

Introduction to Critical Care: A COVID19 Rapid Response Document

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Introduction to Critical Care

For the pharmacist who is now faced with either opening a critical care unit or joining an existing critical care pharmacy team, it may feel like a mountain to climb to even reach a beginning of understanding of critical care medicine.

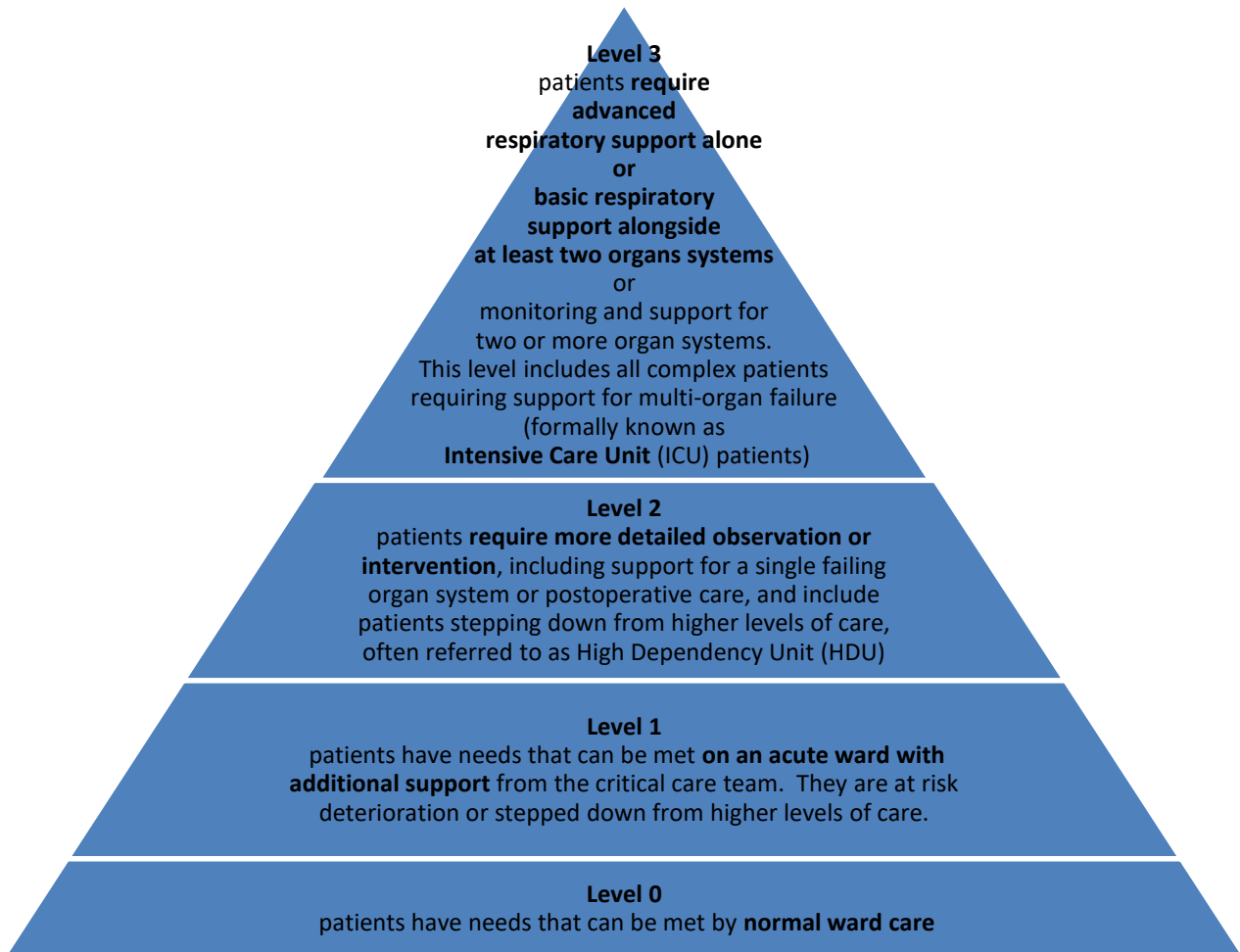
Trying to become a critical care pharmacist overnight is not what is needed right now. You may be caring for patients that are critically unwell and what they need is excellent pharmaceutical care. You are a clinical pharmacist and your clinical pharmacist skills are what your patient's and your colleagues need, regardless of the clinical area the patient is in. Critical care medicine will be organised and delivered differently during the COVID-19 pandemic compared to normal times. Ward rounds and levels of supervision are likely to change, and practice will have to change and be flexible to meet the needs of our patients.

There will be non-critical care trained physicians and nurses caring for these patients and you are on the same team with the same goal - to ensure the patient gets the best possible care.

This rapidly prepared paper aims to provide you with a brief understanding of the critical care patient, the environment, and some of the tools you will need to provide a basic but solid clinical review.

Levels of Critical Care

In the UK, critical care patients are grouped in to one of four levels, a designation that changes according to severity of illness and degree of organ support required by the patient:



This classification has meant that critical care has come to define a type of therapy, rather than a specific place where such therapy is administered¹.

Critical care teams work in intensive care units (Level 3), high dependency care units (Level 2), specialist surgical units, (Level 1/2) recovery areas (Level 2/3), perioperative care (Level 2/3) and on general wards (Level 1) with outreach teams.

During the COVID surge, escalation beds in unusual locations will also be utilised.

¹ Department of Health. Comprehensive critical care: a review of adult critical care services. Dept Health. 2000

The Critical Care Multidisciplinary Team (MDT)

Consultant intensivists (*either anaesthetist or physician*): Highly trained doctors. Normally Fellows of Faculty of Intensive Care Medicine. However, in these times, the consultant may have been recently drafted in to cover and are more familiar with clinical environments other than critical care (e.g. anaesthetist or general medicine).

They lead the team and have overall responsibility for patient care. They usually like to be consulted on all decisions related to their patients².

Specialist critical care nurse: In better times highly specialist nurses. Although in current times, it may well be a theatre or surgery nurse. They will be at the bedside probably caring for more than one patient. There may be evolving support for bedside nursing staff, from specialist critical care nurses³.

Allied Healthcare Professional: Physiotherapists, dietitians, speech and language therapists (SLT), they are unit rather than patient specific².

Healthcare Assistants: Supportive role to the whole unit, useful in terms of stock control and troubleshooting, runners if necessary

Technical staff: for ventilation, infusion devices and so forth.

Advanced critical care practitioners (ACCP): Critical care practitioner whose has a stem profession (such as nurse, physiotherapist, etc) and has received additional training to specifically look after critically ill patients. They maybe prescribers, and undertake procedures such as line insertion, etc.




Trainees: of every discipline

The critical care pharmacist: An essential member of the MDT, every level 3 patient should have access to an advanced critical care pharmacist².

² Dr Danbury C, Dr Gould T, Dr Baudouin S, Ms Berry A, Ms Bolton S, Mr Borthwick M, et al. [Guidelines for Provision of Intensive Care Services](#). GPICS [Internet]. 2015;1:1–200.

³ Critical Care National Network Nurse Leads Forum (CC3N). [COVID-19: Principles for increasing the nursing workforce in response to exceptional increased demand in Adult Critical Care](#).

What do the MDT team expect from you?

	<p>Sorting out medicines supply, controlled drugs, emergency intubation medicines, infusions, antimicrobials, dosing adjustments.</p> <p>During this period of unprecedented capacity, it is likely that the medicine's supply chain will struggle to cope with the demand. Supply will therefore become a far more challenging function than in conventional practice.</p> <p>We must ensure that nursing time can be spent on caring for patients and not chasing stock or Controlled Drug deliveries.</p>
	<p>Safe and effective use of medicines - you may be working with staff who have specialist knowledge (e.g. anaesthetic staff) but may lack experience in dealing with the broad range of medication our patients need. That is where the clinical pharmacist adds real benefit. Also, non-ICM trained staff may not be aware of the treatment guidelines and have many competing tasks they need to focus on.</p> <p>The clinical pharmacist is the medicines specialist, with an attention to detail and (should have) good knowledge of the key guidelines. These key guidelines will encompass antimicrobials, anticoagulation, VTE prophylaxis, blood glucose/insulin, stress ulcer prophylaxis etc.</p> <p>The clinical pharmacist can use their skills to fulfil the role of being the medicines expert to keep patients safe and to optimise medicine related outcomes. We know that unfamiliar staff working under increased pressure will increase the risk of medication error.</p>
	<p>Medicines reconciliation is required, with review on a daily basis and with clear documentation. You must ensure the prescribed medicines can be administered, review of the patient's pharmacokinetic reserve and check for intravenous compatibilities. You will need to understand and access the resources available to you, and appreciate your limits, referring to others as and when you need to.</p>

How do I begin to deliver what is expected of me?

Try not to worry. You may not know the nuances and subtleties of various standard critical care interventions such as vasopressors or sedation and analgesia. You are in fact unlikely to unless you have committed to a career in critical care pharmacy.

Your role is not the same as everyone else's. In time, you may understand the intricacies of the available monitoring and supporting equipment, but for now, concentrate on the area you know best: **basic clinical pharmacy.**

Put your patients first

As in every other hospital area, you must put the patient first. If there are limited resources and you have several patient care responsibilities, then you must do the best you can for the patients who need you the most and *prioritise* (e.g. high-risk medicines, TDM, adjustments for altered clearance, medicines supply).

For example, if the patient's immediate need is an antimicrobial in sepsis and this is not stocked on the critical care, then your immediate need is to go to pharmacy, dispense, check and bring the medication back to the patient. This is because in sepsis there is good evidence that the earlier one administers the antimicrobial the better the clinical outcome⁴. In addition, consider that with a prescription for a newly prescribed item, the first dose may not be scheduled for several hours if the prescriber has selected standard timings. This timing may need adjusting so that the patient is treated promptly.

Daily Prescription Review

You will need to be aware of:

- The patient's medical history, and reason for critical care admission
- Drug history
- Allergy status
- Daily progress
- Indication for all drugs prescribed as a minimum dataset from which to work

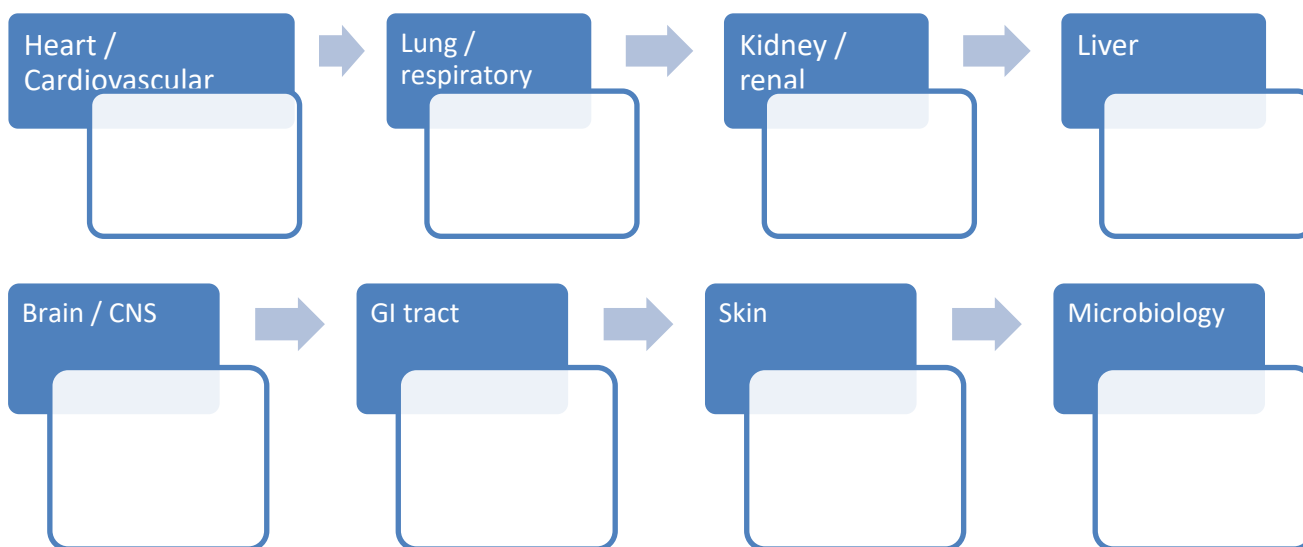
There may be a daily written handover between the night team and day team that you can use to quickly ascertain much of this.

⁴ Rhodes A, Evans LE, Alhazzani W, Levy MM, Antonelli M, Ferrer R, et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016. *Intensive Care Med.* 2017;43(3):304–77.

How do I review my ICU patient (Level 3) patient?

One of the key differences in critical care is that you start to assess your patient in terms of their organ function and systems:

For example:

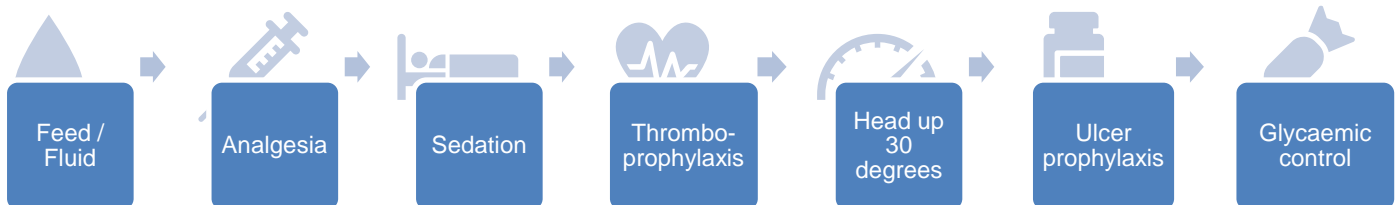


Clearly there is interrelationship between systems but developing a systematic way of reviewing the patient helps deal with the sheer volume of information presented by putting these into manageable chunks. A systematic approach also ensures things are not accidentally missed.

Most ICUs use some sort of mnemonic to ensure the basic elements are covered for every patient, every ward round (e.g. FASTHUG (below), FLATHUG, FLATCHUG and variants). A pharmacy specific method of review may also be helpful, such as FASTHUG MAIDENS as a validated reworking of FASTHUG^{5,6}.

⁵ Mabasa VH, Malyuk DL, Weatherby E-M, Chan A. A Standardized, Structured Approach to Identifying Drug-Related Problems in the Intensive Care Unit: FASTHUG-MAIDENS. Canadian Journal of Hospital Pharmacy. 2011; 64(5)

⁶ Masson SC, Mabasa VH, Malyuk DL, Perrott JL. Validity Evidence for FASTHUG-MAIDENS, a Mnemonic for Identifying Drug-Related Problems in the Intensive Care Unit. Canadian Journal of Hospital Pharmacy. 2013; 66(3)



Reviewing Medication

Medicines are only one of the tools that can be utilised in the care of a patient. Try to think beyond just drugs (for example there are mechanical methods for venous thrombus prophylaxis as well as anticoagulants, and Glycaemic control may be a function of enteral feeding). Critical care patients consist of a broad case mix, from septic shock to end-stage heart failure, immunosuppressed patients to extreme inflammatory states.

Draw on what you know...

Your broad generalist knowledge of medicine is a huge bonus. You may have to return to the basics of your undergraduate degree. Think:

- What is this medication?
- What is the indication in this patient?
- Is the prescription needed today?

For example regular antihypertensive therapy are frequently withheld in a patient in septic shock requiring cardiovascular support (e.g. noradrenaline infusion), although may be restarted once cardiovascular support is no longer needed⁷.

High level decisions are often required when reconciling medicines on admission to ICU and consideration will need to be made about the immediate benefit to the patient and whether there is an available and reliable route of administration⁸.

⁷ Rhodes A, Evans LE, Alhazzani W, Levy MM, Antonelli M, Ferrer R, et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016. *Intensive Care Med.* 2017;43(3):304–77

⁸ Barrett NA, Jones A, Whiteley C, Yassin S, McKenzie CA. Management of long-term hypothyroidism: A potential marker of quality of medicines reconciliation in the intensive care unit. *Int J Pharm Pract.* 2012;20(5).

Medication Adjustment

Despite the fact that the majority of critically ill patients have disturbances of organ function that necessitate adjustments of dose, route or choice of agent, this area is often not consistently tackled by medical staff, (especially in current times) and is one area where you will be expected to contribute.

Examples include dose adjustment in renal dysfunction to changes in route of administration due to surgery.

Drug Handling and Organ Failure

In terms of drug handling in critical illness it is renal function that is commonly the most critical factor. This is because the majority of drugs are eliminated from the body via the kidneys, either as the parent drug or as a metabolite. Furthermore, renal function fluctuates continually in critical care.

Assessing Renal Function

How do I assess my patient's renal function? The key factors are serum creatinine (and change in last 24hours), urea, potassium, sodium, urine output and presence of renal replacement therapy.

Look for trends in biochemical figures and consider patient factors that underpin the standard equations you will have learnt. For example, an ICU patient may have a low serum creatinine because they have low skeletal muscle mass. This means one would be required to review the trend rather than a single figure, to track changes in renal function. In addition, ask yourself questions like:

- What is the urine output? A reduction in urine output can indicate a reduction in renal perfusion and possibly, function?
- Do you know if renal function is deteriorating?

In reality, all you are doing is broadly assigning a patient's renal function into one of a few categories.

- Enhanced renal clearance (often young, septic patients with apparently good clearance from biochemistry)
- Normal renal function
- Mild renal impairment
- Moderate renal impairment (borderline urine output 0.5ml/kg/hour)
- Severe renal impairment (less than 0.5ml/kg/hour)
- Complete renal impairment (Anuric, rapidly rising creatinine)

In addition, the effect of renal replacement therapies needs considering. In continuous renal replacement therapy (CRRT), the [Renal Drug Database](#) is a source to start when looking for details or references for dose / frequency alterations.

Then consider the medicine you are reviewing:

For example beta blockers, a patient in renal failure taking atenolol, a long acting beta blocker that is eliminated unchanged should be switched to metoprolol that is metabolised in the liver⁹.

Absorption and Administration

The second domain that falls to you is the administration of medication. In critical care, drugs are very frequently administered parenterally.

- How is my drug administered? If oral/ng is this route available?
- Can I change to another route, or even a different drug or class, but with the same therapeutic intent?

And don't forget to consider how does it behaves in respective organ failures.

Adverse Drug Reactions

Keep a look out for avoiding adverse drug reactions, these are very important. This can sometimes be more about refuting that such a reaction has taken place rather than the more usual situation of avoiding problems that may arise.

ADRs are frequently subjective, especially with regards to the number of interventions / therapies in use in this physiologically challenging patient cohort. Identifying an individual culprit may not necessarily be possible and may require de-escalation of medicines in a stepwise manner to identify a causative agent. This may not always be possible or practical.

Drug Interactions

You will be expected to appreciate drug interactions and know where to review. [Medicines Complete](#) has Stockley, the interactions checker, as an invaluable resource. It is always a good idea to become familiar for classes of medicines or individual drugs where interactions are common for example rifampicin and enzyme inductions or azole antifungals and increased risk of QTc prolongation.

⁹ Ltd A-U. [Amitriptyline Tablets BP 50mg - Summary of Product Characteristics \(SmPC\) - \(eMC\) \[Internet\]](#).

If you don't know the answer, say when you don't know!

Knowing your limitations is something to be respected. Do not guess or talk your way through an issue, it is obvious when you do and nobody likes it, and it can result in harm!

Recognise the expertise of others

Everyone has expertise; anaesthetists, surgeons, nurses, physiotherapists, dietitians, relatives and loved ones, everyone. There will be overlaps as well as gaps in knowledge and differences in opinion. Learn to live with this and collaborate. Do not create needless conflict; this will not help the patient and may also result in reluctance to accept your contributions.

Be aware of, and utilise other resources

Liaise with pharmacists from the service that the patient came from. Critical care is a support service, treating the sickest patients from many other services. Obtaining valuable advice from pharmacists who routinely work in those services will greatly aid in the provision of appropriate care for the patient.

Critical care units do not work in isolation from each other. Each unit is part of a larger network or group of units that covers a distinct geographical location. This means that within each network or group, there will be other critical care pharmacists with whom you can talk to or draw support from.

Find out who they are and introduce yourself to them (face to face, by telephone, e-mail, instant messaging services), before you need their advice in a crisis. Each network or group will have standards of practice and therapeutic protocols (often called care bundles). Obtain copies and be familiar with them. If you are working in the private sector, make contact with your local acute NHS trusts, you will be warmly received and dutifully supported.

The [UK Clinical Pharmacy Association \(UKCPA\) Critical Care Group](#) has an excellent network, and currently has a closed group available on Facebook specifically to deal with the issues caused by COVID.

Remember the relatives, carers and friends

The patient is not always alone. Loved ones visit and ordinarily stay by the bedside without restrictions on visiting hours. Although in the current climate, many units have moved to closed units with visiting strictly controlled by individual circumstance which may only be offered for those patients receiving end of life care.

As a member of the team, you will be asked about various aspects of the patients care. As a junior pharmacist, you should defer giving information about progress or planning to a member of the medical team. This ensures that visitors receive consistent information. You may still need to talk to relatives, to obtain information about medications, or possibly because you are asked to discuss a specific aspect of care with them by the medical team.

When you do so, employ great sensitivity. Relatives have lot of time to think and dwell on the consequences of the illness that brings the patient to critical care and as such can be extremely fragile. Remember that certain aspects of the patient may not be known to them and should not be divulged, sometimes at the specific request of the patient.

Final thoughts

A comment that many more senior critical care pharmacists often face is that dosing adjustments made by junior or novice critical care pharmacist are often unnecessary, or the adjustment is too drastic when you consider the full context of the patient.

This is a difficult balance to achieve, especially when you start in critical care. Careful discussion with more experienced pharmacists can often help you significantly, and you must also discuss fully with the clinician and bedside nurse.

Conclusion

Critical care provides a challenge for the novice of every profession, the pharmacist is no different. A big advantage of critical care is that everyone is very accustomed to having newer or more junior members of the wider MDT, don't forget there are new trainees in critical care almost weekly in larger units.

Therefore, the MDT understands that you won't know everything. The most important thing to remember is don't be afraid to ask your fellow members of the MDT and **be confident that you have much to give.**

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