

Critical Care Outreach: A Review of Current Practice and Evidence

K Rowe & S J Fletcher

Key points:

- The Department of Health, following publication of a review of adult critical care services,¹ recommended the development and implementation of outreach services
- The Critical Care Outreach teams across the UK, and the services provided, are by no means consistent
- The DOH recommended that outreach had three principal objectives:
 - To avert admissions
 - To enable discharges
 - To share critical care skills
- The efficacy of outreach has proven difficult to confirm, however this may be due to the heterogeneity of service

Abstract

Critical Care Outreach teams have been developed in most acute hospitals within the UK. This article aims to summarise the evidence behind the development of this service and some of the outcomes which have been demonstrated to-date.

Keywords

Outreach, Critical illness.

Introduction

The clustering of severely ill patients into one area within the hospital developed from the mass ventilatory support required for victims of the polio epidemic of the early 1950's. At this time the iron lung had been the only means of providing assisted ventilation. The necessities of the numbers involved required a different approach. Continuous hand ventilation by, amongst others, medical students, via tracheostomy tubes, and later with simple mechanical devices, demonstrated a significant survival advantage. Advances in medical technology have seen these devices evolve in complexity, along with the management of all aspects of critical illness. As a consequence the need for 'expertise' has seen the parallel specialisation of nurses and doctors trained in the field of intensive care medicine.

However, the co-location of many of the sicker patients, and the concentration of their care among a few, may have contributed to the deskilling of doctors and nurses working outside this environment. This 'void' in skill set outside of the critical care complex was acknowledged by the Department of Health (DoH) in 2001 when they published a review of adult critical care services. The recommendations included the concept of critical care 'without boundaries'

Level	Description
0	Patients whose needs can be met through normal ward care in an acute hospital
1	Patients at risk of their condition deteriorating, or those recently relocated from higher levels of care, whose needs can be met on an acute ward with additional advice and support from the critical care team
2	Patients requiring more detailed observations or intervention including support for a single failing organ system or postoperative care and those 'stepping down' from higher levels of care
3	Patients requiring advanced respiratory support only, or basic respiratory support together with support of at least two organ systems. This level includes all complex patients requiring support for multi-organ failure

Table 1. DoH level of care classification.¹

considering also the needs of those at risk of developing critical illness, regardless of their location in the hospital. A classification of illness severity was developed (Table 1). £142.4 million was allocated to the implementation of this report, with the intention that part of this sum was used to fund the development of **outreach services**.²

Level 2 and 3 patients are often cared for within the ICU/HDU, not only because of their need for specialist organ support, but also for their requirement for greater nursing intervention.

Level 0 patients on the other hand, can be safely looked after on a normal ward. This leaves only the level 1 patients with an as yet, undetermined clinical course, in a potentially unsafe environment.

The 'Level 1' patient is not easy to define with a multitude of factors contributing to risk. The

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Intensive Care Society has recently attempted to offer specific guidance (subsequently withdrawn).

The Association of UK University Hospitals has suggested that level 1 care be subdivided into 1a and 1b:

- 1a. Acutely ill patients requiring intervention or those who are unstable with a greater potential to deteriorate
- 1b. Patients who are in a stable condition but with an increased dependence on nursing support

For each acute 'medical' discipline, patients fulfilling these criteria are not insignificant in number. However they are often nursed side by side with level 0 patients. Not only is recognition a problem, but the ability to provide adequate monitoring and care, by an overstretched nursing staff, is questionable. One possible approach would be the development of level 1 care units, able to provide a higher intensity of care. These units/areas would involve outreach nurses, but might naturally lie within the domain of 'Acute Medicine' as this continues to develop.

Who and what is 'Critical Care Outreach'?

The Critical Care Outreach teams across the UK, and the services provided, are by no means consistent. One hospital's service may have a team of senior nurses working independently on a day time basis only. Another may have a combined medical and nursing team providing comprehensive, 24/7, cover. Thus the 'expectation' that outreach be provided on a 24hr per day, seven day a week basis^{1,3} incorporating both critical medicine consultants and trainee medical cover,⁴ is far from fulfilled.

A postal survey⁵ determined that availability of UK outreach services on a 24/7 basis, was poor, with only 14.5% of acute hospitals offering bedside clinical support and 33.8% providing telephone "hotline" advice. Similarly, medical cover was disappointingly low with 71.1% of outreach services having no medical consultant input and the majority of the services being provided by F or G grade nurses.

The DOH recommended that outreach had three principal objectives:

1. To avert admissions
2. To enable discharges
3. To share critical care skills

Reassuringly these aims were addressed by the outreach services as demonstrated in a National Survey published in 2007.⁵ Aversion of admissions to critical care was considered one of the three main aims of the service in 102/127 responses (80.3%), while discharge from critical care units and sharing of skills were similarly ranked in 32% and 40.5% of responses respectively. Other key aims included timely identification of acute illness (85.8%), avoidance of readmission to critical care (43.8%) and to support ward-based care through education at the bedside (31.5%).

Medical Emergency Team Calling Criteria All cardiac and respiratory arrests and all conditions listed below	
Acute changes in:	Vital signs:
Airway	Threatened
Breathing	All respiratory arrests
	Respiratory rate <5 per minute
	Respiratory rate >36 per minute
Circulation	All cardiac arrests
	Pulse rate <40 per minute
	Pulse rate >140 per minute
Neurology	Sudden fall in level of consciousness (Fall in Glasgow Coma Score >2 points)
	Repeated or prolonged seizures
Other	Any patient who does not fit the criteria above, but whom you are seriously worried about

Table 2. MET Criteria.

Below we will discuss these 'goals' and the efficacy of outreach in addressing them.

The Outreach Objectives:

Averting Admissions to Intensive Care Units (ICU)

There is evidence to suggest that pre-ICU care of the deteriorating patient is sub-optimal. The 2005 NCEPOD report 'An Acute Problem?'⁶ demonstrated that only 58% of acutely ill medical patients received prompt and appropriate therapy and that a considerable time delay, between the onset of physiological instability and ICU referral was common. This is concerning, as late referral has been demonstrated to lead to increased mortality.⁷

For some patients, the first recognition of their critical illness is at cardiopulmonary arrest. Worryingly the vast majority will have had documented instability for many hours prior to this seminal event^{8,9,10}

Physiological indicator systems have been used worldwide in an attempt to recognise the unstable patient, with the goal of ensuring early recognition, early intervention and hopefully improved outcome.

Physiological indicator systems

Medical Emergency Team

This system was one of the first to be introduced, and was developed by an Australian team in 1995.¹¹ A doctor or nurse was required to call the Medical Emergency Team (MET) when any of the designated criteria were reached (see Table 2). The MET team, usually consisting of an intensive care registrar, a medical registrar and a senior ICU nurse, would rapidly assess and further manage the patient as appropriate.

The effectiveness of 'MET' systems is as yet unproven and several studies have shown conflicting results. Preliminary trials demonstrated a reduction in unplanned ICU admissions,¹² cardiac arrests, and death,^{13,14,15} but a larger, cluster randomised controlled trial,¹⁶ found no significant decrease in these outcomes in those hospitals randomised to full MET team implementation. This study,

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A: The senior ward nurse should contact the responsible doctor and inform them of a patient with:
any 3 or more of the following:

respiratory rate $\square$ 25 breaths.min⁻¹ (or <10)
arterial systolic pressure < 90mmHg
heart rate $\square$ 110 beats.min⁻¹ (or <55)
not fully alert and orientated
Oxygen saturation <90%
urine output <100ml over last 4 h

Or a patient not FULLY alert and orientated AND
respiratory rate $\square$ 35 breaths.min⁻¹ OR heart rate $\square$ 140 beats.min⁻¹

Unless immediate management improves the patient, the doctor should consider calling the team. Exceptionally (in an emergency when a responsible doctor not immediately available) the senior ward nurse may contact the team directly.

B: A doctor or registrar grade or above may call the team for any seriously ill patient causing acute concern. This will normally be done after discussion with the patient's consultant.
The consultant responsible for the patient must be informed as soon as practical that the team has been called.

Table 3. The PAR protocol.¹⁹

however, had several methodological flaws, which may have contributed to this negative finding.

When a purely surgical population was used to determine MET efficacy, an association with increased long-term survival was demonstrated.¹⁷ Although improved patient outcome has not been clearly demonstrated, MET systems may have a role in decreasing ICU admissions of patients unlikely to benefit from ICU care e.g. post-cardiac arrest.¹⁸ This may be a poor reward for such a resource rich service.

Patient At Risk Team (PAR)¹⁹

The PAR system, designed by the Royal London Hospital in the late 1990's is outlined in Table 3

The centre reporting this intervention had within its PAR team an ICU consultant or deputy, a senior ICU nurse and the duty medical or surgical registrar as appropriate. The PAR intervention was able to demonstrate a significant reduction in patients admitted to the ICU following a cardiac arrest, and a trend towards decreased mortality in unplanned admissions to the ICU compared to control.¹⁹ However, only 69 calls in total were made to the PAR team in the six-month intervention period, suggesting either problematic implementation or a hospital with a pre-existing, well developed method of identifying and managing the critically ill.

A larger UK study was also able to demonstrate a benefit in using the PAR identification system.²⁰ This study took advantage of the introduction of outreach within its hospital using the wards where outreach hadn't

been implemented as controls. Ward staff used PAR to trigger referral to a 24hr cover outreach nurse who had ICU medical back up if required. They demonstrated a statistically significant reduction in hospital mortality with PAR intervention.²⁰

Early Warning Scores (EWS)²¹

The 'early warning' scoring system was first designed in 1999,²¹ and shortly after this was updated to produce the Modified Early Warning Score (MEWS)²²(Table 4).

The MEWS system provides the ability to be able to quantify the unstable physiological variables, with a higher score representing increasing risk.²³ Studies have shown that scores of >4 are associated with a higher risk of death.^{24,25}

The MEWS system allows some flexibility in setting an arbitrary score, which when met, empowers the ward nurse to contact a doctor for assessment.

MEWS is one among many physiological scoring systems in use but all are ineffective in isolation.

Identifying risk requires appropriate monitoring but is only a first step. Importantly a doctor must respond and both manage the patient appropriately and identify whether further specialist help is required. One of the major roles of the outreach service involves the education of nursing and medical staff in the importance of these factors.

Measurement of Outcomes of Outreach Service

A systematic review in 2006 investigating the effectiveness of critical care outreach services found that, although there

	3	2	1	0	1	2	3
HR		<40	40-50	51-100	101-110	111-129	$\square$ 130
BP	>45% $\square$	30% $\square$	15% $\square$	Normal*	15% $\square$	30% $\square$	>45% $\square$
RR		$\square$ 8		9-14	15-20	21-29	$\square$ 30
TEMP		<35.0		35.0-38.4		>38.5	
CNS				A	V	P	U
URINE	Nil	<1ml/kg/2h	<1ml/kg/h		>3ml/kg/2h		
*= $\square$ for patient							

Table 4. The Modified Early Warning Score.²²

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was a trend towards improved patient outcome with outreach intervention, the level of evidence was so poor that no firm conclusion could be drawn.²⁶

A later study using data from the case mix programme database (CMPD), which records all admissions, from contributing institutions, to adult general critical care units in England, Wales and Northern Ireland was able to extract information from 172 critical care units before and after the introduction of outreach services.²⁷ The data demonstrated that, although there was only a slight reduction in overall ICU mortality following the introduction of outreach services, the number of patients admitted out of hours, and their mean physiology scores were lower, indicating that perhaps the patients were being admitted to the ICU at an earlier and more appropriate time.

Enabling Discharges from ICU

Appropriate discharge of the ICU patient should have the following characteristics:

1. The original problem that brought them to the ICU has resolved
2. No further need for invasive organ support
3. The ability for non ICU doctors and nurses to be able to manage their care
4. A discharge during day time working hours

Ideally, these criteria should be considered and fulfilled before any patient is discharged; however, theory and practice often do not match. With the high demand for critical care beds, patients often leave the unit before all of these criteria can be fulfilled. For example, it is not uncommon for an ICU patient to be discharged in the middle of the night.

Once discharged from ICU, patients follow one of three pathways:

1. Get better and go home
2. Deteriorate and get readmitted to ICU
3. Deteriorate and die on the ward

For some patients the reason for ICU discharge is palliative, i.e. it is considered that their condition is non-survivable and thus they would not benefit from further intensive support. However for the vast majority, this is not the case and patients are discharged with the expectation that they should continue to improve and eventually leave hospital.

Worryingly, approximately 11% of patients die in hospital following discharge from the intensive care unit,²⁸ and a need for readmission to ICU is associated with a 10 fold increase in mortality.²⁹

Outreach should be able to 'support the continuing recovery of discharged patients on wards'¹ with the expectation of decreasing in-hospital mortality. One, small-scale, study was able to demonstrate this outcome,³⁰ however others have not.^{27,31}

Sharing critical care skills

The sharing of critical care skills with ward staff is a fundamental role of an outreach service. Providing good acute care throughout the entire hospital can only be achieved if all team members are involved. A postal survey demonstrated that 77% of UK outreach services participated in informal bedside teaching outside of critical care areas and 82% delivered formal educational courses on critical illness topics.⁵

As well as theoretical aspects of learning, outreach teams importantly provide a very practical input. They are often the first point of contact for ward teams. Guidance over tracheostomy management (10.1% of interventions) including assistance with tracheal suction and chest physiotherapy (8.7%) were the commonest interventions in one study.³⁰ Guidance in the provision of continuous positive airways pressure (8.3%) and optimisation of patient position (7.9%) were also important interventions in this study.

Summary

The provision of outreach services was funded with the expectancy of improving the care of critically ill patients within the hospital setting. Intuitively this should be the case but to date, the efficacy of outreach, in many areas, has proven difficult to confirm. This may in part be due to the heterogeneity of the service within the UK, thus preventing large, multi-centre randomised trials. Effective or not, comprehensive outreach is now a contractual obligation of many Strategic Health Authorities. However well resourced, outreach will never be effective unless the right patients are identified and referred at the right time. This requires robust systems comprehensively applied, supported by continuous education, general and targeted. Rigorous and regular audit should test these systems, but is unlikely to demonstrate outcome benefit, given the absence of all but historical controls.

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