

## **BDA Critical Care Specialist Group COVID-19 Best Practice Guidance: Bolus Enteral Feeding.**

*Prepared on behalf of the British Dietetic Association (BDA) Critical Care Specialist Group (CCSG) by the following working group:*

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### **Introduction**

Within the UK intensive care environment, enteral nutrition is predominantly provided via a feeding pump. However due to the rapid expansion of existing intensive care units (ICU) and the creation of entirely new ICU capacity in Critical Care Field Hospitals throughout the UK to manage COVID-19 patients, it is expected that there will be a shortfall in the number of feeding pumps required. In this instance it may become necessary to consider bolus feeding in a select cohort of ICU patients.

### **Summary of published studies used to inform recommendations.**

A literature search was performed to inform this guideline from 2016-April 2020. Four studies published in the English language pertaining to bolus feeding were identified. Of the four <sup>1-4</sup> studies, three<sup>1-3</sup> were in intensive care patients of which two were randomised control trials<sup>1-2</sup> and one an observation study<sup>3</sup>, none of the studies specifically considered patients with severe respiratory failure as characterised by the COVID-19 patients and therefore the extrapolation of their results to the COVID-19 patient group should be made cautiously. The recommendations on bolus feeding from the ESPEN guideline on clinical nutrition in the intensive care unit 2019 were also included <sup>5</sup> Where evidence was lacking recommendations were made based on the consensus of best practice established amongst the working group which contained experienced critical care dietitians from within the British Dietetic Association Critical Care Specialist Group. When ICU specific evidence was lacking

descriptive evidence presented in the fourth study which was a cross section survey of bolus tube feeding in home enterally fed patients<sup>4</sup> was considered to help inform guidance.

### **Definition of feeding methods**

Continuous or cyclical feeding, is defined as feeding via a feeding pump for several hours during a 24hour period. Usually in the ICU setting patients are continuously fed over 20-24hrs.

Bolus feeding, is used to describe a method of feeding where either a syringe or gravity is used to deliver feed over a 5-10 minute period, 4-6 times a day<sup>6</sup>.

### **The safety of bolus vs continuous feeding in the ICU.**

Since the introduction of enteral feeding pumps in the UK they have become the mainstay method of delivering feed on ICU. Although the evidence base is limited continuous feeding is expected to improve feed tolerance thereby helping to manage the risk associated with poor feed tolerance. It is also considered to cause less variability in blood glucose levels.

### **Gastrointestinal tolerance**

Of the literature reviewed, two studies<sup>1,2</sup> recorded no difference in gastric tolerance between the groups of patients fed continuously or via bolus in the ICU setting. Both studies monitored gastric tolerance through a combination of gastric residual volumes (GRVs), symptoms of diarrhoea, nausea and abdominal distention. GRVs were monitored 3hourly<sup>2</sup> with a tolerance of 200-300mls.

It is however noted that the ESPEN guideline<sup>5</sup> recommends using continuous rather than bolus, as a meta-analysis found a significant difference in rates of diarrhoea in bolus feeding compared to continuous feeding.

### **Blood sugar control**

Blood sugar control on the ICU focuses on the avoidance of glucose variability, whilst recognising that hypoglycaemia is independently linked to a poorer outcome.

One study of 50 ICU patients randomised to continuous or bolus feeding via a percutaneous endoscopic gastrostomy tube<sup>3</sup> (PEG) recorded no difference between glucose variability or insulin utilisation seen between the two groups. It is however acknowledged that as the study population were feeding via a PEG tube they were likely to represent a more stable ICU patient. The study also provided no detail on the type of feed used, how the feed bolus was administered or if any of the study population had pre-existing diabetes.

In a study by McNelly et al 2020<sup>1</sup> those that were bolus fed were observed to have a greater number of days with hyperglycaemia but there was no difference in cumulative insulin received between the continuous and bolus feeding groups. There was also no difference in hypoglycaemic events between the two groups, but of the seven adverse events recorded in the bolus group two were related to erratic glucose levels in patients with pre-existing diabetes. The author therefore concluded that the increased blood glucose variability seen

in the bolus feeding may require more bespoke insulin protocols for patients with greater insulin resistance.

### **Enteral feeding regimes.**

Of the 2 studies<sup>1,2</sup> that described their bolus feeding method, bolus feeds were administered 3-4 hourly up to 6 times a day. Feeding was initiated at 50-80ml boluses which were increased as gastric tolerance was established, to a maximum of 200mls/feed bolus<sup>2</sup> (1200ml/day).

The type of feed varied in nutritional composition from 1kcal/ml<sup>2</sup> using a reconstituted feed to 2.4kcal/ml<sup>1</sup> using a compact style oral nutritional supplement.

### **Aims**

This document aims to provide guidance on how to deliver enteral nutrition via the bolus feeding route safely in the ICU setting.

### **Best Practice recommendations**

This guidance is designed to be general enough to apply to a range of usual practice and circumstances. When applied it is essential to consider the specific circumstances of each critical care unit, which may change over the course of the COVID-19 pandemic.

**It remains the consensus of the critical care specialist group of the British dietetic association that bolus feeding should only be considered in the ICU patient if no feeding pump is available.**

Ideally the identification of patients who are likely to best tolerate bolus feeding will be made by the multidisciplinary team looking after the patient.

### **Patient selection**

For bolus feeding a patient must not be prone or have any abnormalities of the gastrointestinal tract for example a roux en-y, gastric band, gastrectomy or previous whipples procedure.

Bolus feeds should not be given via jejunal feeding tubes.

Preference for a feeding pump should be given to patients who are more critically unwell, evidenced by high dose vasopressors and concerning ventilation (FiO<sub>2</sub> >50%) or who have pre-existing diabetes, erratic blood glucose control or poor gastric emptying as defined by local standards.

### **Patient position**

The patient should be positioned in as upright a position as possible, but as a minimum their head and shoulders should be raised by at least 30 degrees for the duration of the feed and for at least 45 minutes after the feed<sup>7</sup>.

### **Tube position and size**

The gastric position of the nasogastric tube should be confirmed prior to each feeding episode using locally agreed guidelines.

Ideally the nasogastric tube should be at least of 12fg in size to facilitate bolus feeding.

### **Choice of feed**

Based on the available evidence regarding bolus feeding in ICU it is recommended that a 2.4kcal/ml oral nutritional supplement is used, to facilitate the balance between optimal feed tolerance, fluid balance management and frequency of feeding. It is recognised that these supplements may contain lower than optimal levels of electrolytes, this is often not a problem for ICU patients who will be receiving electrolytes from a variety of other sources, however it is recommended that patient electrolyte levels are carefully monitored.

Where bolus feeding is already an established practice on ICU local protocols should be followed.

### **Feed delivery**

It is recommended that a 60ml enteral feeding syringe is used for bolus feeding, enteral syringes of a bigger or smaller size risk feed leakage or damaging the feeding tube.

The nasogastric tube should be flushed with at least 30mls of water prior to administering the feed.

Then either;

- With the plunger removed, pour the oral nutritional supplement into the syringe barrel and allow gravity to draw the feed through the feeding system or carefully insert the plunger and continue to apply gentle pressure to push the feed through the feeding tube,.
- Draw up the feed bolus with the syringe plunger, connect to the nasogastric tube and gently apply pressure to the plunger to push the feed bolus through the feeding tube.

Repeat as necessary until the prescribed volume of feed is given

Once the feed is complete flush the tube with at least 30mls of water. (If the bolus feed has been given via gravity it is advised that the plunger is used to ensure that the tube is cleared as much as is possible of feed residue, otherwise this can build-up and block the tube<sup>7</sup>.)

When initiating the feed a maximum feed bolus size of 80mls<sup>1</sup> is recommended, increasing in size by 30mls with each feed until prescribed feed volumes are attained as long as gastric tolerance is achieved. It is not recommended to exceed a feed bolus size of 300ml without direction from a dietitian.

It is not unusual for ICU patients to receive fluids from a variety of sources, however if additional fluid boluses via the nasogastric tube are required it is advised that the water bolus size is no greater than 400mls and given at least 1 hour before or after feed.

If there is any nutritional supplement left replace the lid on the supplement ready for the next feed. All open feed should be clearly labelled with the patient's name, date and opening time and stored in accordance with local infection control guidance. All open feed should be discarded after 24-hour period.

Appendix 1 contains an example of a bolus regimen.

### **Monitoring feed tolerance**

Gastric aspirates should be monitored prior to each feeding episode.

It is recommended that a maximum GRV of 300mls should be used unless a lower GRV threshold is already established practice.

GRV's up to 300mls should be returned to the patient and the remainder discarded, unless a more conservative practice is already locally established.

Regular monitoring of bowels is recommended and if diarrhoea is experienced, reverting back to continuous feeding may be indicated.

### **Managing feed Intolerance**

If a GRV exceeds threshold at any time, commencing prokinetics in accordance with local guidelines is recommended.

If gastric aspirates remain above threshold after 12-24hrs of prokinetic use, a second line of feeding should be considered:

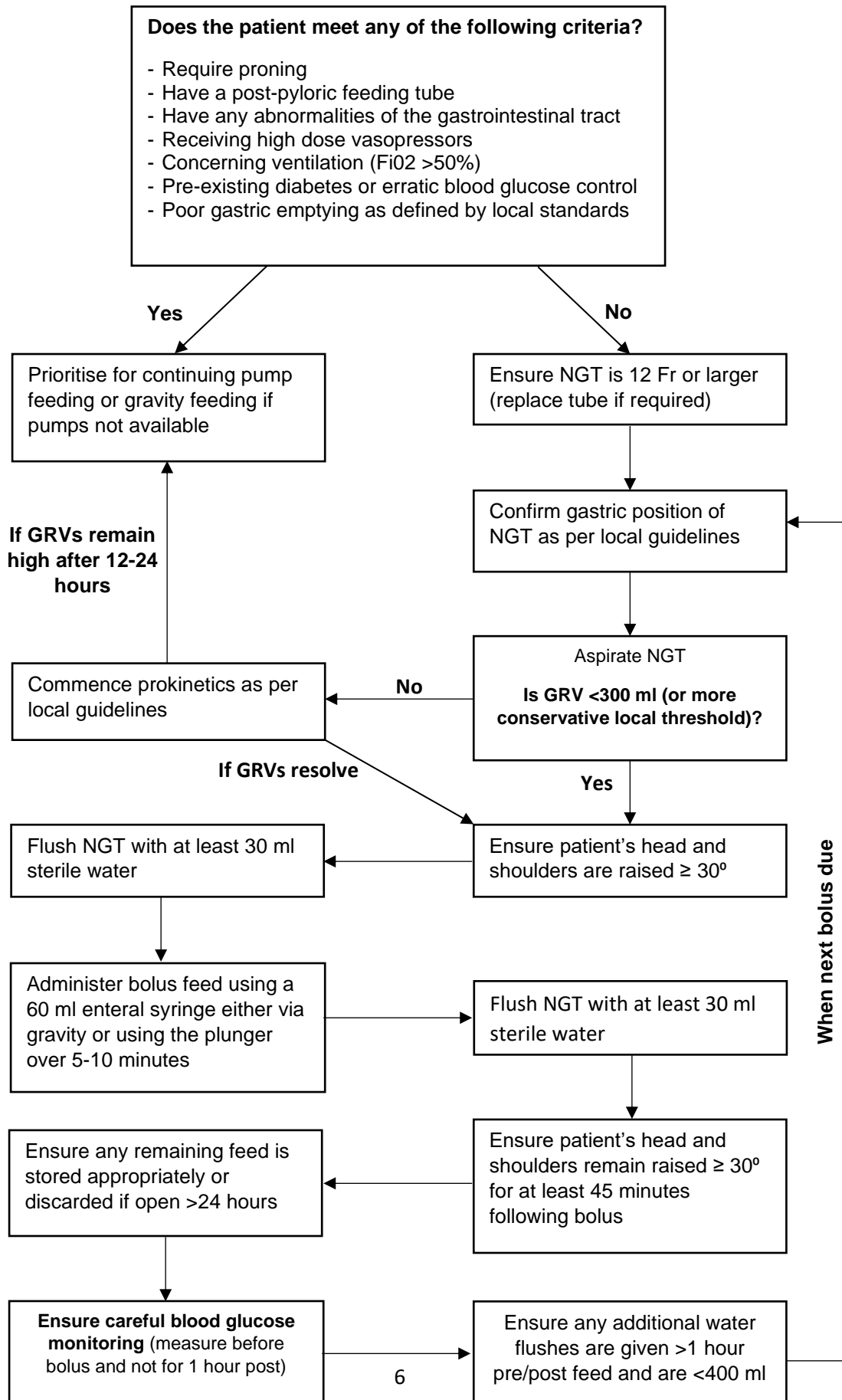
- Ideally where possible a feeding pump should be sourced, and continuous feeding commenced.
- If a feeding pump is unavailable parenteral nutrition should be considered after 72hours and feed boluses should be reduced to 50% of the last given volume. If gastric tolerance can then be achieved feed boluses can slowly be advanced in size to tolerance or prescribed volume.

### **Blood glucose levels**

Blood glucose levels should be carefully monitored in all patients receiving bolus feeding and hyperglycaemia or hypoglycaemia managed in accordance with local trust policy. It is recommended that blood sugars are measured before a bolus feed is given and not measured within 1 hour of a feed bolus having been administered, as this may give a false high reading.

It is important to note that the latest and most comprehensive review of bolus feeding in the ICU found that bolus feeding considerably increased glucose variability and it was recommended that more bespoke insulin regimens maybe required for patients with greater insulin resistance.

## ICU Bolus Feeding Chart



### Example Bolus Feeding Regimen

Feed Used: 2.4 kcal/ml oral nutrition supplement

Bolus x6/24 hours i.e. 01:00, 05:00, 09:00, 13:00, 17:00, 21:00

Flush with 30 ml water pre and post bolus

Below regimen provides ~20-25 kcal/kg

If BMI >25 use Ideal Body Weight at BMI 25 kg/m<sup>2</sup>

Weight (kg)	Bolus amount (ml)	Energy (kCal/day)	Volume feed + minimum flush (ml/day)
≤40	60	864	720
41-49	70	1008	780
50-59	85	1224	870
60-69	105	1512	990
70-79	120	1728	1080
>80	140	2016	1200

If bolus amount >80 ml: 1<sup>st</sup> feed administer 80 ml, increase by 30 ml at each bolus if tolerating until target bolus amount reached.

If additional fluids required: give 200 ml water flush 2 hours post bolus up to 6x daily as required (up to an additional 1200 ml water)

May need to adjust target bolus amount depending on non-feed energy i.e. propofol in discussion with Dietitian

## References

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2. Nasiri M, Farsi Z, Ahangari M and Dadgari (2017) Comparison of intermittent and bolus enteral feeding methods on enteral feeding intolerance of patients with sepsis: A triple-blind control trial in intensive care units. *Middle East Journal of Digestive Diseases* 9(4) 218-227
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4. Hubbard GP, Andrews S, White S, Simpson G, Topen S, Carnie L, Murphy C, Collins R, Davies J, Owen A, Barker J, Green L, Patel I, Ridgway, Lenchner J, Faerber J, Pearce L, Meanwell H, Kominek N, Stark L, Best H, Simons R, Cross T and Stratton R (2019) A survey of bolus tube feeding prevalence and practice in adult patients requiring home enteral tube feeding. *British Journal of Nutrition* 122, 1271-1278.
5. Singer, P., Blaser, A.R., Berger, M.M., Alhazzani, W., Calder, P.C., Casaer, M.P., Hiesmayr, M., Mayer, K., Montejo, J.C., Pichard, C. and Preiser, J.C., 2019. ESPEN guideline on clinical nutrition in the intensive care unit. *Clinical nutrition*, 38(1), pp.48-79.
6. Bear DE, Hart N and Puthuchery Z (2018) Continuous or intermittent feeding: pros and cons. *Current opinion critical care* 24(4) 256-261.
7. Brito-Ashurst I, Brown V, Ferguson F, McClenaghan M, Ridgway J and Topen S (2017) Bolus feeding in Adults: A practical guide. Accessed 09042020 [bolusfeeding.co.uk](http://bolusfeeding.co.uk)

## Other useful information sources

National Nurses Nutrition group (2020) Practical advice and guidance for the management of nutrition support during COVID-19. Accessed 09042020