

Orientation Manual for Resident Physician Medical Intensive Care Unit

Pitt County Memorial Hospital

Brody School of Medicine

East Carolina University

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Important points for ICU-summary sheet

Central venous lines:

Use the procedure template in the CVL pack. Please ensure the unit secretary makes a copy. It is inconspicuously folded and packed on the BOTTOM of the outer tray.

DO NOT insert a femoral line unless there is no alternative

Use full sterile technique as prompted on the note template

Sedation holiday

Please ensure every patient has sedation held every morning at 06.00. Sedation should be d/c'd as a matter of routine every day and only restarted when the patient attains their sedation goal for that day.

Other ICU core measures

Every ventilated patient must have a 30-45 degree head of bed elevation MINIMUM. They must all have stress ulcer prophylaxis-ie an acid blocker-and dvt prophylaxis

Infection control

Please remember to use alcohol rub before and after every patient contact on your hands as well as your stethoscope. If your hands are visibly soiled, or after a suspected contact with spore-forming agents (eg C Diff) you should use soap and water.

Airway management

Recent ACLS guidelines (2006) emphasis the importance of good BLS and oxygenation over attainment of perfect endotracheal intubation. Other methods of oxygenation are faster and more effective, notably the LMA which is located in the fourth drawer down on every code cart. Just open the pack and insert it in the mouth. It's easier than you will believe and will secure an oxygenated airway in moments. Remember this is now an ACLS recommendation!

Unit telephone and pager numbers

ECU Pulmonary	Fellow	Nuclear 74470
Dr. Brown 561-9373	Dr. Patrikyan 4262	Portable 75342
Dr. Childs 757-5710	Fellow	Ultrasound 74549
Dr. Downie 707-8210	Dr. Singh 0841 Fellow	Vascular 74644
Dr. Kavuru 413-4154		Respir. Therapy 74487
Dr. Mazer 561-9102	Eastern Neurology 752-4848	Chaplain 71002
Dr. Owen-Reece 382-1062	Dr. Breuer 752-4848	Waiting room 7352/7208
Physicians East 752-6101	Dr. Cooper 752-4848	Eastcare 7-5285
Dr. Shaw 329 5122	Dr. Fleming 413-5280	SICU 74159
Dr. Fogarty 329 5175	Dr. Frere 752-4848	SIU 7375
Dr. Dietrich 329 5167	Dr. Gibbs 413-0101	TICU 74866
Dr. Mann 329-5122	Dr. Hardy 752-4848	ED Triage 74942
	Dr. Leacock 752-4848	ED Side A 74461
Physicians East GI	Dr. Lee 413-5286	ED Side B 74295/4709
830-2121	Dr. Price 754-4385	BMTU 74893
Dr. Barrier	Dr. Saul 752-4848	Spanish Interpreter
Dr. Dellasega	Dr. Pynn 413-5290	Blood Bank 74228
Dr. Stein		Eastcare 74297
Dr. Ruffalo 329-5063	Private Pulmonary	Echocardiogram 74631
	CICU A 74157	EEG 75150
ECU Fellows	CICU B 74158	EKG 74781
Dr. Huang 2367	CICU C 7266	GI Lab 74536
Dr. Brescia 2399	CIU 77150	HDU 74464
Dr. Patel 4293	CSICU 74204	Sue Taylor 77145
Dr. Varju 2249	CSIU 74895	Pulmonary CNS 71056
	Hospitalist 561-3881	QMI
MICU 74896; old SCU	Medical Records 74468	Hospital Police 78568
MICU fax 7-8140	Morgue 74460	Social Worker 74490
MICU pharmacist 3279	Nursing office 74470	Switchboard 74100
Pharmacy 7-7310	Nutrition Support beep 242	Transporter 75140
MICU respiratory therapist 3109	ENA Nephology 752-8880	Satellite Pharm. 77311
MICU nutritionist	Dr. Bynum 757-5505	Pastoral Services 74790
MIU 77125	Dr. Fisher	Patient Rep. Beep 3139
NSICU 74290	Dr. Hoggard 757-7931	Lab 74467 - Chem 74867
Pulmonary office 744 4653	Dr. Kendrick	Hematology 74824
Answer Phone 752-4136	Dr. Reed 754-5639	Microbiology 74210
ECU Nephrology-744-2545	Dr. Taylor	Phlebotomy 7446
Dr. Barchman 561-9325	Dr. Vannorsdall	
Dr. Bolin 329-6614	Pharmacy 74686/4919	
Dr. Gerkin 561-9343	Pulmonary Lab 74343	
Dr. Hames 561-9516	Radiology 74485	
Dr. Saha 744-2545	CT 44660	
Dr. Christiano 561-9534	Diagnostic 74794	
Dr. Neverov 0821	Film Library 74654	
	Fluro 74683	

Welcome to the Medical ICU at BSOM/ECU and PCMH! It is important that you read all of this documentation right at the beginning of your month on MICU and we suggest you keep it for reference during your time here.

Attending Physicians

Currently there are ten attending staff on the medical ICU. They include five from ECU and three from Physicians East:

Dr. **Carter Childs**, Clinical Assistant Professor; fellowship program director.

Dr. **Gordon Downie**, Clinical Associate Professor, Pulmonary and Critical care.

Dr. **Mani Kavuru**, Professor and Chief, Pulmonary and Critical care

Dr. **Mark Mazer**, Clinical Associate Professor and co-director, MICU/MIU

Dr. **Huw Owen-Reece**, Clinical Associate Professor and co-director, Medical ICU/MIU.

Dr. **Robert Shaw**, Attending physician, Physicians East,

Dr. **Robert Dietrich**, Attending physician, Physicians East,

Dr. **John Fogarty**, Attending physician, Physicians East.

Dr. **Richard Mann**, Attending Physician, Physicians East

Attending physicians supervise the MICU for two weeks at a time, beginning on a Monday morning. Night time attending call is rotated but varies, with Physicians East and ECU operating different patterns of cover. The on-call fellow and the charge nurse will always be aware which of the attending physicians is on call for the ICU at night.

Fellows

We have four fellows in pulmonary and critical care medicine. They are:

Dr. Yu Ya (John) Huang

Dr. Chirag Patel

Dr. Donald Brescia

Dr. Gabor Varju.

They spend one month at a time on the MICU. Their nights on-call rotate, per posted schedule.

Trainee medical staff

There are usually six or seven MICU residents at one time. These will include two senior residents, two IM interns, one or two Family Medicine interns and one-second year ED resident. Of course, we also have occasional medical students and acting interns.

The senior nursing staff of the unit comprise:

Stephanie Westbrook, Nurse manager MICU

Jarvis Campbell, Assistant nurse manager, MICU

Sue Taylor, Nursing Administrator internal medicine.

In addition, there is a charge nurse supervising the unit on each shift. These experienced nurses have many years “under their belt” and are very familiar with correct ICU management, MICU working practises and so on. You are encouraged to take their advice freely!

Multidisciplinary teamwork

We encourage you to solicit the advice and input of the following members of the MICU multidisciplinary team:

Occupational therapy
Physical Therapy
Speech therapy
Nutrition/Dietician
End of life care
Chaplaincy
Pharmacy
Social Work

Once a week at 1.00 pm on a Tuesday there is a multidisciplinary round. Most or all of the staff listed above assemble on MICU A side and review patients t who have issues requiring their specialist input. This is an excellent opportunity to proactively manage the longer term disposition of patients who are deconditioned, have nutritional issues, tracheostomies, social problems and so on. Either the fellow or the attending will be present in addition to you.

Pagers on MICU

The senior resident and the intern on call each day will carry a code pager which gets passed along from day to day. When a code call is activated the holders of these pagers are expected, obviously, to emergently attend the code. In this hospital the MICU residents run the code unless a more senior physician is present.

The second pager carried by the MICU resident has number 1257. This pager is used at any time that input is sought from MICU medical staff. Therefore you can expect to receive consult calls to the floor and ED on this pager, for example.

When you are called to see patients on the floor and decide to intubate them, a couple of points may not be immediately obvious. It is wise to ensure that the charge nurse of that ward is fully aware of what is going on. In emergencies everyone thinks that “someone else has done it” so-as for any matter of importance-you should do it or check on it

yourself! The reason, apart from their need to know, is especially because they will need to contact the bed coordinator and arrange for emergent disposition of the patient to an intensive care unit after intubation.

Secondly, having completed intubation, it is not sufficient to leave the patient in the care of a respiratory therapist. EVERY SUCH PATIENT MUST BE CARED FOR, 1:1, BY AN ICU LEVEL NURSE. You must not leave a patient without such nursing care in place.

The medical work pattern is as follows:

Non-call days: Arrive 06.00

Depart 16.00

When on-call: Arrive 06.00

Depart by 12 noon.

The attending physicians are in charge of the MICU for two weeks at a time, and change over on a Monday. They round at 08.30 each morning and typically the work rounds will last most of the morning. The rounds will be completed by noon whenever possible. The post-call staff are guaranteed a departure by noon and we aim to let other housestaff attend the Dept. of Medicine lectures. In addition, there is a didactic/interactive critical care lecture at 1:30 pm on a core curriculum topic in the MICU. Elective procedures and other patient care activities occupy the afternoon. There will be late afternoon “sign out” rounds. Following this the fellows and residents sign out to the call staff. In general, unless you are post-call **you will be expected to attend both rounds** in order to participate actively in planning care for your own patients.

Duty Hours

1. Duty hours are defined as all clinical and academic activities related to the residency program; i.e., patient care (both inpatient and outpatient), administrative duties relative to patient care, the provision for transfer of patient care, time spent in-house during call activities, and scheduled activities such as conferences. Duty hours do *not* include reading and preparation time spent away from the duty site.
2. Duty hours must be limited to 80 hours per week, averaged over a four-week period, inclusive of all in-house call activities.
3. Residents must be provided with 1 day in 7 free from all educational and clinical responsibilities, averaged over a 4-week period, inclusive of call. *One day* is defined as 1 continuous 24-hour period free from all clinical, educational, and administrative duties.
4. Adequate time for rest and personal activities must be provided. This should consist of a 10-hour time period provided between all daily duty periods and after in-house call.

On-Call Activities

The objective of on-call activities is to provide residents with continuity of patient care experiences throughout a 24-hour period. In-house call is defined as those duty hours beyond the normal work day, when residents are required to be immediately available in the assigned institution.

1. In-house call must occur no more frequently than every third night.
2. Continuous on-site duty, including in-house call, must not exceed 24 consecutive hours. Residents may remain on duty for up to 6 additional hours to participate in didactic activities, transfer care of patients, conduct outpatient clinics, and maintain continuity of medical and surgical care.
3. No new patients may be accepted after 24 hours of continuous duty. A new patient is defined as any patient to whom the resident has not previously provided care.

Presenting your patient on the round.

There are several ways to present a patient's initial condition as well as their daily progress. In general critical care, being so physiologically based, is best considered in a system-by-system approach, for the "objective" part of the note. However when summarizing the patient and formulating the plan a problem-based strategy will usually represent the pragmatic thought process most often employed for critical care management and often merges with the system based concept.. Once you have seen the presentation and planning in action this will become clear.

On the days when you have your clinic, you will need to sign-out to your on-call colleague before you leave.

This seems the appropriate place to point out that there is generally expected to be a physician in attendance on the unit 24/7. Of course, sleeping in your call room adjacent to the unit is fine, as is leaving for brief visits to the cafeteria and so forth. Again, rounding or calls to other units may unavoidably take you away. However as a general sentiment is that it is not acceptable for an intensive care unit to go without a physician in the immediate vicinity for more than the minimum possible amount of time.

Medical record keeping and order sets

In order to streamline the large amount of detailed and specific information required for adequate evaluation and management of each of the ICU patients in your charge, we have developed a charting template, which you are **required** to follow. Of course, other relevant information-including the actual admission note-may not be accommodated in the proforma template and you should feel include it in additional handwritten text. The note is also, as a secondary role, tailored to facilitate the billing and clinical audit activity of the department which is why its use is mandatory.

Please use the MICU order sets available on the website which will assist both quality of care and also save you time! Likewise there are several order sets for neurology patients which must be used-for example for thrombolysis in stroke.

Procedure templates

Largely to assist you with accurate procedure notes, we have developed procedure templates for intubation, central and arterial line and chest tube insertion. These are fairly new and whilst it is required that you use them, your feedback on how they may be improved is welcome.

Protocols

In common with many other intensive care units, we are using some protocols for what might be called "boring but important" aspects of intensive care. These include such things as nutrition and sedation. There is a wealth of evidence that these things make a

big difference to ICU outcome when managed properly and consistently, but it is unnecessarily time-consuming to review in detail on a daily basis. Therefore, please understand that protocols are not to replace any need for your knowledge and intelligent interpretation but to streamline and ease our working lives well as to improve patient care.

The daily MICU census sheet is useful but only if kept up-to-date. Of course after a busy night you may not have time to update it but when you are on-call please make an attempt to quickly update the sheet before the morning ward rounds.

It is important to order daily labs in a timely fashion. Once we request them “stat” the cost is far higher; this is an avoidable extravagance and nurses will decline to draw blood for stat labs when a routine request would have been sufficient, unless there is a good reason.

Do not use	Instead use
U	Units
IU	International units
MgSO ₄	Magnesium sulfate
MSO ₄	Morphine sulphate
MS	Magnesium sulfate or morphine sulfate
QOD, Q.O.D., qod or q.o.d.	Every other day
QD, Q.D., qd or q.d.	Daily
Trailing zeros ie 1.0mg	1 mg
A leading decimal ie .1mg	A leading zero (0.1 mg)

Unapproved abbreviations

Please remember that the hospital is looking closely at the use of unapproved abbreviations as a consequence of the serious potential for

error and harm. They are listed here as a further reminder for you:

Infection control

Cross infection is a major problem in hospitals generally as well as ICU particularly.

Please remember:

Wash your hands between EVERY patient with the alcohol wash provided everywhere in MICU.

Use gloves liberally when making contact with patients.

Apply alcohol to your stethoscope in between patients

Minimize the amount of hand and wrist jewelry you wear while working. It is a great trap for pathogenic organisms and fomites.

Encourage families and most importantly visiting staff to do likewise.

Admission and discharge practices and policies

Admission of patients to medical ICU is by attending intensivist physician. This responsibility may be delegated to a fellow. For all patients assigned to the MICU service, the MICU team comprises of the house staff, pulmonary & critical care fellow, and MICU attendings will be responsible for all daily care and writing of all orders. In any case where you feel that there is ambiguity or sensitivity you should not hesitate to call the fellow who will in turn discuss the situation with the attending physician if necessary. There is active encouragement for participation in a consultative role by all appropriate specialists.

On admission of a patient to the medical ICU the attending physician will obviously review the patient as soon as they judge appropriate. If for any reason the attending physician is unable to arrive the responsibility for early review is delegated to the fellow. The majority of patients admitted to our ICU fall into easily recognized groups. These broadly comprise patients with sepsis and multiorgan failure, patients in respiratory failure, patients who have suffered cardiopulmonary arrest (quite often during dialysis), patients in liver failure with or without GI bleeds and so forth. A separate group will be those transferred in from outside hospitals when their clinical course exceeds the capacity of those institutions but the diagnostic range is generally similar.

As important as timely resuscitation for the unstable and critically ill patient is the proper attention to their expressed wishes in the form of the advance directive. This document is ever more frequent in the chart and so is the number of instances where we discover too late that we have admitted a patient who expressly declined to be intubated or to have advanced critical care.

Successful relationships between doctors and patients depend on trust. To establish that trust you must respect patients' autonomy - their right to decide whether or not to undergo any medical intervention even where a refusal may result in harm to themselves or in their own death¹. Patients must be given sufficient information, in a way that they can understand, to enable them to exercise their right to make informed decisions about their care.

When we omit to pay attention to these directives, it becomes, firstly, difficult and traumatic for all involved to “backtrack” in a prompt way and second, we have breached one of our ethical duties of care-the respect for autonomy which we would wish for ourselves as outlined above.

Some fundamental concepts of critical care

Airway and breathing

The procedure of intubation has acquired a semi-mythical status amongst trainee physicians for a variety of reasons. It is rarely especially difficult but it can be made very difficult indeed in suboptimal conditions. Patients do not die from a failure to intubate but from a failure to oxygenate. It is far preferable to maintain an airway with a bag-mask-valve or a with a laryngeal mask than to risk hypoxia, oral and laryngeal trauma and aspiration, whilst trying to intubate. The ONLY absolute advantage that an endotracheal tube offers is of airway protection from aspiration and though it may sound a little glib, it is always preferable to have a well oxygenated patient who has aspirated than an intubated patient who has hypoxic brain damage.

The indications for intubation are various:

- 1 To ventilate a patient in ventilatory failure. For example, a patient with a Guillain-Barre syndrome has little problem with oxygenation of blood passing through the lungs but cannot “breathe enough” for adequate gas exchange.
- 2 To ventilate a patient who is in respiratory failure leading to hypoxia as well as ventilatory failure-for example, acute-on-chronic pulmonary disease, ARDS.
- 3 To protect the airway of an obtunded patient-for example, after overdose, head injury or stroke.
- 4 To allow paralysis of a patient for surgery.
- 5 To control arterial gas concentrations for other reasons-for example, to normalize arterial carbon dioxide concentration in brain injury where it is known that a rise would worsen elevated intracranial pressure.
- 6 To maintain patency where a lesion such as a tumor or edema is obstructing it.

For maximum ease of intubation a patient should have their laryngeal reflexes ablated with either deep anesthesia or paralysis before laryngoscopy. However intravenous anaesthetic or paralyzing agents are very dangerous in untrained hands. Induction agents can cause fatal hypotension in hemodynamically unstable individuals and paralysis can lead to the theoretically disastrous situation of “can’t intubate-can’t ventilate”. For this reason the use of deep sedative and/or paralyzing agents is banned at this hospital (and many others) except by, or in the immediate presence of, credentialed senior staff. This means that intubation is often safer but that conditions are potentially suboptimal.

Circulation

Physiology of resuscitation: Restoration of tissue perfusion and oxygen delivery.

Most of the oxygen in blood is carried on the hemoglobin. Typically, 100 mL of blood contains 20 mL of oxygen of which 19.5 mL are combined with hemoglobin and 0.5 mL dissolved in plasma (it has a low solubility in plasma of 0.002 mL/100 mL at atmospheric pressure)

If 100g haemoglobin carries 1.39g of oxygen, Q is the cardiac output and the solubility in plasma is as above then oxygen delivery per minute is given by:

$$[1.39 \times [\text{Hb}] \times \text{SaO}_2 + (0.002 \times \text{PaO}_2)] \times Q$$

And it stands to reason that the most effective ways of improving suboptimal tissue oxygen delivery are to:

1. Increase the hemoglobin oxygen saturation (with extra inspired oxygen) where it is low.
2. Increase the hemoglobin concentration
3. Increase the cardiac output by repleting circulating volume where it is low
4. Increase the cardiac output after repletion of volume, with inotropes.

There is increasing evidence that early and adequate restoration of oxygen delivery has a major effect on mortality and morbidity in ICU. Concerns about putting a patient into pulmonary edema are generally overemphasized and whilst this is perfectly possible, is generally more difficult to achieve than is recognized. Moreover, once a patient is intubated any concerns about pulmonary edema are greatly lessened as, since the airway and oxygenation are controlled, it is easy to counteract the edema with increased oxygen concentration, PEEP and volume offloading.

Day to day clinical management of a critically ill patient

Almost all of the therapies employed in ICU have two purposes: To support failed organ systems while they recover and to prevent further deterioration while the patient gets better. Implicit in these statements is the concept of taking over many homeostatic mechanisms for the patient, and therefore, by meticulous management, of doing no further harm. Meticulous management-for example when to change out a central line which may be infected-has to be based upon meticulous appraisal so that you are familiar with the detailed condition of the patient each day.

The great majority of critical care is not curative but merely supportive. It is also true that because physical and physiological deconditioning occurs so rapidly, patients usually need to be “pushed” very hard to keep them improving; a passive approach to critical care will result in a ward full of rather static patients. Proactive and pre-emptive care will make a big difference to the progress and definitely has an impact on length of stay and even survival. Therefore, in each section or system of the assessment and plan the attending will generally expect to hear an active approach as to how the patient can be moved one “baby step” at a time away from ventilator dependency. It is sometimes the case that patients do not manage to handle the challenge presented to them each day and “fall in a heap”-for example a proportion of patients who have a trial of extubation do not manage to breathe unsupported and need reintubation-but this is a part of appropriate ICU management nevertheless.

After the initial period of acute illness, which often resolves in a few days, the system support (in terms of, for example, pressors, interventions and ventilation generally starts to de-escalate. At this stage much of the daily planning of care will evolve to the

unspoken question “Why is this patient still in ICU?” Much of the time this can be viewed as “Which systems are still needing our support and why?”

A large proportion of the planning is frequently directed towards weaning the patient from ventilation and this is often directed by protocol (see below.) This does not free the physicians from the responsibility in having an overview and understanding of how and why the patient is or is not weaning successfully. Consideration generally needs to be given to both the oxygenation function of the lung as well as the ventilation or bellows function, which is frequently weakened and deconditioned whatever the initial status was at admission. Finally the maintenance of the airway will be considered since it is a separate but related issue:

Tracheostomy

Once a patient has been intubated for more than 7-10 days there is increasing evidence that maintaining the airway no longer with an ET tube but with a tracheostomy has a number of advantages. Not only is it easier to wean and breathe (for reasons of reduced deadspace and so on) but it is more comfortable and is a step away from the dependent state which our sickest patients are in. It therefore has important psychological advantages for the individual. If it is clear that there will either be a slow wean expected, or the patient needs to have an airway maintained for other reasons, tracheostomy will generally feature in the plan at an early stage.

Sedation

The evidence is now very strong that sedation holds every day are a powerful way to decrease length of stay not only on ICU but also in hospital afterwards. Moreover it also seems that the very extensive psychological morbidity of ICU (patients typically have an incidence of post-traumatic stress disorder of 15-30% compared with 1% of the general population) may be reduced in this manner. The technique consists of no more than discontinuing the sedative infusions each morning and restoring them at half the rate when the patient’s level of consciousness lightens to an level of comfortable calm. There is a natural concern amongst many staff that the patient will emerge rapidly and experience pain or agitation but the nature of sedative drugs is such that this is rarely a problem and emergence typically takes hours or days. It should be routine an all patients in whom sedation hold is not contraindicated, for the drugs to be held every morning and this is, in fact, incorporated in the order set for this reason.

Please use the standardised patient record template for admission and daily progress notes. The admission note will probably contain much historical information which does not need to be repeated on the daily chart and you are requested to insert this information in a conventional free-text manner.

Likewise, there is a new standard MICU order set which covers most daily eventualities from the point of view of your prescribing needs. Please ensure that daily orders are completed in a timely fashion.

Also in connection with this topic, please note that the facility of telephone orders has been developed to ease your working life. These orders need to be signed very promptly

– i.e. by the following morning. Withdrawal of telephone order privileges would be regrettable but you should know that this has been raised as an option recently.

On admission of a neurology patient to the medical ICU service, the medical attending will need to be informed as usual. It is important to note that appropriate consulting services (i.e.-nephrology, neurology, GI) need to be notified promptly.

The decision to discharge a patient out of the MICU is made by the MICU team, with active involvement/knowledge of the MICU attending. This is time for both the timing as well as the location of the discharge. On discharge of patients from the MICU to the floor it is necessary to arrange an accepting team. This is typically either the specialist team who have had a major input in the MICU care or the general medical team on call for admissions that day. It is obviously essential to write a complete discharge summary and orders at an early stage to avoid delays.

One of the roles of the **rapid response team** is as a liaison between ICU and the floor and it should be routine for MICU to inform the team of any ICU discharge of interest.

Family conferences and information

Soon after admission it is important to liaise with the relatives who are, of course, usually concerned and frightened. It is frequently also the case that this fear manifests as aggressive or demanding behavior and it follows that strong, confident but diplomatic responses are required from the physician. This is very difficult at times but try never to get into a confrontational situation, nor, if you are yourself apprehensive, let that show. Remember that you may be the target of misdirected grief in the form of anger but try not to take it personally. You may also notice that in family groups it is often the relatives who are more peripheral who speak the loudest and that in between meetings the family dynamics will often mute the more vocal individuals.

It is often useful to start a discussion by asking the identified “spokesperson” (ideally the next of kin) if they would summarize for you the state of their understanding. In that way you know what knowledge base to build on and sometimes it will help you to avoid “putting your foot in it.” Often, for example, patients have been repeatedly told by others that the prognosis is far better than it really is and knowing this you can be prepared to gently but firmly refute this.

Honesty is always the best policy and families sometimes benefit from being reminded that we are sharing painful news with them, even though it would be easier to pretend otherwise, precisely because we have a relationship of trust with them. You may be surprised how often you will be directly thanked for being the first person to really tell them the truth...

The overall mortality rate in medical ICU is about 40% at a minimum. Obviously this can be further stratified for various diseases, and in any case does not detract from the prospects for recovery in the remaining 60% of our patients. Nevertheless the temptation to be optimistic can be overwhelming. Families have the same outlook and will be grasping for positive news. It is a reality that they will remember positive news much more than negative news, so a far wiser strategy is to keep the prognosis very grave and

to bear this high mortality figure in mind. Then, as is often said, if the patient dies the family is not surprised and if they survive the family is pleased...

With such sick patients you are not expected to be intimately familiar with either ICU management nor to be able to prognosticate accurately for a patient. It is easy for harm to be done by misinformation and you should not attempt to “go it alone” with families in any but routine situations. The skills that the senior physicians have acquired over years in this area are no different to other more technical ones and no one would expect you to insert a pulmonary artery catheter without supervision so why would you embark alone on a difficult discussion, the memory of which a family will carry for the rest of their lives? You are expected to be accompanied by at the very least a senior resident or a fellow. In many end-of-life discussions the attending physician will have one or more lengthy and stressful talks with the family; clear and honest communications up to that point underlie the good relationships which most families have with most trainee physicians and greatly aid the more difficult ones which may come later.

Teaching

Medical ICU is a speciality in which there is arguably more opportunity to learn acute general medicine than most other areas of medicine. We have developed a program of teaching which we hope you will find interesting and rewarding.

There is daily teaching in the MICU conference room which currently takes place at 1pm. You are expected to attend unless there are overwhelming clinical commitments taking precedence.

At the start of the month you are requested to attend one of the two or three afternoon sessions on practical airway skills. These take place in the classroom on the third floor of the ED and offer you an opportunity to revisit airway maintenance in general, and intubation and laryngeal mask insertion in particular.

Also at the start and finish of the month you will be asked to sit a brief written test on common medical ICU subjects. The questions are drawn from the ACGME bank and aim to help both you and us in your evaluation for MICU.

On Friday mornings the weekly internal medicine grand rounds take place at 8 am and on that day the ward rounds start later, at 9 am, specifically in order to allow you to attend. Internal medicine morning report takes place at 11 am each day and of course this tends to coincide with the MICU ward rounds. However, if a patient of yours is being presented in the report meeting you will be given every consideration in attempting to attend. Likewise, if a patient of yours has an autopsy which you wish to observe, please feel free to ask to be excused from rounds for the time required.

During ward rounds you will receive much of your teaching at the bedside. So much of ICU is technologically based that you will not be familiar with it-particularly on your first time in the MICU. Please do not hesitate to ask any questions you like to whomever you fell appropriate. Ward rounds are more interesting for the attending staff when the resident staff are themselves interested!

We have compiled a list of useful reading, relevant papers, useful links and so forth which are available on the department website. In addition, all handouts from the lunchtime talks are likewise available on the site. You will be given all of the literature on CD-ROM when you start and we hope you find it useful. We welcome additions and suggestions.

Care bundles and core measures

A bundle, which is a concept developed by IHI, is a group of interventions that, when implemented together, result in better outcomes than when implemented individually. This evidence is often of less than class 1 quality; nevertheless such bundles are being mandated and implemented by the United States, and interestingly by the United Kingdom, healthcare systems.

The adherence of institutions to care bundles is measured in terms of so-called “core measures” and we are required to report, on a daily basis, on the following aspects of our care:

Ventilator Associated Care Bundle:

- stress ulcer prophylaxis
- 30 degrees head up head of bed elevation
- DVT prophylaxis
- daily sedation hold (see below)

There is evidence that each and all of these interventions are effective in reducing the incidence of nosocomial pneumonia, which in turn has a high mortality for ICU populations.

The next set of core measures which it is again mandatory to record are those pertaining to:

Central venous line insertion Care bundle.

Hand Hygiene - Wash hands or use alcohol-based waterless hand cleaner:

- Before and after palpating catheter insertion sites
- Before and after inserting, replacing, accessing, repairing, or dressing an intravascular catheter
- Palpation of the insertion site should not be performed after the application of antiseptic, unless aseptic technique is maintained
- Wash hands if obviously soiled or if contamination is suspected

Wash hands or use an alcohol-based waterless hand cleaner between patients, after removing gloves and after using the bathroom.

Maximal barrier precautions on insertion – Include all the following:

- Provider: Hand hygiene, non-sterile cap and mask, all hair under cap, mask covering nose and mouth tightly, and sterile gown and gloves

Patient: Cover the pt’s head and body with large sterile drape

Chlorhexidine skin antisepsis – Includes the following:

- Prepare skin with antiseptic/detergent Chlorhexidine 2% in 70% isopropyl alcohol by saturating the pad, pressing it against the skin, and applying Chlorhexidine solution using a back-and-forth friction scrub for at least 30 seconds. Do not wipe or blot.

Allow antiseptic solution time to dry completely before puncturing the site (~ 2 min)

Optimal catheter site selection – In adult pts, a subclavian site is preferred for infection control purposes, although other factors (potential for mechanical complications such as pneumothorax or hemorrhage, risk for subclavian vein stenosis, and catheter-operator skill) should be considered where to place catheter (CDC Guidelines).

Daily review for necessity and prompt removal of unnecessary lines – the ICU patient with a central line will be reviewed daily, with a notation on the daily goals sheet or medical record indicating the continued need for the central line. Routine replacement should be avoided, and all lines should be removed as early as possible. (Assess for compliance for day of monitoring).

Sepsis care bundles-resuscitation bundle and subsequent management bundle

Sepsis resuscitation bundle-within 6 hours of recognition:

1 Measure serum lactate

Patients with severe sepsis and septic shock may experience ineffective arterial circulation due to the vasodilatation associated with infection or impaired cardiac output. Poorly perfused tissue beds result in global tissue hypoxia, which is often found in association with an elevated serum lactate level. A serum lactate value greater than 4 mmol/L (36 mg/dl) is correlated with increased severity of illness and poorer outcomes even if hypotension is not yet present. As such, patients who are hypotensive or have a lactate greater than 4 mmol/L (36 g/dl) require intravenous fluids or colloid to expand their circulating volume and effectively restore perfusion pressure.

2 Obtain blood cultures prior to antibiotic administration

3 Improve time to broad spectrum antibiotics

4 Treat hypotension or elevated lactate with FLUIDS

The Severe Sepsis Resuscitation Bundle calls for an initial administration of 20 ml/kg of crystalloid as a fluid challenge in cases of suspected hypovolemia or actual cases of serum lactate greater than 4 mmol/L.

Fluid resuscitation should be commenced as early as possible in the course of septic shock (even before intensive care unit admission). Requirements for fluid infusion are not easily determined so that repeated fluid challenges should be performed. Fluid challenge should be **repeated** at 20 mL/kg until the cvp rises to 12 mmHg or the MAP rises to over 65 mmHg. Fluid challenges are distinct from an increase in the rate of maintenance fluid administration. In mechanically ventilated patients, a higher target central venous pressure of 12–15 mm Hg is recommended to account for the presence of positive end expiratory pressure and increases in intrathoracic pressure.

5 Apply vasopressors for ongoing hypotension

If despite an adequate CVP (i.e. adequate fluid repletion) the blood pressure does not rise into the normal range, a vasopressor is indicated. This is likely to be norepinephrine for pure septic vasodilation, or dobutamine plus norepinephrine if there is a cardiac component. At this time a Swan-Ganz catheter may be indicated and this should be discussed with the fellow.

6 Maintain adequate central venous pressure

As a patient is repleted the venoconstrictive response to hypotension and hypovolemia will start to relax resulting in a declining cvp once more. It is important to maintain adequate fluid resuscitation, following the rules above (20mL/kg challenge and review) otherwise hypotension will once more ensue.

7 Maintain adequate central venous oxygen saturation

As regards the Sepsis Resuscitation Bundle, a minimum fluid challenge is defined in an effort to avoid hypotension. The bundle does not restrict additional fluids. Traditional targets for fluid filling have focused on CVP and MAP; more recently the work of Rivers from the ED has shown that central venous oxygen saturation may be of greater utility as a goal to aim for.

In Rivers et al., hospital mortality was 30.5 percent in the group assigned to the early goal-directed therapy group compared with 46.5% in the standard care group ($p = .009$). Rivers et al. used restoration of a central venous oxygen saturation of > 70 percent as one of their goals, and this was met in 95 percent of the early goal-directed group, compared with just 60 percent of the standard treatment group ($p < .001$). Patients in the early goal directed treatment groups received more fluids (5 vs. 3.5 L, $p < .001$) and more were given red cell transfusions (64 vs. 18.5 percent, $p < .001$) in the first 6 hours than in the standard treatment group, emphasizing the importance of early and adequate fluid resuscitation in patients with severe sepsis.

Importantly, remember that each end point must be considered in its context, and the combination of clinical variables (mean arterial pressure, urine output, apparent skin perfusion, level of consciousness) along with serum lactate values may be helpful to the clinician despite a lack of randomized trials to establish this point.

Safety Margins:

Patients should be carefully observed for evidence of pulmonary and systemic edema during fluid resuscitation. The degree of intravascular volume deficit in patients with severe sepsis varies. With venodilation and ongoing capillary leak, most patients require continuing aggressive fluid resuscitation during the first 24 hours of management. Input is typically much greater than output, and input/output ratio is of no utility to judge fluid resuscitation needs during this time. Remember that pulmonary edema in an intubated patient is not as immediately serious as in an unintubated patient because it is much more easily treated and because it is much simpler to improve oxygen delivery while it is being treated. Generally, restoration of circulating volume takes precedence over any slight risk of pulmonary edema in this situation.

Tips

1. Establish a standardized protocol for managing septic patients with shock that includes immediate fluid resuscitation as above. Detail the type, amount, and duration of the initial bolus. Detail the same for subsequent fluid challenges.
2. Do not delay the beginning of fluid administration for placement of central access.
3. Be prepared to deliver additional fluids. In order to reach the target central venous pressure (CVP) goal of ≥ 8 mmHg in subsequent steps, volumes much greater than the initial 20 ml/kg or colloid equivalent may be required.

4. If the patient is not responding to vigorous volume resuscitation, think of other causes of hypotension such as depressed myocardial function, adrenal insufficiency, tension pneumothorax, cardiac tamponade, etc.
5. If using crystalloid, be sure to use isotonic fluids such as normal saline or lactated Ringer's only.

Here is a link to the IHI website on which you can find this and much more information.

<http://www.ihi.org/IHI/Topics/CriticalCare/Sepsis/Changes/ImplementtheSepsisResuscitationBundle.htm>

Sepsis Management Bundle

Subsequent steps in sepsis management.

These evidence-based patterns of care are also implemented in our ICU as appropriate:

Administer Low-Dose Steroids by a Standard Policy

Typically here we either perform an ACTH test and initiate hydrocortisone 50 mg 6 hourly plus fludrocortisone 50 micrograms once daily pending the result of the test. We discontinue if the patient can generate endogenous steroid but otherwise D/C after 5 days. A recent meta-analysis has suggested a number needed to treat of 9 for one life saved.

Administer Drotrecogin Alfa (Activated) by a Standard Policy

The PROWESS study showed that administration of activated protein C reduced mortality in septic patients (19.4% relative risk reduction; NNT 19-54). It is worth noting that notwithstanding the evidence mentioned, and in view of the very high cost of the drug, it is possible to achieve similar improvements in ICU outcome with inexpensive strategies such as the other three mentioned in this section. Nevertheless in patients for whom it is suitable (for example APACHE score >24) this use of this drug will be sanctioned by the attending physician.

<http://www.sfar.org/scores2/apache22.html>

Maintain Adequate Glycemic Control

Maintenance of a blood glucose level between 80- 110 mg/dL has been shown to greatly reduce ICU mortality in surgical patients (4.6% mortality versus 8% in conventionally treated) and recent work has confirmed that the effects are replicated in medical patients. We are using software (glucommander) which expedites and tightens control of blood glucose levels and the nurses will be happy to show you this system and explain its advantages.

Prevent Excessive Inspiratory Plateau Pressures

The ARDSnet trial to investigate optimal ventilator strategies was halted early because of the dramatic improvement in survival with low tidal volume (V_t 6mL/Kg calculated from patient's height), high PEEP (12-15 mmHg), low peak pressure (<30 cmH₂O) ventilation. There was a 9% absolute reduction in mortality. Wherever appropriate, in patients with poorly compliant lungs, we employ this strategy on our MICU.

Respiratory therapy weaning protocol.

There is now a strong evidence base to indicate that protocol-driven weaning from ventilation can enhance clinical outcomes and reduce costs. We have adopted the summary guidelines produced by the American College of Chest Physicians, The American College of critical Care Medicine and the American Association for Respiratory Care.

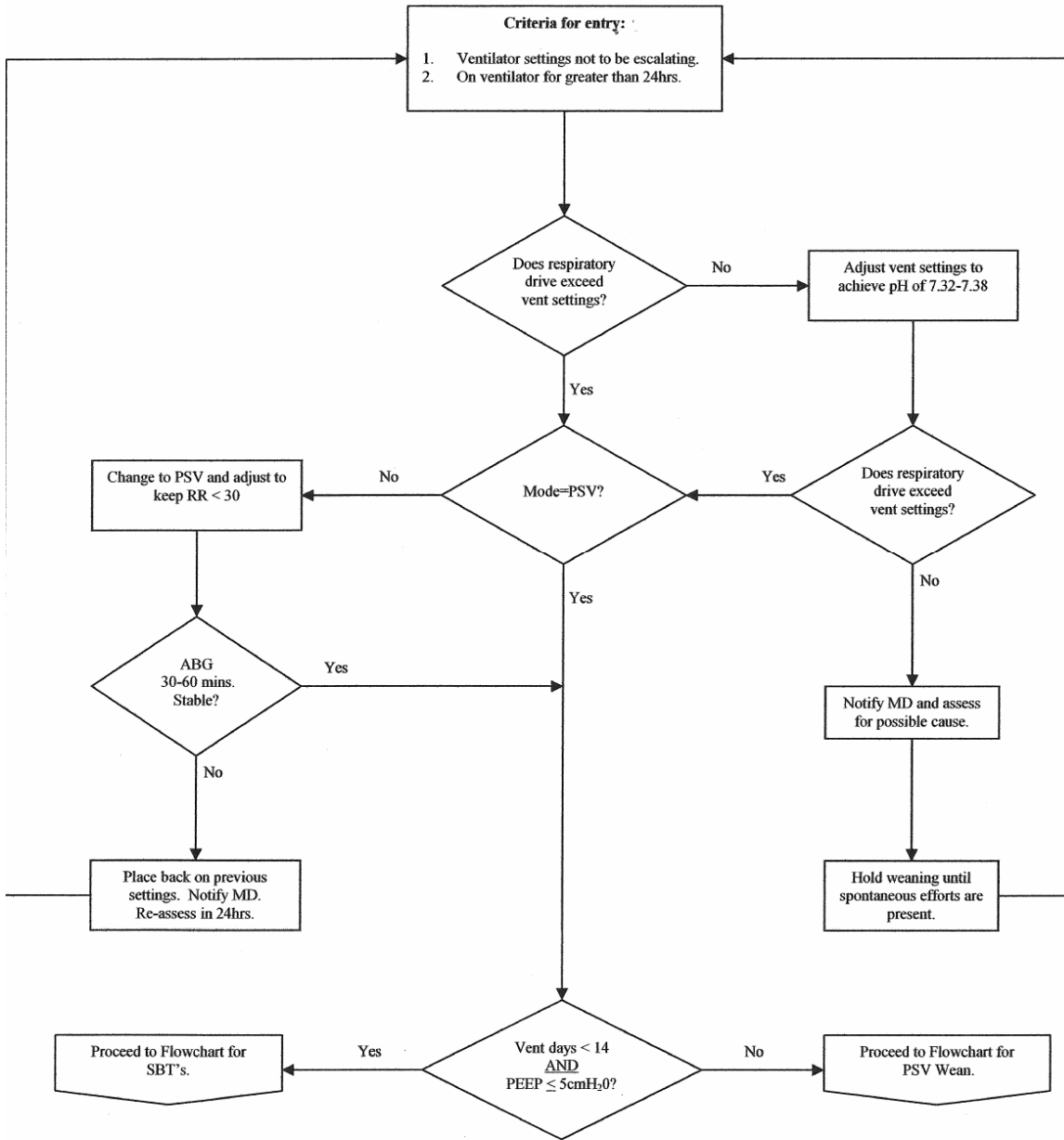
It is first necessary to determine the cause of ventilator dependence. This may, broadly, be neurologic, respiratory, metabolic, cardiovascular, psychological or ventilation-perfusion related.

Secondly it is necessary to reassess daily for weaning readiness. There are several criteria which are largely to do with clinical commonsense and patient stability, and which are outlined in the full protocol which is easily available.

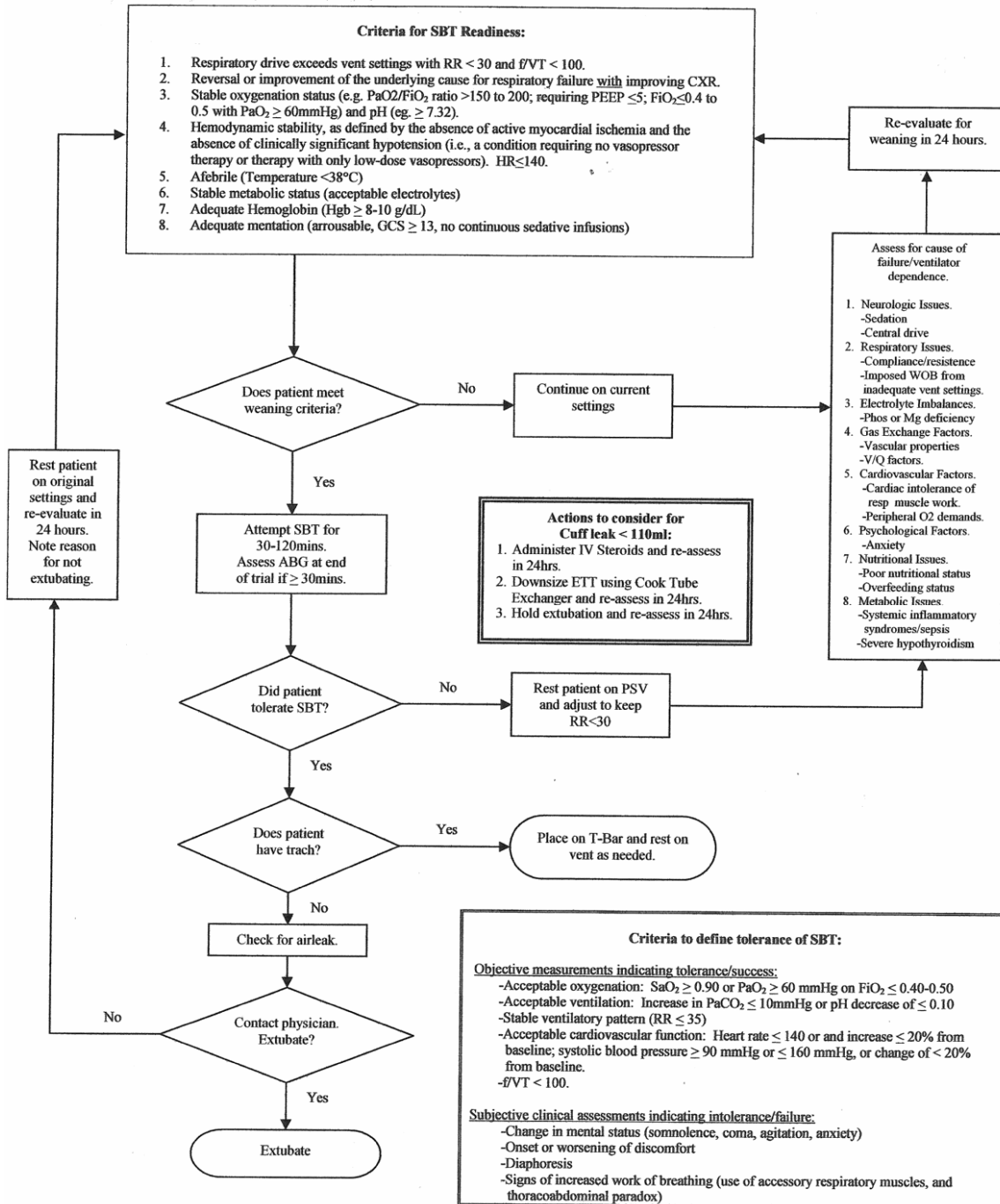
Strategies for weaning broadly fall into two groups. In patients ventilated for less than two weeks daily trials of spontaneous breathing are more effective. Over two weeks, patients respond better to a slow pressure support wean. These general strategies are applied in the MICU by the respiratory therapists.

The two flowcharts for weaning are outlined on the following pages to give you an overview.

Initial Protocol Entry Flowchart



SBT Flowchart



Rapid response team

The rapid response team is an intervention which has been used with some success elsewhere, notably in the UK and Australia, for a few years. The idea is to make available resuscitative or general medical care when the ward teams are either busy or not comfortable with the level of input required. The term implies possibly more haste and urgency than is actually seen in practice-these are not often teams who race to an imminent cardiac arrest-but more often teams who advise on a septic patient, a dyspneic patient or a hypoxic patient, for example, at the request of ward doctors or nurses. The team at Pitt consists of a MICU attending physician, an ICU nurse and a respiratory therapist. It currently operates from 7 am Monday to 7 am Saturday, 24 hours a day. Soon it will be a 24/7 facility. All three rapid response pagers have the number 0333 and you can leave a voice message for an individual member of the team if you wish, as well. The RRT office is located on the MICU "A" side next to Jarvis's office, near room 209. Renee Grainger is the nurse manager and she is always happy to meet or speak with you to help in any way that she can.

It is an integral part of the way in which these teams operate that there is free access among clinically trained staff to call the team pager. Thus, as mentioned above, any member of hospital staff is welcome to call the team. Guidelines are widely available and there is a publicized list of clinical states and variables-such as blood pressure and oxygen saturation, for example-but if following an attempt to contact the primary provider the nursing staff remain concerned or if a physician is at all concerned the team can be paged through switchboard. It is never the intent that the resident or primary physician should be bypassed in calling the RRT.

The team will advise and is equipped to resuscitate as indicated. Disposition and follow-up will be arranged as appropriate and in constant liaison with the primary providers.