



**Nutrition Management for Critically and Acutely
Unwell Hospitalised Patients with COVID-19 in
Australia and New Zealand**

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Executive Summary:

Purpose:

The purpose of this document is to provide evidence-based advice for nutrition management of critically ill and acutely unwell hospitalised patients during the COVID-19 pandemic. It provides key adaptations of usual best practice, taking into consideration staff safety, reduced staffing, resource utilisation, and the clinical condition of the patients. As this pandemic is evolving rapidly, this document may be updated.

We recommend enacting this COVID-19 nutrition guideline when hospitals enter phase 2 management strategies as outlined in the Australian and New Zealand Intensive Care Society (ANZICS) COVID-19 Guideline (Version 1, 16th March 2020)[1]. Phase 2 of the tiered ICU pandemic plan refers to a moderate impact on daily operations, with the ICU at or near maximum capacity but still able to meet demand and when up to 25% beds are occupied by patients with pandemic illness [1].

Key recommendations:

ICU Recommendations:

Energy and protein targets:

1. We do not recommend the use of indirect calorimetry (IC) in patients with COVID-19.
2. We recommend commencing enteral nutrition (EN) support using an algorithm with a set rate for up to the first 5 days of ICU admission (see ICU algorithm and recommendation #5).
3. We recommend providing 25 kcal/kg bodyweight/day after the first 5 days of illness (and up to 30 kcal/kg bodyweight/day for severely unwell patients or those who have a prolonged admission (e.g. Extracorporeal membrane oxygenation (ECMO), continuous renal replacement therapy (CRRT), or length of mechanical ventilation (MV) >7days) and protein prescription of at least 1.2 g/kg bodyweight/day.

Insertion of an enteral tube:

4. We recommend using personal protective equipment (PPE) for full airborne precautions during the insertion of nasogastric tubes (NGT) tubes, and that unnecessary NGT changes be avoided.

Commencement of nutrition support:

5. In MV patients who are low nutrition risk, we recommend commencing EN support within 24 hours of ICU admission via the gastric route using an algorithm with a set rate for up to the first 5 days of ICU admission (see algorithm).
6. In high nutrition risk patients, the Dietitian or treating consultant should be contacted to determine if the standard feeding algorithm is appropriate to commence prior to commencement, and a dietetic consult should be conducted within 24-72 hours where possible, pending staff capacity and hospital COVID-19 phase.
7. For low nutrition risk patients, a care plan should be provided between 3-5 days (based on dietetic capacity due to case load), if they are likely to require MV for greater than 5 days and are likely to survive.
8. We recommend the use of an energy-dense EN formula (1.25-1.5 kcal/ml).

Continuing nutrition support:

9. We recommend, where possible, keeping enteral tubes in place post-extubation due to the prolonged recovery anticipated for patients who survive COVID-19.
10. We recommend the consideration of post-pyloric feeding, using PPE for full airborne precautions given the risk to staff, if gastrointestinal intolerance remains an issue over 5-7 days despite use of appropriate management strategies, and calorie and protein delivery is consistently <50% of prescribed targets.

11. We recommend supplemental parenteral nutrition (PN) be considered after other measures to improve EN have been attempted or insertion of a post-pyloric enteral feeding tube is deemed unsafe and calorie and protein intake remain significantly less than prescribed targets (i.e. <50% over a 5-7 day period).

Dietetic assessment and reviews:

12. For patients who are not high nutrition risk, we recommend that a nutrition assessment be completed by day 3-5 of ICU admission in most circumstances, depending on staff capacity, or earlier if patients are at high nutritional risk (see ICU algorithm).
13. Where dietetic capacity is exhausted, and if a full dietetic review is not possible, we recommend increasing EN targets to meet 25-30 kcal/ kg body weight/ day after day 5 as a minimum.

Monitoring of gastric residual volumes (GRVs):

14. We recommend continuing to measure GRVs in COVID-19 patients where appropriate PPE is available (airborne precautions) but using a threshold of less than 300ml and measuring 8 hourly.
15. We recommend ceasing measurements when GRVs have been less than 300ml for > 48 hours in patients who are not prone.

Prone:

16. We recommend that EN is paused and the NGT be aspirated prior to any position changes. EN should be recommenced as soon as possible to avoid unnecessary interruption to feeding.
17. We recommend GRV monitoring continue 8 hourly while in the prone position, even if intolerance is not an issue.

Nutrition for non-ventilated patients and those receiving high flow nasal oxygen (HFNO):

18. We recommend routine provision of an appropriate oral diet (e.g. high energy, high protein), and oral nutrition supplements (e.g. 1.5 or 2 kcal/ml oral supplement) as soon as oral intake is commenced.
19. We recommend advocating for escalation to EN, with consideration given to the safety risk of NGT placement, for patients not receiving MV and meeting <50% of energy and protein targets orally for ≥5-7 days, despite provision of oral nutritional supplements, or if intubation is expected.

Ward Recommendations:

Identifying nutrition risk:

20. Where there is capacity, we recommend the use of a validated malnutrition screening tool to identify patient who are at risk of malnutrition although coordination of care should be considered to minimise staff exposure and PPE use.

Dietetic assessment and reviews:

21. For patients transferring to the ward from ICU, we recommend that the ICU dietitian provides an appropriate handover to the ward dietitian within 24 hours of ICU discharge.
22. For patients admitted directly to the ward, we recommend the implementation of local pathways to optimise nutrition provision for patients as soon as possible, prior to full nutritional assessment, where appropriate (refer to ward algorithm).
23. We recommend a Dietetic consult for high nutrition risk patients (see list) be conducted within 24 hours.
24. We recommend that nutritional monitoring is maintained, including the monitoring of intake and weight (where possible), and high nutrition risk patients are reviewed at least twice weekly and lower risk patients at least weekly.

Continuing nutrition support:

25. We recommend advocating for escalation to EN in patients who are meeting <50% of energy and protein targets orally for ≥ 5 -7 days, or where a patient is assessed as malnourished and has a suboptimal oral intake (<65% of estimated requirements), despite provision of oral nutritional supplements or food fortification.

Contingency planning and workforce considerations:

Dietetic workforce:

26. We recommend that all dietitians who are likely to be treating COVID-19 patients or entering a high-risk space have formal instruction on the use of PPE (including training, practice and supervision).
27. We recommend conducting nutrition consults remotely, utilising family and relatives to obtain nutrition history where possible, limiting the number of staff in the patient space and the utilisation of PPE.
28. We recommend nutrition departments are familiar with the hierarchy of hazard control [1].
29. We recommend the utilisation of Allied Health Assistants (AHA) where possible for non-face-to-face management activities.

Food service considerations:

30. We recommend developing food service systems to enable electronic or phone meal ordering to minimise contact with the patient at the bedside while enabling patient menu selection and ensuring optimal nutrition provision.

Additional contingency planning is recommended with consideration to nutrition formula and delivery equipment stock levels, alternative feeding methods when supplies are unavailable, remote consultations, and up-skilling of dietetic staff and allied health assistants.

Impact of COVID-19 on nutrition:

Patients with COVID-19 pneumonia, who develop respiratory failure, shock or multi-organ failure, require intensive care management with mechanical ventilation (MV) and other organ supports. COVID-19 pneumonia is characterised by high fevers, which induce a catabolic state, resulting in impaired glucose utilisation, increased protein breakdown and energy utilisation[2]. It has been reported that in addition to critical illness, there may be significant effects on appetite, conscious state, and direct gastrointestinal affects resulting in diarrhoea, nausea, and vomiting. These factors adversely impact nutritional intake and status. Patients with COVID-19 often require prolonged MV and ICU support, resulting in significant immobility, catabolic stress and muscle wastage[2]. These patients are at high risk of malnutrition during the period of critical care, as well as in the recovery phase of this illness, and may stay in hospital for a significant length of time. There is limited available data to guide the optimal nutritional management of patients with COVID-19, and as such, these guidelines are based on the available evidence from other similar conditions such as Acute Respiratory Distress Syndrome (ARDS)[3, 4].

Risk to staff:

While procedures such as nasogastric tube (NGT) insertion are not considered aerosol generating procedures, there may be a risk to staff through the induction of coughing. In addition, the COVID-19 virus is shed in the stool and may also exist in the gastric secretions (although this is currently unknown). Therefore, procedures such as aspirating gastric contents *may* also pose a risk; although, where staff are using personal protective equipment (PPE) for airborne precautions, they should be adequately protected. To ensure any excess risk is minimised, prior to any procedure involving an insertion or change of an enteral tube, the risk should be minimised through the use of appropriate PPE, or where unavoidable, reduction in frequency or avoidance. Where staff are required to individually review patients for nutrition care, this should be done remotely where possible, or using the appropriate PPE, after appropriate training and according to hospital guidelines.

Intensive Care Guidelines:

Nutrition risk categories:

For the purpose of the ICU guideline, patients at 'high nutrition risk' are defined as those with:

- Anaphylactic food allergy
- Pre-existing or suspected malnutrition (e.g. weight <50kg, BMI <18.5 kg/m², recent weight loss of ≥5%)
- Weight >120kg or Body Mass Index (BMI) >40
- Requiring parenteral nutrition (PN)
- Considered at high risk of refeeding
- Type 1 diabetes mellitus
- Cystic fibrosis
- Inborn errors of metabolism

All other patients are considered 'low nutrition risk'.

Recommendations:

Energy and protein targets:

1. We do not recommend the use of indirect calorimetry (IC) in patients with COVID-19.

IC requires the disconnection of the ventilator circuit which risks exposing staff to the airborne virus. IC also takes considerable time to perform, which will also increase overall exposure to staff.

2. We recommend commencing enteral nutrition (EN) support using an algorithm with a set rate for up to the first 5 days of ICU admission (see algorithm and commencement of nutrition support recommendations below)

3. We recommend providing 25 kcal/kg bodyweight/day after the first 5 days of illness (and up to 30 kcal/kg bodyweight/day for severely unwell patients or those who have a prolonged admission e.g. ECMO, CRRT, or length of MV >7days) and protein prescription of at least 1.2 g/kg bodyweight/day.

- Minimal evidence exists for the optimal nutritional targets in these patients, but in the absence of indirect calorimetry, we recommend calorie prescriptions to be based on 25 kcal/kg bodyweight/day after the first 5 days of illness (and up to 30 kcal/kg bodyweight/day for severely unwell patients e.g. ECMO, CRRT, or length of MV >5 days) and protein prescription of at least 1.2 g/kg bodyweight/day[4, 5]. Actual body weight should be used for patients of normal weight, and an adjusted body weight for overweight and obese patients as per usual site method (e.g. ideal body weight + 25% of actual weight).
- Current case reports state that fever of between 37.5-39.0 °C is common. The metabolic impact of increased temperature is said to be ~10-13% per every 1°C increase[6]. This should be considered in the overall nutrition prescription.
- In obese patients, it is appropriate to commence nutrition as per the algorithm provided, but these patients should be considered high nutrition risk and prioritised for nutrition review.
- Contribution of calories from propofol should be considered in the nutrition provision if more than 10% of daily calories are being provided from this source. EN calories should be reduced and adequate protein delivery ensured while considering overall fluid provision.

Insertion of a nasogastric tube (NGT) tube for enteral feeding

4. We recommend using PPE for full airborne precautions during the insertion of NGT tubes, and unnecessary NGT changes avoided.

- The insertion of a NGT may induce coughing, and nasal and gastric sections may also contain virus.

- The decision to insert a NGT should include consideration of the risk to staff, the benefit of providing nutrition support, and alternative modes of feeding including PN.

Commencement of nutrition support:

5. **In MV patients who are low nutrition risk, we recommend commencing EN support within 24 hours of ICU admission via the gastric route using an algorithm with a set rate for up to the first 5 days of ICU admission (see suggested algorithm).**

This recommendation takes into consideration: the safety of dietitians in ICU (recognising that reducing exposure is a fundamental method of preventing COVID-19 infection[1]); preservation of PPE for clinical staff that have no choice but to be in contact with patients; the workload required for clinicians to calculate an individualised rate considering the high volume of patients anticipated; and the likelihood of gastrointestinal dysmotility with early full feeding in this population. There is no critical care nutrition literature to demonstrate negative consequences of early hypo-caloric feeding strategies for the first 5-7 days of ICU admission[3, 7]. This recommendation is also in keeping with recent international guidelines that recommend the introduction of hypo-caloric nutrition over the first 5-7 days of illness[5]

6. **In high nutrition risk patients, the Dietitian or treating consultant should be contacted to determine if the standard feeding algorithm is appropriate to commence prior to commencement, and a dietetic consult should be conducted within 24-72 hours where possible, pending capacity and hospital COVID-19 phase.**

This is to ensure the safe provision of appropriate nutrition support, minimising the risk of refeeding, anaphylactic reactions and to decreased the risk of significant over or underfeeding.

7. **For low nutrition risk patients, a care plan should be provided between 3-5 days (based on dietetic capacity due to case load) if they are likely to require MV for greater than 5 days and are likely to survive.**
8. **We recommend the use of an energy-dense EN formula (1.25-1.5 kcal/ml).**

- In order to reduce the volume of fluid provided to patients (in keeping with the ANZICS COVID-19 Guideline recommendations of avoiding high volume EN as part of a restrictive fluid management strategy in patients with respiratory failure to reduce the risk of extravascular lung water)[7]. We recommend selecting an enteral formula that meets caloric needs, without compromising protein delivery.
- We recommend avoiding the prescription of a highly concentrated enteral formula (2kcal/ml) unless essential for further fluid restriction. Highly concentrated enteral formula have been shown to delay gastric emptying and therefore they may exacerbate gastrointestinal dysfunction; additionally they usually have a low protein content

Continuing nutrition support:

9. **We recommend, where possible, keeping enteral tubes in place post-extubation due to the prolonged recovery anticipated for patients who survive COVID-19.**

- This decision should be made in consultation with the dietitian. This takes into consideration the high metabolic demands and the challenges to achieving adequate oral nutrition (e.g. work of breathing, conscious state, potential eating and swallowing difficulties due to weakness, challenges with food selection and feeding with high workloads for bedside staff) and existing data in other populations informing of poor adequacy of nutrition with oral nutrition alone following critical illness[8-11].
- Where wide bore NGT are *in situ* consider changing to a fine bore NGT prior to extubation if ongoing EN for >5 days is deemed likely. This should take into consideration the associated safety risks to staff, and should be performed with PPE for full airborne precautions and coordinated with other clinical care.
- For commencement of post-extubation oral nutrition, please refer to the statement on oral intake in the section '*Nutrition for non-ventilated patients and those receiving high flow nasal oxygen (HFNO)*'.

10. **We recommend the consideration of post-pyloric feeding, using PPE for full airborne precautions given the risk to staff, or parenteral nutrition (PN) if gastrointestinal intolerance remains an issue over 5-7 days despite use of appropriate management strategies, and calorie and protein delivery is consistently <50% of prescribed targets.**
11. **We recommend supplemental PN be considered after other measures to improve EN have been attempted or insertion of a post-pyloric enteral feeding tube is deemed unsafe and calorie and protein intake remain significantly less than prescribed targets (i.e. <50% over a 5-7 day period).** This should be assessed on a case-by-case basis and the long-term impact of nutrition deficit considered.

Dietetic assessment and reviews:

12. **For patients who are not high nutrition risk, we recommend that a nutrition assessment be completed by day 3-5 of ICU admission in most circumstances, depending on staff capacity, or earlier if patients are at high nutritional risk (see ICU algorithm).**
13. **Where dietetic capacity is exhausted, and if a full dietetic review is not possible, we recommend increasing EN targets to meet 25-30 kcal/ kg body weight/ day after day 5 as a minimum.**
 - Nutritional monitoring should be maintained where possible, including assessment of calorie and protein delivery compared to prescribed targets, feeding intolerance and other complications, to identify patients who may require an escalation in their nutritional care.
 - It is anticipated there will be a reduction in dietetic workforce with staff illness and increased patient caseload. **Therefore, a delay in the** conduct of an initial nutrition assessment and less frequent reviews of nutritionally stable patients should be anticipated. Where resources are limited, we recommended dedicating these to the:
 - first week of illness for high nutrition risk patients only
 - first week of illness in low nutrition risk patients with feeding complications
 - second week of illness in patients deemed low nutrition risk on admission
 - ICU teams should be advised to escalate patients with nutritional concerns quickly to facilitate prioritisation.

Monitoring of gastric residual volumes (GRV):

14. **We recommended continuing to measure GRVs in COVID-19 where appropriate PPE is available (airborne precautions) but using a threshold of less than 300ml and measuring 8 hourly.**
15. **We recommend ceasing measurements when GRVs have been less than 300ml for > 48 hours in patients who are not prone.**
 - These recommendations are made as the viral load of gastric contents is unknown; however, the risk of not measuring GRVs is increased vomiting which also places staff at risk and hence strategies to avoid vomiting should be taken.

Nutrition for patients in the prone position:

16. **We recommend that the EN is paused and the NGT be aspirated prior to any position changes. EN should re-commence as soon as possible to avoid unnecessary interruption to feeding.**
17. **We recommend GRV monitoring continue 8 hourly while in the prone position, even if intolerance is not an issue.**
 - Patients in the prone position should commence EN as per the previous recommendations, with consideration that the prone position is associated with increased GRVs and risk of vomiting [12].
 - Assessing the position of the NGT after placing the patient in the prone position is important to assess the potential risk of pressure injury.

Nutrition for non-ventilated patients and those receiving high flow nasal oxygen (HFNO):

- 18. We recommend routine provision of an appropriate oral diet (e.g. high energy, high protein), and oral nutrition supplements (e.g. 1.5 or 2 kcal/ml oral supplement) as soon as oral intake is commenced.**
- 19. We recommend advocating for escalation to EN, with consideration given to the safety risk of NGT placement, for patients not receiving MV and meeting <50% of energy and protein targets orally for ≥5-7 days, despite provision of oral nutritional supplements, or if intubation is expected.**
- The provision of nutrition in patients receiving HFNO is difficult due to fasting for potential intubation and oral intake is often poor due to nausea, delirium, fatigue, poor appetite, and difficulty breathing[13]. This recommendation also considers the high patient numbers restricting timely individualised assessment.

Acute Ward Guidelines:

Nutrition risk categories:

For the purpose of the **acute ward guideline**, patients at 'high nutrition risk' are defined as those:

- Requiring EN or PN
- Malnutrition or suspected malnutrition (Malnutrition Screening Tool (MST) ≥ 3 , Malnutrition Universal Screening Tool (MUST) ≥ 2 , BMI $<18.5 \text{ kg/m}^2$, recent weight loss $\geq 10\%$)
- Anaphylactic food allergy
- Considered at high risk of refeeding
- Type 1 diabetes mellitus
- Cystic fibrosis
- Inborn errors of metabolism

**Refer to Ward algorithm to define low and moderate nutrition risk*

Recommendations:

Identifying nutrition risk:

20. Where there is capacity, we recommend the use of a validated malnutrition screening tool to identify patient who are at risk of malnutrition (e.g. MUST, MST, Mini Nutritional Assessment–Short Form (MNA-SF)) although coordination of direct patient care should be considered to minimise staff exposure and PPE use.

- Malnutrition screening is the most appropriate way to identify those who are most at risk and would benefit from nutrition interventions. This should be completed as part of standard care by staff who are required to attend the bedside and are already utilising PPE.

Dietetic assessment and reviews:

21. For patients transferring to the ward from ICU, we recommend that the ICU dietitian provides an appropriate handover to the ward dietitian within 24 hours of ICU discharge.

- This is to ensure the safe and appropriate transition of care from ICU to the ward, this handover should include the nutritional status of the patients (if malnutrition is present, was it pre-existing or hospital-acquired) and the assessed nutritional adequacy over the ICU admission.

22. For patients admitted directly to the ward, we recommend the implementation of local pathways to optimise nutrition provision for patients as soon as possible, prior to full nutritional assessment, where appropriate (Refer to ward algorithm).

- This takes into consideration the level of risk and also the availability of staffing and allows dietitians to focus on patients who require complex nutrition support and those at high nutritional risk.

23. We recommend a Dietetic consultation for high nutrition risk patients be conducted within 24 hours.

- High risk patients include those requiring EN or PN, or who have anaphylactic food allergy, cystic fibrosis, or inborn errors of metabolism.
- Other patients at high nutritional risk should be seen within 24-72 hours (e.g. patients at high risk of re-feeding, severe malnutrition, or patients with medical conditions in which specific nutrition therapy is required) based on dietetic capacity.

24. We recommend that nutritional monitoring is maintained, including the monitoring of intake and weight (where possible), and high risk patients are reviewed at least twice weekly and lower risk patients at least weekly.

Continuing nutrition support:

- 25. We recommend advocating for escalation to EN in patients who are meeting <50% of energy and protein targets orally for ≥ 5 -7 days, or where a patient is assessed as malnourished and has a suboptimal oral intake (<65% of estimated requirements), despite provision of oral nutritional supplements or food fortification.**

Contingency Planning and Additional Workforce Considerations:

Recommendations:

Dietetic workforce considerations:

- 26. We recommend that all dietitians treating COVID-19 patients or entering a high-risk space have formal instruction on the use of PPE (including training, practice and supervision).**
 - 27. We recommend conducting nutrition consults remotely, utilising family and relatives to obtain nutrition history where possible, limiting the number of staff in the patient space and the utilisation of PPE.**
 - 28. We recommend nutrition departments are familiar with the hierarchy of hazard control [1].**
 - 29. We recommend the utilisation of Allied Health Assistants (AHA) where possible for non face-to-face management activities.**
- Potential AHA tasks could include: assistance with monitoring of oral intake; quantification of oral nutrition supplement compliance; liaison with bedside staff regarding menu preferences; assisting with food service tasks; assistance with facilitating ICU transfer; and obtaining weight history etc).

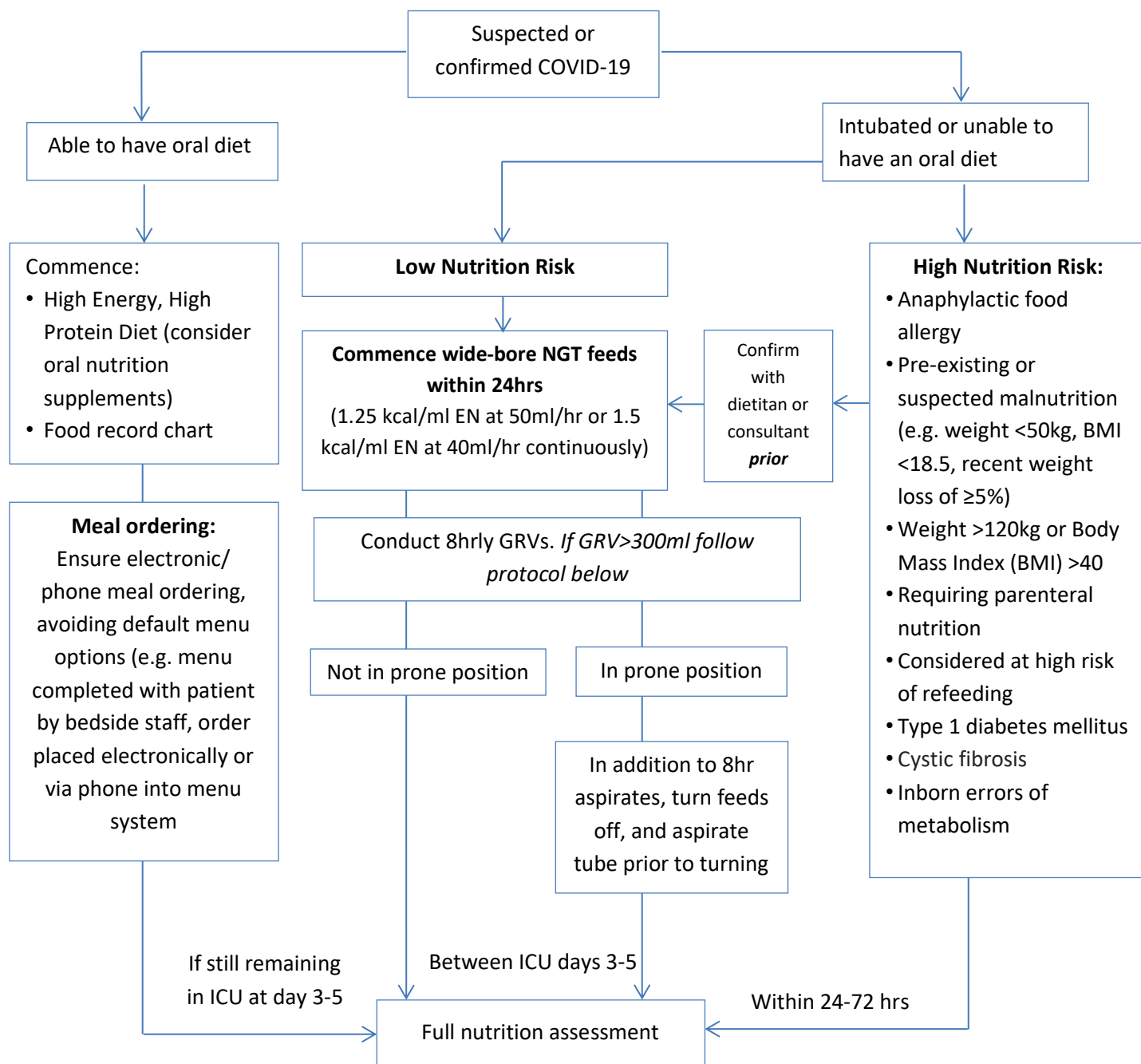
Food service considerations:

- 30. We recommend developing food service systems to enable electronic or phone meal ordering to minimise contact with the patient at the bedside while enable patient menu selection and ensuring optimal nutrition provision.**

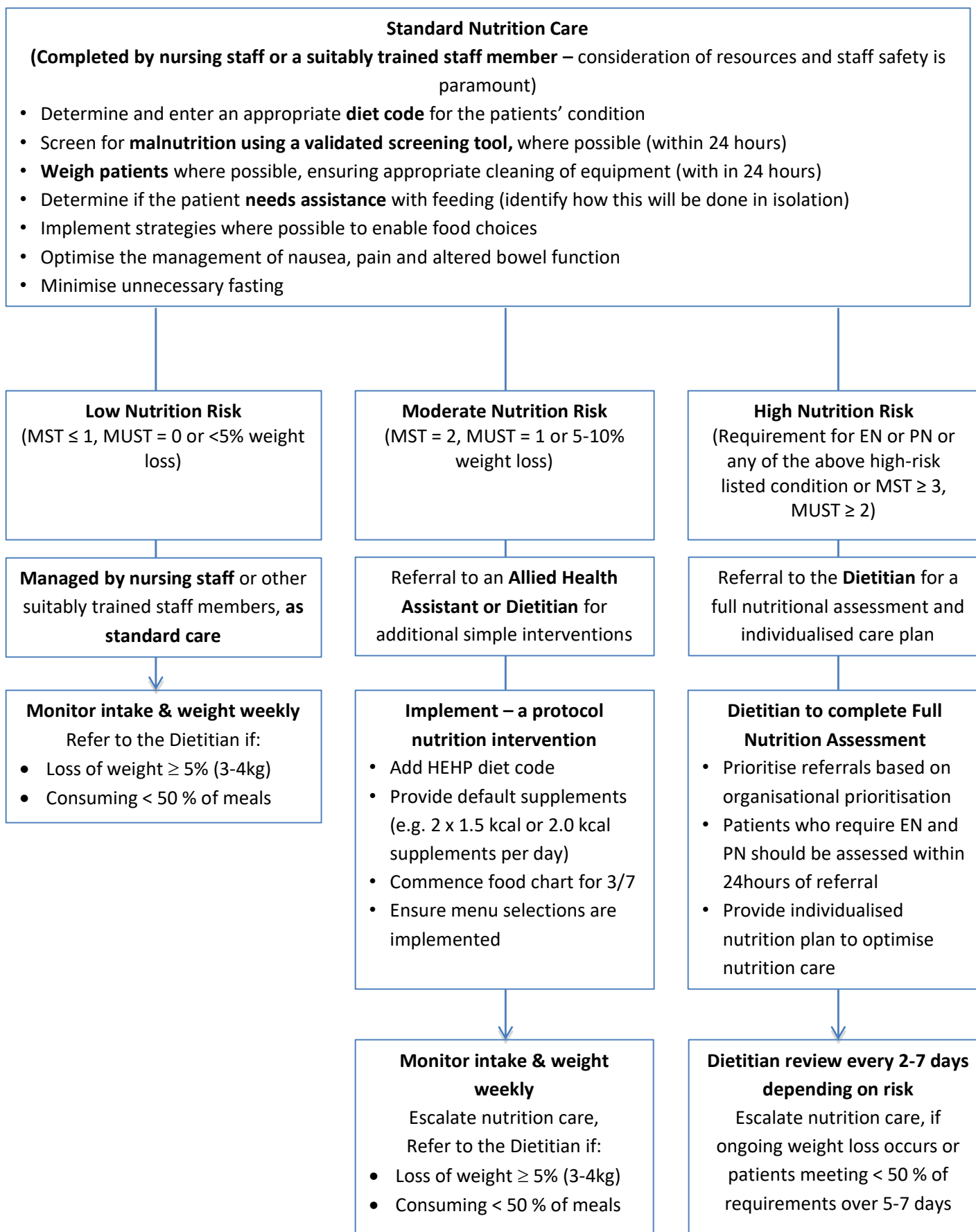
Other contingency planning:

In combination with these protocols, **we recommend sites consider the following:**

- Ensuring adequate equipment for EN is available, given the expected increase in bed numbers and patients, including feeding pumps, giving sets and EN formula (including consideration of strategies for management, where some of the ICU may be isolated from the rest and planning for potential EN or delivery system shortages with an appropriate contingency plan, such as equipment to facilitate gravity or bolus feeding).
- Local instructions should be developed to communicate to staff where all nutritional products (e.g. pumps, giving sets, formulae) are stored, and how to access additional stock.
- Providing appropriate up-skilling to non-ICU dietetic staff in ICU or non-acute staff in other ward areas, including the necessary IT access.
- Ensuring dietitians are able to facilitate nutrition by being competent at pump operation and changing of EN formula and giving sets to reduce the workload expectation on nursing staff. This should include non-COVID-19 patients within the ICU.
- Minimising workload and risk of food borne infection by avoiding the use of decanting of formula unless absolutely necessary.
- Reviewing contingency processes with Food Service, to ensure optimal food choices are available and the maintenance of compliance with hospital food service guidelines, to ensure nutritional adequacy, with considerations for staff shortages.
- Adapting workspace and team structure where possible to facilitate COVID-19 vs non-COVID-19 areas and staff.
- Planning for an occurrence of exposure within the nutrition team and how this will be managed at an operational level.
- Formalising communication pathways with bedside clinicians and food service to enable remote nutrition assessment and reviews where possible to limit clinician contact at the bedside such as alternatives for attendance at ward rounds.
- Considering areas for advanced scope of practice to support medical and nursing staff where appropriate e.g. post-pyloric tube insertion.



- Please use in conjunction with local nutrition policy and procedures.
- **The dietitian or treating consultant may elect to commence the standard algorithm in high nutrition risk patients**
- Medical and nursing teams to please contact the Dietitian if a nutritional assessment is necessary earlier than stated in the algorithm.
- For first GRV >300ml commence prokinetics as per usual site practices (e.g. metoclopramide IV 10mg 6-hourly **together with** erythromycin IV 200mg bd) for 24 – 72hrs where possible and no contraindications exist.
- If GRV remains >300ml, despite prokinetics, consider post-pyloric feeding or supplemental PN.
- Nutrition support should be escalated if energy and protein delivery are <50% of prescribed targets for ≥5-7 days.



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