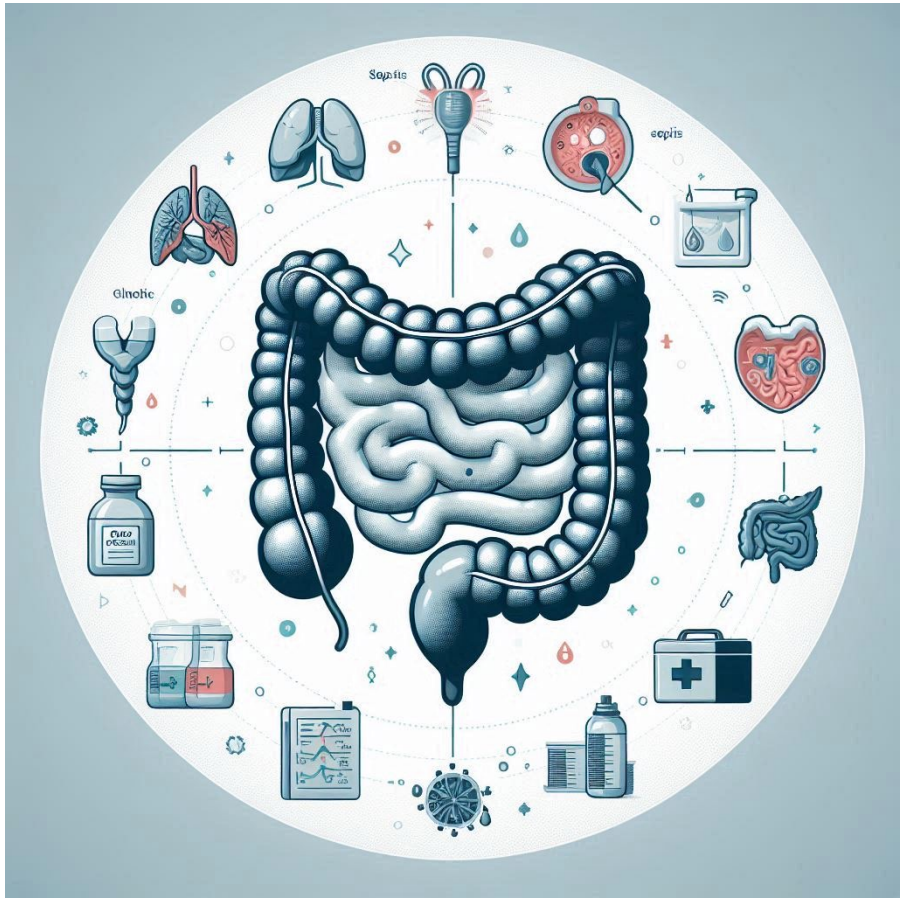
MODS – multiple organ dysfunction syndrome.

L. Pironi et al. / Clinical Nutrition 34 (2015) 171e180

Insufficienza Acuta Tipo 1

Insufficienza Intestinale di Tipo 1

- Il Tipo I è estremamente comune, spesso causato da **ostruzione intestinale meccanica o ileo paralitico** (15% degli interventi chirurgici addominali postoperatori).
- Le cause includono **interventi chirurgici addominali**, **infezioni intra-addominali**, **malattie critiche**, **traumi**, **pancreatite acuta**.
- La gestione tipica comprende **drenaggio nasogastrico e nutrizione endovenosa**.
- La frequenza dell'ostruzione intestinale postoperatoria varia, ma può essere **gestita in modo conservativo** nella maggior parte dei casi.
- I pazienti sono solitamente assistiti nei **reparti chirurgici**, talvolta in ambienti di **terapia intensiva**.
- Le tecniche multimodali di recupero potenziato (**ERAS**) possono ridurre la frequenza dell'ileo dopo interventi chirurgici addominali e facilitare un rapido recupero.



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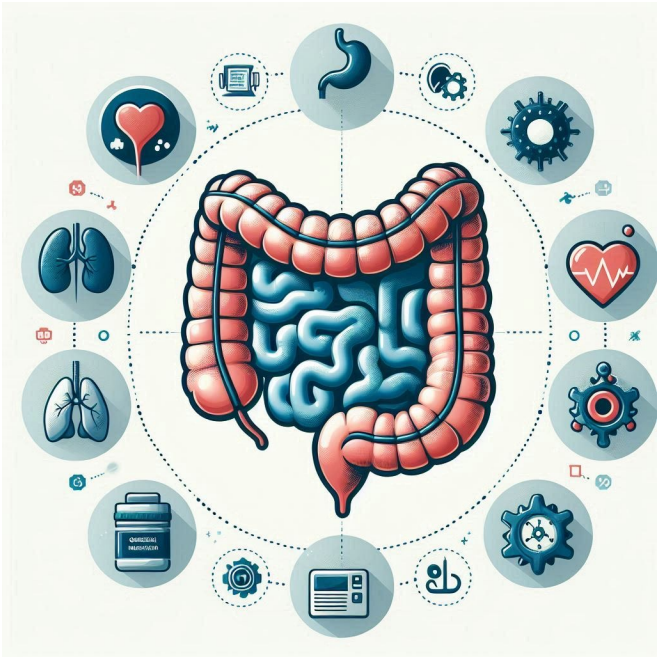
Insufficienza Acuta Tipo 2

- Severe condition with high mortality (In-hospital mortality 9.6% - 13%)
- Requirement for parenteral nutrition of 28 days or more as a surrogate marker
- Annual incidence of Type II IF: 9 patients per million population
- Full intestinal rehabilitation in about 40%
- Evolution toward Type III IF requiring prolonged HPN (50%).
- Deaths mostly due to sepsis, intra-abdominal, bone, cardiac, central nervous system, CVC-related
- Specialist in intestinal failure units, with multidisciplinary, teams are recommended



Cause

- Postoperative complications
- Crohn's Disease
- Mesenteric ischemia
- Trauma
- Volvulus
- Radiation Enteritis

Proceedings of the Nutrition Society (2011), **70**, 321–328

Original article

Acute intestinal failure: International multicenter point-of-prevalence study

Clinical Nutrition 39 (2020) 151–158

Annika Reintam Blaser [a, b, *], Ilse Ploegmakers [c], Michael Benoit [b], Mette Holst [d], Henrik Hojgaard Rasmussen [d], Rosa Burgos [e], Alastair Forbes [f], Jon Shaffer [g], Simon Gabe [h], Oivind Irtun [i], Ronan Thibault [j], Stanislaw Klek [k], Steven WM Olde Damink [c], Marcel van de Poll [c], Marina Panisic-Sekeljic [l], Geert Wanten [m], Loris Pironi [n], AIF study group

25 Centri di ricovero per acuti

Table 1
Overview of study sites.

Site	Type of hospital	Acute care beds	ICU beds	IMC/HDU beds	Specialist IF unit beds	Patients on PN	Patients with AIF	Patients with CIF
1	University	876	40	61	0	13 (1.5)	8 (0.9)	0
2	University	1200	28	15	10			
3	University	745	28	0	10	22 (3.0)	9 (1.2)	6 (0.8)
4	University	900	180	0	0	21 (2.3)	17 (1.9)	1 (0.1)
5	University	948	18	10	0	5 (0.5)	3 (0.3)	0
6	University	508	27	33	0	11 (2.2)	9 (1.8)	2 (0.4)
7	University	227	5	12	0	3 (1.3)	3 (1.3)	0
8	University	300	10	8	2	2 (0.7)	2 (0.7)	0
9	University	1000	52	0	2	4 (0.4)	1 (0.1)	0
10	Regional	21	4	0	4	6 (28.6)	2 (9.5)	4 (19.0)
11	Regional	350	10	0	0	5 (1.4)	4 (1.1)	0
12	University	1200	50	20	0	19 (1.6)	10 (0.8)	3 (0.3)
13	University	960	21	0	20			
14	University	387	85	49	0	10 (2.6)	7 (1.8)	3 (0.8)
15	Regional	529	45	133			5 (0.9)	2 (0.4)
16	University	762	114	12			13 (1.7)	5 (0.7)
17	University	933	50	30			11 (1.2)	0
18	Regional	523	19	0	0	7 (1.3)	6 (1.1)	0
19	University	1142	228	0	0	44 (3.9)	24 (2.1)	17 (1.5)
20	University	342	18	17	0	13 (3.8)	11 (3.2)	1 (0.3)
21	University	745	50	28	2	14 (1.9)	13 (1.7)	0
22	University	1346	93	24	2	41 (3.0)	20 (1.5)	2 (0.1)
23	University	1127	38	0	0	23 (2.0)	13 (1.2)	3 (0.3)
24	University	648	27	0	27	13 (2.0)	9 (1.4)	0
25	University	797	46	10	0	10 (1.3)	6 (0.8)	0
TOTAL		16'356	1237	447	49	338 (2.1)	206 (1.3)	49 (0.3)
CI 95% for prevalence						1.58–2.53	1.00–1.61	0.11–0.41
TOTAL without Site 10		16'335	1233	447	45	332 (2.0)	204 (1.2)	45 (0.3)
CI 95% for prevalence without Site 10						1.55–2.41	0.99–1.58	0.11–0.37

ICU – intensive care unit; IMC/HDU – intermediate care/high-dependency unit; IF – intestinal failure; PN – parenteral nutrition; AIF –acute intestinal failure; CIF – chronic intestinal failure; CI – confidence interval.

Prevalenza AIF: 1,3%

Table 4
Pathophysiology and underlying diseases in AIF.

	Number of patients N = 206	%
Mechanism of AIF		
Disordered motility	106	51.5
Obstruction	29	14.1
Fistula	23	11.2
Short bowel	12	5.8
Extensive mucosal disease	12	5.8
Other	24	11.7
Underlying disease		
Surgical complication	76	36.9
Active malignancy	31	15.0
Crohn's disease/IBD	16	7.8
Shock	10	4.9
Pancreatitis	10	4.9
Mesenteric vascular pathology	8	3.9
Primary motility disorder	2	1.0
Other abdominal pathology	23	11.2
Other pathology	30	14.6

AIF – acute intestinal failure; IBD - inflammatory bowel disease.

Original article

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OUTCOMES A 90 GG:

MORTALITA' PER AIF: 20,5%

Table 5

Outcome data at day 90. Data presented as number of patients (percentage) or median [interquartile range] if not stated otherwise.

	All patients N = 330	CIF N = 49	AIF N = 200	Non-IF N = 81	p-value AIF vs non-IF
Outcome					0.257
Discharged	239 (72.4)	39 (79.6)	147 (73.5)	53 (65.4)	
Deceased	71 (21.5)	6 (12.2)	41 (20.5)	24 (28.9)	
Still in hospital	20 (6.1)	4 (8.2)	12 (6.0)	4 (4.8)	
Abdominal surgery	196 (59.4)	27 (55.1)	147 (73.5)	22 (27.1)	<0.001
Two or more abdominal surgeries	77 (22.8)	12 (24.5)	57 (28.5)	8 (9.9)	0.001
Presence of a stoma during the study	110 (33.3)	32 (65.3)	70 (35.0)	8 (9.9)	<0.001
Presence of fistula during the study	58 (17.6)	16 (32.7)	38 (19.0)	4 (4.9)	0.003
Total duration of PN, days	19 [10–37]	26 [11–79]	19 [10–37]	17 [10–29]	0.269
Total patients in the ICU	174 [7,52]	19 [38,8]	118 (59.0)	37 (45.7)	0.014
Total ICU stay, days	29 [16–50]	27 [16–42]	30 [16–46]	26 [16–75]	0.647
Total hospital stay, days	36 [21–61]	26 [14–54]	38 [21–61]	35 [23–71]	0.950

ICU – intensive care unit; IF – intestinal failure; PN – parenteral nutrition; AIF –acute intestinal failure; CIF – chronic intestinal failure.

MORTALITA' ASSOCIATA A:

- -Età
- -Sepsi
- -Ricovero in ICU
- -Durata PN>42 giorni

Table 7

Stepwise multiple regression analysis identifying variables associated with hospital mortality within 90 days.

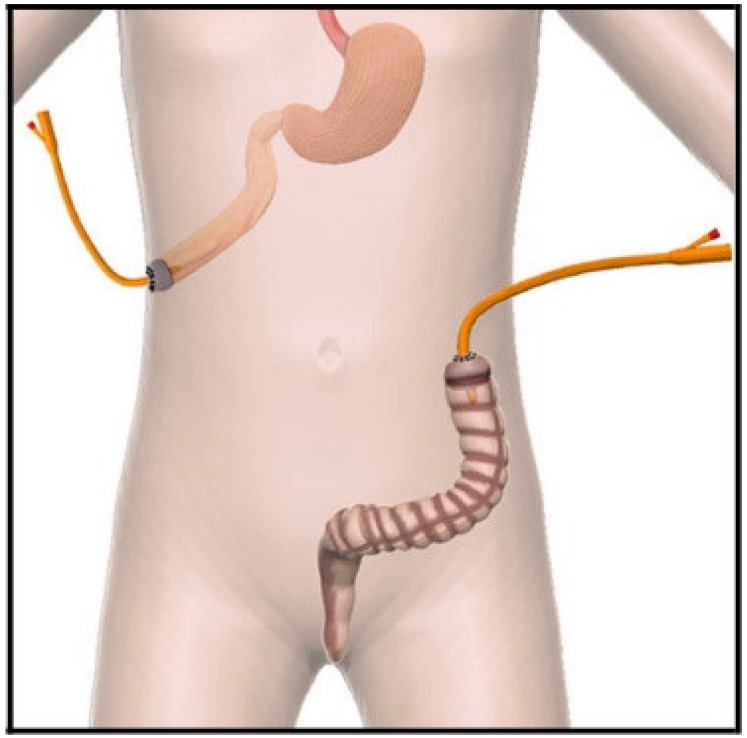
Variable	P-value	Odds ratio	95% CI lower	95% CI upper
Intestinal failure				
No IF	0.988			
Acute IF	0.956	1.053	0.166	6.689
Chronic IF	0.886	1.107	0.276	4.428
Age	0.013	1.029	1.006	1.052
Sepsis on study day	0.024	2.349	1.120	4.925
Home PN before	0.731	0.775	0.180	3.325
Stoma ever	0.230	0.624	0.289	1.347
ICU admission ever	0.023	2.459	1.133	5.336
3 or more abdominal surgeries	0.105	0.405	0.136	1.206
PN ≥ 42 days	0.008	2.868	1.319	6.235

IF – intestinal failure; PN – parenteral nutrition; CI – confidence interval.

POST SURGICAL RARE CONDITIONS

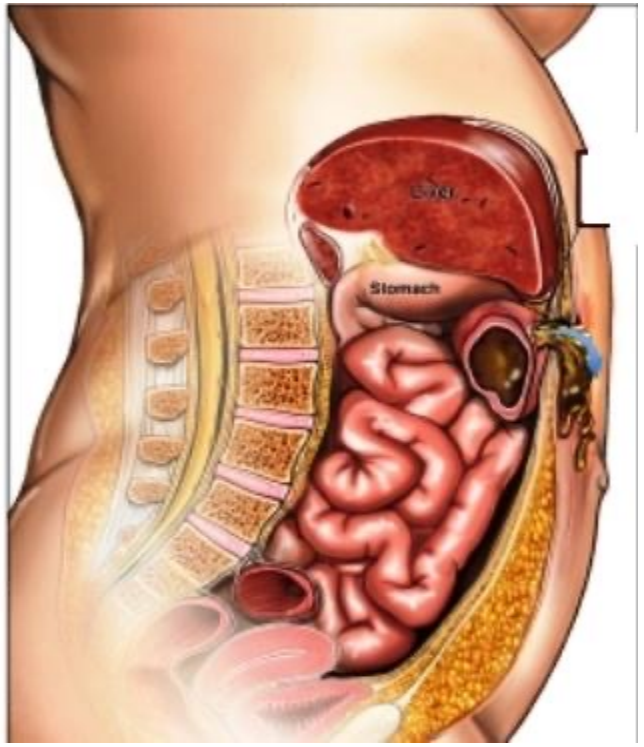
DOUBLE OSTOMY

Presence of two enterostomy following surgical interventions



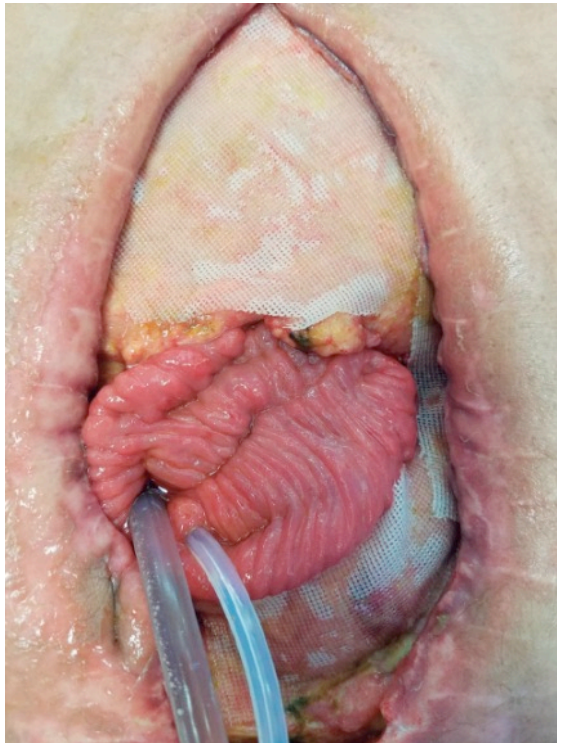
ENTEROCUTANEOUS FISTULAS

Connection between the gastrointestinal tract and the skin

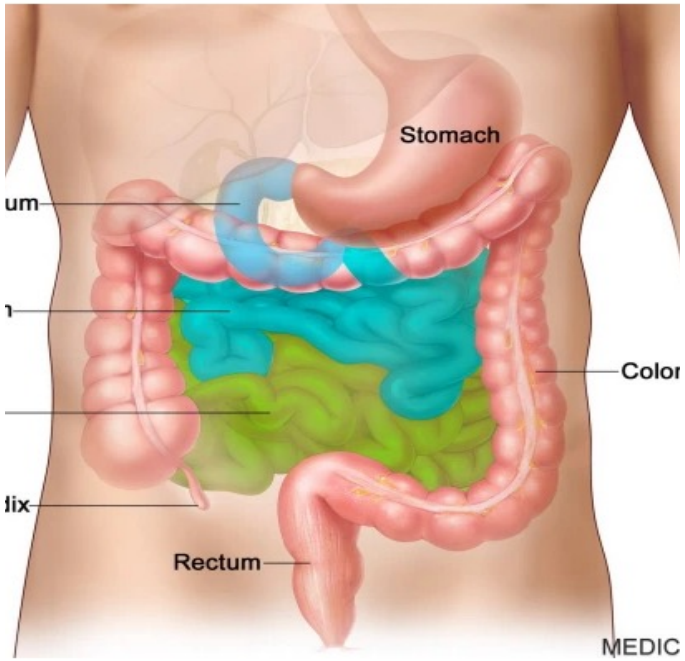


ENTEROATMOSPHERIC FISTULAS

GI tract in connection with the external environment through an open abdomen



EZIOLOGIA DELLE DOPPIE ENTEROSTOMIE (Double ostomy -DO)

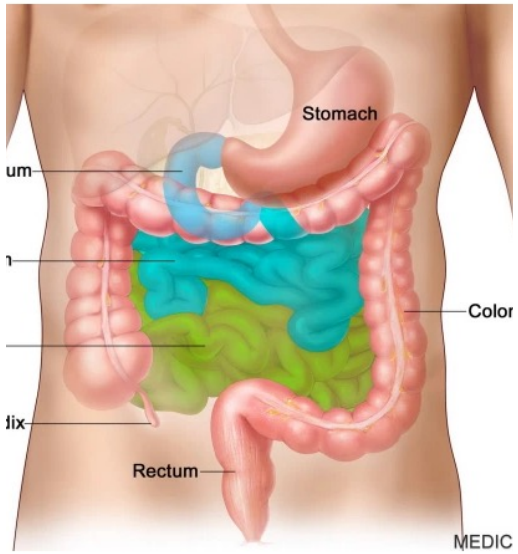


- Diverse situazioni cliniche possono portare il chirurgo a confezionare una doppia enterostomia temporanea:
  - Resezione dell'intestino tenue
  - Peritonite
  - Fistole
  - Protezione per anastomosi
- Il ripristino chirurgico della continuità intestinale viene solitamente programmato **almeno tre-sei mesi dopo**.
- **Incidenza annuale** di doppia enterostomia temporanea che richiede nutrizione parenterale (PN) per più di 14 giorni: <u>20 pazienti per milione (dati nel Regno Unito)</u>
- L'enterostomia può portare a gravi **complicanze**:
  - Disidratazione, segnalata nel 18-29% dei pazienti ed è responsabile del 40-50% dei ricoveri ospedalieri
  - Insufficienza renale
  - Disturbi elettrolitici
  - Disturbi equilibrio acido-base
  - Malnutrizione (macro e micronutrienti)

Queste complicanze sono responsabili dell' **aumento dei ricoveri ospedalieri dei Costi sanitari**e ed hanno un forte impatto sulla **qualità della vita dei pazienti**

EZIOLOGIA DELLE FISTOLE ENTERICHE (EF)

- **Complicanze di**:
  - perforazioni intestinali
  - resezione del colon e/o del retto
  - reinterventi chirurgici
  - fistole anastomotiche
  - traumi addominali complessi
- **Tra il 15% e il 25% delle fistole enterocutanee si sviluppano spontaneamente in pazienti con**
  - malattie infiammatorie intestinali (più comunemente la malattia di Crohn);
  - esposizione a radiazioni;
  - patologie oncologiche;
  - ostruzione intestinale distale;
  - infezioni intestinali come tubercolosi, amebiasi e febbre tifoide



FISTOLE ENTERICHE

- La terapia attualmente considerata il gold standard fino al **ripristino chirurgico della continuità intestinale** è la **nutrizione parenterale domiciliare**.
- Il **tasso di mortalità** di questi pazienti varia dal 6 al 30%, a seconda della portata della fistola
- Complicanze delle Fistola enterica ad alto flusso (EAF) (**perdita di liquidi, elettroliti, minerali e proteine)**:
  - Malnutrizione
  - Squilibri elettrolitici
  - Sepsi
  - Squilibrio metabolico e disfunzione epatica

CLASSIFICATION OF ENTERIC FISTULA

Localization	Proximal	Stomach, duodenum, jejunum or proximal ileum
	Distal	Distal ileum or colon
Daily output	Low	<200 ml/24 h
	Moderate	200 - 500 ml/24 h
	High	>500 ml/24 h
Location at the open abdomen	Superficial	Drains through the wound of the abdominal cavity
	Deep	Drains intestinal contents into the abdominal cavity
Number of fistulas	Single	One single fistula
	Multiple nearby fistulas	Two or more fistulas close together
	Multiple distant fistulas	Two or more distant fistulas

GESTIONE E TRATTAMENTO DELLE FISTOLE ENTERICHE

- La gestione delle fistole ad alto output (>500 ml/24 h) rappresenta ancora una **sfida per il team multidisciplinare** a causa dell'alterazione metabolica.
- E' improbabile che avvenga una risoluzione spontanea delle fistole ad output moderato e alto.
- Si raccomanda di attendere circa **3-6 mesi per l'intervento chirurgico di ripristino della continuità gastrointestinale, per ottenere:**
  - **raggiungimento di un equilibrio nutrizionale e metabolico,**
  - **controllo ottimale delle infezioni**
  - **migliore condizione intra-addominale** (sindrome aderenziale)

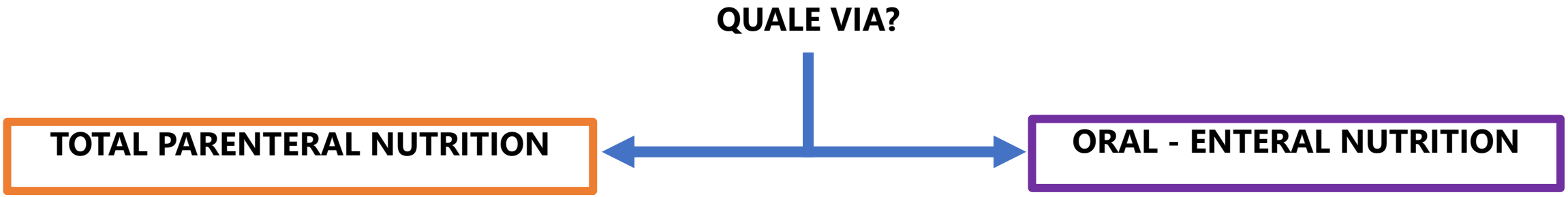
AIMS OF THE MULTIDISCIPLINARY MANAGEMENT

Controlling sepsis	Surgeons Radiologists Infectiologists Intensivists
Optimization of fluids and metabolics and controlling/ avoiding organ dysfunctions	Intensivists Nurses Nephrologists, respiratory therapists and others according to specific organ dysfunctions
Optimization of nutritional status. Creation of distal access where appropriate.	Nutrition specialists Intensivists Nurses Gastroenterologists Surgeons
Assessment of GI function	Nurses Intensivists Gastroenterologists Surgeons
Wound/fistula care	Surgeons Nurses Wound/stoma specialists
Mobilisation/Physiotherapy	Nurses Physiotherapists
Avoidance of complications such as aspiration of gastric contents, pressure sores, catheter infections etc.	Nurses Physiotherapists Intensivists Surgeons Anaesthetists

Nutritional Intervention

INTERVENTO NUTRIZIONALE IN DO / EF

- **Migliorare lo stato nutrizionale del paziente per raggiungere la stabilità clinica**.
- Perdita significativa di **fluidi e nutrienti**.
- Un **basso apporto calorico giornaliero** e un **elevato fabbisogno energetico** derivante dal processo infiammatorio porteranno a un intenso catabolismo e alla conseguente malnutrizione.



PARENTERAL – ENTERAL NUTRITION: PROS & CONS

TOTAL PARENTERAL NUTRITION

PROS

- Ridurre la secrezione intestinale intrinseca
- Diminuire la motilità
- Ridurre la perdita stomale
- Innescare l'anabolismo
- Ottenere il riposo del tratto gastrointestinale
- Il più ampiamente utilizzato

CONS

- Complicanze:
  - disfunzione epatica
  - infezioni del catetere
  - iperglicemia
  - sovracrescita batterica (traslocazione -> sepsi)
  - Costi più elevati

ORAL - ENTERAL NUTRITION

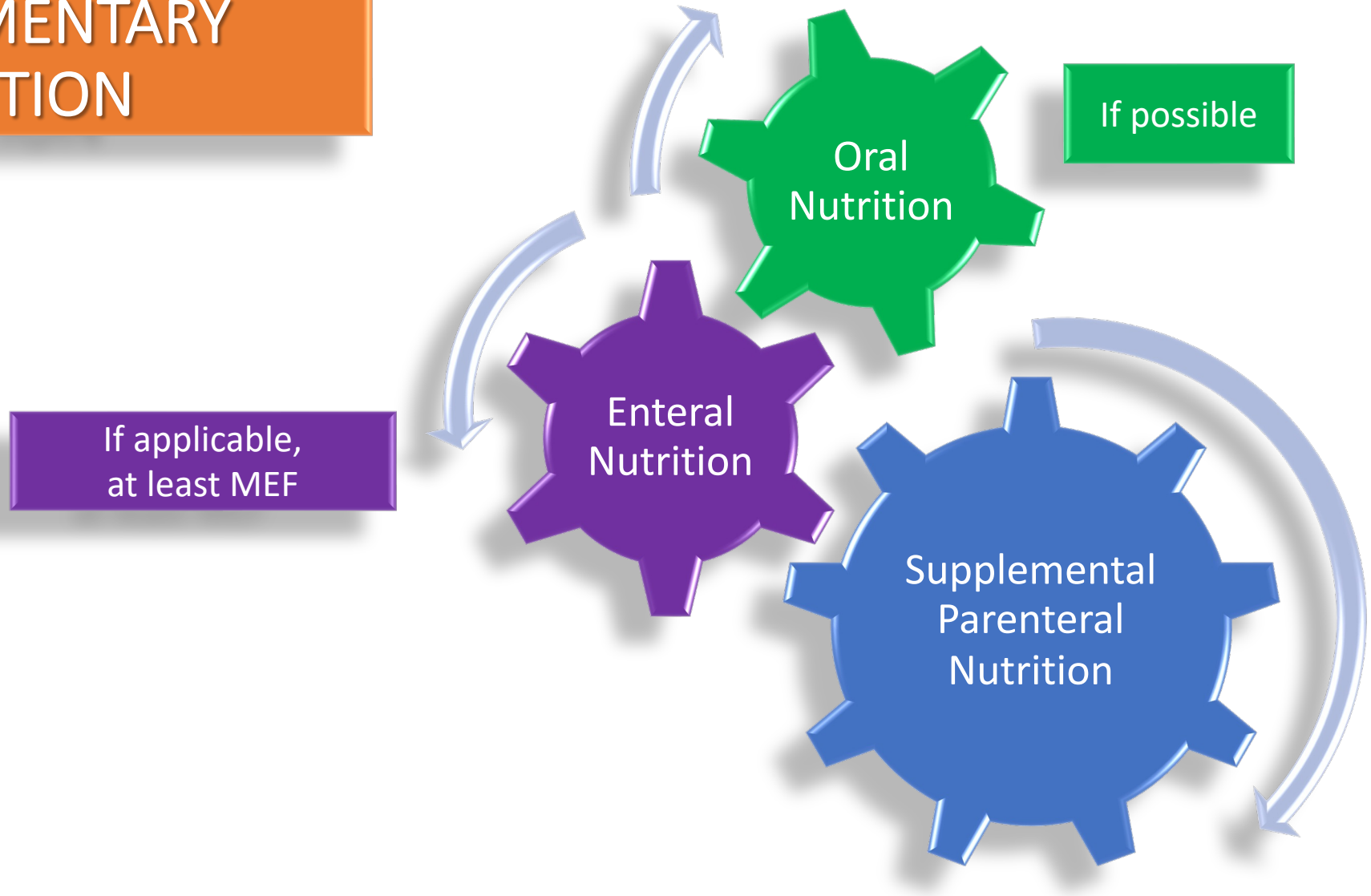
PROS

- Più fisiologico
- Stimola perfusione mesenterica
- Aumenta l'integrità strutturale e funzionale della mucosa gastrointestinale
- Previene l'adesione batterica alle cellule epiteliali intestinali
- Stimola la secrezione di IgA e riduce la risposta infiammatoria locale
- Migliora il trofismo della mucosa locale, fornendo nel lungo termine risultati migliori nell'intervento chirurgico

CONS

- Nelle fistole ad alto output, è di scarso beneficio nel mantenere lo stato metabolico e nella gestione delle complicanze del paziente.
- La nutrizione enterale potrebbe potenzialmente aggravare la malnutrizione e ritardare la correzione definitiva a causa di un aumento della fuoriuscita della fistola.

BEST APPROACH: COMPLEMENTARY NUTRITION



Distal Feeding: Chyme Reinfusion, Enteroclysis, Fystuloclysis»

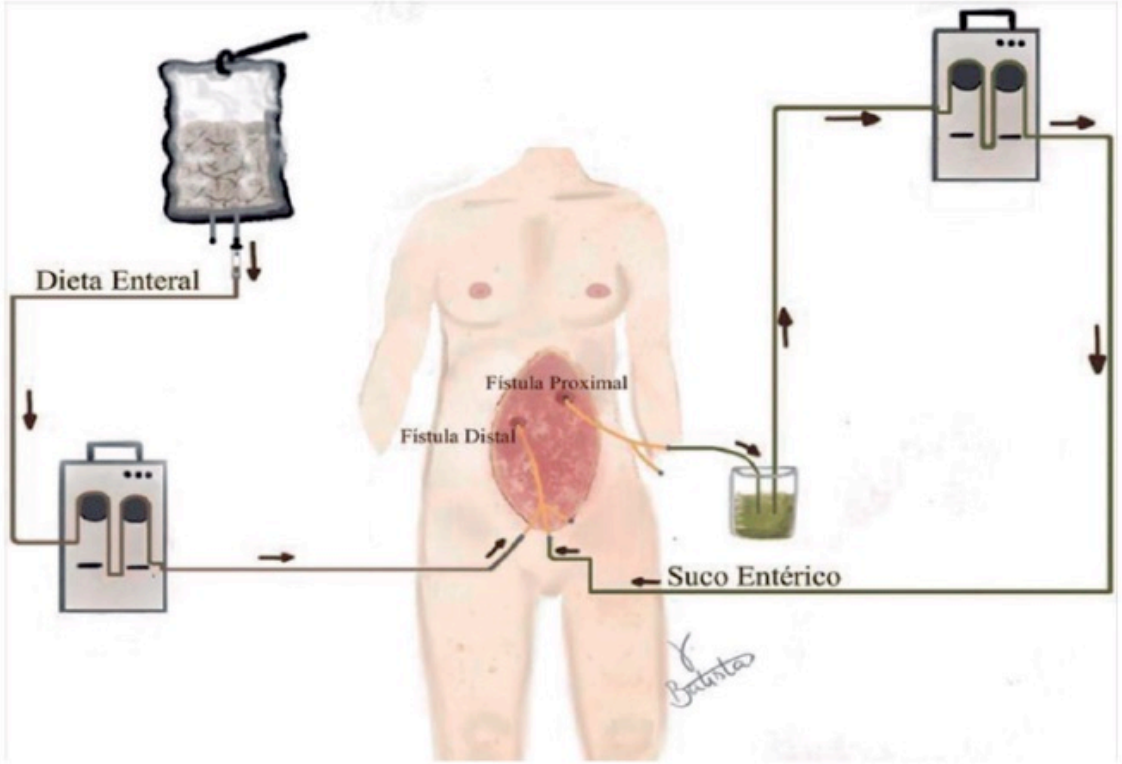
DISTAL FEEDING

REINFUSIONE DEL CHIMO

- L’effluente dal tratto prossimale viene infuso manualmente o meccanicamente nel tratto defunzionalizzato dell'intestino distale;
- Il chimo fornisce macronutrienti, micronutrienti, sali minerali, acqua, elettroliti e sali biliari, amilasi salivare, pepsina gastrica, enzimi pancreatici, flora intestinale.

ENTERO/FISTULOCLISI

- L'enteroclisi è definita come l'infusione di miscele (NE) attraverso la stomia distale di un doppia enterostomia
- Fistuloclisi tramite stomia distale di una FCE (fistola enterocutanea) o FEA (fistola enteroatmosferica)



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Clinical Nutrition 39 (2020) 3695–3702

Original article

Management of entero-atmospheric fistulas by chyme reinfusion: A retrospective study

Sabrina Layec*, Eloi Seynhaeve, Florence Trivin, Marie Carsin-Mahé, Laurence Dussaulx, Denis Picot

- **212 patients**: 183 patients had temporary double enterostomy and 29 exposed enterocutaneous fistulas.
- **CR reduced the intestinal output by 85%** (2444 ± 933 vs 370 ± 457 ml/day, P < 0.001), improved nitrogen (46 ± 16 vs 80 ± 14%, P < 0.001) and fat absorption coefficients (48 ± 25 vs 86 ± 11%, P < 0.001),
- The number of patients with output higher than 1200 ml/24 h decreased from 155 to 9 (p<0.0001).
- Normalized **plasma citrulline** concentration (17.6 ± 8.4 vs 30.3 ± 11.8 mmol/l, P < 0.001).
- **PN was stopped in 126/139 (91%)** patients within 2 ± 8 d.
- **Nutritional status improved** (P < 0.001): **weight** (+4.6 ± 8.6%), BMI (+3.8 ± 7.7%), **plasma albumin** (+6.2 ± 6.1 g/l), and NRI (+10.9 ± 9.5).
- The proportion of patients with **plasma liver tests abnormalities decreased (88 to 51%,** P < 0.01).
- Home CR was feasible without any serious complications in selected patients.
- 59 pz (28%) received **home CR** (15 pz for more than 2 months)

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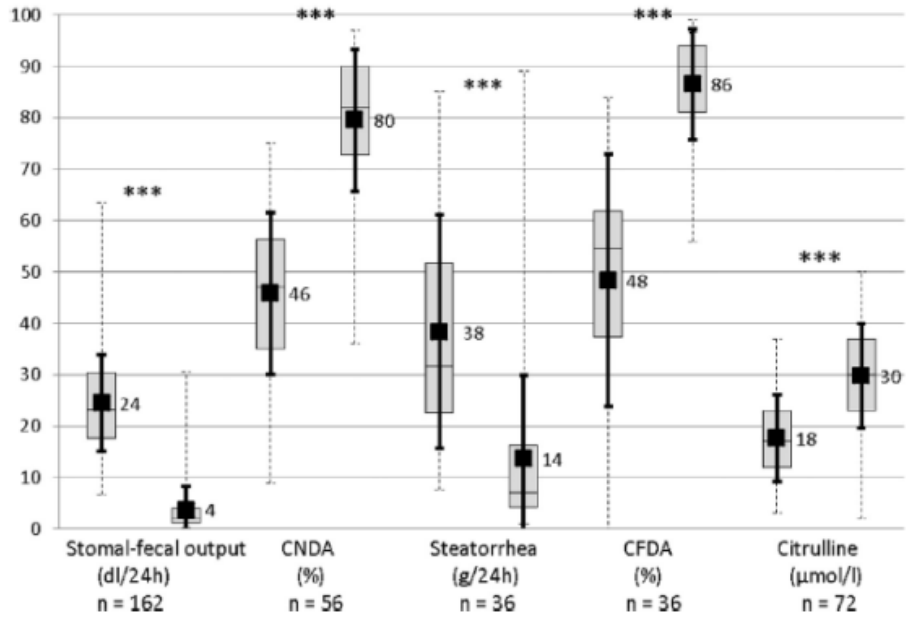
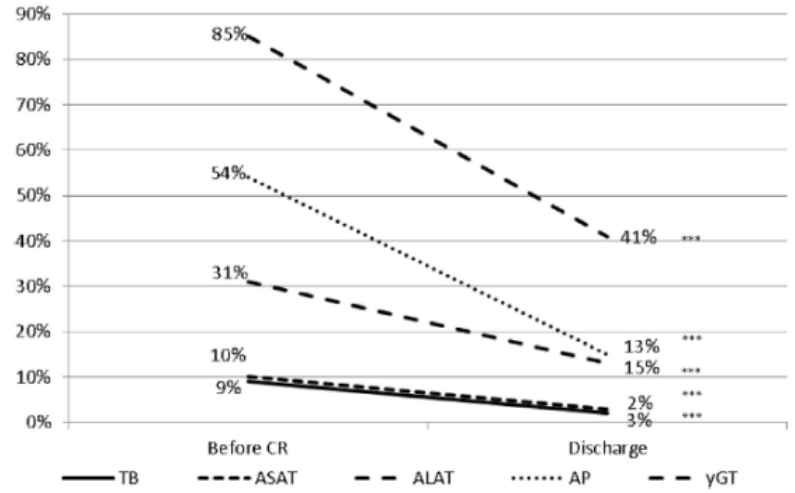
- Median delay (IQ 25-75%) between the surgery leading to EAF and admission to the centre 39 (25-65) days.
- After admission CR was begun in a median delay of 9 (4e15) days and for a **median duration of 89 (58-139) days**.
- The date of end of CR corresponds to the date of the reconstructive surgery.





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Chyme Reinfusion for Small Bowel Double Enterostomies and Enteroatmospheric Fistulas in Adult Patients: A Systematic Review

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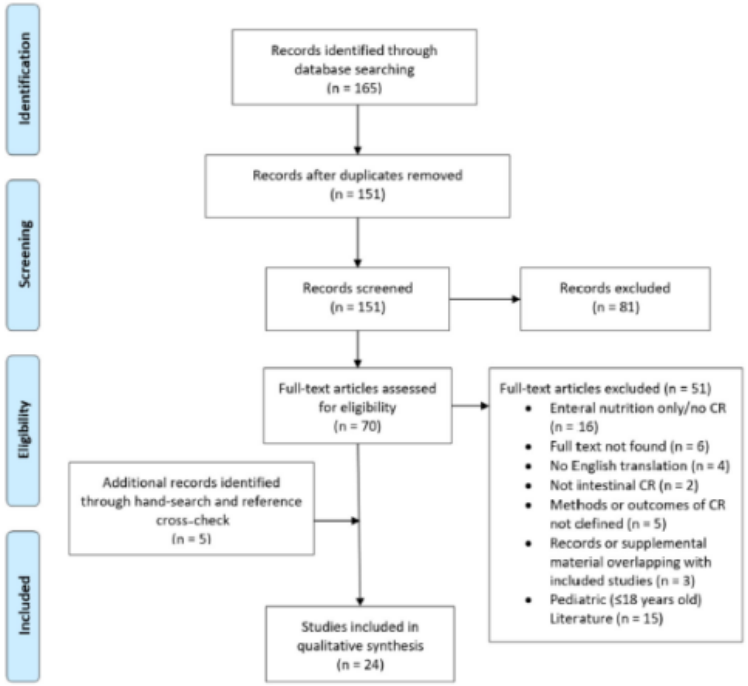

Inclusi 24 studi retrospettivi

Table 2. Population Descriptors of Selected Articles.

Author	Small Bowel EAF (Number)/DES (Number)	Study Population Size	CR Population Size[a]	Sex (Male; Female)	Mean Age ± SD (Range)
Bissett[30,31]	EAF	21	8		(12–58) years
Calicis et al[23]	DES	21	21	11;10	46 ± 15 (18–74) years
Coetzee et al[15]	EAF and DES	54	20	15;5	47 ± 16.6 years
Cresci et al[27]	EAF	1	1	1;0	26 years
Du Toit[13]	EAF and DES	1	1	1;0	30 years
Gouma et al[18]	EAF and DES	6	6		
Kittscha[36]	DES	1	1	1;0	70 years
Kwun[33]	DES	1	1	1;0	62 years
Lefevre et al[38]	DES	1	1	1;0	53 years
Levy et al[32]	EAF (14)/DES (16)	30	30		
Liu et al[29]	DES	6	6	3;3	65 ± 9.6 (53–83) years
Maeda et al[42]	DES	1	1	1;0	26 years
McGrogan et al[34]	DES	1	1	0;1	
Nagar et al[20]	DES	35	35	26;9	[47][b] (19–74) years
Pflug et al[19]	EAF	1	1	0;1	42 years
Picot et al[21]	DES	26	26	17;9	57.8 ± 13.7 (17–79) years
Picot et al[11]	EAF (29)/DES (183)	212	212	125;87	61.4 ± 14.8 (17–90) years
Prior et al[41]	DES	1	1	1;0	58 years
Rinsema et al[37]	EAF and DES	8	8	4;4	53.4 ± 10.12 (30–62) years
Sanchez-Guillen et al[40]	EAF	1	1	1;0	19 years
Wu et al[10]	EAF	95	35	24;11	50.2 ± 14.1 years
Yang et al[28]	DES	183	22		
Ye et al[39]	EAF and DES	1	1	1;0	41 years
Yuan et al[35]	EAF	82	41		

481 pazienti

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Review | Full Access

Chyme Reinfusion for Small Bowel Double Enterostomies and Enteroatmospheric Fistulas in Adult Patients: A Systematic Review

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Nutrition in Clinical Practice
Volume 35 Number 2
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Adverse Events and Mortality

Picot et al identified occurrence of [redacted] 3) and development of distal coloni[redacted] 1) among a large cohort of reinfused pa[redacted]ver, these complications appeared to represent unmasking of existing pathologies or progression of underlying pathology rather than being complications of CR per se, as these were patients excluded from the reinfused group. Specific mention of no adverse events (AEs) related to reinfusion were reported in 6 articles,[15,18,21,27,37,38] whereas 11 other studies did not report whether any AEs occurred.[13,19,28,30-35,39,40] No studies reported any serious AEs or mortality directly associated with CR.

GI side effects were reported in association with CR in some studies, including abdominal discomfort, diarrhea, constipation, nausea, and vomiting, which were generally controlled sufficiently to enable reinfusion to be continued.[10,20,23,29,36,41,42] However, it was not clear whether these effects were directly related to CR or the underlying etiology that resulted in DES or EAF formation, or both. One article noted that extremely rapid or bolus reinfusion may contribute to these symptoms.[20,36]

Clinical Outcomes (24 STUDIES ANALYZED):

- **Improvement in nutrition status** (increase in mean weight, body mass index, an[redacted]al Risk Index (NRI), in 8 articles.
- Rise in plasma **citrulline** concentration after CR by ≈80%
- All but one of these **showed >85% of reinfused patients as having PN withdrawn completely**
- Improvement in **liver profiles** (particularly alkaline phosphatase (ALP), gamma-glutamyl transferase (GGT), and bilirubin) was observed in 8 studies
- Restoration of **liver enzymes** and function was postulated by 2 groups as being related to reestablishment of the **enterohepatic circulation of bile salts** following reinfusion and beneficial effects on the small intestine microbiome.
- Levy et al observed a **30% decrease in output from the proximal** limb following CR into the distal limb. They postulated that this was due to an inhibitory effect on the upper gastrointestinal (GI) tract secretions initiated by chyme within the distal small bowel.
- Two studies reported **favorable economic outcomes** of CR, demonstrating a savings in total healthcare cost per patient

ILEAL BRAKE

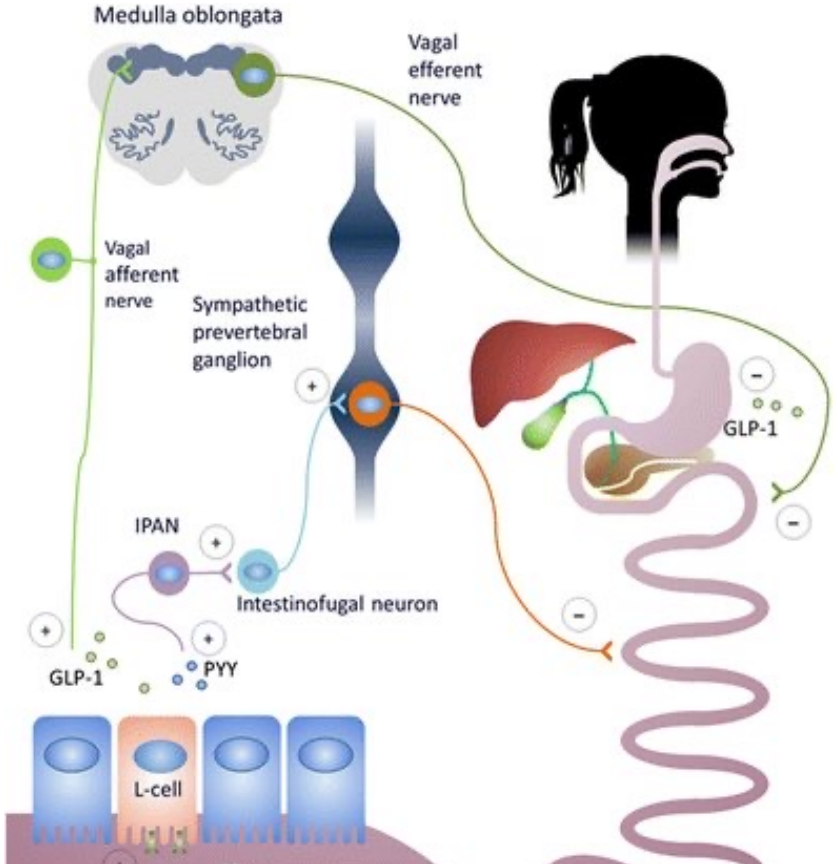
L'ileal brake è un **meccanismo fisiologico che rallenta la motilità e la secrezione gastrointestinali** in risposta all'arrivo di nutrienti non digeriti, in particolare lipidi, nell'ileo distale (l'ultima parte dell'intestino tenue). In pratica, funge da sistema di feedback per ottimizzare la digestione e l'assorbimento dei nutrienti e per prevenire il sovraccarico dell'intestino tenue.

PUNTI CHIAVE DEL MECCANISMO:

•**Rilevamento dei nutrienti:** L'ileal brake si innesca quando l'ileo distale rileva l'arrivo di nutrienti non digeriti, in particolare acidi grassi e lipidi. Questi nutrienti possono essere presenti a causa di un'insufficiente digestione o assorbimento a monte, nel duodeno e nel digiuno.

•**Rilascio di ormoni:** Il rilevamento dei nutrienti stimola le cellule enteroendocrine dell'ileo distale a rilasciare vari ormoni gastrointestinali, tra cui:

- •**Peptide YY (PYY):** Inibisce la motilità gastrica e la secrezione acida, riducendo la velocità con cui il cibo lascia lo stomaco (svuotamento gastrico). Aumenta anche l'assorbimento di acqua ed elettroliti nell'intestino crasso.
- •**Glucagon-like peptide-1 (GLP-1):** Inibisce anche lo svuotamento gastrico e aumenta la secrezione di insulina (specialmente in risposta al glucosio), migliorando il controllo della glicemia.
- •**Oxyntomodulina (OXM):** Simile al GLP-1, sopprime l'appetito e rallenta lo svuotamento gastrico.
- •**Glucagon-like peptide-2 (GLP2):** modula la motilità intestinale, rallentando il tempo di transito e promuovendo la ritenzione dei nutrienti. GLP-2 promuove la crescita della mucosa intestinale, aumentando la superficie assorbente e migliorando la capacità di assorbimento dei nutrienti

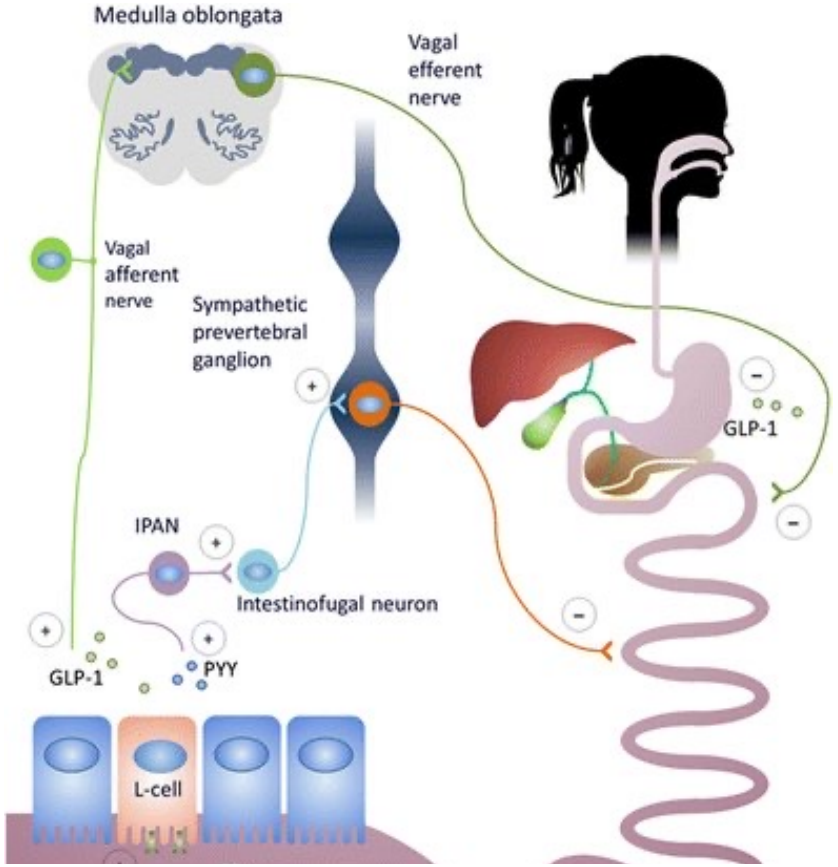


ILEAL BRAKE

•**Effetti sulla motilità e sulla secrezione gastrointestinale:** Questi ormoni, rilasciati in risposta alla presenza di nutrienti non digeriti nell'ileo, esercitano i seguenti effetti:

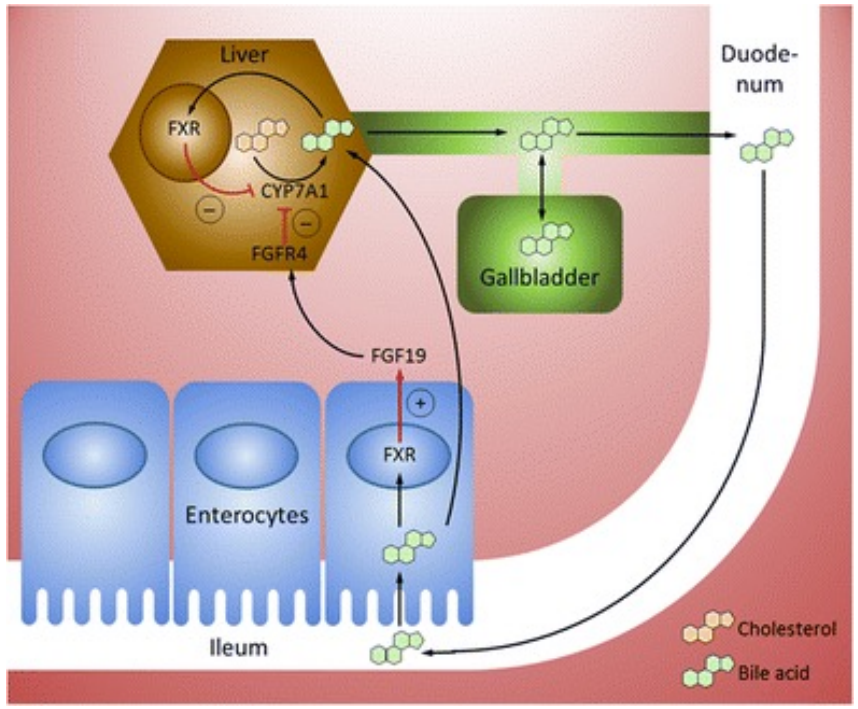
- •**Rallentano lo svuotamento gastrico:** Il cibo rimane nello stomaco più a lungo, consentendo una migliore digestione.
- •**Diminuiscono la motilità intestinale:** Il transito del cibo attraverso l'intestino tenue è rallentato, consentendo un maggiore assorbimento dei nutrienti.
- •**Inibiscono le secrezioni gastriche, pancreatiche e biliari:** Questo riduce il carico di lavoro del sistema digestivo e fornisce più tempo per la digestione e l'assorbimento dei nutrienti.

•**Coinvolgimento del sistema nervoso:** Il sistema nervoso enterico e il nervo vago giocano un ruolo nel mediare alcuni degli effetti dell'ileal brake, contribuendo a coordinare la risposta digestiva.

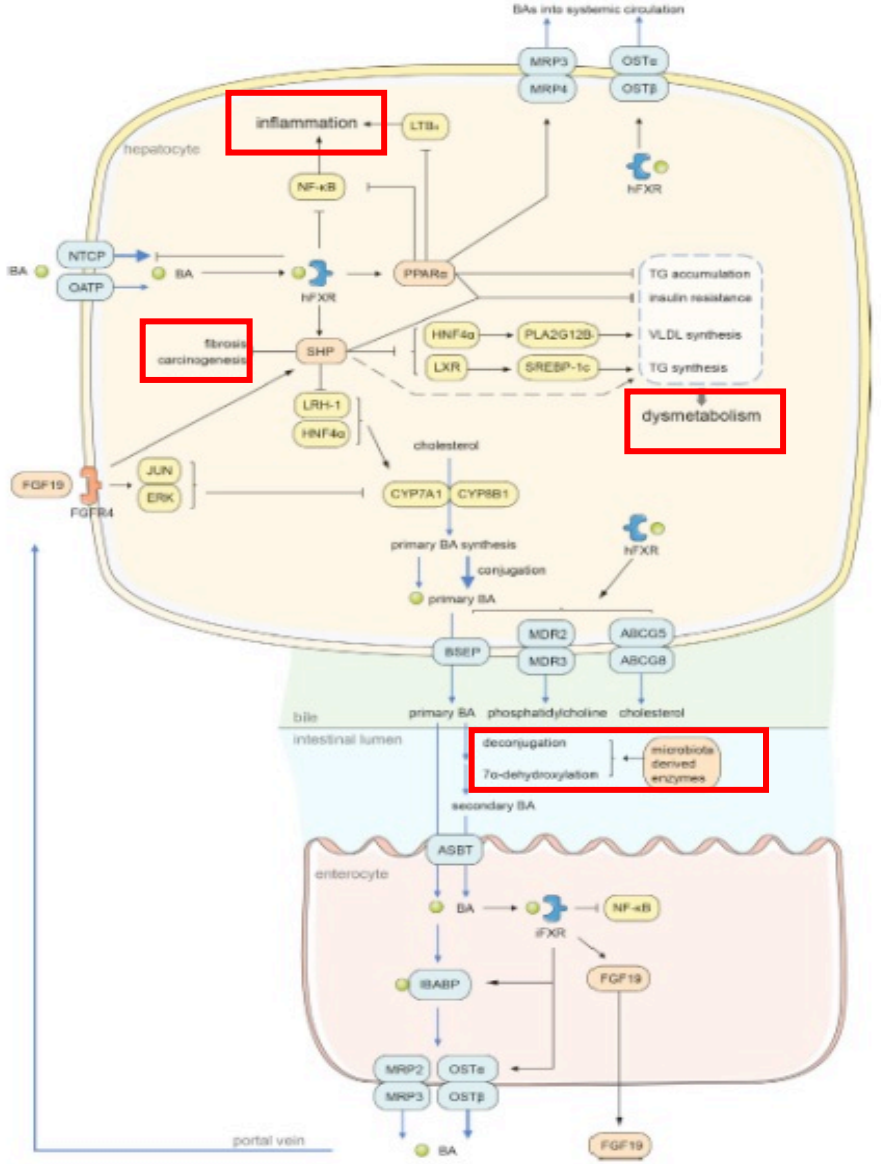


Journal of Colorectal Disease

Circolo Entero-epatico degli acidi biliari



Journal of Colorectal Disease



Aliment Pharmacol Ther. 2022;55:49–63

DOI: 10.1002/jpen.2704

ORIGINAL RESEARCH

Chyme reinfusion therapy in adults with severe acute intestinal failure: A descriptive cohort study

Kirstine Farrer MPhil | Maja Kopczynska MBBCh | Maria Barrett MSc | Simon Harrison MPharm | Antje Teubner MD | Arun Abraham MD | Derek McWhirter MD | Jonathan Epstein MD | Simon Lal PhD | Gordon L. Carlson CBE, MD

J Parenter Enteral Nutr. 2025;49:85–93.

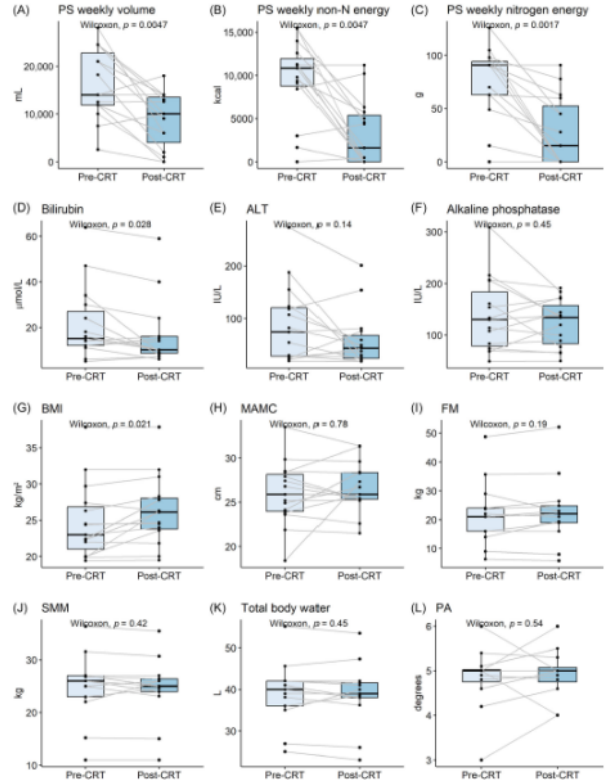
- **Descriptive cohort study** of adult patients with **severe acute intestinal failure** due to a high-output stoma and distal mucus fistula or a high-output small intestinal fistula **receiving chyme reinfusion therapy**
- **Aim: evaluate the effect of chyme reinfusion therapy** on:
  - Parenteral nutrition requirements
  - Medication
  - Nutrition status
  - Liver function
  - Treatment cost

Chyme reinfusion therapy in adults with severe acute intestinal failure: A descriptive cohort study

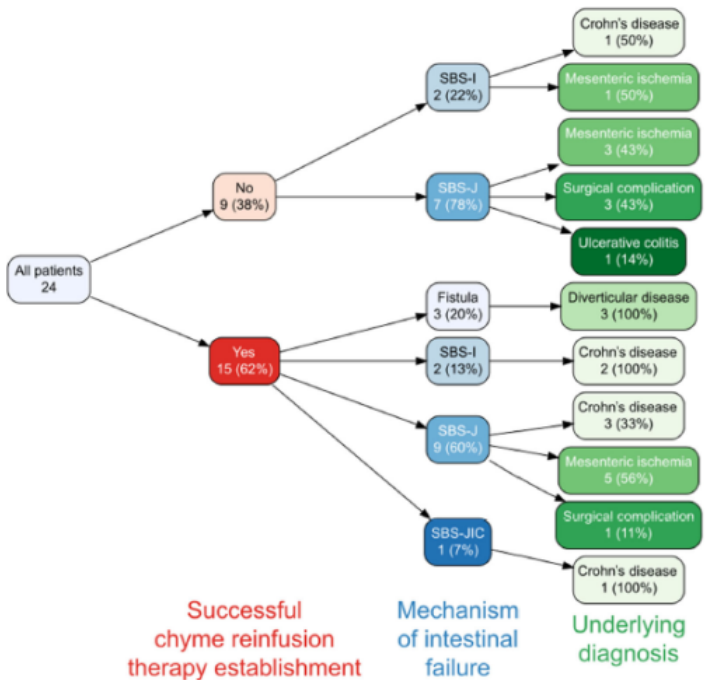
Kirstine Farrer MPhil | Maja Kopczynska MBBCh | Maria Barrett MSc | Simon Harrison MPharm | Antje Teubner MD | Arun Abraham MD | Derek McWhirter MD | Jonathan Epstein MD | Simon Lal PhD | Gordon L. Carlson CBE, MD

J Parenter Enteral Nutr. 2025;49:85–93.

Results: Twenty-four patients commenced treatment for a median of 44 (range, 3–571; total, 2263) days. Fifteen (62.5%) were successfully established for 1208 days, and nine continued treatment at home. Parenteral requirements, including volume, energy and nitrogen content, and frequency, were significantly reduced ($P = 0.002$), whereas anthropometric measurements remained stable. However, chyme therapy was not tolerated in nine patients (37.5%), and only two (8.3%) weaned fully from parenteral nutrition. Chyme reinfusion therapy was associated with a 47.6% reduction in parenteral energy requirements, 42.8% reduction in nitrogen, and 33.3% reduction in volume of parenteral nutrition requirements. Treatment was associated with a net cost of £30.05 ($40.27) per patient per day.



Patient characteristics	N = 24[a]
Age at starting chyme reinfusion therapy, years	51 (17)
Sex	
Male	14 (58.3%)
Female	10 (41.7%)
Mechanism of intestinal failure	
Fistula	3 (12.5%)
SBS-J	16 (66.7%)
SBS-I	4 (16.7%)
SBS-JIC	1 (4.2%)
Underlying diagnosis	
Ischemia	9 (37.5%)
Crohn's disease	7 (29.2%)
Surgical complication	4 (16.7%)
Diverticular disease	3 (12.5%)
Ulcerative colitis	1 (4.2%)
Proximal length of small bowel, cm	88 (61)
Distal length of small bowel, cm	105 (145)
Presence of colon	21 (87.5%)
Presence of ileocecal valve	15 (62.5%)



Conclusion: Chyme reinfusion therapy was associated with reductions in the need for parenteral therapy and medication but did not replace parenteral nutrition or result in a significant cost saving.

Chyme Reinfusion in Patients with High-Output Enterocutaneous Fistulas and Enterostomies Undergoing Surgical Reconstruction: A Systematic Literature Review and Meta-Analysis

Sascha Vaghiri[1] · Alireza Pandkhahl[2] · Ward Al Akeel[2] · Sultan Kazzlha[2] · Ali Alipourlani[3] · Hermann Kessler[3] · Wolfram Trudo Knoefel[1] · Dimitrios Prassas[1,4]

Abstract

Background Chyme reinfusion (CR) is a simple technique that reestablishes gastrointestinal continuity. The primary objective was to analyze the pooled evidence of the CR effect on postoperative outcomes following ostomy or fistula repair.

Methods This meta-analysis was performed according to the current PRISMA guidelines and included all studies that provided postoperative outcome data on CR compared with the control group (no CR) in high-output ostomies and enterocutaneous fistulas. The data from eligible studies were extracted, qualitatively assessed, and included. Odds ratios (ORs) and standardized mean differences (SMDs) with 95% confidence intervals (CIs) were calculated. The risk of bias was assessed using the ROBINS-I criteria.

Results Five eligible studies with a total of 460 patients were included (CR: $n=219$, control: $n=241$). CR demonstrated significantly lower rates of overall complications (OR 0.25, 95% CI 0.13–0.46, $p<0.00001$), ileus (OR 0.35, 95% CI 0.22-0.53, $p<0.00001$), and diarrhea (OR 0.29, 95% CI 0.12–0.69, $p=0.005$). As a result, the hospital stay was significantly reduced after CR as compared to the control group (SMD −0.76, 95% CI − 1.46 to −0.07, $p=0.03$). In addition, the postoperative inflammatory markers CRP (C-reactive protein) (SMD −0.76, 95% CI −0.98 to −0.53, $p<0.0001$) and WBC (white blood count) (SMD −0.67, 95% CI − 1.09 to −0.25, $p=0.002$) were significantly lower after CR.

Conclusions CR is a safe and easy-to-use method which leads to a significant reduction in inflammatory response and postoperative complications such as ileus or diarrhea and thus significantly shortens the hospital stay. This method should therefore be considered as an additional supportive procedure for patients with high-output ostomies or fistulas. The further legitimacy and justification of CR should now be verified in multi-center randomized studies.

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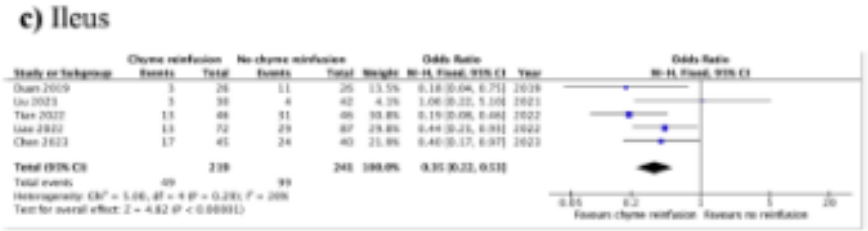
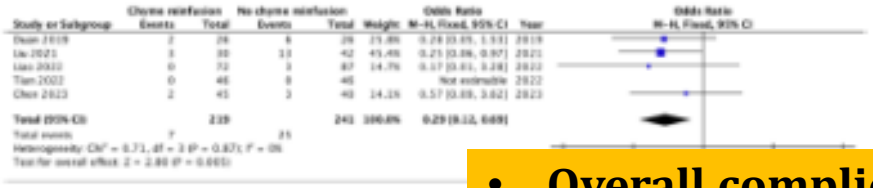
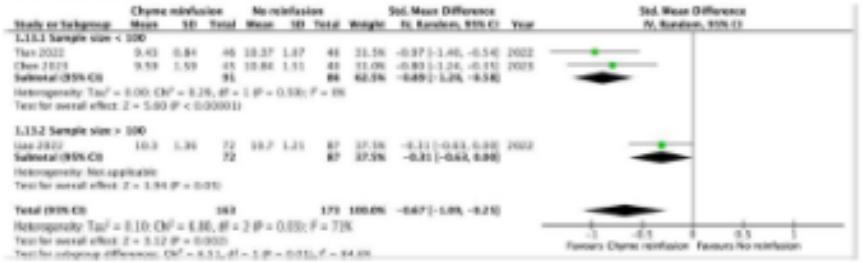
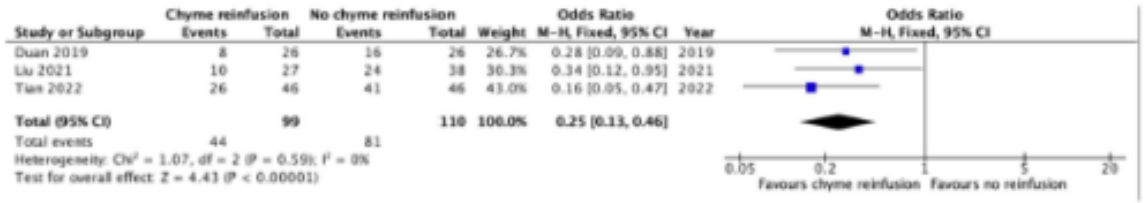
Digestive Diseases and Sciences
https://doi.org/10.1007/s10620-025-09189-3

Postoperative outcomes following ostomy or fistula repair

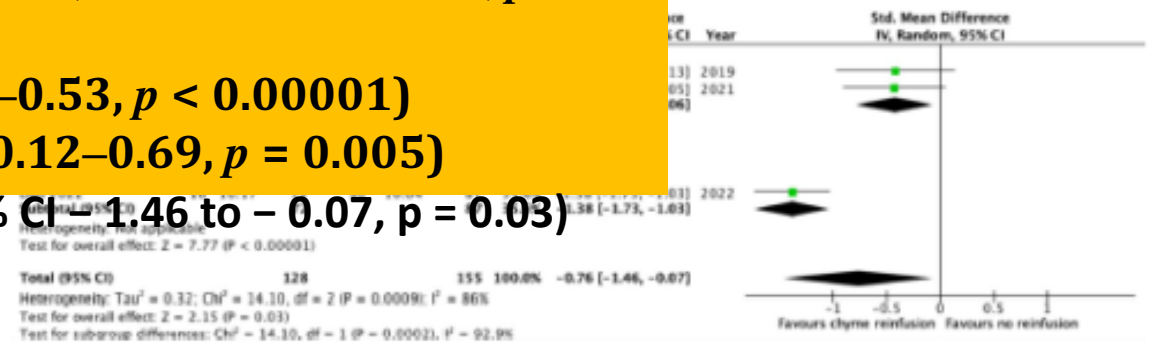








- **Overall complications (OR 0.25, 95% CI 0.13–0.46, $p < 0.00001$)**
- **Ileus (OR 0.35, 95% CI 0.22–0.53, $p < 0.00001$)**
- **Diarrhea (OR 0.29, 95% CI 0.12–0.69, $p = 0.005$)**
- **Hospital Stay (SMD – 0.76, 95% CI – 1.46 to – 0.07, p = 0.03)**



Digestive Diseases and Sciences
https://doi.org/10.1007/s10620-025-09189-3

ESPEN endorsed recommendation

Management of acute intestinal failure: A position paper from the European Society for Clinical Nutrition and Metabolism (ESPEN) Special Interest Group

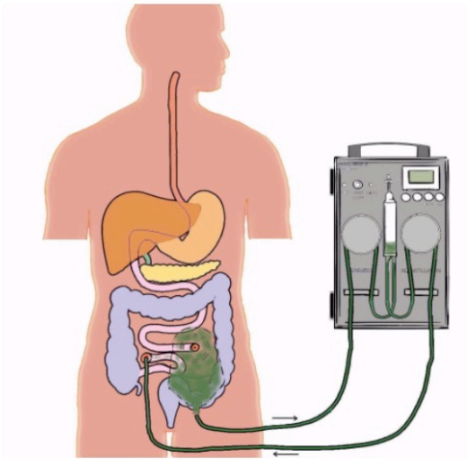
Stanislaw Klek [a, *], Alastair Forbes [b], Simon Gabe [c], Mette Holst [d], Geert Wanten [e], Øivind Irtun [f, g], Steven Olde Damink [h], Marina Panisic-Sekeljic [i], Rosa Burgos Pelaez [j], Loris Pironi [k], Annika Reintam Blaser [l, d], Henrik Højgaard Rasmussen [d], Stéphane M. Schneider [m], Ronan Thibault [n], Ruben G.J. Visschers [h], Jonathan Shaffer [o]

Clinical Nutrition 35 (2016) 1209–1218

3.2.2.5. Distal feeding. In addition to the generally positive effects of enteral nutrition, distal delivery of feed exercises negative feedback on bilio-pancreatic secretions, the so-called ileal brake [9,34]. Specialized techniques, such as fistuloclysis and chyme reinfusion, should be considered to stimulate the distal intestine in patients where this would otherwise be inaccessible or "out-of-circuit" [9,11]. These methods allow the administration of proximal secretions and/or a nutrition formula into the intestine distal from a proximal stoma or ECF. This represents a physiological way to prepare the downstream (effluent) small bowel and colon for the reestablishment of digestive continuity, and will help to anticipate and avoid postoperative problems (diarrhoea, faecal incontinence, identification of colonic stenosis, etc).

The reinfusion technique consists of collection of the intestinal effluent and its reinfusion into the distal part of the intestine. In addition to reducing (sometimes eliminating) the need for parenteral support this has been convincingly shown to normalise alkaline phosphatase, γ-glutamyl transpeptidase and bilirubin in patients on PN with ECF-associated liver disease [34–40]. Chyme reinfusion appears to improve intestinal function and nutritional status [39,40]

The other technique is fistuloclysis, in which nutritional formulae are infused into the (normal) intestine distal to the proximal stoma or fistula. Fistuloclysis has (for example) been successfully applied in 11 of 12 patients in a study of patients being prepared for restorative surgery [36].



ESPEN Guideline

ESPEN guideline on clinical nutrition in the intensive care unit

Pierre Singer [a, *], Annika Reintam Blaser [b, c], Mette M. Berger [d], Waleed Alhazzani [e], Philip C. Calder [f], Michael P. Casaer [g], Michael Hiesmayr [h], Konstantin Mayer [i], Juan Carlos Montejo [j], Claude Pichard [k], Jean-Charles Preiser [l], Arthur R.H. van Zanten [m], Simon Oczkowski [e], Wojciech Szczeklik [n], Stephan C. Bischoff [o]

Clinical Nutrition 38 (2019) 48–79

Recommendation 47

In the case of an unrepaired anastomotic leak, internal or external fistula, a feeding access distal to the defect should be aimed for to administer EN.

Grade of recommendation: GPP – strong consensus (95.83% agreement)

Recommendation 49

In case of high output stoma or fistula, the appropriateness of chyme reinfusion or enteroclysis should be evaluated and performed if adequate.

Grade of recommendation: GPP – strong consensus (100% agreement)

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American Society for Parenteral and Enteral Nutrition

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DOI: 10.1177/0148607116680792
jpen.sagepub.com
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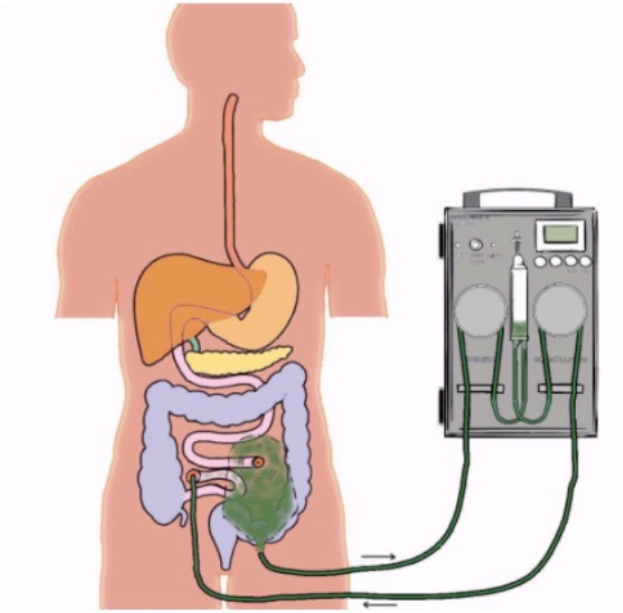
ASPEN-FELANPE Clinical Guidelines: Nutrition Support of Adult Patients With Enterocutaneous Fistula

Vanessa J. Kumpf, PharmD, BCNSP[1]; Jose Eduardo de Aguilar-Nascimento, MD, PhD[2]; Jose Ignacio Diaz-Pizarro Graf, MD[3]; Amber M. Hall, MPH[4]; Liam McKeever, MS, RDN[5]; Ezra Steiger, MD, FACS, AGAF, FASPEN[6]; Marion F. Winkler, PhD, RD, LDN, CNSC, FASPEN[7]; and Charlene W. Compher, PhD, RD, CNSC, LDN, FADA, FASPEN[8]; FELANPE; American Society for Parenteral and Enteral Nutrition



Question 4: In adult patients with ECF, is fistuloclysis associated with better outcomes than standard care?

Recommendation:

- We suggest the use of fistuloclysis for nutrition therapy for patients with intact intestinal absorptive capability distal to the infusion site and when the infusion ECF site is not expected to close spontaneously.
- We suggest the use of polymeric formulas initially and change to semi-elemental (oligomeric) diet if intolerance occurs.

Quality of Evidence: Very low.

SFIDE ED OSTACOLI NELLA DISTAL FEEDING

- Sebbene molto promettente, la tecnica è **non ampiamente praticata**.
- **Nessuna standardizzazione dei materiali** utilizzati per eseguire fistuloclisi/CR.
- Necessità di alimentarsi con **texture LIQUIDE e PASTOSE** per evitare l'ostruzione del catetere
- **Possibili complicanze:**
  - Fuoriuscita del contenuto del liquido raccolto
  - Peristomiti (flogosi della mucosa e della cute peristomale)
  - Dislocazione del tubo a causa della peristalsi
- **I pazienti spesso rifiutano** l'idea della reinfusione del chimo dopo la sua escrezione
- **Difficoltà di gestione intraospedaliera**, elevato impegno per l'applicazione della tecnica, mancanza di esperienza
- **Selezione attenta dei pazienti candidati all'alimentazione distale**

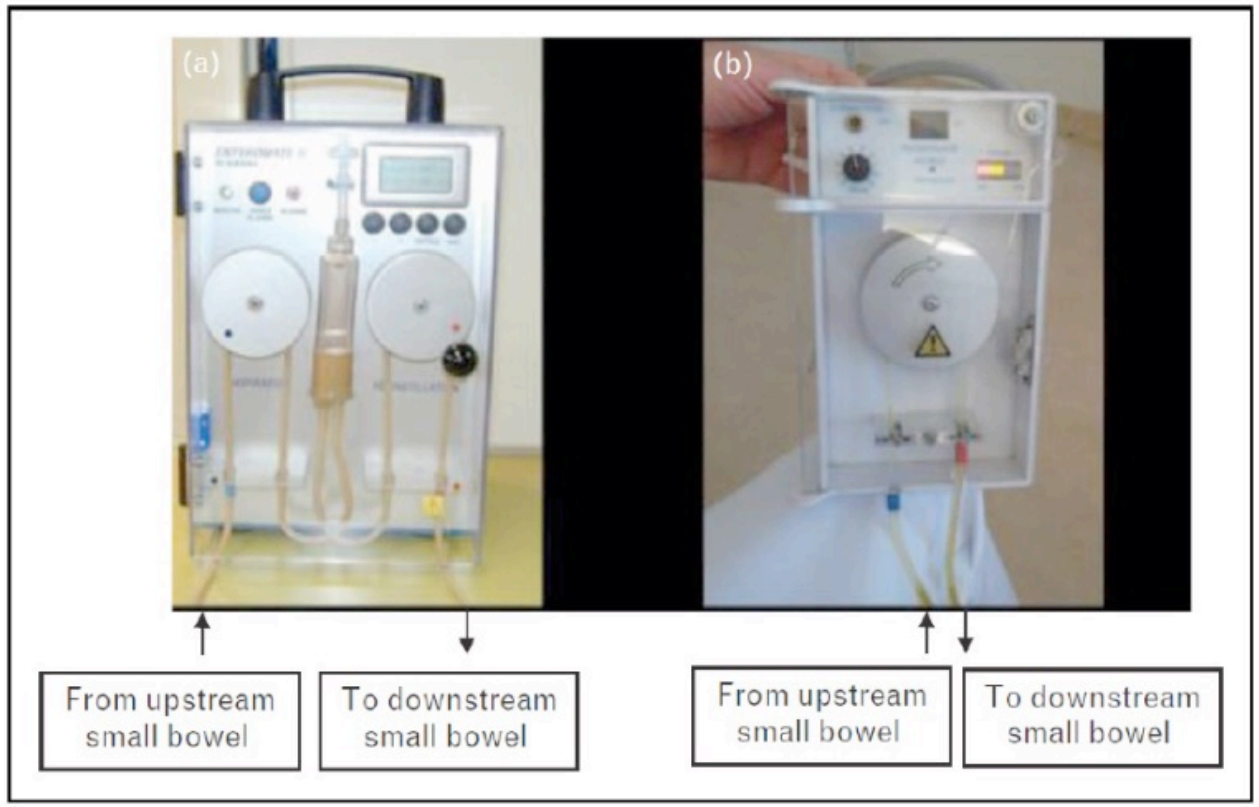
FATTIBILITÀ DELL'ALIMENTAZIONE DISTALE

- **ESEGUIRE UNA FISTULOGRAFIA/ILEOGRAFIA PER:**
  - Identificare la lunghezza del tratto intestinale distale,
  - Identificare la presenza o assenza di ostruzioni,
  - Confermare la posizione esatta della fistola/stomia,
  - Determinare se l'orifizio della fistola/stomia è adeguato per l'ingresso di un catetere.
- **In relazione alle condizioni per la procedura, il paziente deve essere:**
  - Emodinamicamente stabile,
  - Senza infezioni attive,
  - Senza possibilità di risoluzione spontanea della fistola nel prossimo futuro (quando la mucosa intestinale è a contatto con la pelle o intervallata da tessuto di granulazione, la risoluzione spontanea della fistola è improbabile).

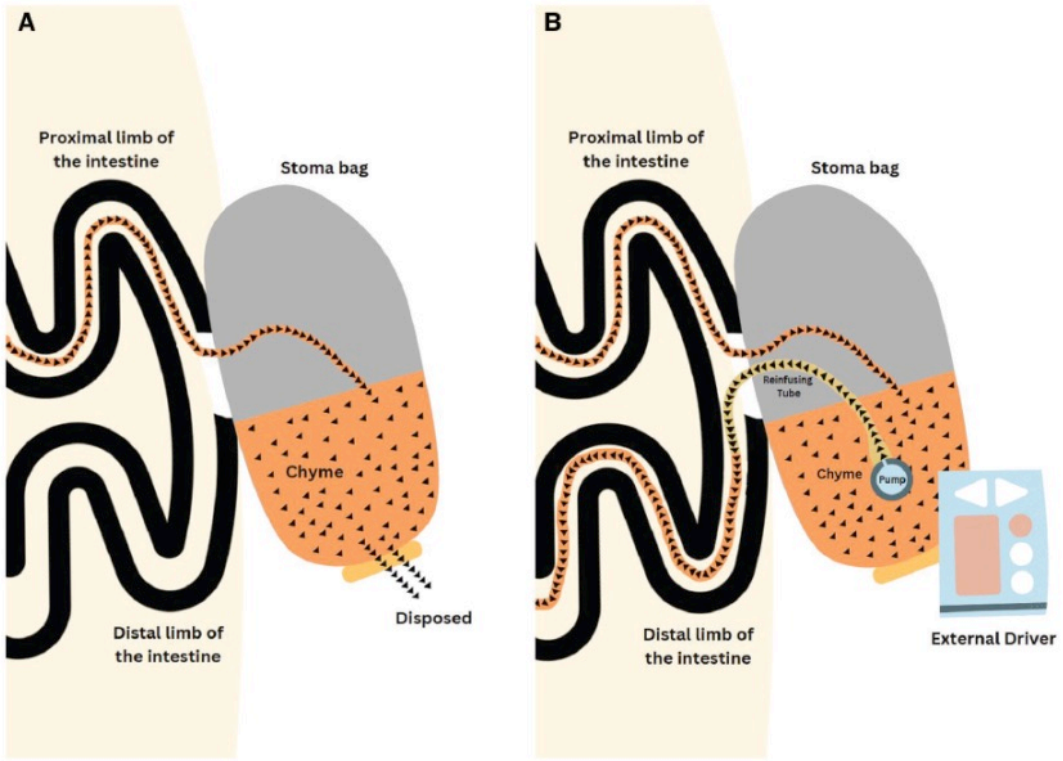
CONCLUSIONI

1. **La distal feeding** è un'opportunità terapeutica ancora poco conosciuta e praticata
2. E' applicabile in pazienti con **doppia enterostomia o in presenza di fistole**
3. **Campi di applicazione**:
    1. in preparazione all'intervento di chirurgia riparativa
    2. nei casi in cui non è possibile la chirurgia riparativa (**riduzione/svezzamento** dalla nutrizione parenterale)
4. E' necessario un **approfondito assessment** ed **un'attenta e corretta selezione** del paziente candidato a distal feeding (applicabilità, timing, obiettivi, ecc..)
5. La gestione deve essere fatta da un **team esperto multidisciplinare**

OLD DEVICES FOR DISTAL FEEDING



NOVEL DEVICES FOR DISTAL FEEDING



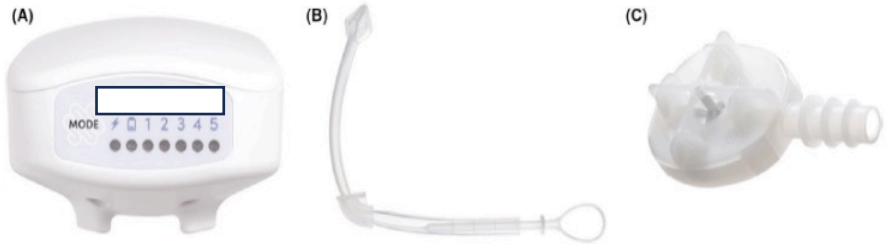


FIGURE 1 (A) Driver unit with a five-speed setting that couples externally to the pump across the wound management appliance. (B) Feeding tube which is cannulated into the distal limb of the fistula, alternatively a Foley catheter may be used. (C) Centrifugal pump with a magnetic impeller which sits inside the stoma appliance and couples to the base of the driver unit. The pump connects to a Foley catheter or feeding tube.

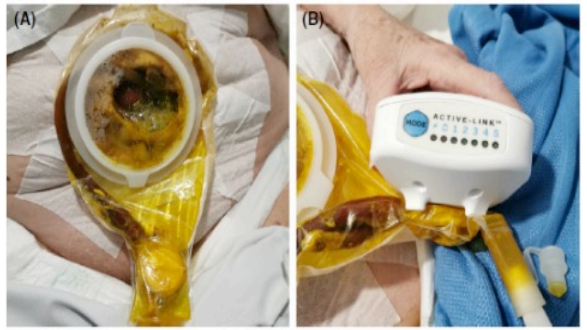


FIGURE 2 (A) A 32 Fr Foley catheter cannulated into the distal limb of the fistula with a centrifugal pump attached to the catheter end, lying within the wound management appliance. The pump remains immersed within the effluent during chyme reinfusion (CR). (B) The driver is coupled magnetically to the pump across the stoma appliance avoiding direct contact with chyme. The five speed options for CR are visible.

Grazie per l’attenzione

Classificazione Fisiopatologica

Pathophysiological classification of intestinal failure.

Condition	Primary mechanism of intestinal failure	Concomitant mechanisms
Short bowel	Reduced absorptive mucosal surface	• Increased intestinal losses of fluids and electrolytes (adjunctive mechanism in the case of end-jejunostomy) • Restricted oral/enteral nutrition (to reduce intestinal losses) • Disease-related hypophagia • Lack of adaptive hyperphagia • Accelerated gastrointestinal transit time • Small bowel bacterial overgrowth
Intestinal fistula	By pass of large areas of absorptive mucosal surface	• Increased intestinal losses of fluids and electrolytes • Disruption of the entero–hepatic cycle • Restricted oral/enteral nutrition or total fasting (bowel rest) to decrease fistula output • Impaired intestinal peristalsis and increased metabolic demand related to concomitant sepsis and inflammation
Intestinal dysmotility	Restricted oral/enteral nutrition or total fasting from intolerance due to feeding-related exacerbation of digestive symptoms or to episodes of non-mechanical intestinal obstruction	• Malabsorption due to small bowel bacterial overgrowth • Increased intestinal secretion of fluids and electrolytes in the obstructed segments • Increased intestinal losses of fluids and electrolytes due to vomiting, gastric drainage and/or diarrhoea
Mechanical obstruction	Incomplete or total fasting (bowel rest)	• Increased intestinal secretion of fluids and electrolytes in the obstructed segments • Increased intestinal losses of fluids and electrolytes with vomiting or gastric drainage
Extensive small bowel mucosal disease	Inefficient absorptive and/or nutrient losing mucosal surface.	• Increased intestinal losses of fluids and electrolytes • Restricted oral/enteral nutrition • Disease-related hypophagia

L. Pironi et al. / Clinical Nutrition 34 (2015) 171e180