



Advances in intestinal Rehabilitation

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Indication for intravenous nutrition/PN:

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Intestinal Failure

Inability to maintain weight and growth despite adequate enteral nutrition

even using most appropriate type of feed & feeding device

Goulet O et al. Curr Opin Organ Transplantation 2009; 9: 192-200

Aetiology of Intestinal Failure

PDD

PNDD

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Primary digestive disorder



Primary non-digestive disorder



PDD

- Major intestinal surgery
- Short bowel syndrome
- Gastroschisis, volvulus
- Necrotising enterocolitis
- Congenital enteropathies
- microvillous inclusion disease

PNDD

- Prematurity: immature gut
- Multi-organ failure in extensive trauma & burns
- Post chemotherapy
- Bone marrow transplant

Intestinal Failure

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PRESENTATION:

- Diarrhoea
- Vomiting
- Abdominal distension



Complications

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- Underfeeding
- Metabolic
- Infection
- Thrombo-embolic
- Liver disease

Underfeeding

Factors to Consider on

Commencing PN

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- Clinical status
- Fluid requirements
- Venous access
- U&Es, LFTs
- Weight
- Drugs intravenous

Underfeeding: Urgency of PN

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In severe gut failure use within:

- 24 hours: very premature
- 5 days: term neonate
- Older child: < 7 days

If in good Nutritional



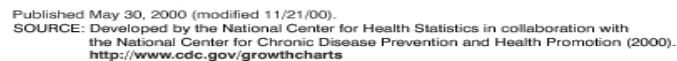
Introducing PN

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- Gradual: 4-6 days
- Glucose slowly increased from 5mg/kg/min
- Monitor closely; correct electrolytes
- Add vitamins
- Adjust PN formulation as per patient needs
 - Weight gain X 2 /week, MAC, length monthly

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NAME _____
RECORD # _____

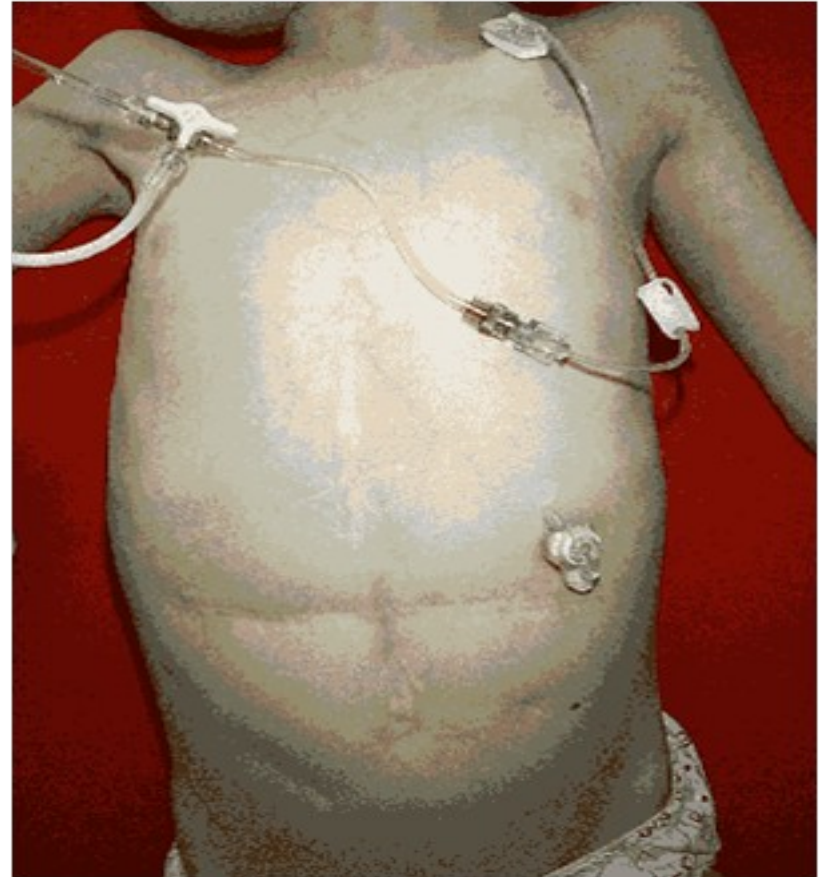


Underteeding:IV Access

Children live and die by their veins

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- Peripheral 12.5%
- Central 20%
- Single lumen



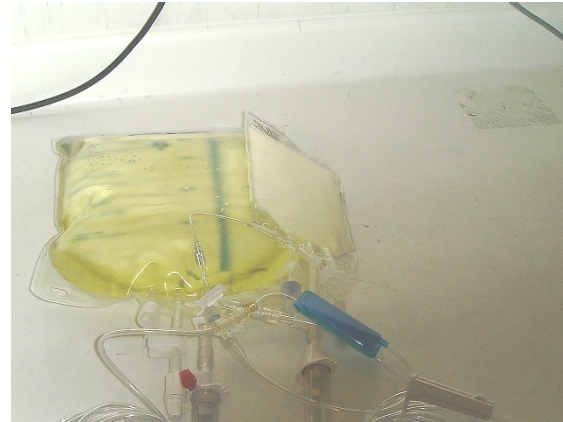
Underfeeding

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□ Ready made



vs Tailor made



□ Peripheral
<12.5% glucose

vs Central
< 20% glucose

PN not TPN
Partial **not** total



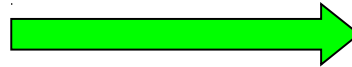
Metabolic: Nutritional Monitoring

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□ Re-feeding

PO_4

ADP



ATP

NCEPOD - A Mixed Bag

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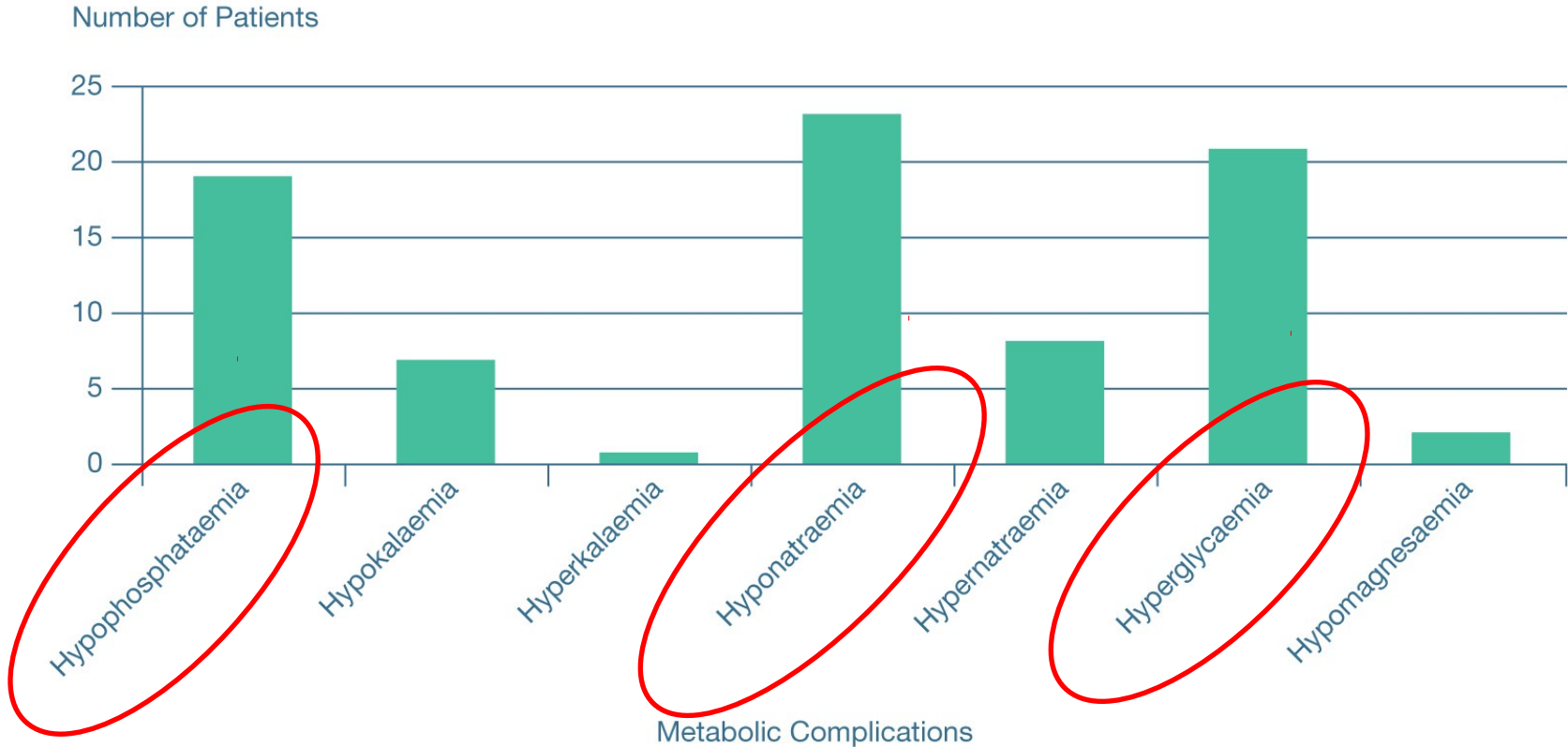


Figure 3.7 Types of metabolic complications (answers may be multiple)

ESPGHAN/ESPEN GUIDELINES FOR PAEDIATRIC PARENTERAL NUTRITION

PN complications

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- 3rd child: healthy, unrelated parents
- Normal pregnancy, B.Wt 2.5kg, 40 weeks
-
- Home Day 3, well
- Mum needed to help pass stool from 4 weeks
- Colic
- 5 months local hospital: Hirschsprung's disease
 - on barium enema: laparotomies x 4

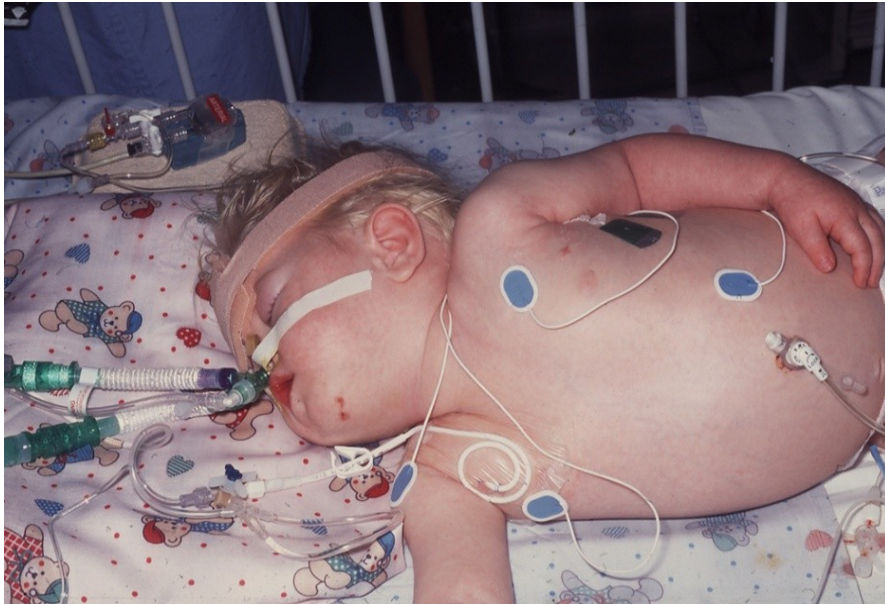
PN Complications

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- 5 months old:
 - full thickness gut biopsy:
- **myopathic intestinal
pseudobstruction**
- Aged 3: home on PN
- Several months later:
 emergency : coma
 ?

Beri-Beri/thiamine deficiency

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- Heart failure
- Vasodilatation
- Metabolic acidosis
- Lactate 20mM
- Reversed within 3 hours by intravenous thiamine

CHO i/v, thiamine
PO

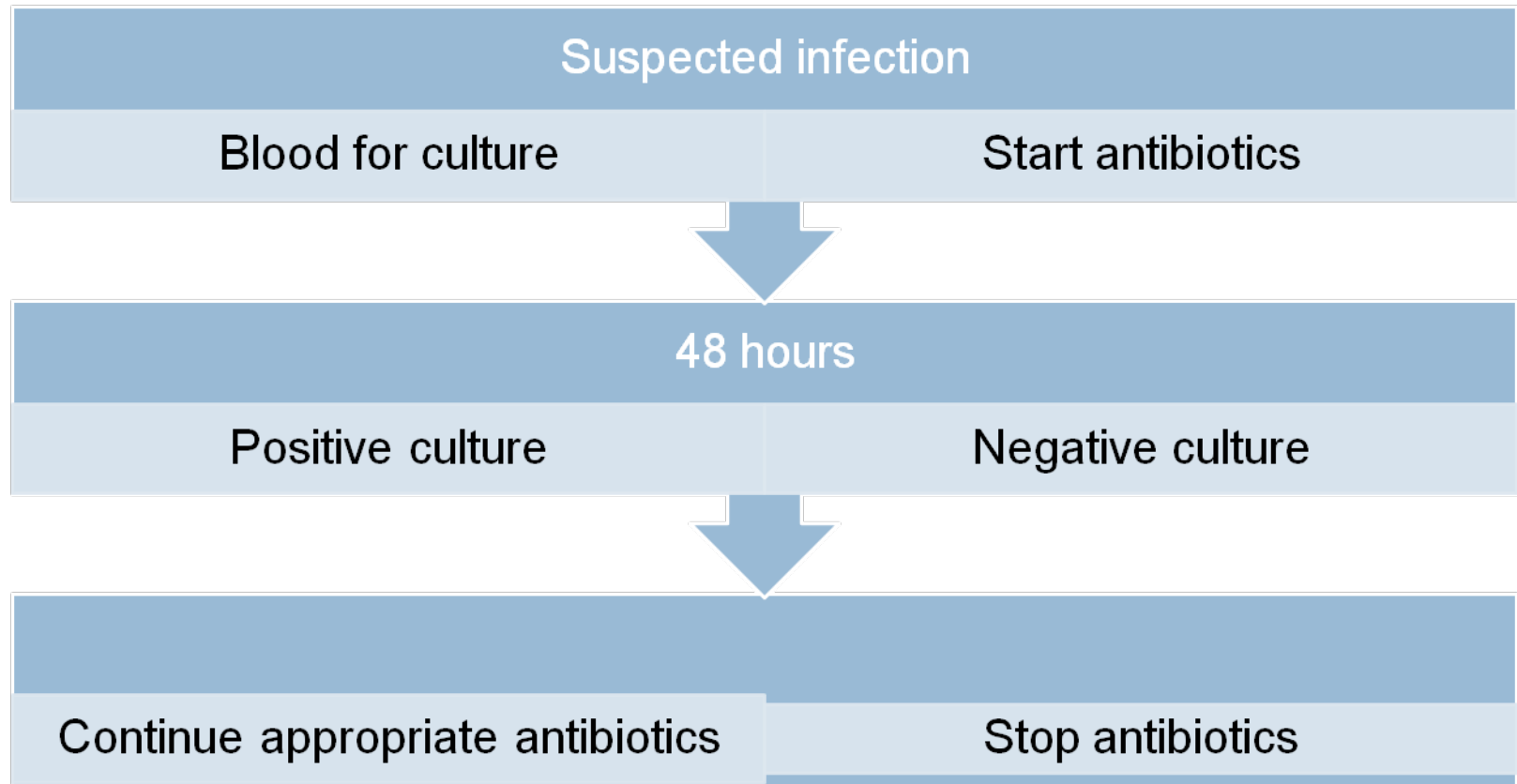
Long-term PN

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- 12-14 hours overnight
- Single bag
- Include vitamins
- At home
- Formal training programme for parents
- Portable pump

Septicaemia

Catheter related bloodstream infections (CRBSI)



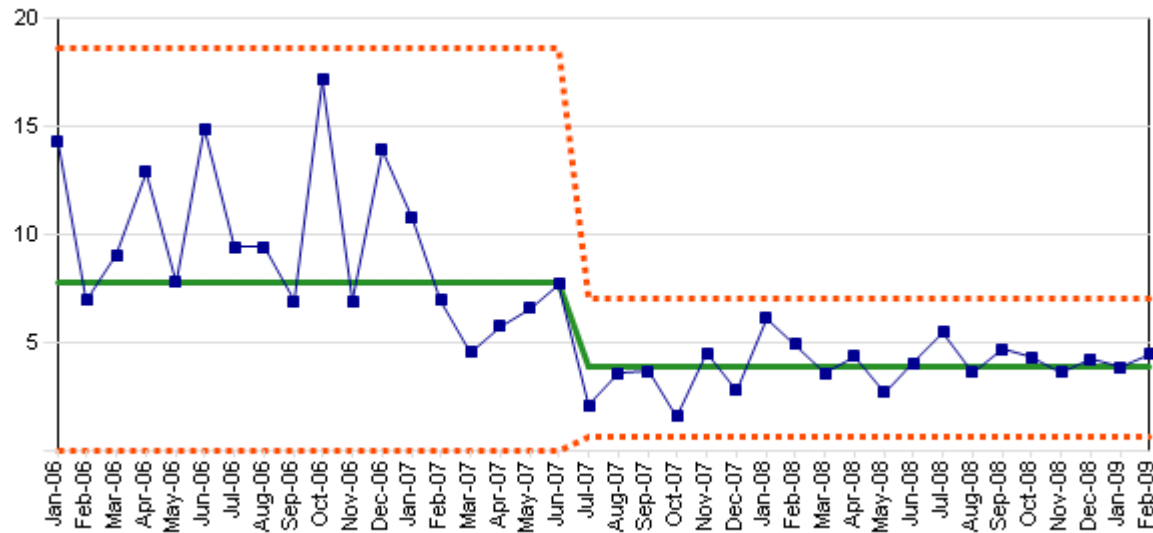
Continue PN throughout (if at all possible)

Chlorhexidine

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□ 2% clinell wipes

The number of GOSH acquired CVL infections for every 1000 line days.



Taurolidine: catheter lock solution

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- Bacterial & fungal lysis
- Inserted in catheter hub after infusion
- Effective if minimum 4 hours break in infusion
- Substitute for heparin lock

Catheter-related bloodstream infections (CRBSI) 19 children

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- Before taurolidine
 - 7.5 episodes /1000 catheter days.
- After
 - 0.8 episodes /1000 catheter days
 - $p = 0.001$
- 74% no further infections for up to 32 months
- *Chu HP, Brind J, Tomar R, Hill S. J Pediatr Gastroenterol*

Thrombo-embolism

Improved line insertion techniques

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□ Radiological/US control

- < venous damage

- < loss of vessels

Thrombo-embolism: pulmonary emboli

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- 
- Lipid stabilisation
 - Egg lecithin

- Phosphatidylcholine antibodies
- Pulmonary emboli

- Long-term warfarin

- Dollery CM et al. Thrombosis and embolism in long-term central venous access for parenteral nutrition. Lancet 1994; 344: 1043-1045

Liver disease

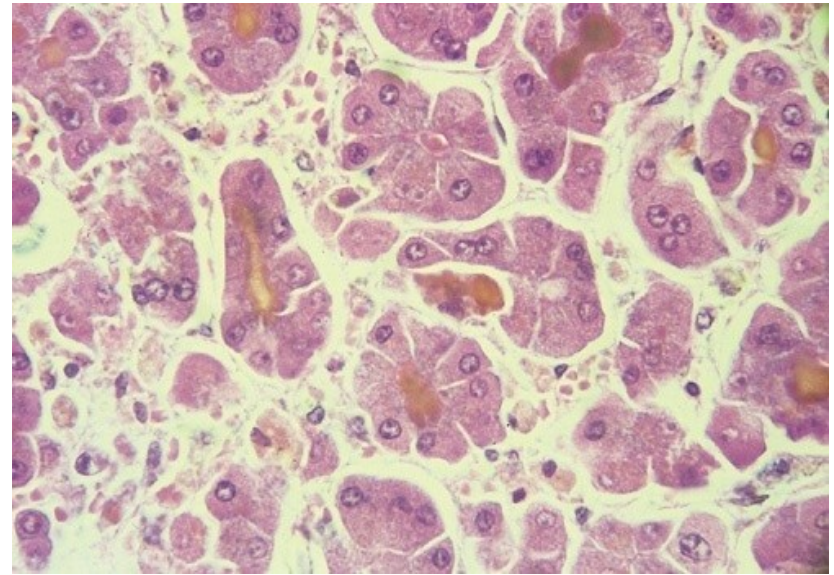
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- Prematurity
- not using gut
- Components of PN
 - e.g. lipids
- Recurrent sepsis
- Published incidence:-
 - ▢ 7.4-84% adult studies
 - ▢ 40-60% children

Liver disease

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- intrahepatic cholestasis
- Cholelithiasis
- hepatic fibrosis
- biliary cirrhosis
- portal hypertension



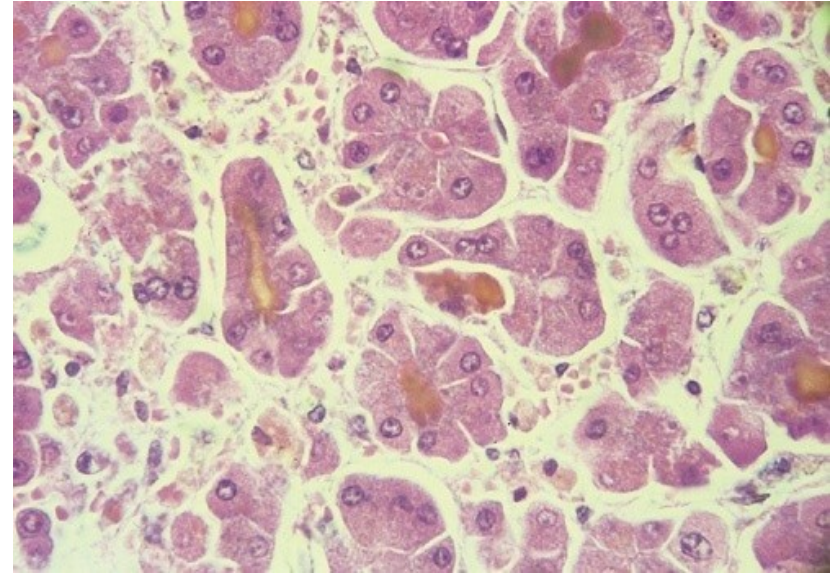
Liver disease: GOSH 2006-2010

- 279 PN children > 28 days
- 60, (22%) liver disease
- Survival 86% 1%/ 3 cases death IFALD
All other cases reversible
- Significant association
 - Prematurity & infancy $p < 0.03$
 - Surgery $p < 0.003$
 - Length of treatment $p < 0.001$
- Not septicaemia
- Pichler J, Horn V, Macdonald S, Hill S Arch Dis Child. 2012;97:211-4.

Lipid to prevent cholestasis

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- Cycling
- X 2/ week
- Variety
 - ▣ Soya – LCT – essential fatty acids
- Immediate treatment suspected sepsis



Liver disease: The lipid menu

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- Soya

- Olive

- coconut

- Structured
MCT:LCT

- fish

- Intralipid

- Lipofundin

- Clinoleic

- SMOF

- Lipidem

- (omegaven)

Extra tips

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- Essential fatty acids 0.1g/kg/d linoleic acid
0.25g/kg/d
neonate
- “Use the Gut”
 - Walnut oil
 - Gastrostomy/jejunostomy
- Paediatric dietitian
 - Liquid semi/elemental/polymeric feeds
 - Bolus and/or continuous feeds
 - Solid diet (hypoallergenic)

NCEPOD - A Mixed Bag

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Recommendations

- consensus (ESPGHAN/ESPEN) European
- teamwork
- protocols (regimen, monitoring, CVC)
- education

It's all about the team

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Treatment

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- Establish good nutritional state – PN
- Maintain good nutritional state – PN and enteral feeds
- Maximise intestinal function – manage underlying
- disease
- Wean
- Recovery

Continuing PN at Home

best chance for long term survival with chronic intestinal failure is PN at home

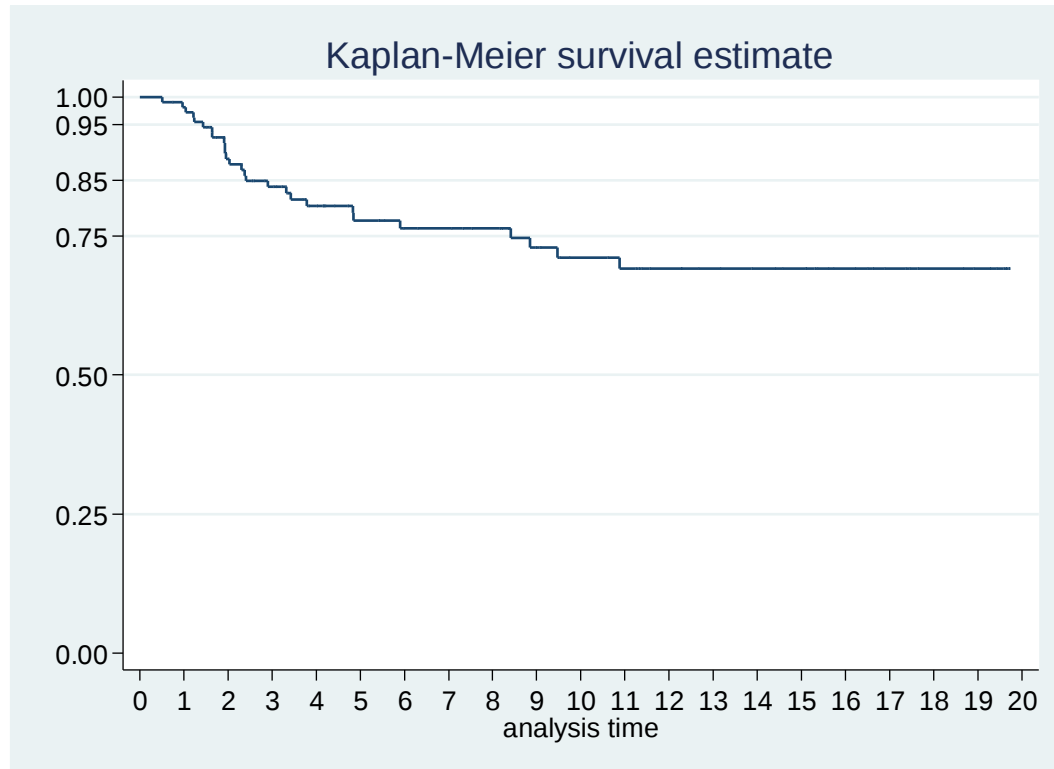
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- < septicaemia
- Psycho-social
- Good quality of life
- Family holidays



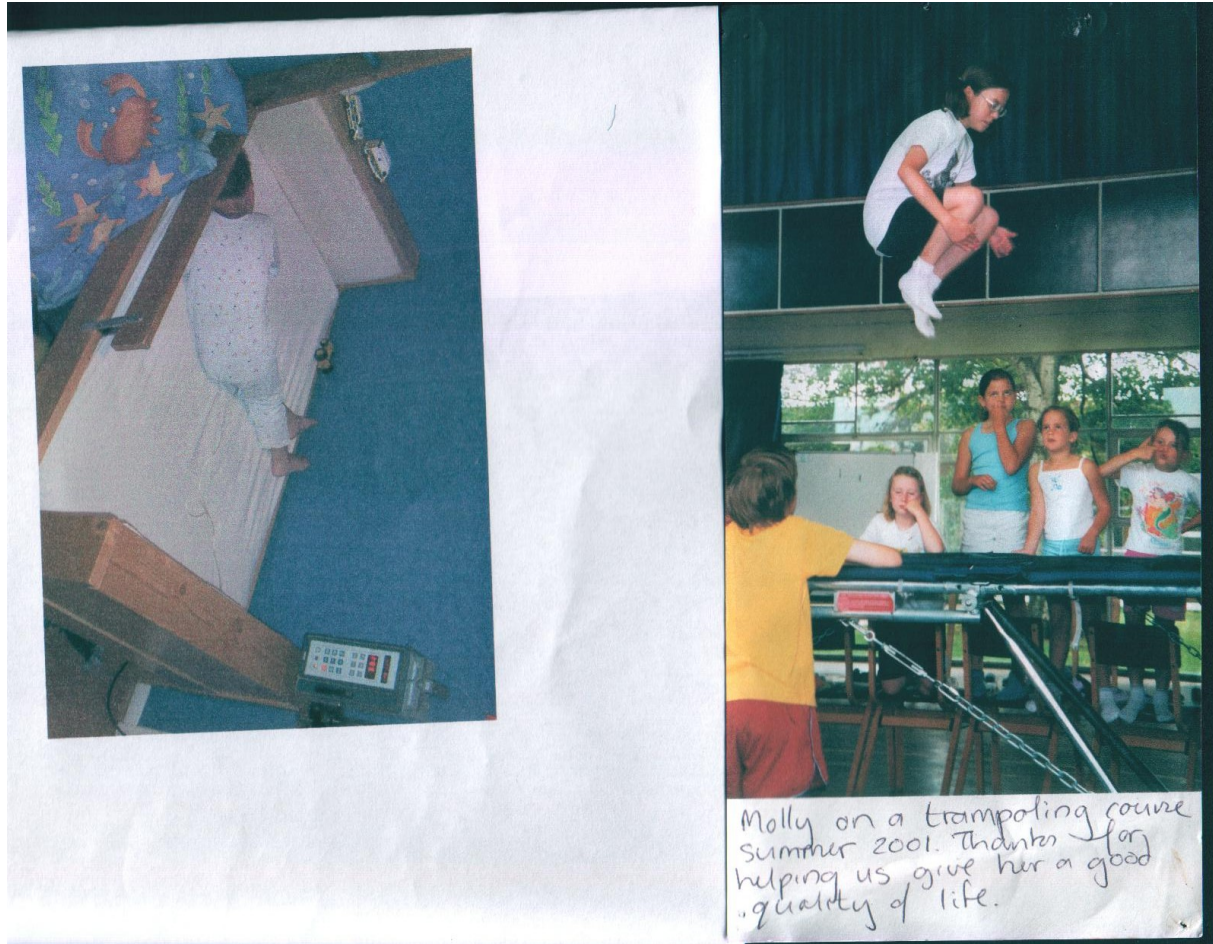
Survival from start of intravenous nutrition in children sent home on treatment

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Good quality of life

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Summary

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- Central access
- Tailor made
- Aggressive enteral feeding

Why should outcome improve?

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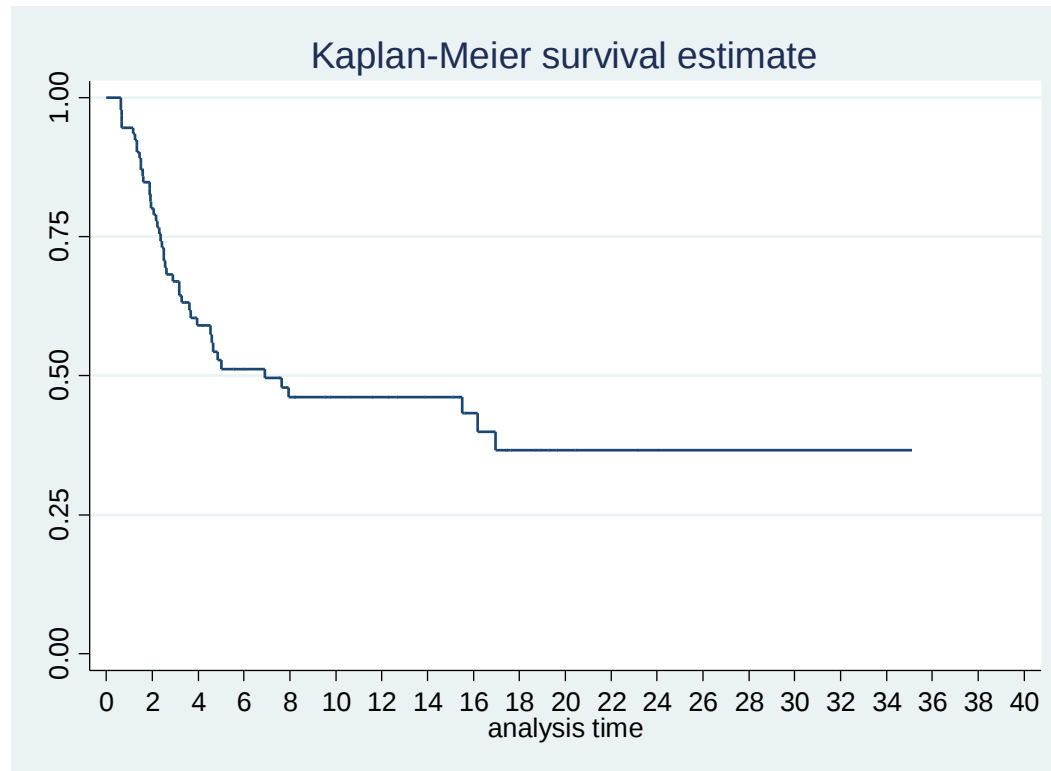
problem

solution

- < infection  2% chlorhexidine
Taurolidine
- < line blockage  Taurolidine
- < liver disease  Alternative lipids
- Improved weaning  solids
- Improved line insertion  Radiological control

Number of children recovering intestinal function with time (years)

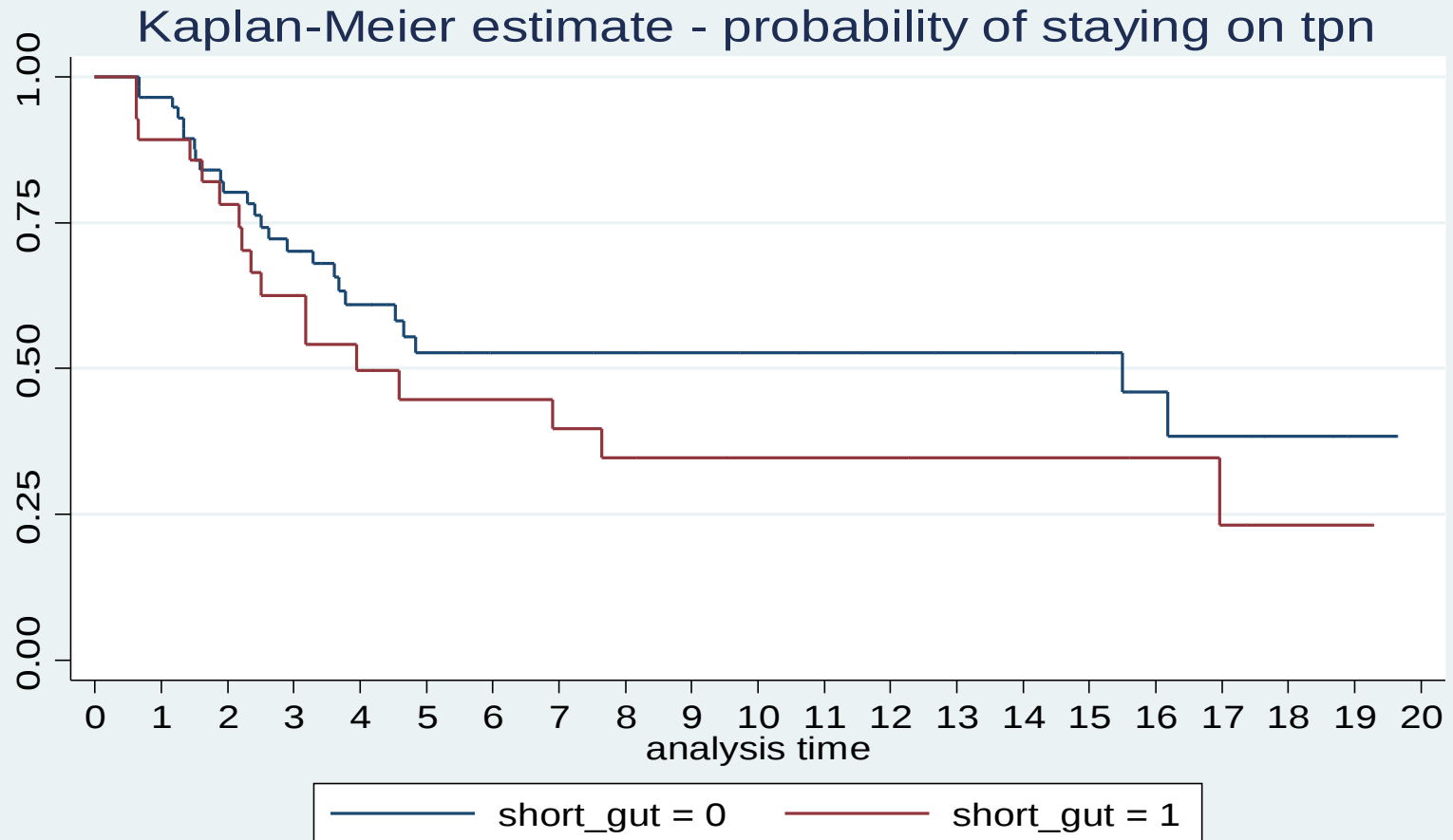
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outcome

Short Gut

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outcome



