Enteral Nutrition (EN) for the Critically Ill

Part I

Clinical Practice Guidelines				
Revision	**Description of Change**	**Author**	**Effective Date**	**Page No.**
1	Initial Release	Dr. Tom BUCKLEY, PMH Dr. Kenny CHAN, PYNEH Dr. Osburga CHAN, QEH Dr. S O SO, KWH	June 2006	P.2 – P.7

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Part II

Sample Clinical Practice Protocol				
Revision	**Description of Change**	**Author**	**Effective Date**	**Page No.**
1	Initial Release	Intensive Care Working Group on Clinical Practice Guidelines	June 2006	P8. – P16

Clinical Practice Guidelines on Enteral Nutrition (EN) for the Critically Ill

Introduction

Adequate and appropriate diet is a basic human right and prolonged starvation will eventually lead to death. Malnutrition is prevalent in ICU patients, has been reported as being as high as 40%, and is associated with increased morbidity and mortality (1). The benefits of nutrition support in the critically ill include improved wound healing, a decreased catabolic response to injury, improved gastrointestinal structure and function and improved clinical outcomes, including a reduction in complication rates and length of stay with accompanying cost savings (2). Nutrition support is not without adverse effects or risks. Early EN can be associated with high gastric residual volumes, bacterial colonization of the stomach and increased risk of aspiration pneumonia (3,4).

Questions surrounding the provision of feeding have been subjected too less rigorous scientific evaluation than other interventions (5,6). Many decisions about feeding in ICU are based more on pragmatism than high-grade evidence.

Strategies for Institution of Enteral Nutrition

1. Objective

To develop evidence-based clinical practice guidelines for EN support in mechanically ventilated critically ill patients.

2. Scope

All mechanically ventilated ICU patients in whom EN is not contraindicated. Absence of bowel sounds is not a contraindication to EN.

3. Evidence

a. Enteral Nutrition vs Parenteral Nutrition (PN) and outcomes
Several studies when aggregated statistically show no apparent difference in mortality rates across groups receiving EN or PN (7-14).

b. Early vs late nutritional support
There are no randomised, controlled trials of nutritional support versus starvation in the critically ill. Several randomised, controlled trials comparing early vs late intake of EN demonstrate a trend towards reduced mortality and reduced infectious complications in the early EN groups (15-21). A recent meta-analysis found that early versus late EN reduced

mortality by 12% (p= 0.02, 9% confidence interval 0.02-0.21) (5). A similar reduction in mortality was observed in the ACCEPT cluster randomised trial which also resulted in a significant reduction in hospital length of stay (22).

c. Infection risk: TPN vs EN

Experimental studies suggest that EN is likely to be associated with fewer infectious complications than TPN (23).

Several studies in the critically ill trauma patients demonstrate a lower incidence of infectious complications in the enteral nutritional group (11,12,15). One study in severe head injuries demonstrated a higher incidence of aspiration pneumonia (14). Meta-analyses of existing randomised trials in critically ill patients demonstrate reduced morbidity associated with the use of EN compared with PN (24,25).

d. Achieving target dose EN

Current recommendations suggest that 25kcal/kg per day is a reasonable target intake for ICU patients. If to rigorously adhered to, especially in sepsis and trauma pr other treatment modalities altering energy expenditure, this may be inadequate in the long run (26). One study of EN in head injured patients using strategies to optimise delivery of nutrients (starting at target rate, higher threshold of gastric residual volumes and use of small bowel feedings) resulted in more calories delivered, fewer infectious complications, a more rapid recovery from their illness but no difference in mortality compared with a standard early EN regimen (27). It has been suggested that medical ICU patients who receive less than 25% of target feed have a higher risk of nosocomial bloodstream infections (28).

e. Feed composition

Early work in the field of critical care nutrition focused on the effects of changes in gross composition, in terms of protein, fat and carbohydrate. The rationale for immunonutrition has centred around the use of glutamine, arginine, nucleotides and omega fatty acids. The evidence for enteral immunonutrition remains controversial (29-42) and it is not recommended that diets be supplemented with arginine and other select nutrients (24).

Critically ill patients who require PN should also receive high-dose parenteral glutamine supplements. Whether patients who are tolerating standard EN should receive glutamine supplements is unknown.

Based on one study the use of products with fish oils, borage oils and antioxidants should be considered in patients with ARDS (43).

f. Feeding protocols

There is a paucity of data that demonstrate feeding protocols (checking residual volumes) influences clinical outcome. In fact, a recent study suggested that residual volume has a poor correlation with the risk of aspirations (44).

g. Routine use of motility agents

A systematic review of the literature synthesizing randomised controlled trials of cisapride, metoclopromide and erythromycin concluded that promotility agents seem to have a physiologic benefit on GI motility and may improve tolerance to EN in critically ill patients (45).

h. Small bowel feeding
Several studies demonstrate that small bowel feeding compared with gastric feeding may be associated with a reduction in pneumonia in critically ill patients (20, 27, 46-52).

i. Body position
One randomised controlled trial demonstrated that the semirecumbent position is associated with a significant reduction in the incidence of ventilator-associated pneumonia compared with those fed in the supine position (53).

j. PN in combination with EN
Several recent studies demonstrate a trend towards an increased mortality associated with the combination of EN and PN (8, 54, 55).

Practice Guidelines

1. Recommendations

a. Commence a standard, polymeric enteral formula within 24 to 48 hours after admission to ICU
b. Patients should be cared for in the semirecumbent position
c. Consider strategies to optimise delivery of EN
- starting at the target rate
- use of a feeding protocol using a higher threshold of gastric residuals volumes
- use of motility agents

d. Small bowel feeding should be considered for patients at high risk of intolerance to EN
- on inotropes
- on continuous infusion of sedative agents or
- on paralytic agents or
- patients with high nasogastric drainage

e. Minimize the risks of EN (elevation of head of the bed)
f. Use of products with fish oils, borage oils and antioxidants should be considered in patients with ARDS
g. A glutamine – enriched formula should be considered for patients with severe burns and trauma
h. When initiating EN do not combine with PN
i. There are insufficient data to generate recommendations in the following areas:
- use of indirect calorimetry
- optimal pH of EN
- supplementation with trace elements, antioxidants or fibre
- optimal mix of fats and carbohydrates
- use of closed feeding systems
- continuous vs bolus feeding and use of probiotics

2. Procedure

a. A radio-opaque nasogastric tube or orogastric tube should be inserted unless the patient is conscious and stable when the usual oral diet can be offered.
b. After placement of the gastric tube, it's position should be assessed clinically.
c. Tube feeding should only be commenced after tube placement is confirmed radiologically.
d. The caloric requirements should be calculated by using preset formula.
e. Advice should be sought from a senior or a dietician before commencement of specialised feeds and / or the role of immunonutrients.
f. A protocol describing the process of establishing EN should be followed.
g. The patient should be monitored for complications associated with EN.
h. A process of management for impaired gastric motility and reduced gastric aspirates should be followed.
i. Nasojejunal feeding (endoscopic or non endoscopic placement) reduces gastric residual volumes and in some studies improves calorie intake.

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Sample Clinical Practice Protocol on Enteral Nutrition (EN) for the Critically Ill

1. Objective

Achieve safe and adequate nutrient support for intensive care patient whenever possible.

2. Scope

All intensive care patients whom enteral nutrient are not contraindicated from initiation to termination of support.

3. Definitions

Senior	Medical practitioner registered as critical / intensive care specialist or an experienced medical practitioner as assigned by the director of the unit
MO	Registered medical practitioner after ICU orientation
RN	Registered nurse after ICU orientation

4. Responsibilities

4.1 **Senior** shall:
Ensure early initiation of enteral feeding. Advice on problems encountered.

4.2 **MO** shall:
Assess and review the process of enteral feeding daily. Assess placement of gastric tube and insert feeding tube in complicated situations. Actively look for complications.

4.3 **RN** shall:
Insert gastric tube except in complicated situations. Provide the formula feed. Refer any problems to MO. Consult dietician on doctor's instruction.

5. Procedures

5.1 Enteral Feeding

	Action	*Responsible*
5.1.1	Enteral feeding should be considered within 24 hours after ICU admission	MO / Senior
5.1.2	Some contraindication of enteral feeding includes	MO / Senior

	Action	*Responsible*
	▪ Non-functional gut ◆ anatomic disruption ◆ obstruction ◆ generalized peritonitis with ileus ▪ Severe pancreatitis ▪ Extremely short bowel ▪ High output enterocutaneous fistula ▪ Comatose patients at risk of aspiration before airway is protected (especially gastric feeding) ▪ Abdominal distension during EN ▪ Severe diarrhoea ▪ Severe shock states	MO / Senior
5.1.3	• Tube feeding (naso-gastric or oro-gastric) is the usual way of feeding in ICU, unless the patient is conscious & stable when usual oral diet could be offered • A radio-opaque nasogastric tube is usually preferred. Contraindication for nasogastric tube includes: ▪ Suspected basal skull fracture ▪ After trans-sphenoidal hypophysectomy ▪ Recent nasal surgery • Use larger bore tube which enables aspiration until enteral nutrition is well tolerated. Change to small bore feeding tube if enteral feeding is well-tolerated. Tube is changed according to manufactory's instruction.	RN / MO
5.1.4	• After placement of the gastric tube, its position is commonly assessed clinically by: ▪ Aspiration & test fluid for pH ▪ Auscultation at epigastrium with injection of air These methods are not fool-proof • Tube feeding should only be started after tube placement is confirmed by X-ray study. (Appendix A). The tube placement should be reassessed during and before re-start feeding (Appendix B) • Date of insertion should be recorded in the ICU flow chart	RN / MO
5.1.5	See Appendix C for the process of establishing full enteral nutrient support	RN / MO
5.1.6	Calculating Caloric Requirement and target TEE by using the preset formula (Appendix D)	RN
5.1.7	Monitor for any problems with enteral feedings (e.g. impaired gastric motility, diarrhea)	RN / MO

5.2 Feeding Regime Technique

	Action	*Responsible*
5.2.1	Unless contraindicated, all patients receiving enteral feeding should be positioned 30^{o} head up	RN
5.2.2	Proper hand washing techniques should be observed for manipulation of enteral nutrition prepartions and apparatus	RN
5.2.3	• Re-used feeding bottle and connector set should be changed every 4 hours while disposable one changed be every 24 hours • Close system feeding set can be changed up to 48 hours and referred to manufacture's instructions	RN / MO
5.2.4	Feeding solution should be administered continuously using a feeding pump	RN

5.3 Gastric Motility

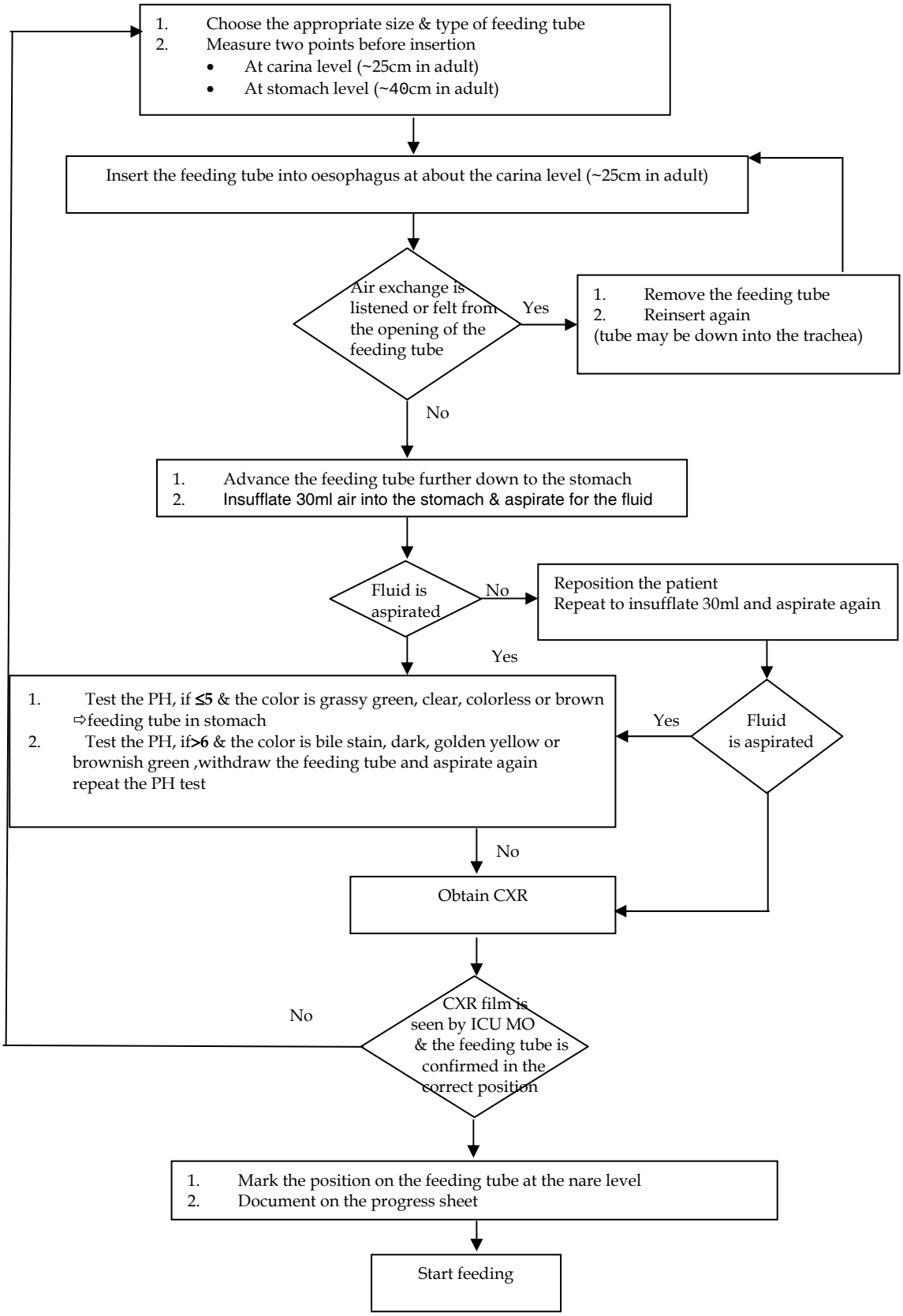
	Action	*Responsible*
5.3.1	Gastric tube is aspirated every 4 hourly. Aspirate >200ml suggests impaired gastric motility	RN
5.3.2	Look for life-threatening condition which could present as impaired gastric motility. Examples includes: ▪ Peritonitis (e.g. ischemic bowel, acalculus cholecystitis): Examine the abdomin ▪ Intestinal obstruction: PR for faecal impaction. Check AXR	MO / Senior
5.3.3	See Appendix E for the management of impaired gastric motility	RN / MO
5.3.4	Reduction of morphine infusion used for sedation may also help in improving gastric emptying	MO

6. Quality Records

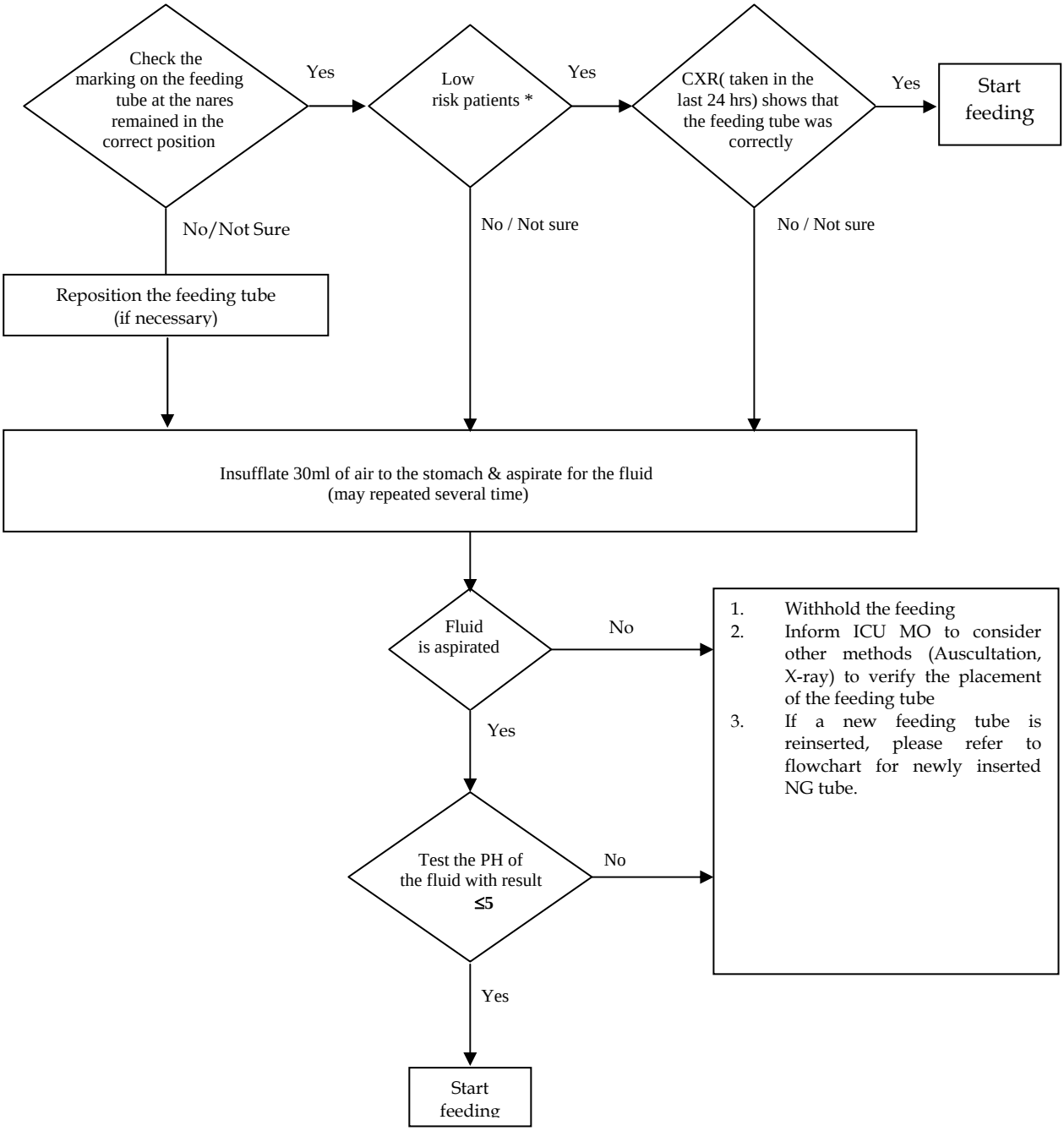
- Patient's medical record
- ICU flow chart

7. Appendix

Appendix A: Flowchart on assessing placement of newly inserted nasogastric & nasointestinal tube



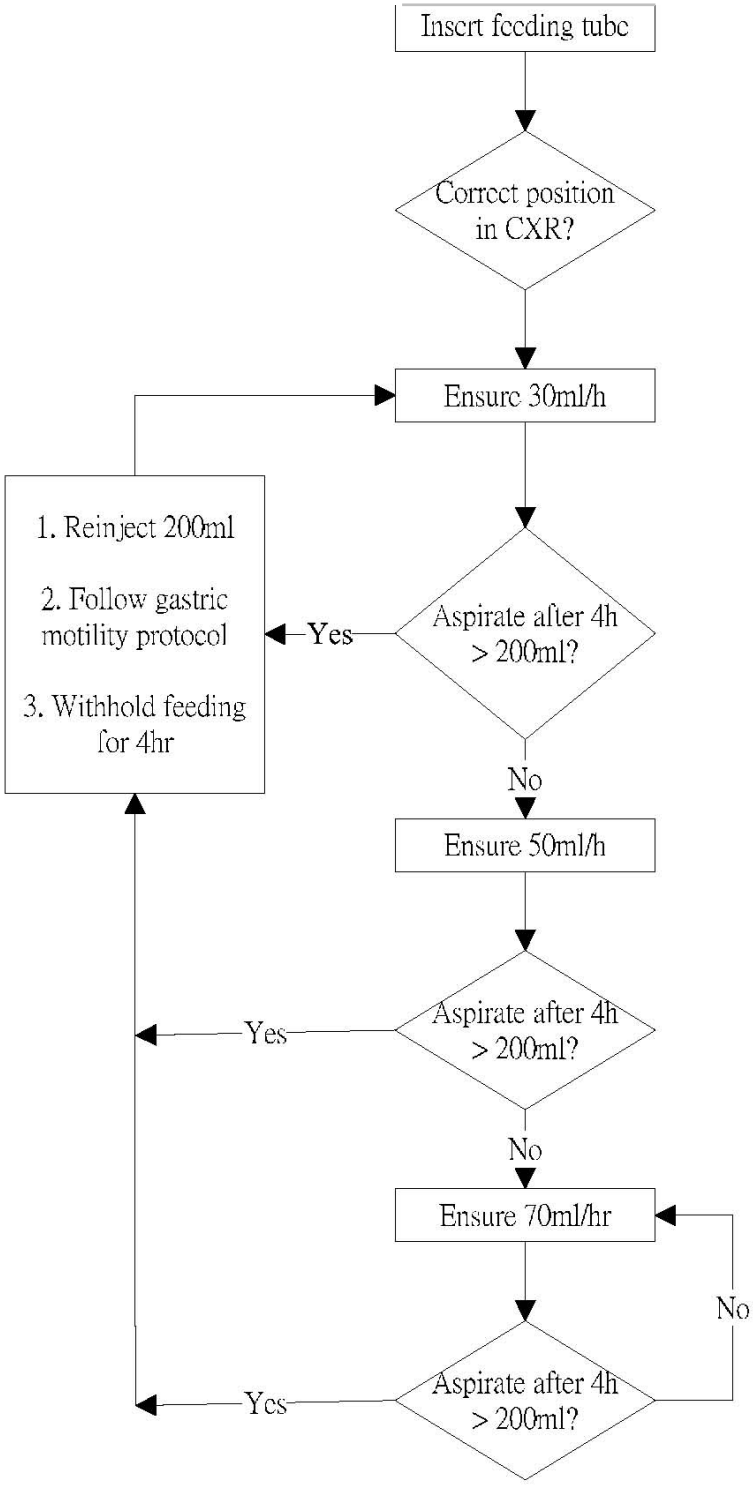
Appendix B: Flowchart on assessing placement of nasogastric & nasointestinal tube during or re-start feeding



Low risks;

- ❖ No retching
- ❖ No vomiting
- ❖ No severe bouts of coughing
- ❖ No Frequent nasotracheal suctioning

Appendix C: Enteral Feeding



Appendix D: Calculating Caloric Requirement

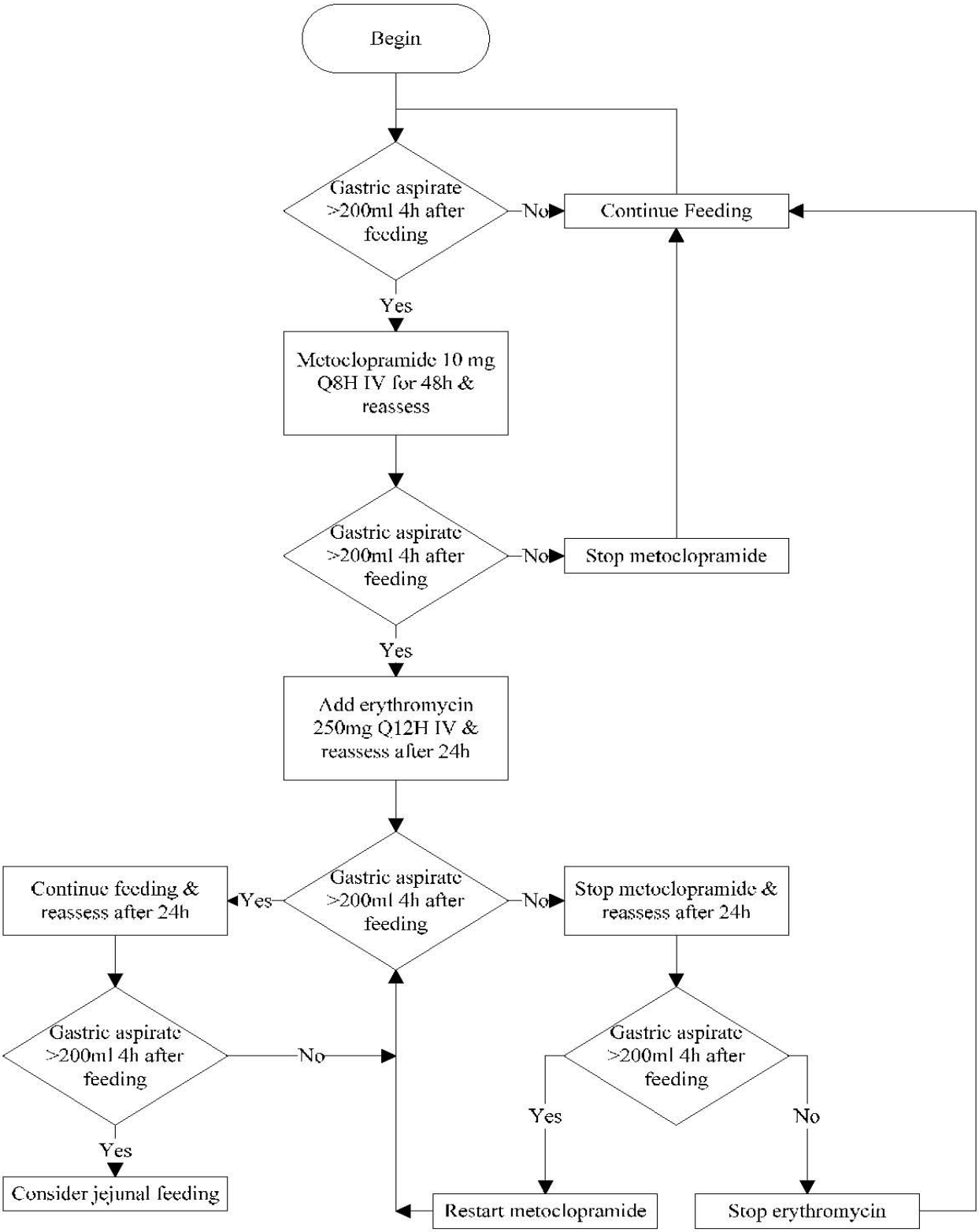
1. Calculate resting energy requirement (REE) using Harris-Benedict Equation
   - Males
     REE = 66 + (14 x weight/kg) + (5 x height/cm) – (6.8 x age/yr)

   - Females
     REE = 55 + (10 x weight/kg) + (1.8 x height/cm) – (4.7 x age/yr)

2. Adjustment may be necessary base on patient's conditions eg. Patients with septic shock require a total energy expenditure (TEE) = REE x 1.3 (≈25kcal/kg/day) during the first week but TEE increase to REE x 2.3 (≈47kcal/kg/day) during the second week.

3. Calculate the target TEE for the patient and round up it to multiples of 100 ml.

Appendix E: Gastric Motility



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