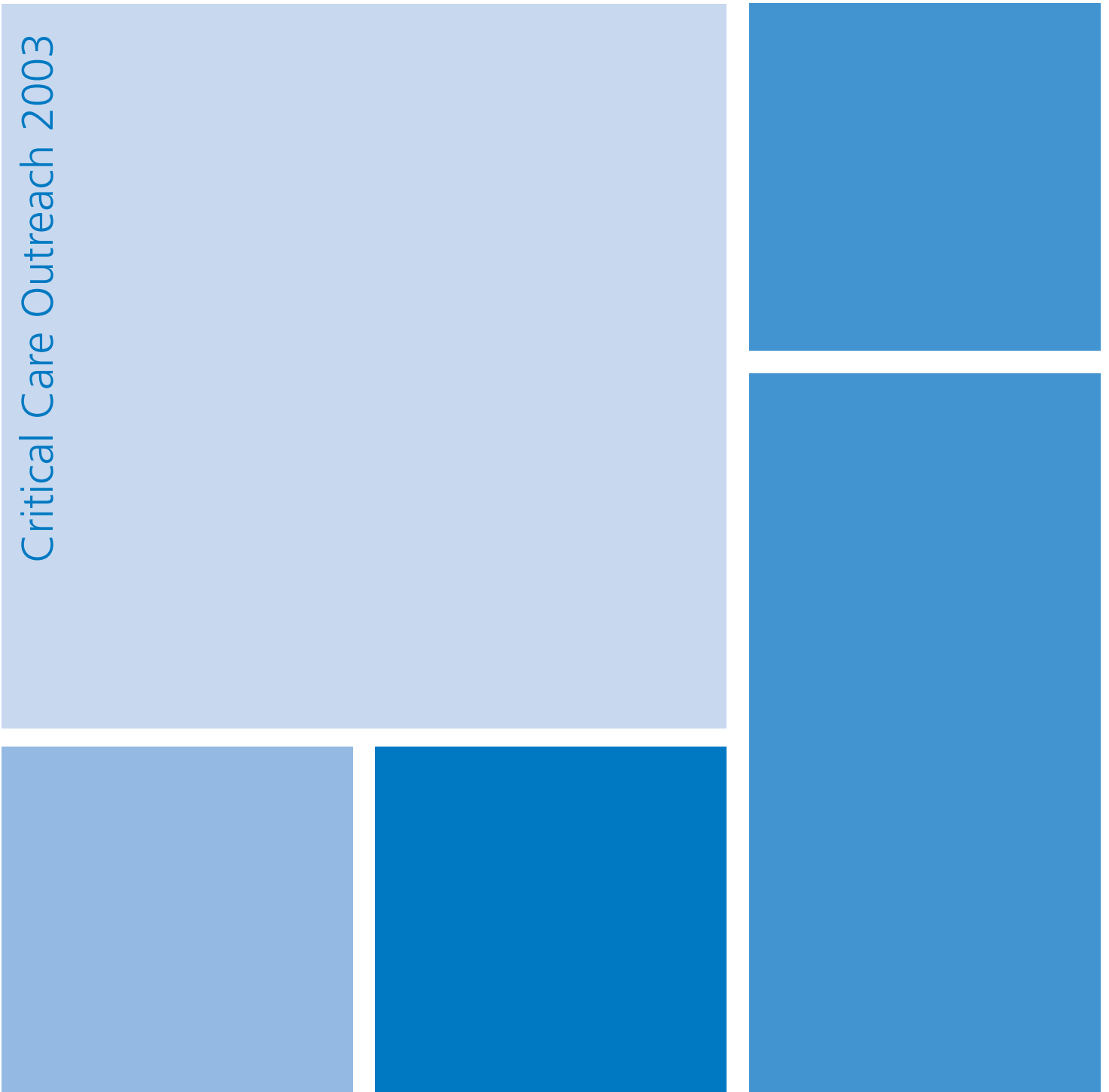


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Critical Care Outreach 2003



READER INFORMATION

Policy HR/Workforce Management Planning Clinical	Estates Performance IM & T Finance Partnership Working
Document Purpose	Best Practice Guidance
ROCR Ref:	Gateway Ref: 2019
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FOREWORDS

Sarah Mullally: Department of Health

I have watched with interest the blossoming of critical care outreach services since the publication of Comprehensive Critical Care (Department of Health, 2000). Outreach has enabled services to respond to the increased acuity and complexity of patient need within surgical and medical wards. As a result, ward based staff and clinical teams feel better supported and equipped to manage patients who are acutely ill.

What has been really interesting for me to see is how critical care outreach has broken down the professional and organisational barriers that often get in the way of staff being able to provide the right care to patients and in a timely manner. I am aware that it is too early in their evolution to have developed a robust evidence base on clinical outcome. But, intuitively it feels right, and local audits and evaluations are beginning to demonstrate benefits.

Critical care outreach services help us to understand better the connections between levels of patient need, and the knowledge, skills and competencies required by multi-professional clinical teams. It may help us to think about options for the future organisation of medical and surgical services and how we describe hospital-based clinical teams of the future.

I am aware of the energy and commitment of the clinical champions and would like to add my congratulations to the critical care community including ward based teams for making a real difference within a relatively short period of time. As with any innovation, the work still goes on to embed the principles of outreach into every day practice. Further development of practice may include independent and supplementary prescribing by nurses and pharmacists, and the establishment of consultant roles for allied health professionals.

The next steps will be to build the evidence base and to look at the impact on improving patient care in terms of physical and emotional wellbeing, and clinical and cost effectiveness.

Sarah Mullally

Chief Nursing Officer for England

Dr David Goldhill

Critical care outreach services are undoubtedly one of the success stories of the modernisation of critical care. They have followed from a recognition that critically ill patients exist throughout the wards of a modern acute hospital. The skills, knowledge and attitudes of those delivering critical care within level 3 and level 2 units are relevant to many of these patients. We need to identify these patients early. We can then deliver appropriate treatment in the appropriate location. For some patients this will mean an early admission to a critical care unit. Other patients may be properly cared for on a ward, sometimes with additional critical care outreach support. Part of this process has been a realisation that patients have critical care needs that continue beyond the ICU and even after hospital discharge; hence the vital importance of post-hospital follow-up. In all these endeavours there has been a realisation of the importance of collecting information to understand what we do and how well we do it. Encompassing all these themes is the role of education and training, possibly the most important and enduring of the outreach initiatives.

The National Outreach Report 2003 is a testament to the support, enthusiasm and achievements of all those involved in critical care outreach services. There is much information, good advice and practical examples that will be relevant, not only to those already involved in outreach services, but to all with an interest and concern for the welfare of hospital patients.

David Goldhill

Consultant in Anaesthesia and Critical Care
Royal London Hospital

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Executive Summary

1. INTRODUCTION

Outreach: a New Approach to Critical Care

- In 1999, the Audit Commission report *Critical to Success* gave a "highest priority recommendation" that acute hospitals "develop an 'outreach' service ... to support ward staff in managing patients at-risk".
- In 2000, the Department of Health national expert group recommended outreach as an integral part of each Trust's critical care services.
- This year (2003), Alan Milburn (then Secretary of State for Health) wrote that "we should see outreach services developing in every hospital" (letter to Chief Executives dated 12/03/2003).

Critical care outreach (termed outreach) is part of a new approach to the management of all critically ill patients. Previously, critical care has largely developed within discrete departments often quite separate from other clinical areas (Hillman, 2002). It is now evident that there are many at-risk and deteriorating patients in general wards who also need critical care: review of 1,873 ward patients in four Trusts found 12.2% of patients required care above "normal" ward level (Chellel et al, 2002). Such patients often have poor outcomes, although their problems are potentially avoidable (McQuillan et al, 1998; Goldhill and Sumner, 1998; McGloin et al, 1999).

Aims of Critical Care Outreach

The DoH Comprehensive Critical Care document (2000) identified three main aims for outreach services: to avert admissions – or to ensure that admissions are timely – by identifying patients who are deteriorating; to enable discharges; and to share critical care skills (Department of Health, 2000).

In essence, outreach may be viewed as an organisational approach to ensure equity of care for all critically ill patients, irrespective of their location.

Many of the issues that critical care outreach seeks to address are symptomatic of a historic failure to recognise the increasing numbers of at-risk and acutely ill patients distributed throughout the acute hospital; and a failure to equip properly the workforce that must identify and care for such patients.

Outreach Services are not a substitute for insufficient critical care beds, poor ward facilities or inadequate staffing.

National Outreach Forum

The National Outreach Forum (NORF) developed with the support of the NHS Modernisation Agency, to bring together key stakeholders in the field of critical care outreach in order to determine, represent, and disseminate their views. NORF has representatives from the twenty-nine critical care networks in England, and from Allied Health Professions (AHP), the British Association of Critical Care Nurses, Critical Care Information Advisory Group, Intensive Care National Audit and Research Centre, Intensive Care Society, and Royal College of Nursing Critical Care Forum.

Aims of Report

This report has been written by members of NORF, drawing on the expertise of clinicians in acute care and critical care outreach throughout the country. It is intended for multi-professional use and may be used to inform operational and business planning of acute services.

The main aims of the report are:

- to highlight good practices,
- to offer practical guidance in the establishment, maintenance and development of outreach services.

The key points identified in this document have been drawn from current evidence and effective outreach practice. In accordance with the approach outlined in 'Shifting the balance of power' the key points are to enable Trusts to meet local and national priorities in developing outreach services.

(<http://www.doh.gov.uk/shiftingthebalance/>)

NORF acknowledge the work of the Intensive Care Society, publishers of the 'Guidelines for the introduction of Outreach Services (2002a), and 'Levels of critical care for adult patients' (2002b). This report aims to complement and build on those guidelines.

2. SERVICE CONFIGURATION AND PROCESSES

Outreach is delivered variably across the country. A large proportion of hospitals provide critical care education for ward-based staff, and also use audit to determine important issues (National Outreach Survey 2002). Development of outreach might be viewed as a progression of services.

- Critical care education and training for general ward staff,
- Audit and evaluation of key issues in individual organisations,
- Use of physiological track and trigger systems,
- Direct support at the bed-side for varying periods,
- Direct support at the bed-side all-day every day.

Different forms of outreach service have evolved depending on local priorities and resources. A co-ordinated, whole hospital approach to appraisal and timely response to patient need is essential. Further research and evaluation are required to identify the most effective service configuration(s).

Local organisations should consider how they can best support outreach personnel and ward staff to deliver effective care; e.g. by enabling prompt administration of fluids and oxygen, and referral for diagnostic tests such as chest X-rays and arterial blood gases by appropriate persons. The goal is to facilitate essential treatment when needed, but with proper safeguards for patients and staff, and consideration of professional and legal issues. Patient group directions are used in some Trusts for fluid, medication and oxygen administration. Future additions to the Nurse Prescribers' Extended formulary may support further development.

In most cases critical care outreach services will need dedicated funding for proper implementation.

3. EDUCATION

Individual organisations should undertake education and training needs analyses to identify particular areas of risk.

Individual organisations should develop coherent educational strategies with local workforce development confederations and education providers, so that staff are properly prepared to address the needs of critically ill patients.

Organisations should ensure dissemination of the necessary skills for all relevant staff to care for acutely ill patients at the earliest stages of their deterioration, and also during recovery from critical illness.

Training should be delivered against agreed quality assurance criteria. Ultimately, it may be necessary for national professional organisations, Royal Colleges and professional regulatory bodies to indicate minimum standards of patient care and clinical competence.

The fundamental goal is that all staff providing acute care can recognise basic signs of deterioration and appreciate the necessity of obtaining timely and appropriate help.

4. TRACK AND TRIGGER WARNING SYSTEMS

Early Warning Scoring systems (EWS) are based upon the allocation of 'points' to physiological observations, the calculation of a total 'score' and the designation of an agreed calling 'trigger' level. Some early warning systems use "calling" or referral criteria based upon routine observations, which are activated when one or more variables reach an extreme value outside the normal range. To avoid ambiguity, all warning systems based upon physiological observations will be referred to as 'physiological track and trigger warning systems' within this text.

Physiological tracking and triggering can lead to measurable direct and indirect improvements in the quality of patient care

- There is as yet no clear evidence identifying the ideal choice track and trigger model,
- The principles of physiological track and trigger warning are as important as is focusing on the detail when selecting a model for implementation.

Post-implementation audit, evaluation and local refinement of the selected track and trigger system are essential.

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5. POST-HOSPITAL FOLLOW-UP

Two-thirds of survivors of critical illness experience significant problems with physical health, work issues, or mental health. The DoH national expert group recommended follow-up "to enable discharges by supporting the continuing recovery of discharged patients ... post discharge from hospital, and their relatives and friends" (Department of Health, 2000).

Multi-professional support is needed for follow up clinics. If such support is not available, fast track referral systems, e.g. for physiotherapy, dietetics, clinical psychology, and psychiatry should be established so that patients with specific needs are seen as soon as possible.

Provision of structured, self-directed rehabilitation following critical illness has been shown to aid physical recovery and help reduce depression.

6. AUDIT AND EVALUATION

Audit should be simple.

Audit processes should:

- focus on the aims of the outreach service,
- measure outcomes rather than associations,
- focus on patient needs, not activity,
- be based on whole hospital experiences, systems and outcomes rather than simply referrals,
- be key component of work processes rather than an additional process,
- be included in the funding for outreach services.

Commissioners and other key stakeholders should be involved in the audit process.

- The terms of reference for trust wide Critical Care Delivery Groups should clarify how audit findings will be reported within the organisation,
- An audit calendar (a clear plan for audit) should be used,
- Audit should be undertaken both internally and externally,
- The distinction between research and audit should be recognised. Small scale research may be required to identify audit themes.

In line with the (proposed) recommendations of the Critical Care Information Group, critical care outreach requires a distinct data set. While outreach data can form part of the critical care data set, it must be possible to extract and analyse key aspects independently

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SECTION 1: INTRODUCTION

1.1 Outreach: a New Approach to Critical Care

- In 1999, the Audit Commission report "Critical to Success" gave a "highest priority recommendation" that acute hospitals "develop an 'outreach' service ... to support ward staff in managing patients at-risk".
- In 2000, the Department of Health national expert group recommended outreach as an integral part of each Trust's critical care services.
- This year (2003), Alan Milburn (then Secretary of State for Health) wrote that "we should see outreach services developing in every hospital" (letter to Chief Executives dated 12/03/2003).

Critical care outreach (termed outreach) is part of a new approach to the management of all critically ill patients. Previously, critical care has largely developed within discrete departments often quite separate from other clinical areas (Hillman, 2002). It is now evident that there are many at-risk and deteriorating patients in general wards who also need critical care: review of 1,873 ward patients in four Trusts found 12.2% of patients required care above "normal" ward level (Chellel et al, 2002). Such patients often have poor outcomes, although their problems are potentially avoidable (McQuillan et al, 1998; Goldhill and Sumner, 1998; McGloin et al, 1999).

1.2 Critical Care Outreach: Definition

The Intensive Care Society (2002a), define critical care outreach as "a multidisciplinary approach to the identification of patients, at-risk of developing critical illness, and those patients recovering from a period of critical illness, to enable early intervention or transfer (if appropriate) to an area suitable to care for that patient's individual needs. Outreach should be a collaboration and

partnership between the critical care department and other departments to ensure a continuum of care for patients regardless of location, and should enhance the skills and understanding of all staff in the delivery of critical care."

In essence, outreach may be viewed as an organisational approach to ensure equity of care for all critically ill patients, irrespective of their location.

1.3 Aims of Critical Care Outreach

The Department of Health *Comprehensive Critical Care* document (2000) specified three main aims for outreach services:

- to avert admissions to critical care – or to ensure that such admissions are timely – by early identification of patients who are deteriorating;
- to enable discharges from critical care;
- to share critical care skills with staff in wards and the community.

1.4 National Outreach Forum

The National Outreach Forum (NORF) developed with the support of the NHS Modernisation Agency, to bring together key stakeholders in the field of critical care outreach in order to determine, represent, and disseminate their views. NORF has representatives from the twenty-nine critical care networks in England, and from Allied Health Professions (AHP), the British Association of Critical Care Nurses, Critical Care Information Advisory Group, Intensive Care National Audit and Research Centre, Intensive Care Society, and Royal College of Nursing Critical Care Forum.

1.5 Aims of Report

This report has been written by members of NORF, drawing on the expertise of clinicians in acute care and critical care outreach throughout the country. It is intended for

multi-professional use and may be used to inform operational and business planning of acute services. The main aims of the report are:

- to highlight good practices,
- to offer practical guidance regarding the establishment, maintenance and development of outreach services.

The key points identified in this document have been drawn from current evidence and effective outreach practice. In accordance with the approach outlined in 'Shifting the balance of power' the key points are to enable Trusts to meet local and national priorities in developing outreach services

(<http://www.doh.gov.uk/shiftingthebalance/>).

NORF acknowledge the work of the Intensive Care Society, publishers of the 'Guidelines for the introduction of Outreach Services (2002a), and 'Levels of critical care for adult patients' (2002b). This report aims to complement and build on those guidelines.

The report is divided into five main sections:

- Outreach service configuration and processes,
- Education,
- Physiological 'track and trigger' warning systems,
- Post-hospital follow-up,
- Audit and evaluation.

1.6 Critical Care Outreach: Evidence

There is evidence that severe illness is often predictable and that prompt, expert treatment improves outcomes. For example:

- Basic vital signs (e.g. respiration, heart rate, level of consciousness) can identify patients with an increased risk of dying. A study of 433 ward patients showed

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those with normal vital signs had a negligible risk of death in the following month, those with 2 abnormalities had 9.2% mortality; those with 3 or more abnormalities had 21.3% mortality (Goldhill and McNarry, 2003: Appendix 2).

- Patients who suffer cardiopulmonary arrest usually have abnormal vital signs many hours before the event (Schein et al, 1990).
- Early thrombolysis for acute myocardial infarction reduced mortality and morbidity in the GUSTO trial of 41,021 patients (Newby et al, 1996).
- Early, aggressive therapy reduced mortality from 46.5% to 30.5% in severe sepsis and septic shock (Rivers et al, 2001).

There is still relatively little published research to directly support the outreach approach as a means of addressing these issues (Cuthbertson, 2003); but some positive reports are now in print or in press:

- Observational study of an outreach service linked to four surgical wards in Leeds General Infirmary found unplanned transfers from the four wards to intensive care were significantly reduced, and ICU mortality significantly improved compared to a similar period before the service was introduced (Pittard, 2003). In addition, average length of stay decreased from 7.4 to 4.8 days. There were no significant changes in these measures for patients from wards not offered the service.
- The Royal Free Hospital in London compared a year before and the year after introduction of an outreach service (Ball and Kirkby, in press). The service follows-up all discharges from critical care: 546 patients from July 2001 to February 2002. Hospital mortality significantly improved (14.7% from

22.7%), and re-admissions were reduced from 12.8% to 5.8%.

- However, re-admissions into critical care at Norfolk and Norwich University Hospital had not changed since introduction of an outreach service (Leary and Ridley, 2003).

Interpretation of the impact of critical care outreach must be undertaken with reference to the particular model and location of service under scrutiny. Leeds General Infirmary and Norfolk and Norwich University Hospital both reported services operating during normal working hours – with contrasting results, while the Royal Free Hospital outreach team works a twelve-hour daytime service, seven days a week (Pittard, 2003; Ball and Kirkby, in press; Leary and Ridley, 2003).

1.7 Limits to Critical Care Outreach

Many of the problems that critical care outreach seeks to address are symptomatic of a historic failure to recognise the increasing numbers of at-risk and acutely ill patients distributed throughout the acute hospital. This has been compounded by a failure to adequately equip the workforce that must identify and care for such patients.

- 42% of 3,446 newly qualified doctors indicated that their training did not fully prepare them for their clinical responsibilities (Goldacre et al, 2003).
- Nurses record deteriorations (McGloin et al, 1998), but are not usually empowered to directly intervene.
- Reductions in junior doctors' hours and continuing difficulties in the recruitment and retention of skilled staff are also factors.

*The Intensive Care Society (2002a) asserts that outreach services are **not** a substitute for insufficient critical care beds, poor ward facilities, or inadequate staffing.*

1.8 Future Evaluation

There is still much to be done to delineate the benefits of critical care outreach, beginning with identification of the most appropriate outcome measures. At the time of press, the NHS Service Delivery and Organisation (SDO) Research & Development Programme of the London School of Hygiene and Tropical Medicine is considering proposals for a 3-year, multi-centre study to evaluate outreach services in critical care, asking:

- "Have critical care outreach services achieved the essential objectives set for them in ... Comprehensive Critical Care?"
- What have been the resource implications of the introduction of outreach services?
- What have been the implications of outreach beyond critical care?

The National Co-ordinating Centre for NHS SDO R&D (NCCSDO) is based at London School of Hygiene and Tropical Medicine, 99 Gower Street, London WC1E 6AZ. Information about the project can be found at http://www.sdo.lshtm.ac.uk/pdf/evalmodels_criticalcare_brief.pdf.

SECTION 2: SERVICE CONFIGURATION AND PROCESSES

2.1 Philosophy

Critical care outreach services have developed in various ways depending on local priorities and resources. Whichever model is chosen, outreach should form part of a co-ordinated approach to the support of all patients with a need for critical care. This concept is underpinned by the belief that all at-risk and critically ill patients are entitled to timely and appropriate care wherever they are located. Individual organisations have found it useful to create explicit philosophies (see Appendix 1: City Hospital, Birmingham Outreach Philosophy).

2.2 Aims of Outreach Services

The Department of Health *Comprehensive Critical Care* document (2000) gave three objectives for critical care outreach:

2.2.1 To avert admissions to critical care by identifying patients who are deteriorating and either helping to prevent admission or ensuring admission to a critical care bed happens in a timely manner to ensure the best outcome.

The Royal Free Hospital critical care outreach team has reduced the critical care readmission rate from 12.8% to 5.8% patients readmitted (Ball and Kirkby, in press). Contact Dr Carol Ball, Consultant Nurse in Critical Care, Royal Free Hospital, London carol.ball@rfh.nthames.nhs.uk.

2.2.2 To enable discharges by supporting the continuing recovery of discharged patients.

Daly et al (2001) produced a triage model to identify patients at risk from inappropriate discharge from intensive care. 'Premature' discharges or those occurring out of hours are identified as having worse outcomes (Goldfrad and Rowan 2000, Daly et al 2001). Services supporting discharged patients may improve these outcomes.

Park et al (2003) from Addenbrooke's NHS Trust report follow-up ward rounds reviewing patients discharged from ICU, identifying and managing a range of problems that had not previously been addressed. These included oxygen therapy given incorrectly, infected central venous catheters, poorly controlled pain, drug regimes that should have been stopped or were inappropriate – and other treatments that should have been started. Sixteen potential or actual adverse events were identified and managed. In addition, counselling and other follow-up was arranged for patients with psychological distress; and plans for longer-term care were formalised.

2.2.3 To share critical care skills with staff in wards and the community (see Education Section).

2.3 Configuration of the Outreach Service

The service model selected should be based on local needs analysis encompassing such factors as:

- which patients are at risk of critical illness,
- the location of such patients,
- clinical governance and risk management issues, e.g. complaints, adverse incidents, morbidity and mortality.

A point prevalence study gives a snapshot view of the location of patients with physiological derangements and their hospital mortality. (See Appendix 2: Point prevalence study from the Royal London Hospital.)

The model selected will be further influenced by:

- patient case-mix,
- skills of personnel,
- proposed hours of service,

- size of Trust (including split site issues),
- existing services; e.g. pain teams, nutrition teams, tracheostomy specialist practitioners, respiratory specialists involved in non-invasive ventilation, renal specialists, night teams,
- training facilities for nursing, medical and AHP staff,
- service location and equipment needs including information technology,
- potential sources of funding.

2.4 Key Features of Outreach Work

The National Outreach Survey (2002) identified key features of outreach work:

- audit and evaluation of key issues in individual organisations,
- critical care education and training for general ward staff,
- use of physiological track and trigger warning systems,
- telephone 'hot line' advice,
- post-critical care discharge follow-up (in-hospital),
- post-critical care discharge follow-up (outpatient),
- direct bedside clinical support – for varying periods,
- shared services, e.g. with the acute pain team.

Of the 167 survey respondents (response rate 70%), 119 were currently delivering an outreach service.

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Percentage of 167 respondents to the National Outreach Survey (2002) engaged in different strands of outreach work

Service component	Selected days only	Weekday working hours 0800–2200 hours	24 hours per day, 7 days per week
Follow-up of discharged level 2 and 3 patients on general wards	13%	60%	24%
Direct clinical support service to wards	8%	50%	34%
Education and training	19%	53%	19%
Post-hospital follow-up of discharged level 2 & 3 patients		34%	

- The National Outreach Survey (2002) showed that critical care outreach is delivered very variably across the country. Some Trusts do not provide any sort of outreach service, and some employ just one dedicated individual for outreach work. However, a significant number of Trusts offer critical care education for general ward staff as well as undertaking needs analysis and audit. In addition to these fundamental activities, many hospitals employ physiological track and trigger warning systems to assist in the timely identification and management of critically ill patients. A smaller number supplement these functions with periodic direct bedside support during the working week, often focussing on post-critical care discharge follow-up. Only a small minority of Trusts provide 24 hour bedside support while still engaging in education, audit, and use of track and trigger warning systems.

2.5 Developing an Outreach Service

These processes might be viewed as a 'natural' progression of services, i.e.,

- Critical care education for general ward staff,
- Organisational needs analysis and audit,

- Implementation of physiological track and trigger warning systems,
- Post-critical care discharge ward follow-up,
- Periodic direct support at the bed-side during the working day,
- Direct support at the bedside, all-day, every day.

Services may be developed incrementally, using clinical evidence to support the addition of further components. Clinicians may need to reach a consensus view about the best service configuration for their Trust. This includes clarification about who is ultimately responsible for the care of specific patients, ensuring that parent teams remain key stakeholders in the management of patients on general wards and are central in any communication process.

2.6 Outreach team configurations also vary between Trusts regarding the number, grades and disciplines of staff involved in service delivery. There is no definitive evidence to support particular team structures; however, the expertise required within the team is highlighted in section 3.16. Local requirements and existing services should determine the team structure.

2.7 Allied health professionals play a fundamental role in outreach services. Some teams have a part or fully funded physiotherapist. Southampton University Hospital has a pharmacist specialising in critical care who supports the outreach team in resolving medication issues at the ward/ICU interface; e.g. by ensuring common ward and ICU medication guidelines, and providing support with patient group directions (contact Mark Tomlin, mark.tomlin@suht.swest.nhs.uk).

2.8 Three examples illustrate team configurations developed to meet local needs:

Example 1 Central Manchester and Manchester Children's University Trust focuses on education, use of an early warning tool and follow-up of patients after discharge from critical care (see Appendix 3).

Example 2 Southampton University Hospitals Trust provides a 24 hour/seven day a week comprehensive service (see Appendix 4).

Example 3 University Hospital Birmingham Outreach and Acute Pain Teams provide a combined service (see Appendix 5). Common features and challenges are shared by acute pain teams and outreach services (Counsell, 2001) although differences in the role of the acute pain team "may not always bear amalgamation with outreach" (Morgan and Lawler, 2002).

2.9 Enabling Staff to Meet the Aims of Outreach

Local needs assessments will underpin the development and working practices of outreach services. Nurses, Allied Health Professionals and Health Care Assistants work closely with patients and are usually first to record deteriorations, but are rarely empowered to make appropriate interventions. Therefore, local organisations should consider how they can best support

outreach personnel and ward staff to deliver effective care; e.g. by enabling prompt administration of fluids and oxygen, and referral for diagnostic tests such as chest X-rays and arterial blood gases. The goal is to facilitate essential treatment when needed, but with proper safeguards for patients and staff, and consideration of professional and legal issues.

- Guidelines, protocols and algorithms can inform both the assessment and treatment of critically ill patients, and may be used to enable agreed interventions in defined situations; e.g. UCL Hospitals have devised algorithms for the outreach team to use in such cases as tachycardia, hypotension, breathlessness (see Appendix 6 for example).
- Patient group directions are used in some Trusts to allow nurses and AHPs to supply and administer medications. Future additions to the Nurse Prescribers' Extended Formulary may support further development.

2.10 Planning and Funding Outreach

Outreach services form part of a whole systems approach to the delivery of care. Critical Care Networks can provide valuable advice when planning the service and help to inform Primary Care Trusts (PCTs) and commissioning groups on performance against criteria defined within Local Delivery Plans (LDPs), Service Level Agreements (SLAs) or contracts.

In most cases, critical care outreach services will need dedicated funding for proper implementation. The mechanisms of all critical care funding are currently under review, but one proposal is that critical care outreach support for acute ward patients may be included in the national tariff for inpatient Healthcare Resource Groups: see Department of Health Technical Paper (July

2003) 'Critical Care Funding and Payment By Results' (<http://www.doh.gov.uk/nhsfinancialreforms/technicalpapers/criticalcaretechnicalpaper300703.PDF>).

2.11 Key points

2.11.1 Outreach is delivered variably across the country. A large proportion of hospitals provide critical care education for ward-based staff, and also use audit to determine important issues (National Outreach Survey 2002). Development of outreach processes might be viewed as a progression of services:

- Critical care education and training for general ward staff,
- Audit and evaluation of key issues in individual organisations,
- Use of physiological track and trigger systems,
- Direct support at the bed-side for varying periods,
- Direct support at the bed-side all-day every day.

2.11.2 Different forms of outreach service have evolved depending on local priorities and resources. A co-ordinated, whole hospital approach to appraising need is essential. Further research is required to identify the most effective service configuration(s).

2.11.3 Local organisations, should consider how they can best support outreach personnel and ward staff to deliver effective care; e.g. by enabling prompt administration of fluids and oxygen, and referral for diagnostic tests such as chest X-rays and arterial blood gases by appropriate persons. The goal is to facilitate essential treatment when needed, but with proper safeguards for patients and staff, and consideration of professional and legal issues. Patient group

directions are used in some Trusts for fluid, medication and oxygen administration. Future additions to the Nurse Prescribers' Extended Formulary may support further development.

2.11.4 In most cases critical care outreach services will need dedicated funding for proper implementation.

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SECTION 3: EDUCATION

3.1 Patients at-risk, deteriorating, or recovering from critical illness are not always well managed: sub-standard care is seen in failures to optimise essential functions – airway, breathing and circulation, oxygen therapy, fluid balance, monitoring (McGloin et al, 1999; Neale et al, 2001).

3.2 Organisational problems, inadequate supervision, failure to seek advice and poor communication compound the situation, but significant deficits in fundamental skills and knowledge are also major factors. Current education does not properly equip healthcare providers to care for critically ill patients, particularly those outside designated critical care departments (Smith and Poplett 2002). For example, UK medical schools have only recently delivered universal training in basic life support (Soar et al, 2003).

3.3 These issues are acknowledged by the General Medical Council (GMC) in the document 'Tomorrow's doctors' (2002), stating that medical graduates "must know about and understand the principles of treatment including ... "recognising and managing acute illness".

3.4 The key goal is that all staff providing acute care should recognise basic signs of deterioration (e.g. reduced consciousness, difficulty in breathing, circulatory compromise) and also that they appreciate the necessity of obtaining timely and appropriate help.

3.5 Over and above this minimum requirement, good practice indicates that individual organisations should undertake education and training needs analyses to identify particular areas of risk. This may include for example, discussions with clinical staff, examination of adverse incidents and complaints, or review of referrals to specialists.

3.6 The aim is to develop cohesive educational plans for individual organisations and sectors, with local workforce development confederations and education providers, so that staff are prepared to address the particular needs of critically ill patients throughout the hospital.

3.7 Common problems in acute care that require attention

3.7.1 *The basic understanding of applied physiological and pathological processes* – e.g. respiratory function, circulation, renal system, etc; particularly with regard to acute care. Appraisal of pre-registration/undergraduate training for all healthcare personnel involved with critically ill patients at any stage is needed, with guidelines similar to the GMC above (section 3.3) applied as necessary.

3.7.2 *Poor quality recording and interpretation of vital signs observations* – can be dealt with by practical, competency-based training aimed at explaining the importance and interdependence of patient observations. Such instruction ought to be an integral part of training of all acute health care providers, reinforced by written standards of patient observation in hospital wards.

3.7.3 *Failure to appreciate the seriousness of the patient's condition* – may be overcome with Primary Survey Model training focusing on the early recognition of deterioration, prompt initiation of treatment, and communication with experienced colleagues; e.g. the A(irway)-B(reathing)-C(irculation)-D(isability)-E(xposure) approach taught on the Acute Life-threatening Events – Recognition and Treatment (ALERT) course (Smith et al, 2002).

3.7.4 *Failures to promptly obtain appropriate assistance* – have structural and process aspects but also educational components.

The Royal College of Physicians (2002) recommends "systems should specify the point at which the personal involvement of consultant medical staff is mandatory". Proper use of these systems requires agreement by stakeholders and training for all staff affected.

3.8 Organisations should ensure dissemination of the necessary skills for all relevant staff to identify and begin treatment of acutely ill patients at the earliest stage of their deterioration, and during recovery from critical illness. The goal is that general ward staff will eventually need lesser support from outside. Courses may be undertaken from the increasing portfolio of national courses (see below), or organised locally based on locally set priorities.

For example, O'Riordan et al (2003) describe a critical care course for ward nurses, taking 1 day a week over 5 weeks. The course covers the practicalities of patient assessment, revision of respiratory and cardio-vascular anatomy and physiology, peri-operative care, the shocked patient, transfer of the critically ill patient; basic cardiac monitoring, central venous pressure monitoring and care of patients with tracheostomies.

3.9 There are benefits to combining resources across Trusts and networks. For example, the Greater Manchester Network, in collaboration with the Workforce Development Confederation, collectively designed a complete set of critical care competencies and an educational programme to deliver these, accessible to all staff in the area (Greater Manchester Multi-Professional Critical Care Programme: http://www.gmconfed.org.uk/core_developments/lead/criticalcare/programme.html). Similarly, a pan-London competency framework for critical care, developed

through the London Standing Conference aims to serve the whole range of practitioners in these areas, focusing on patient need for particular levels of critical care. (Bench et al, 2003).

3.9.1 The Department of Health (2000) stated that "high dependency care training for [all] ward staff should be set up: 50% by the March 2002 and 100% by March 2004." Similarly the Royal College of Physicians working party (2002) described educational requirements of Post registration House Officer and Senior House Officer level doctors, "which depart from organ system-based training in favour of an approach based on the recognition of the significance of physiological perturbations." Continuing education is needed at every level, including updates for more senior consultant staff.

3.10 Existing Educational Methods and Resources

Acute care and critical care training courses for nurses or AHPs are generally run through particular universities, across a district or network, or within individual organisations. Consequently, there are few detailed, nationally agreed standards. Therefore, acute hospitals need to have a clear view of the critical care education needed by their staff, and to have quality assurance systems that monitor the acquisition of key skills. There are advantages in different disciplines learning together in order to emphasise the importance of also working collaboratively in practice.

3.11 Education providers should provide training that can be agreed against quality assurance criteria. Ultimately, national professional organisations, Royal Colleges and professional regulatory bodies may indicate minimum standards of patient care and clinical competence. However, standards and competencies should focus on addressing the needs of the critically ill

patient rather than describing the traditional practices of different health care providers.

3.12 It appears that many staff have difficulty with the practicalities of managing acutely ill patients. Therefore, education must integrate appropriate theory with opportunities to practise key psychomotor skills, ideally with work in simulated or real clinical situations. In the future, clinical simulators may have a particularly useful role in such training.

3.13 Some acute care courses are widely available:

- Basic Life Support (BLS) Courses,
- Advanced Cardiopulmonary Resuscitation Courses (Resuscitation Council, UK; Advanced Life Support Group) www.resus.org.uk,
- Immediate Life Support Course (ILS). www.resus.org.uk,

- Acute Life-threatening Events – Recognition and Treatment (ALERT) Course,
- Care of the Critically Ill Surgical Patient (CCrISP) course,
- Early Trauma and Critical Care Course,
- Ill Medical Patient Acute Care and Treatment (IMPACT) Course.

3.14 A proposed integration of undergraduate and postgraduate teaching for doctors illustrates the co-ordination that is necessary and may be a model for other disciplines too.

Suggested components of an undergraduate core medical curriculum showing how these might be integrated with other elements in undergraduate and postgraduate training.

Grade	Content	Training
Undergraduate		
Year 1-2	Basic life support and AED	BLS/AED training programme
Year 3	Care of the acutely ill patient	ALERT Course or similar Accident and Emergency Medicine Acute medicine and surgery
Years 4 and 5	Intermediate training in resuscitation. Practical skills in acute medicine and perioperative care	Immediate life support course (ILS) ALERT Course or similar Anaesthesia Intensive Care Medicine Speciality medical training
PRHO	Providing safe acute care	ILS/ALERT revision
Postgraduate	*	*
Foundation year SHO	Advanced Life Support (ALS)	ALS
Basic speciality training SHO	Speciality specific critical care courses	FCCS (Intensivists) CCrISP (Surgeons) IMPACT (Physicians)

Gary Smith: Consultant Intensivist Portsmouth Hospitals

AED = Automated External Defibrillator

FCCS = Fundamental Critical Care Support course

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3.15 Education for Critical Care Outreach Personnel

Outreach personnel roles depend on patient need and existing services. To date, service leads and staff have mostly had a nursing background in critical care, but other disciplines with appropriate skills are also needed (e.g. physiotherapists, dieticians, pharmacists, speech and language

therapists). Experienced ward nurses are invaluable, and can also offer insights into general ward issues. Key skills can be acquired in clinical practice, particularly when facilitated by experts in particular areas. The courses described in sections above may be useful, or there may be specific programmes organised for outreach staff.

3.16 Suggested skills for outreach service personnel

Suggested skills for outreach service personnel are presented below, but should be informed by local needs analysis

Clinical Skills

- Critical care/acute care experience is essential, in order to provide expert physical assessment and give advice on the correct course of action for sick ward patients (e.g. chest auscultation, interpretation of blood results, ECGs, etc). Advanced resuscitation training is essential.
- Venepuncture for blood sampling and cannulation for fluid and drug administration.
- Competence in management of patients requiring respiratory support, so as to provide proper advice and support (e.g. regarding CPAP, non-invasive ventilation, care of tracheostomy).
- Knowledge of nutritional needs of critically ill patients and those recovering from critical illness.
- Good communication skills to facilitate liaison between outreach service personnel, ward areas and other specialists.
- Understanding of physical, cognitive and psychological problems following critical illness.
- Knowledge of likely medication needs of the critically ill patient.
- Accountability, legal and ethical awareness.

Skills in Education and Training

- The effective sharing of critical care skills is crucial, as are organisational skills required for the planning and delivery of Trustwide education in critical care.

Research and Audit

- Audit skills to ensure evaluation, development, and reporting of the service.
- Research skills to develop evidence-based practice, formulation of guidelines and protocols.

3.17 Education: Key Points

3.17.1 Individual organisations should undertake education and training needs analyses to identify particular areas of risk.

3.17.2 Individual organisations should develop coherent educational strategies with local workforce development confederations and education providers, so that staff are properly prepared to address the needs of critically ill patients.

3.17.3 Organisations should ensure dissemination of the necessary skills for all relevant staff to care for acutely ill patients at the earliest stages of their deterioration, and also during recovery from critical illness.

3.17.4 Training should be delivered against agreed quality assurance criteria. Ultimately, it may be necessary for national professional organisations, Royal Colleges and professional regulatory bodies to indicate minimum standards of patient care and clinical competence.

3.17.5 The fundamental goal is that all staff providing acute care can recognise basic signs of deterioration and appreciate the necessity of obtaining timely and appropriate help.

SECTION 4: PHYSIOLOGICAL TRACK AND TRIGGER SYSTEMS

4.1 Diligent, skilled monitoring of patients' physiological vital signs, with timely and appropriate response to abnormalities, are fundamental to the pre-emptive care of patients with established or potential critical illness.

Terminal cardiovascular, respiratory and neurological collapse is often preceded by a period of abnormal physiological observations, during which time potential life saving therapeutic interventions might be initiated (Schein et al, 1990). However, in recent years the 'routine' monitoring of basic physiological observations in acute wards has failed to generate effective, timely clinical intervention for some sick patients (McQuillan et al 1998, Goldhill et al 1999).

4.2 In the mid 1990s 'calling criteria' based on physiological observations were introduced in an effort to secure timely help for the critically ill (Lee et al 1995, Morgan et al 1997).

Early Warning Scoring systems (EWS) are based upon the allocation of 'points' to physiological observations, the calculation of a total 'score' and the designation of an agreed calling 'trigger' level (Morgan et al 1997, Stenhouse et al 1999, Subbe et al 2001). Other calling criteria, based upon routine observations, are activated when one or more variables reaches an extreme value outside the normal range. To avoid ambiguity all warning systems based upon physiological observations will be referred to as 'physiological track and trigger warning systems' within this text.

4.3 Critical care outreach aims to ensure equity of critical care support for all patients. The use of physiological track and trigger warning tools seeks to enhance equity by giving:

- timely recognition of **all** patients with potential or established critical illness irrespective of their location;

- Timely attendance to **all** such patients, once identified, by those possessing appropriate skills, knowledge and experience.

4.4 Classification of Track and Trigger Warning Systems

Physiological track and trigger warning systems may be classified as follows:

4.4.1 'Single parameter' systems:

Tracking: Periodic observation of selected basic vital signs.

Trigger: One or more extreme observational values.

Example 1: Single Parameter Track and Trigger Warning System *The Princess Alexandra Hospital NHS Trust Critical Care Outreach Team Patient Assessment using the HOT (Harlow Outreach Team) Tool*

A patient who fulfils any one or more of the criteria below or is causing concern, needs urgent intervention.

BREATHING

Respiratory rate of less than 8 or greater than 25/min

Oxygen saturation less than 90% despite oxygen

PaO₂ of less than 8 kPa on an arterial blood gas sample despite oxygen

CIRCULATION

Pulse of less than 45 or greater than 125/min

Systolic blood pressure of less than 90 or greater than 200 mmHg, or a sustained fall of greater than 40 mmHg from patient's normal value

pH of less than 7.3

Base Excess of lower than -7 mmol/l

RENAL

Urine output less than 30 ml/hr for 3 consecutive hours

Evidence of deteriorating renal function

CONSCIOUS LEVEL

Patient does not respond to voice

Glasgow Coma Score of 8 or less

OR

Patient looks unwell or you feel worried about their clinical condition

Care of all patients remains the responsibility of the admitting team

Phone **2222** and ask for the **Critical Care Outreach Team**

Contact: Sarah Starr, Nurse Consultant Critical Care, Princess Alexandra Hospital NHS Trust, Hamstel Road, Harlow, CM20 1QX, Tel: 01279 827251. E-mail: sarah.starr@pah.nhs.uk

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4.4.2 Multiple parameter systems:

Tracking: Periodic observation of selected basic vital signs.

Trigger: Two or more extreme observational values.

Example 2: Multiple Parameter System: Barking, Havering & Redbridge NHS Trust S.E.C.S. (System for Evaluating Critically Sick)

Systolic Blood Pressure	<101	>200
Respiratory Rate	<9	>20
Heart Rate	<51	>110
Saturation (room air)	<90%	
Urine output	<1ml/kg/2 hours	
Conscious level	Not fully alert	

If a patient fulfils **two or more** of the above criteria **OR** you are worried about their condition **BLEEP** the **Registrar** from the admitting team and the **Outreach Sister (899)**

These two parties **MUST** review the patient within **thirty minutes**

Contact: Dr. Peter Walker, Consultant Intensivist, Anaesthetic Department, Barking, Havering and Redbridge NHS Trust. Tel: 017708 708443

4.4.3 "Aggregate weighted scoring" systems:

Tracking: Periodic observation of selected basic vital signs and the assignment of weighted scores to physiological values with calculation of a total score.

Trigger: Achieving a previously agreed trigger threshold with the total score.

Example 3: The Modified Early Warning Score (MEWS): MEWS Score Table Queens Hospital, Burton Hospitals NHS Trust

Score	3	2	1	0	1	2	3
RR		<8		9-14	15-20	21-29	>30
HR		<40	40-50	51-100	101-110	111-129	>130
BP	<45%	<30%	<15%	Normal for patient	>15%	>30%	>45%
CNS				Alert	Responds to voice	Responds to pain	Un-responsive
TEMP		<35.0		35-38.4		>38.4	
URINE		<0.5 ml/kg/hr	<1 ml/kg/hr		>3 ml/kg/hr		

Trigger level – score 4 for surgical patients, with an adjustment for medical patients

Contact: Sandra Coates, Nurse Consultant, Intensive Care Department, Queens Hospital, Burton Hospitals NHS Trust, Belvedere Road, Burton On Trent. Staffs. DE13 0RB.

* In theory aggregate scoring systems may not trigger in the event of an isolated variable only falling outside the scoring range (e.g. MEWS would not trigger with respiratory rate of less than 8 in the absence of any other physiological derangement). Thus far this theoretical consideration has not been reported as a practical problem.

4.4.4 'Combination' systems:

Elements of single or multiple parameter systems in combination with aggregate weighted scoring

Example 4: Combination Track and Trigger Warning System: Kingston Hospital. Deranged Physiology Scoring: maximum score = 40, minimum score = 5

If ANY vital sign is in 'alert' zone or becomes significantly abnormal, complete Deranged Physiology Score and follow guidelines regarding specific risk band

Score	8	4	2	1
Risk bands	Normal	Observe	Warning	Emergency
Coma score	Alert	responds to Voice	responds to Pain	Unresponsive
Respirations (min⁻¹)	10-20	21-30	31-40	>40
		8-9	6-7	<6
SpO₂ on air (%)	>95	90-95	80-89	<80
Systolic BP (mm Hg)	100-180	90-99	80-89	<80
Pulse (min⁻¹)	50-115	116-125	126-140	>140
		45-49	30-44	<30

The most abnormal finding places the patient in the associated risk band.

Always seek advice if you are concerned about a patient for any reason.

Note re. BP: systolic BP >200 mm Hg requires consideration – is it normal for patient?

Is pain a factor? A >25% drop from normal systolic BP places patient in 'Observe' risk band.

Risk band 'Normal'

Risk band 'Observe' – moderate deviation from normal.

Level I Action – PRHO/SHO from parent team (or any available doctor) should review in <60 mins. Consider level II action. Re-review in <4hours.

2–4 hourly respirations, SpO₂, pulse, BP, temp., urine; (DPS in notes).

Risk band 'Warning' – significant deviation from normal.

Level II Action – PRHO/SHO from parent team (or any available doctor) should review in <15 mins. Senior doctor must re-review in <30 mins. Consider outreach service.

Consider ICU (consultant to consultant); or if not, DNAR.

< hourly resps., SpO₂, pulse, BP, temp., urine; ABG, FBC, U&E; ECG; ? CVP; (DPS in notes).

Risk band 'Emergency' – dangerous deviation from normal.

Level III Action – Registrar or equivalent from parent team (or any available Doctor) should review immediately, and request the urgent help of more experienced Doctor. Consider outreach service.

Note high risk of cardio-pulmonary arrest. Consider ICU; if not, DNAR.

< hourly resps., SpO₂, pulse, BP, temp., urine; ABG, FBC, U&E; ECG; ? CVP; (DPS in notes).

For further details of this system (and associated vital signs observation chart). Contact John Welch, Consultant Nurse, Critical Care, Kingston Hospital, Surrey: John.Welch@kingstonhospital.nhs.uk.

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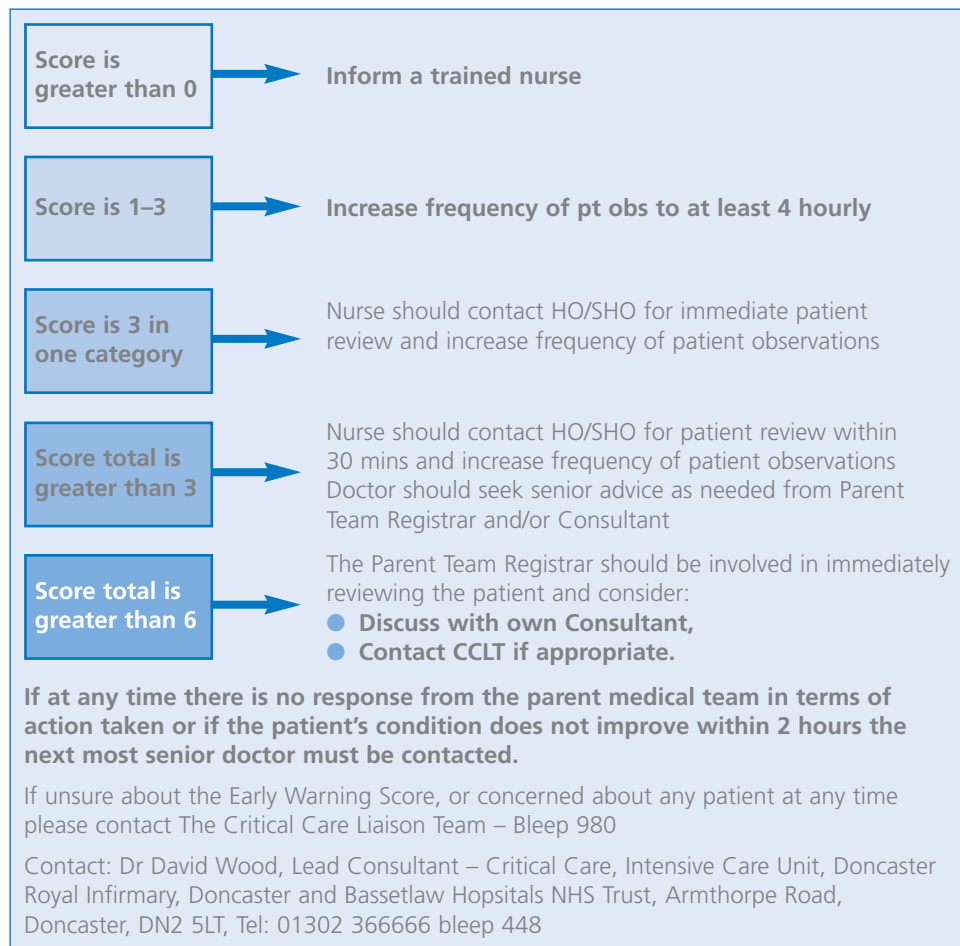
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4.5 Referral Algorithms

When a patient's observations reach a given trigger threshold, the action required of attending staff should be unambiguous. Such actions will depend on the availability and nature of a critical care outreach service. Some hospitals provide clear guidance for ward nurses authorising the initiation of investigations or basic interventions depending upon specific physiological observation(s).

An algorithm may direct ward staff to increase the frequency of vital signs observations or to call the 'parent' medical team and/or the critical care outreach service if available. In some cases a maximum response time is specified.

Referral algorithm example: Doncaster Royal Infirmary



4.6 Track and Trigger Secondary Survey Results

4.6.1 A telephone survey in relation to the use of track and trigger warning systems was performed by NORF subgroup members in the spring of 2003.

A full breakdown of survey results can be found in the Appendix 7.

4.6.2 Chosen Models:

Most units utilising track and trigger warning systems employed an aggregate weighted score model. The majority of responding hospitals had initiated their use of track and trigger warning since the publication of *Comprehensive Critical Care* (DOH 2002).

4.6.3 Range of physiological parameters in use:

All responding hospitals utilised respiratory rate, systolic blood pressure and heart rate as part of their track and trigger system. The majority also included assessment of level of consciousness, some measure of urine flow and temperature. A minority included oxygen saturation and pain as additional parameters.

Supplementary scoring/trigger parameters including biochemical abnormalities and a 'Nurse Concern' component are also included in some Trusts.

4.6.4 Selection of Patients:

The majority of respondents using track and trigger systems applied their system to all patients with a significant minority applying their system to selected groups of patients only (see section 4.11)

4.6.5 Impact of Track and Trigger on the Quality of Routine Observations:

A substantial majority of respondents reported an improvement in the quality of their routine ward observations with the implementation of track and trigger systems.

4.6.6 Staff completing bedside observations (data from 55 hospitals):

In a small minority of responding hospitals only Registered Nurses are authorised to record vital signs. In the remainder health care assistants and/or nursing auxiliaries completed bedside observations with or without the support of registered nurses (RNs). Student nurses also participate in some cases.

4.6.7 Referral algorithms for use with track and trigger warning:

A significant number of hospitals declared the use of a referral algorithm for use in conjunction with physiological track and trigger warning with the majority citing the parental medical team as the first point of referral for patients who trigger the system.

Where critical care outreach services are available they may be accessed alongside the parent medical team or called independently, especially when Senior House Officer or Specialist Registrar are otherwise committed (National Outreach Survey 2002).

4.6.8 Occurrence of false negatives ('undetected' sick patients):

Most hospitals reported occurrence of false negatives with track and trigger warning, though the majority occurred through failure to apply the system and its accompanying algorithm correctly. Some false negatives arose in specific patient groups (Appendix 7).

Very few hospitals reported formal auditing of the occurrence of false negatives with their chosen models of track and trigger warning.

4.6.9 Alternative methods of identifying patients at risk:

A number of respondents identified complementary methods of identifying patients that might benefit from critical care outreach services (Appendix 7).

4.7 Evidence of Benefit to Patients

The secondary survey fails to reveal evidence of randomised controlled trials undertaken to confirm overall outcome benefits to patients from the use of track and trigger warning systems. This is likely to be a reflection of the many confounding influences affecting 'global' outcome measures for critically ill patients.

However, many Trusts report evidence of the benefit of track and trigger warning systems, in improving single process steps in care of the critically ill.

- Improved frequency and quality of routine physiological observations. Contact: Joyce Jordon, Critical Care Outreach Nurse, Southport and Formby DGH, Southport, PR8 6PN, Tel: 01704 547471. e-mail: joyce.hankinson@southportandormskirk.nhs.uk
- Reduced delay in admission to ICU from median 15.5 hrs on wards without MEWS track and trigger monitoring to 5.5 hrs on wards with the tool in use. Contact: Joyce Hankinson, as above.
- Reduction in APACHE scores on admission to Critical Care (Stenhouse et al 2002). Contact: Sandra Coates, Nurse Consultant, Critical Care Directorate, Queens Hospital, Burton on Trent, DE13 0RB, Tel: 01283 566333 ext 4099.
- Reduction in length of stay on Medical Admissions Unit. Contact: Sarah Ingleby, Critical Care Outreach Co-ordinator, Manchester Royal Infirmary, Manchester M13 9WL. Tel: 0161 2761234 pager: 07659 510587.
- Improved communications between health care professionals caring for sick patients. Contact: Tom Andrews, Research Assistant, School of Nursing, Midwifery, and Health Visiting, Gateway House, Piccadilly, Manchester. M60 9PL.

Tel 0161 2372574.

email tom.andrews@man.ac.uk

- Anecdotal information from the secondary survey shows that whichever type of track and trigger warning systems is in use, beneficial effects such as those listed above are more likely to be realised if the tool is embedded in everyday use, for instance by amalgamation into the normal hospital observation chart.

4.8 Choosing a Track and Trigger Warning Tool

In assessing the suitability of any given track and trigger model to meet local needs the following approach is recommended:

- Consider the balance between universal applicability of simple systems and the increased complexity of systems with enhanced sensitivity.
- Consider the potential impact of the chosen system on the quality and frequency of physiological observations.
- Consider the potential impact of the chosen system on the timely identification of patients with potential or established critical illness.
- Consider the context within which the system will be used. The requirements of a track and trigger warning tool will differ between hospitals without a critical care outreach service, where ward staff are required to identify and resolve all issues, and those with a 24 hour outreach service. Similarly, hospitals with extensive critical care facilities will have different needs from those without critical care beds.

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- Consider the orientation and training needs of ward staff conducting bedside observations with particular emphasis on health care assistants and nursing auxiliaries.
- Consider the agreed trigger threshold for seeking senior help. This should be clearly linked to a referral algorithm that ensures timely and experienced clinical review, therapeutic intervention and monitoring.
- Consider the establishment of a maximal response time.
- Consider supplementary referral mechanisms which may be helpful in identifying sick patients in addition to track and trigger warning, such as referral from specific diagnostic groups, or of patients generating abnormal pathology results.
- Consider potential adaptations to the referral algorithm for critical care outreach support enabling automatic referral for specific groups of patients.
- Address the essential requirement for local audit, evaluation and refinement before and after track and trigger implementation. The effectiveness of the chosen track and trigger model should be evaluated against the minimum audit criteria set out below.

4.9 Different Patient Groups

There is some evidence that different patient groups may require a different profile of physiological weightings and trigger thresholds for optimal track and trigger effectiveness e.g.

- General surgery, vascular, general medicine and care of the elderly.
Contact: Lesley Durham, Nurse

Consultant, Critical Care, Sunderland Royal Hospital, City Hospitals Sunderland NHS Trust, Kayll Road, Sunderland, SR4 7TP. Tel: 0191 5656256 bleep 52250.

- General Medical Patients:
Contact: Chris Subbe, Departments of Medicine and Critical Care, Wrexham Maelor Hospital, Wrexham Tel: 01978 291100.
- Renal patients.
Contact: Alison Dinning and Glyn Hudson, Outreach Team – Critical Care, Nottingham City Hospital NHS Trust. Tel: 0115 9691169 ext 47708 bleep (80) 7168.
- Obstetric patients.
Contact: Justine French, Critical Care Educator, Liverpool Women's Hospital NHS Trust, Crown Street, Liverpool, L8 7SS, Tel: 0151 7089988 ext. 4554. E-mail: justine.french@lwh-tr.nwest.nhs.uk
- Haematology patients.
Contact: Peter Johnson, Outreach Team, Royal Cornwall Hospital, Cornwall. Tel: 01872 274242, bleep 2551.
- Neurosurgical patients.
Contact: Jo Love and Fiona Tompkins, Critical Care Outreach Team, Surgical HDU, Queens Medical Centre, Nottingham University NHS Trust, Derby Road, Nottingham, NG7 2UH. Tel: 0115 9249924 ext 35049, bleep (80)6339.

4.10 Minimum Audit and Evaluation Recommendations

The following minimum elements of audit and evaluation are recommended, ideally both before and after the introduction of physiological track and trigger systems:

- The quality of routine bedside physiological observations (completeness).

- The frequency of routine physiological observations.
- The frequency of 'missed' patients with established or impending critical illness (false negatives).
- The identification of specific patient groups 'missed' on a recurring basis.
- The frequency of patients who trigger the tool but are not perceived to be in need of critical care input (false positives).
- Medical and nursing staff perceptions of the value of the system as a means of enhancing communication.
- Frequency of *Do Not Attempt Resuscitation* (DNAR) decisions resulting from activation of track and trigger referral.
- APACHE II scores upon admission to designated critical care beds before and after the introduction of track and trigger warning.

Audit and evaluation findings should be presented to all staff participating in care of the critically ill, in order that improvements to the system and service be agreed and implemented. Continuing audit and evaluation is required.

4.11 Conclusions

4.11.1 Physiological Track and Trigger Warning Systems – General Characteristics:

After careful review of currently available information the following observations are made in order to clarify general characteristics of the tools currently in use:

Physiological track and trigger warning systems are:

Not substitutes for clinical judgement.

Not predictors of the *inevitable* development of critical illness.

Not predictors of *overall* outcome from critical illness.

Not comprehensive clinical assessment tools.

Not indicators for immediate admission to ICU or HDU.

Physiological track and trigger warning systems:

Are aids to good clinical judgement.

Are 'red flag' markers of potential or established critical illness.

Are generally sensitive depending upon their complexity.

Are aids to effective communication in care of the critically ill and a means of securing appropriate help for sick patients.

Are indicators of physiological competence.

Are indicators of physiological trends.

Are valuable even in the absence of a formal critical care outreach service.

4.11.1 Physiological Track and Trigger Warning Systems – Key points

- Physiological tracking and triggering can lead to measurable direct and indirect improvements in the quality of patient care.
- There is as yet no clear evidence identifying the ideal track and trigger model.
- The principles of physiological track and trigger warning are as important as is focusing on the detail when selecting a model for implementation.
- Post-implementation audit, evaluation and local refinement of the selected track and trigger system are essential.

SECTION 5: POST-HOSPITAL FOLLOW-UP

5.1 Post-hospital follow-up is part of the continuum of outreach care. The DoH national expert group recommended follow-up "to enable discharges by supporting the continuing recovery of discharged patients ... post discharge from hospital, and their relatives and friends" (Department of Health, 2000).

5.2 Critical illness has very particular consequences. Two-thirds of survivors experience significant problems with various aspects of physical health, work issues, or mental health, while 13% are severely limited in everyday life, experience post traumatic stress etc (Audit Commission, 1999). The time taken for physical recovery (Jones and Griffiths, 2000) and the high incidence of psychological disorders (Schelling et al 1998; Jones et al, 1998, Jones et al, 2001) reported by recovering patients require a structured approach to follow-up. This may include rehabilitation services similar to those for cardiac patients. Local patient needs can be assessed in a dedicated outpatient clinic.

5.3 Factors to consider when setting up a follow-up clinic

- Funding may be problematic. However, compared to the cost of a critical care bed, the extra cost of a clinic is not large (Waldmann, 2002).
- Frequency of the clinic will be influenced by available resources. It is difficult to see more than 10 patients in a 4 hour clinic, and many patients need at least two appointments.
- Therefore, organisations must decide their own priorities. At a minimum level, the service may be limited to ward visits while the patient is still in hospital, or telephone contact afterwards.

5.4 The first outpatient appointment should typically be within 6-12 weeks of discharge from critical care. This enables early

recognition of physical problems or psychological distress, facilitating referral to appropriate specialist services. Background health issues can also be addressed e.g. a smoking cessation message is likely to work best when reinforced early on.

5.5 Follow-up should continue for at least 6 months to ensure that most of the physical recovery has taken place; although some longer-stay patients may need to be seen again at one year.

5.6 Tertiary referral centres following up critical care patients may have problems related to the distances patients must travel to return to the hospital. Central Manchester University Hospitals manage this by conducting assessment questionnaires by telephone, with further investigation only as needed. Identified patients can be invited to clinic if able to travel; alternatively, the hospital can advise the patient's GP or other local healthcare facilities.

5.7 Staffing the Follow-up Clinic

Ideally, staff who understand the nature of critical care should see returning patients. The patients will benefit from multi-professional inputs e.g. physiotherapy, dietetics, clinical psychology, and psychiatry. If these are not available, fast-track referral systems should be established so patients with specific needs are seen as soon as possible. In order to gain specialist inputs, it may be helpful to collect evidence about the scale of particular problems over a period of time, and then present the data to the relevant department.

5.8 Assessment tools

Physical recovery can be assessed by appraisal of activities of daily living (e.g. using the Barthel Index: Mahoney and Barthel, 1965). Several health related quality of life tools are available, e.g. SF-36 (Ware and Sherbourne, 1992) which appraises

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physical, psychological and social function. The Hospital Anxiety and Depression Scale (Zigmond and Snaith, 1983), and Impact of Events Scale (Horowitz et al, 1979) are used to assess anxiety, depression and symptoms of post traumatic stress disorder respectively.

5.9 Audit

Outpatient clinics can enable audit of interventions performed during the in-patient stay. Patients who have undergone a tracheostomy may be examined for potential problems, e.g. tethering or tracheal stenosis. Lung function tests to determine tracheal air-flow and/or MRI scanning may be considered in some cases. Other, uncommon physical symptoms such as ulnar nerve palsies may be linked with positioning in the ICU.

5.10 Rehabilitation

Provision of structured, self-directed rehabilitation following critical illness has been shown to aid physical recovery and help reduce depression (Jones et al, in press). This package consisted of a manual with general advice (about drugs, psychological issues, relationships, nutrition, etc) detailed information about exercise routines; and week-by-week programmes involving self-assessment of physical function, exercise regimens, and stress management techniques. Use of the manual gave measurably better physicality at 2 and 6 months, and some benefit in reducing depression in the first weeks of the recovery period.

5.11 Forty one centres have reported providing outpatient follow up for level 2 and 3 critically ill patients following discharge (National Outreach Survey 2002). These include:

Whiston Hospital, Merseyside L35 5DR
Christina Jones, Research Fellow:
0151 4261600, ext. 2382;
christinajones@aol.com

Royal Berkshire Hospital, Reading RG1 5AN
Melanie Gager, Follow-up Sister:
0118 9877248;melaniegager@hotmail.com

Nottingham City Hospital, Nottingham NG5 1PB
Cheryl Crocker, Nurse Consultant,
ccrocker@ncht.trent.nhs.uk
Glyn Hudson, Charge Nurse,
ghudson@ncht.trent.nhs.uk
Eleanor Douglas, Senior Physiotherapist,
edougles2@ncht.trent.nhs.uk

Manchester Royal Infirmary, Oxford Road, Manchester M13 9WL
Sarah Ingleby, Outreach Sister,
Sarah.ingleby@cmmc.nhs.uk

Middlesex Hospital, London W1T 3AA
Wendy Harris, Sister: 020 7380 9008;
wendy.harris@uclh.nhs.uk
Sheila Adam, Nurse Consultant: 020 7380 9008;
sheila.adam@uclh.nhs.uk

Southampton University Hospitals NHS Trust
Sister Fiona Hall
Fiona.Hall@suht.swest.nhs.uk

Torbay Hospital, Torquay, TQ2 7AA
Dr Ian Bennun, Clinical Psychologist in Critical Care;
ian.bennun@nhs.net

5.12 Examples of innovative practice

- A diary (with photographs) is kept during the patient's stay in ICU and given to them after discharge. The diary helps the patient understand what has happened to them, fills memory gaps, etc. (Contact Coral Hulse, ICU, Whiston Hospital, Merseyside L35 5DR; 0151 430 1581.)
- The self-help rehabilitation package described above is now standard practice at the Trust where it was developed. (Contact Christina Jones, ICU, Whiston Hospital, Merseyside L35 5DR; 0151 4261600, ext. 2382; christinajones@aol.com.)

- A physiotherapy clinic has been established at Torbay Hospital for critical care patients at different stages of their recovery. Patients appear to benefit from interactions with other patients. Contact Sarah Cowlam, Physiotherapy Department, Torbay Hospital. Tel: 01803 655340.
- A clinical psychologist has been funded to have sessions both in the outpatient clinic and on ICU itself. Contact Ian Bennun, Torbay Hospital, Torquay, Devon TQ2 7AA email: ian.bennun@sdevonhc-tr.swest.nhs.uk.

5.13 Post-Hospital Follow-Up: Key points

5.13.1 Two-thirds of survivors of critical illness experience significant problems with physical health, work issues, or mental health. The DoH national expert group recommended follow-up "to enable discharges by supporting the continuing recovery of discharged patients ... post discharge from hospital, and their relatives and friends (Department of Health, 2000).

5.13.2 Multi professional support is needed for follow up clinics. If such support is not available, fast track referral systems, e.g. for physiotherapy, dietetics, clinical psychology, and psychiatry should be established so that patients with specific needs are seen as soon as possible.

5.13.3 Provision of structured, self-directed rehabilitation following critical illness has been shown to aid physical recovery and help reduce depression.

SECTION 6: AUDIT AND EVALUATION

6.1 "Clinical audit is a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria and the implementation of change. Aspects of the structure, processes and outcomes of care are selected and systematically evaluated against explicit criteria. Where indicated changes are implemented at an individual, team or service level and further monitoring is used to confirm improvement in healthcare delivery". NICE (2002)

An important addendum to this definition is the need to consider key stakeholders. Service aims may vary between stakeholders and thus the quality measures may be different.

6.2 Quality can be objective or subjective. Objective quality is compliance of a process or its outcome with a set standard. Subjective quality is the level of perceived value reported by the person who benefits from a process or its outcome. The aim of audit is quality improvement in both objective and subjective domains.

6.3 Activity data versus audit

Future healthcare funding will be informed by use of Healthcare Resource Groups (HRGs) within the commissioning process. Funding of outreach services will be linked to a requirement to measure activity, costs, benefits and efficiency. However, whilst activity data (patient and service) will inform Primary Care Trusts (PCTs) about patient throughput, audit and research will guide the effectiveness and quality of the service and its benefits to patients and other stakeholders.

6.4 Minimum Data Set

In an attempt to address some of the discrepancies associated with the provision of outreach services the Intensive Care Society has published guidelines (Intensive

Care Society, 2002a). Whilst recognising the need for 'flexibility both in the type and mechanisms of data collection' a 'consistency in what is collected' was recommended. The following is a suggested dataset for outreach services which could be used to measure outreach activity.

Outreach dataset

Demographics:

Age, sex, race, chronic ill health, diagnosis

Outreach contacts:

Details of Assessment

Time, date and location of patient

Reason for referral (new referral, critical care discharge follow-up)

Level of care patient receiving (ICS definitions)

Level of care required

Early warning score (track and trigger) at time of referral

Response time and duration

Action taken:

Intervention (list of potential interventions)

Referral to specialist team (list of specialist teams)

Outcome:

Patient remained on ward, followed-up

Patient's resuscitation status altered

Patient transferred to higher level of care (level 2 or 3)

Hospital outcome – morbidity/mortality

The data should reflect:

Local ownership

Relevance to practice

User friendliness

Resource allocation to enable meaningful data collection

6.5 Evaluation of Outreach Services

Local or large multi-centre studies designed to evaluate the effectiveness of outreach services should be undertaken. Although, it may be difficult to demonstrate the effectiveness of the services, due to several confounding variables, key focus measures should include the following:

- Reduction in the number of "unexpected" cardiac arrest calls.
- Facilitation of "Do not attempt to resuscitate" orders.
- Reduction of the number of critical care re admissions.
- Evaluation of averted critical care admissions and the impact on patient morbidity/mortality.
- Earlier critical care referral in relation to patient morbidity and mortality.
- Assisted discharges versus non-assisted discharges (ward follow up).
- Improvement in the recording of observations.
- Incidence of false negative/positive referrals.
- Reduction in overall hospital mortality.

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6.6 Examples of Audit initiatives

Example 1

A local case mix adjustment tool for all hospital patients

Case mix adjusted hospital wide rates of:

- Death.
- Cardiac Arrest.
- Unanticipated Critical Care Unit admission.

These outcome variables are used as quantitative markers to assess the impact of a service change, i.e. the introduction of the Outreach Service.

The tool uses patient information readily available from existing hospital databases.

Contact: Dr Michael Mercer, Consultant Anaesthetist
Torbay Hospital NHS Trust, (Torquay, Devon)

Example 2

Use of ICNARC (Intensive Care National Audit and Research Centre) data to measure reduced mortality in patients admitted to the Critical Care Unit from the ward

Reduced mortality in patients seen by Critical Care Outreach staff may reflect more timely admission. These data require very careful interpretation, particularly with regard to association or effect.

ICNARC data is subject to a validation process that enhances its accuracy but may limit its utility as a real time monitor of Outreach.

Contact: Carole Butler-Williams
Consultant Nurse Carole.Butler-Williams@egnhst.org.uk
or Sue Smith, Consultant Anaesthetist and Network Lead
Gloucester Hospitals NHS Trust (Cheltenham)

Example 3

Activity data set for Outreach

There are different opinions about what constitutes a minimum data set. These are influenced by the level of resourcing that is available for Outreach.

Most outreach services to collect some data. Particular sites with experience in this area are:

Burton General Hospital
Contact: Sandra Coates, Consultant Nurse. Mike Cunningham, Consultant Anaesthetist.

Royal Berkshire and Battle Hospital NHS Trust
Contact: Mandy Odell, Consultant Nurse

Fundamental information, which might be collected, about each patient should include:

- Demographics.
- Admission Details.
- Care episodes.
- Outreach contacts.

Craig Stenhouse, Burton General Hospital (Intensive Care Society 2002)

Example 4***Audit of vital signs recording***

An audit of the frequency and completeness of physiological vital signs recording represents quality measurement of a single step in the process of patient care. It may also reflect education about vital sign recording and the degree of compliance with agreed physiological track and trigger warning for the critically ill.

Setting of a simple standard such as “all patients in acute areas will have at least one full set of observations including respiratory rate recorded daily” represents an example of baseline standard setting against which performance can be audited.

The potential impact of such a simple audit should not be underestimated.

Richard Morgan, Consultant Anaesthetist, Blackpool Victoria Hospital NHS Trust

6.7.3 Commissioners and other key stakeholders should be involved in the audit process.

- The terms of reference for trust wide Critical Care Delivery Groups should clarify how audit finding will be reported within the organisation.
- An audit calendar (a clear plan for audit) should be used.
- Audit should be undertaken both internally and externally.
- The distinction between research and audit should be recognised. Small scale research may be required to identify audit themes.

6.7.4 In line with the (proposed) recommendations of the Critical Care Information Advisory Group, critical care outreach requires a distinct data set. While outreach data can form part of the Critical Care data set, it must be possible to extract and analyse key aspects independently.

6.7 Key points***6.7.1 Audit should be simple.******6.7.2 Audit processes should:***

- Focus on the aims of the outreach service.
- Measure outcomes rather than associations.
- Focus on patient needs, not activity.
- Be based on whole hospital experiences, systems and outcomes rather than simply referrals.
- Be key component of work processes rather than an additional process.
- Be included in the funding for Outreach Services.

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APPENDICES

Appendix 1

City Hospital Birmingham Outreach Philosophy

OUTREACH works as an integral part of the Critical Care Service committed to the provision of a high standard of care delivery to the critically ill patient (level 1, 2, and 3) and their significant others irrespective of location, in a timely manner.

Utilising and supporting the whole multidisciplinary team to work collaboratively across organisational and professional boundaries to provide patient focused seamless care.

Promoting the education and training of staff and a culture of sharing and learning.

Using advocacy and leadership to ensure the critical analysis and review of patient systems and processes in order to identify and manage clinical risk and identify areas of best practice in order to improve patient outcomes and experiences.

Contact: Rebecca.O'Dwyer@swbh.nhs.uk

Appendix 2

Physiological abnormalities are associated with increased mortality. *David Goldhill, Alistair McNarry. The Royal London Hospital, London E1 1BB*

On December 17th 2002 we recorded the physiological values of adult, non-obstetric inpatients at the Royal London Hospital. The level of the patient's critical care needs and location were also noted. Predefined normal ranges were those used by our outreach service: resps, 10-19 breaths/minute; HR, 50-99beats/minute; SBP, 100-179 mm/Hg; temp, 36.0-37.4oC; SpO₂, >=95%; level of consciousness (LOC), Alert; urine output (catheterised patients), 0.5-3 ml/kg/min. Values recorded within eight hours of the audit were used if available, otherwise new measurements were taken. Outcome at 30 days (discharged alive, died in hospital, inpatient) was retrieved from the hospital records system. Logistic regression analysis, t test and Chi Square were used to compare outcome with number and type of physiological abnormality. Values from ICU patients and those known to be 'Not for resuscitation' were excluded, leaving 433 for analysis. Estimated levels of care were available for 384 (85.5%).

The 26 patients who died were older (p<0.001), average 72.7 years (SD13.9) than survivors, 60.1 years (SD19.1). The single death among those with no abnormalities occurred 21 days after the audit. Death occurred a median of 10.5 (IQR 4-21.25) days after the study. Thirty day mortality increased significantly with number of abnormalities (p<0.001). Backward stepwise logistic regression produced a model for mortality dependent on LOC, HR, SBP, RR and age.

The 34 patients receiving a lower level of care than desirable had a significantly higher mortality (p=0.001) (20.6% mortality) compared to the 349 patients (5.4% mortality) who were judged to be receiving an appropriate level of care.

The results demonstrate that mortality increases with the number of abnormal physiological values. Most patients with physiological abnormalities who died were in hospital for many days. There is, therefore, the opportunity to intervene to improve outcome. A lower than ideal level of care was associated with increased mortality.

Appendix 3

Central Manchester and Manchester Children's University Trust

The Trust – A 930 acute bedded tertiary hospital including a 13-bedded intensive care unit and 10-bedded general high dependency with additional high dependency areas. The outreach service covers all surgery areas, including specialist areas of orthopaedics, head and neck surgery and gynaecology, the accident and emergency and the medical division.

Outreach and Follow up

The outreach service is co-ordinated by a G grade sister with support and advice from consultant anaesthetists from the critical care

Table. 30 day outcome, location and days in hospital before and after the study by number of abnormalities recorded.

abnormalities	30 days after study			number in		days in hospital (median, IQR)	
	no.	died	inpatient	level 1	level 2	before	after
0	139	0.7%	12.9%	1	0	6 (3-15)	4 (1-17)
1	160	4.4%	16.9%	4	1	7 (3.25-22)	6 (2-23.5)
2	87	9.2%	14.9%	5	1	10 (3-19)	6 (2-21)
>=3	47	21.3%	23.4%	3	3	6 (2-29)	12 (3-30)

IQR = interquartile range; before = days before study, after = days in hospital until death, discharge or 30 days.

unit. The follow up team has four F grade sisters who share running the outpatient clinic, ward follow up, education and aromatherapy massage. The allied health professionals play a large role in the follow up team and include a half-time physiotherapist and occupational therapist. A psychiatrist provides one session to review patients of concern to the follow up team. The pharmacist, speech therapist and dietician assist in the review of patients at the weekly ward round, with the senior nurse and ICU consultant, reviewing patients who require extra support and ensuring an appropriate rehabilitation package is in place.

Service provided – Education is a large focus of the Outreach service within the Trust. The aim is to empower and skill nurses doctors and AHP's to look after the sick patients in the ward areas. An early warning score is used and the score triggers a referral to the patients admitting medical team, if required this may lead to a referral to ICU. A link nurse is identified in each area to ensure the most effective introduction of the early warning score. The link nurses assist in continuous audit to ensure effective use of the EWS and appropriate referrals. They also highlight issues and areas for development ensuring on-going recognition of training needs.

The service provides a rolling education programme related to deteriorating and acutely ill patients.

Contact: Sarah.ingleby@cmmc.nhs.uk

Appendix 4

Southampton University Hospitals Trust – Critical Care Outreach Team

Southampton University Hospital has an 800 bedded facility, two sites, with 14 adult ICU beds. The outreach service covers orthopaedics and trauma, surgery, medicine and elderly care, head and neck, cancer

services, theatre recovery, thoracic ward areas and the emergency department

Outreach Team – 6 whole time equivalent (WTE) F/G grade nurses supported by a Consultant Nurse and a Senior Clinical Nurse. The Outreach Team works together with the MEWS (modified early warning system) and resuscitation teams.

Service provided – A 24-hour clinical service is provided by the Outreach team, who receive 228 new patient referrals per month. Medicine, elderly care and the surgical directorate account for most referrals (92%).

The main interventions are the provision of respiratory, cardiovascular and renal clinical management support. Referrals span the 24-hour period substantiating the need for a 24-hour service.

The team also provide follow-up for patients transferred from the ICU to ward areas. As part of the Trust's resuscitation team, Outreach also have a valuable role in offering post-resuscitation care to patient, family and staff, and facilitating DNAR discussions with ward based teams.

The philosophy of the team is to work alongside ward staff, and therefore have set up individual directorate links to facilitate two-way feedback on the impact and effectiveness of outreach. Collaboration with ward staff is actively sought to promote critical incidents reporting to address clinical ward pressures. Through provision of local education programmes on the sick ward patient, ward staff are further supported.

The educational function of outreach also extends beyond ward areas. There is Outreach input into induction programmes, ALERT, and resuscitation programmes, pre and post registration modules, and the team is currently inputting into new pre-registration curricula. Whilst this work is primarily undertaken with nursing staff,

there is an increasing adoption of an interdisciplinary approach to this area.

Contact Critical Care Outreach Southampton email: outreach@suht.swest.nhs.uk

Appendix 5

University Hospital Birmingham

The Trust – The Outreach and Acute Pain team provides a combined service on two sites of a Trust which has 1050 beds, 65 of these being designated for level 2/3 care.

Outreach Team – The establishment is: 1 Nurse Consultant, 1 H grade Nurse, 4 F/G grade nurses, providing an acute pain and outreach service from 08:00 to 16:00 5 days a week.

In addition there are a further 2 G grade nurses (1WTE) providing an ITU discharge follow-up service to patients and their families.

The team

Follow all pain referrals from recovery

Follow all critical care discharges from the General Critical Care Units

Actively "trawl" for deteriorating patients across the medical and surgical assessment units

Receives and acts on referrals from any member of the multidisciplinary team.

Contact: Toni.Mitchell@uhb.nhs.uk

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Appendix 6

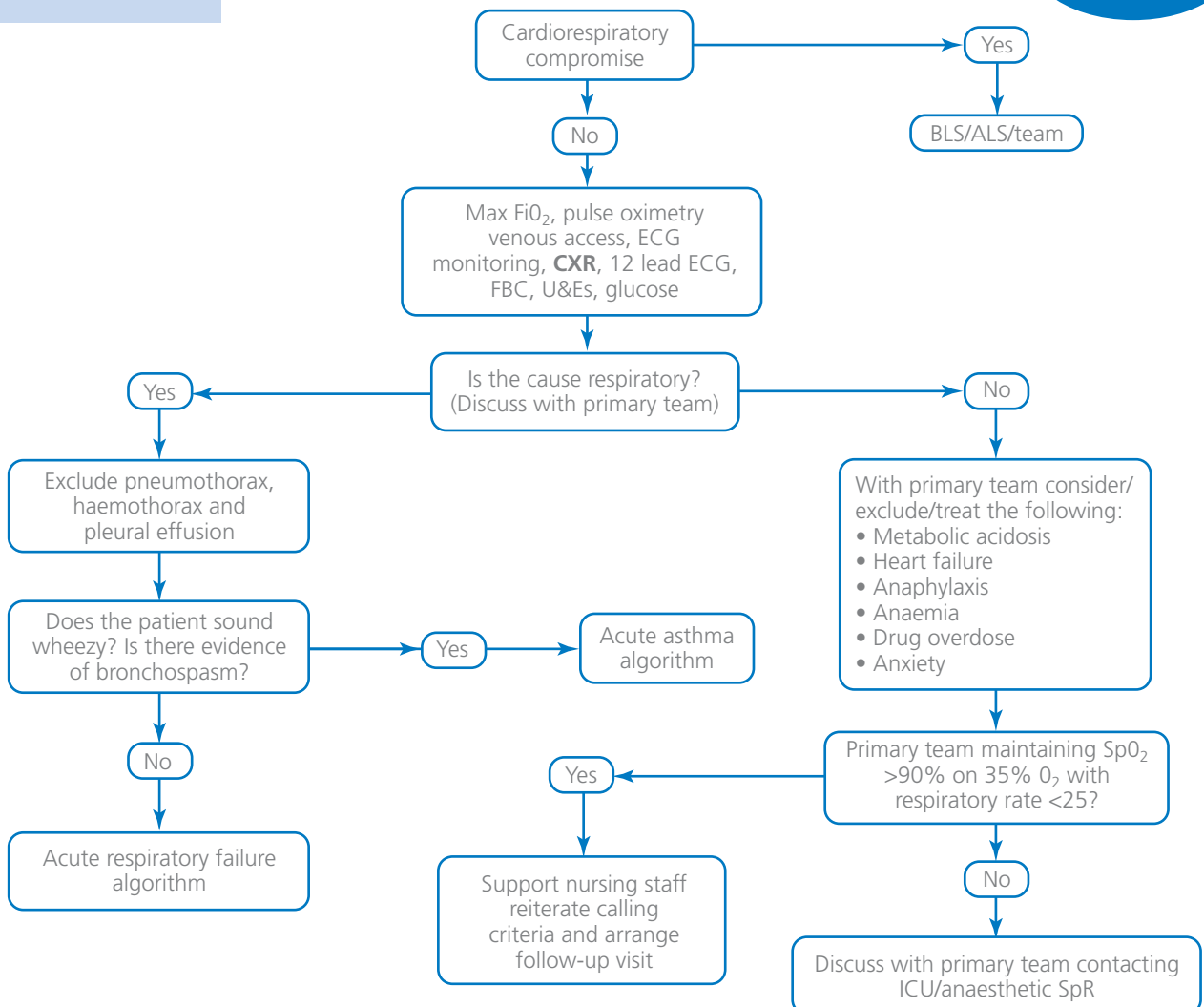
Dyspnoea algorithm

Contact PERT team
University College Hospitals, London

Clinical features
Difficult/painful breathing,
high respiratory rate

Acute dyspnoea

Ensure
primary team
contacted



Appendix 7

Track and Trigger Secondary Survey Results 2003

Alison Dinning adinning@ncht.trent.nhs.uk
Richard Morgan
Sarah Starr

The secondary survey was undertaken by NORF subgroup members to gain more detailed information regarding track and trigger systems, to supplement data in the 2002 National Critical Care Outreach Survey (NCCOS 2002). The results are presented in this appendix should be read in conjunction with the track and trigger chapter in the main report to aid clarity.

Physiological track and trigger warning is known from NCCOS 2001 and 2002 returns to be in use in at least 95 acute units in England. Secondary survey information is available from 71 of these hospitals (75%) though not for all questionnaire parameters in every case. The number of hospitals answering each question has been recorded in order to clarify percentage responses.

The secondary survey was carried out, by identifying all hospitals indicating use of an early warning track and trigger tool in response to the 2001 and 2002 NCCOS. Not all hospitals using track and trigger warning tools have a formal critical care outreach service: track and trigger systems have been introduced in some units specifically to assist ward nurses in the securing of timely help from parent team medical staff without involvement of critical care services.

Table 1: Distribution of Different Track and Trigger Models

Single Parameter Model	6/71 hospitals (8%)
Multiple Parameter Model	1/71 hospitals (1%)
Aggregate Weighted Score Model	62/71 hospitals (87%)
Combination Models	2/71 hospitals (3%)

Time That Track and Trigger Models Have Been In Use

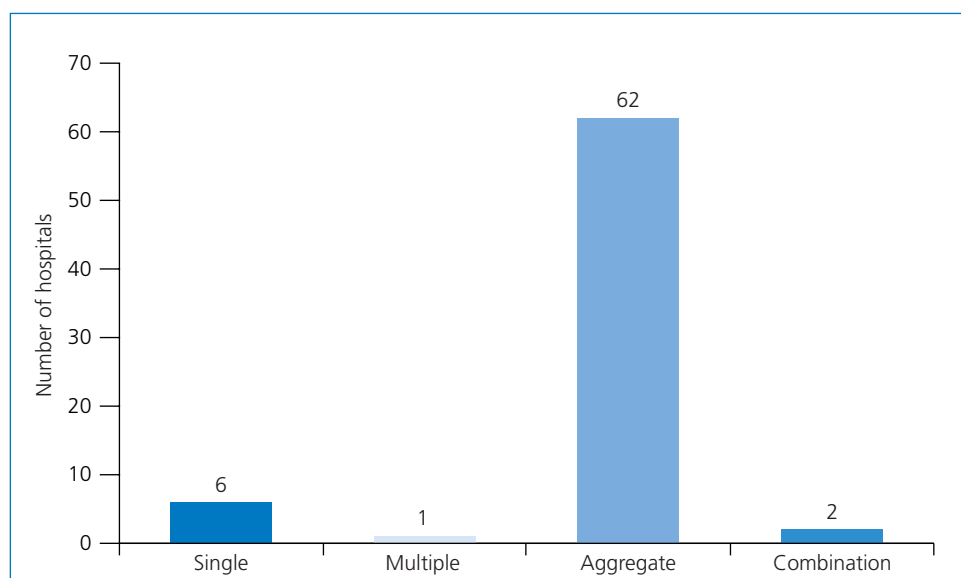
The periods of time for which different hospitals have used track and trigger systems reflect the distribution of critical care outreach services across England (NCCOS 2002), although some hospitals without established outreach services still use track and trigger systems. In addition, in hospitals where an outreach service has been newly

established, it may take several months to determine which type of track and trigger tool is most suitable for local needs. Whilst a majority of hospitals have established the use of track and trigger tools since the publication of *Comprehensive Critical Care* (DoH, 2000), a small number were using track and trigger tools for several years prior to its publication.

Table 2: Length of Time Track and Trigger Model in Use (Months)

0 to 6 Months	6/59 hospitals (10%)
7 to 12 months	9/59 hospitals (15%)
13 to 18 months	13/59 hospitals (22%)
19 to 24 months	16/59 hospitals (27%)
25 to 30 months	7/59 hospitals (12%)
31 to 36 months	5/59 hospitals (8%)
More than 36 months	3/59 hospitals (5%)

Distribution of Different Track and Trigger Models



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Range of Physiological Parameters in Use:

All 71 hospitals in the secondary survey (100%) included the following parameters in their track and trigger system, irrespective of the type of tool used: respiratory rate; systolic blood pressure; heart rate.

The majority also included neurological status in the form of AVPU or Glasgow Coma Scale (92%) and urine flow (85%).

Less commonly used parameters included: temperature (68%); arterial oxygen saturation (17%); nurse/doctor concern (9%); specific biochemical parameters such as pH, base excess (6%); and pain (3%).

Evaluation of Local Track and Trigger Model

As can be seen from the range of parameters used, many hospitals have adapted track and trigger tools according to local needs. Formal evaluation of the system in use at the time of the survey had occurred in 62% of hospitals. Changes to the system originally chosen had been made by 30% of hospitals. Data was recorded as available to support those changes by only a small number of hospitals. Matching track and trigger model evaluation against time since implementation suggests that productive audit is possible after approximately six months.

Table 3: Evaluation of Local Track and Trigger Model

Evaluation Undertaken	33/53 hospitals (62%)
No Evaluation Undertaken	20/53 hospitals (38%)
Changes to Initial Track and Trigger Model	12/40 hospitals (30%)
No Changes to Initial Track and Trigger Model	28/40 hospitals (70%)
Data to Support Change to Initial Track and Trigger Model	12/28 hospitals (43%)
No Data to Support Change to Model	16/28 hospitals (57%)

Selection of Patients

The majority of hospitals used a track and trigger warning tool on all patients (35/64 hospitals -55%). However, the remaining 45% (29/64) of hospitals selected which patients the tool was to be used on. This selection was made, either according to perceived clinical need, (following nursing assessment that a patient was at specific risk) or simply by speciality. Many hospitals had initiated track and trigger warning in one speciality, with subsequent roll out to other areas as outreach services expanded or when clinicians in a speciality agreed to use track and trigger warning. According to the results of the NCCOS 2002, this step-wise approach to specialities typically began on surgical wards. No hospitals responded the use of outreach services or track and trigger warning tools exclusively on medical wards.

Impact of Track and Trigger

An improvement in the quality of routine vital signs observations was reported in 77% of hospitals (40/52 hospitals). The most commonly cited improvement was an increase in the observation and recording of respiratory rate. In one hospital this had increased from 8 to 97% following introduction of a track and trigger tool. An improvement in neurological observations was also reported by a small number of units. In some hospitals vital signs observations are only partially completed unless a patient has a track and trigger tool in use. Others reported that track and trigger warning had increased the awareness among Registered Nurses and Health Care Assistants (HCAs) on the importance of vital signs observations. Whilst many hospitals did report an improvement in the quality of observations, only 40% (17/43 hospitals) had formally audited this improvement in quality following the introduction of their chosen track and trigger warning tool.

Table 4: Impact of Track and Trigger on the Quality of Routine Observations

Improvement in Quality	40/52 hospitals (77%)
No improvement in Quality	12/52 hospitals (23%)
Formal Audit on Quality	17/43 hospitals (40%)
No Formal Audit on Quality	26/43 hospitals (60%)

Staff Completing Bedside Observations

In the majority of responding hospitals, both registered and unregistered nurses undertake vital signs observations, although in a small minority of units registered nurses only carried this remit. A small number of units reported a similar restriction for certain ward

areas or, for example that every third set of observations must be undertaken by a registered nurse. A quarter of hospitals indicated that only HCAs undertook vital sign observations. In addition, where there was a joint role, many responders stated verbally that HCAs in fact still undertook the majority of vital signs observations. In the absence of adequate supervision, the significance of deteriorating physiological parameters may not be appreciated by HCAs without specific training in track and trigger warning.

Table 5: Staff Completing Bedside Observations

Registered Nurses (RN) Only	4/55 hospitals (7%)
Health Care Assistants (HCA) and Nursing Auxiliaries (NA) Only	14/55 hospitals (25%)
HCA, NA, RN and Student Nurses	13/55 hospitals (24%)
HCA, NA and RN	24/55 hospitals (44%)

Empowerment of Ward Staff to Initiate Basic Changes in Management:

38/60 hospitals (63%) support ward nursing staff in the implementation of basic changes to the management of patients who 'just reach' the trigger threshold for their particular track and trigger model. These nurse-initiated changes include alterations in posture, oxygen therapy, and pain control and in some cases, intravenous therapy. In some units this had been formalised by way of patient group directions or algorithms which clarify the nurse's actions prior to seeking or whilst awaiting medical help.

Referral Algorithms for Use with Track and Trigger Warning:

57/62 hospitals (92%) declared the establishment of a referral algorithm for use in conjunction with physiological track and trigger warning. The majority of algorithms cite the parent team doctor (usually PRHO/SHO) as the first point of referral for patients who trigger the system. Where critical care outreach services are available they may be accessed independently of the parent medical team, or more commonly alongside them, especially when the SHO or SpR is otherwise committed

Occurrence of False Negatives ('Undetected' Sick Patients):

37/48 hospitals (77%) recorded an Occurrence of false negatives with track and trigger whilst 11/48 units (23%) declared no false negatives. Whilst a small number of specific patient groups are identified (below) the majority of false negatives 13/37 (35%) occur through failure to apply the track and trigger system and its accompanying algorithm correctly.

Table 6: False Negative Results With Track and Trigger Systems

Ischaemic chest pain, dysrhythmias etc	5/48 hospitals (10%)
Pancreatitis	2/48 hospitals (4%)
Pulmonary embolus	2/48 hospitals (4%)
'Young Sick'	2/48 hospitals (4%)
Tracheostomy patients	1/48 hospitals (2%)
Haematology patients	1/48 hospitals (2%)
Biochemical abnormalities	1/48 hospitals (2%)

Pharmacological 'masking' of significant deterioration in physiological observations was reported by two hospitals (beta blockade moderating systolic blood pressure and pulse rate, and PCA morphine moderating respiratory rate and pulse rate).

Only 4/43 hospitals (9%) reported formal auditing of the occurrence of false negatives with their chosen models of track and trigger warning.

User 'Satisfaction' Surveys'

25/53 hospitals (47%) reported gaining information 'user' satisfaction with the track and trigger system by different staff groups. The majority of these surveys, however, only comprised anecdotal feedback from ward nursing staff. Only 10/53 hospitals (18%) had undertaken formal user satisfaction surveys utilising a structured analysis of the perception of different staff groups involved in care of the sick ward patient. 28/53 hospitals (53%) reported that they had not undertaken any form of user satisfaction survey.

Alternative Methods of Identifying Patients at Risk

37/56 respondents (66%) recorded alternative methods of identifying patients at risk, none of which had been formally audited or evaluated. Track and trigger warning systems are clearly complemented by these alternative methods of alerting the critical care team or outreach service to the existence of deteriorating ward patients.

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Table 7: Alternative Methods of Identifying Patients at Risk

Nursing or medical staff concern	18/37 hospitals (49%)
Post-critical care discharge ward follow-up	9/37 hospitals (24%)
Critical Care Outreach Service guidelines (not specified)	6/37 hospitals (16%)
Specific diagnostic groups (pancreatitis, tracheostomy etc)	4/37 hospitals (11%)
ALERT course calling criteria	3/37 hospitals (8%)
"Trawling" the wards for critically ill patients	3/37 hospitals (8%)
Laboratory notification of abnormal results	2/37 hospitals (5%)
Anaesthetic team or Consultant to Consultant referral	2/37 hospitals (5%)
Pain team follow-up (where joint CCO and Pain team)	1/37 hospitals (3%)
Bed state notification of Track and Trigger patients	1/37 hospitals (3%)

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Critical Care Outreach 2003

Progress in Developing Services

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