



# A Matter of Life and Death

improving hospital mortality rates and end of life care

## **3x2 matrix tool**

to identify care issues around patients who die in hospital

## **Version 1.0**

Developed for the NHS based on the Institute for Health Care Improvement's 2x2 matrix

**July 2004**

# Introduction

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Pursuing Perfection sets out to deliver standards of care not currently available across six dimensions of quality: equality; timely; patient centred; efficient; effective and safe. To achieve this ambition, it is necessary to understand the range of opportunities for improvement and one approach is to use hospital mortality as a window through which to view the quality of care systems.

While death is a rare event, it is a useful lens to view the system as it is a clearly defined event, which is accurately recorded and is generally thought to be associated with the quality of health care. Furthermore, those patients who do die in hospital are likely to have accessed a significant section of hospital services and therefore their experience can shed light on a range of system issues.

As part of Pursuing Perfection, we are testing out methods that use mortality to understand and improve health and care systems with the aim to:

- ensure there are no needless deaths; and
- ensure good end of life care.

Our expectation is that the mechanisms by which these aims are achieved will result in higher quality of care for everyone.

Two approaches are being used to generate system level learning from hospital mortality:

- a case note review of 50 consecutive deaths using the 3x2 matrix described in this document to identify common cause factors that impact on the quality of care; and
- using run charts and statistical process control to identify and understand any special cause factors.

In May 2003, Professor Sir Brian Jarman presented statistics showing how mortality rates vary between hospitals after standardisation<sup>1</sup> to a Pursuing Perfection seminar. He also presented the 2x2 matrix which had been developed by the Institute for Healthcare Improvement (IHI) to improve hospital mortality<sup>2</sup>. This was subsequently adapted for the NHS to the 3x2 matrix tool.

The main feature of the 3x2 matrix as a mortality audit and clinical governance tool is that it focuses on identifying health and care systems problems rather than individual cases, with the intention of improving hospital standardised mortality rates and the quality of care for all patients.

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# How to use the hospital review tool

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Overall, the objective is to develop a system level perspective of the care received and uncover system defects. We have found that the review demands a mindset to focus on system issues around the quality of care rather than identify individual causal factors that may or may not contribute towards death.

The review is a two-staged process. The first stage results in 50 deceased patient records being assigned to one of the boxes in the 3x2 matrix shown in Table 1. As the boxes focus on different system issues, the second stage of the review is to look into one of the boxes in more detail.

The selection of the review team is a critical factor in ensuring ownership and wider acceptance of findings. We strongly recommend that a physician leads the review. Teams have also found senior nurse involvement very useful for all stages of the review and primary care involvement for some parts.

This guide includes data collection forms but we encourage teams to adapt these to collect information that may be of particular use locally.

**Table 1: UK 3x2 Matrix**

		Critical care admission		Ward admission
		Intensive care	High dependency	
Admission for Terminal Care	yes	<b>Box 1a</b> may suggest overuse of ICU beds.	<b>Box 1b</b> may identify issues around the use of intensive care beds.	<b>Box 2</b> may identify system issues in end of life care planning both in the hospital and community setting
	no	<b>Box 3a</b> may identify system issues in intensive care where known improvement techniques can be applied	<b>Box 3b</b> may identify system issues in intensive care where known improvement techniques can be applied	<b>Box 4</b> may identify system issues around risk management in the admission process as well as quality and reliability of ward level care

# Stage 1: initial review to group records (Form 1)

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## Carrying out the review

Clinicians analyse both the admission process for the patient and the purpose of their care using deceased patient records and then assign each case to one of the boxes in the matrix.

**1. Pull around 60 consecutive records** (this is more than 50 to allow records that do not meet the criteria to be discarded). Start the collection back far enough (generally 6 to 8 months from the current date) to give time for discharge summaries and diagnoses to be complete and for records to be returned from the coroner.

### 2. Exclude cases:

- patients aged under 16;
- units whose deaths do not contribute to the hospital standardised mortality rate; and
- patients who die on route to hospital or in A&E.

(Patients placed in beds for observation should be included.)

**3. Use a unique identifier** as it may be necessary to go back and review the patient records in more depth. A medical record number might be appropriate.

**4. Review 50 consecutive patient records** for patients who have died in your hospital using Form 1.

a. Record the following information using admission data:

- age and sex;
- admission diagnosis - ICD 10 (do not look at the discharge diagnosis to determine this);
- place patient admitted to in first 24 hours – Ward, HDU, or ICU;
- for planned admissions - if intensive care is planned following surgery, radiology etc this is counted as an admission to intensive care; and
- the main purpose of care on admission, either for treatment or terminal care. This needs to be determined using admission information (for this part ignore changes in the patient's prognosis subsequent to admission).

b. Record the following information using discharge data:

- the 'discharge' diagnosis - ICD 10.

**5. After reviewing the patient records** for the criteria above, fill in the 3x2 matrix with the appropriate data.

### Additional information (optional)

Many of the teams conducting the 3x2 matrix also collected the following information:

- a brief case summary (eg a sentence);
- adverse events; and
- any information that is locally useful.

However, the less information collected the simpler and quicker the tool is to use.

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## Assessing the information

The main purpose of this stage of the review is to assign cases to a specific box within the 3x2 matrix. The following prompts may help you at this stage:

### Admission and discharge diagnoses

- how many admission and discharge diagnoses match?

### Case file recording and information quality issues

Some hospitals have found it useful to highlight issues around how information is recorded and death certification

You can aggregate the following data and compare it with other hospitals that have completed and supplied us with their information:

- 3x2 matrix distribution;
- age and sex distribution; and
- principle cause of death.

There is, however, no right or wrong distribution for any of these. In particular this is the case for allocating cases to the 3x2 matrix distribution - in essence the next stages provide more information to identify areas for improvement.

## Stage 2:

### In-depth review of cases within the boxes to identify common cause factors

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Stage 2 uncovers different health and care system issues within one box as shown in Table 1. This means that each box has a different set of questions. As most cases in the UK fall within Box 2 and Box 4, organisations have focused on using the tools to understand these to date.

However, known improvement techniques exist for issues identified in boxes 3a and 3b. Examples of these include ventilator care bundle, sepsis care bundle and tight glycaemic control. Please see the resources section for further information.

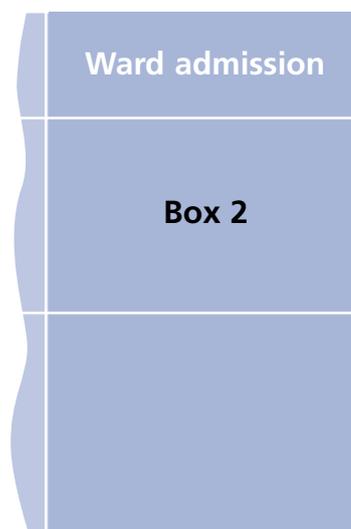
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#### Stage 2: box 2

#### Admission for terminal care to general wards (see Form 2)

**Stage 2** analyses uncover different health and care system issues within one box.

**The Stage 2, Box 2** analysis focuses on issues around end of life care planning, both in the hospital setting and in the community setting, and it has a specific set of questions designed to help the identification of common issues.



#### Carrying out the review

**1. Teams have found a primary care and / or a palliative care physician involvement very useful for this part of the review.**

**2. Review all cases in Box 2 using Form 2.**

a. Record the following information:

- terminal care planning;
- terminal care provision;

- primary and secondary care communication and co-ordination; and
- patient-clinician communication.

b. Record any information that would be useful locally.

**3. Now collate the information.** This will allow you to identify some of the most common or more significant system level defects.

## Assessing the information

The aim is to identify common issues both from a quantitative and qualitative perspective. First aggregate the information collected from Form 2. The following prompts should help your assessment of the data.

### Terminal care planning

- The number of cases with clear plans for terminal care.
- The number of cases that could have had plans for terminal care.
- Did all patients who stated a preference die in their preferred place of care? And if not, what were their preferences?
- The number of cases with advanced directives.

### Terminal care provision

- The number of cases that could have benefited from alternative arrangements.
- How many bed days could have been saved?
- How these match with additional resource required.

### Primary and secondary care communication / co-ordination

- The number of cases where communication between primary and secondary care was a problem.
- What were the issues?
- The number of patients admitted out of hours.
- Did these patients have more problems with terminal care planning / provision than other patients?

### Patient - clinician communication

- The number of cases where patient and or family and clinician communication was an issue.

### Any other issues

- Again look for themes running through the records rather than single issues that occur in a single case.

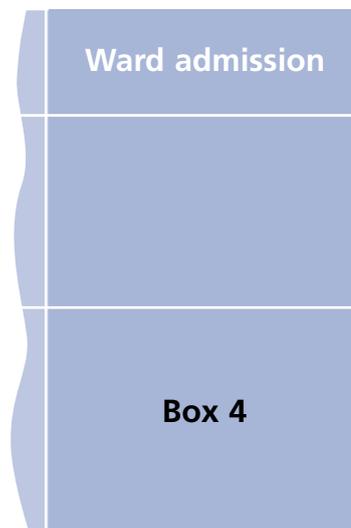
From this assessment select either the most common issues or those issues with the greatest impact on terminal care provision to identify areas to start to action improvement.

## Stage 2: box 4

### Admission for treatment to general wards (see Form 3)

**Stage 2** analyses uncover different health and care system issues within one box.

**The Stage 2, Box 4** analysis focuses on issues around patients admitted to a general ward for treatment and has a range of questions to help the identification of common health and care system issues.



## Carrying out the review

### 1. Review all cases in Box 4 using Form 3

a. Record the following information:

- risk assessment / planning failures;
- adverse events;
- responsiveness and communication; and
- 'transfer' to terminal care.

b. Record any information that would be useful locally.

**2. Now collate the information.** This will allow you to identify some of the most common or more significant system level defects.

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## Assessing the information

The aim is to identify common issues both from a quantitative and qualitative perspective. First aggregate the information collected from Form 3. The following prompts should help your assessment of the data:

- risk assessment / planning failures;
- the number of cases with planning failures;
- number of cases who may have had planning failures on admissions; and
- the number of cases who should have been admitted to a higher level of care (either HDU or ICU).

**Management of co-morbidities.** Some people have found issues around patients who have diabetes as a co-morbidity.

**Adverse events.** The number of cases with an adverse event.

- what were the most common adverse events?
- how many patients were transferred to a higher level of care?

### Responsiveness and communication

Look for common issues as well as the number of cases. Examples are:

- where clinical observations were not frequent enough and / or did not cover all key observations.
- where there is a lack of responsiveness to nurse concerns and this was a contributing factor to death; and

- where patients should have been transferred to a higher level of care (either HDU or ICU).

### **"Transfer" to terminal care**

The number of patients whose care status change to terminal care

- how many days elapsed before this decision was taken?
- what's the total number of 'bed-days' used for this group of patients?
- what proportion of their total stay was terminal care?
- were there any other issues? Some people have found delays in discussing the change in status with patients and their families.

### **Any other issues**

- again look for themes running through the records rather than single issues that occur in a single case.

From this assessment select either the most common issues or those issues with the greatest impact on patient safety for planning and to action improvements.

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## Definitions

### **Intensive care**

Equates to level 3 in the Intensive Care Society's Levels of Care document.

### **High dependency care**

Equates to level 2 in the Intensive Care Society's Levels of Care document

### **Terminal (supportive/palliative/comfort/end of life) care**

Terminal care is generally defined as care provided near the end of life to support patients both physically and psychologically. Admission orders and progress notes in patient's records generally make clear when patients should be deemed "terminal care" patients. Note: A DNR patient is not necessarily a "terminal care" patient unless reflected otherwise in patient's notes.

# Form 1

## Stage 1: Carrying out the 3x2 matrix

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Chart Identifier

age

 years

sex

male

female

Principle ICD-10 code and/or diagnosis on admission  
(based on admission information only)

Was the initial admission for intensive care?

Yes

no

Was the initial admission for high dependency care?

Was the patient admitted for terminal care

Principle ICD-10 code and/or diagnosis on discharge

Did the admission and discharge match?

Length of Stay

 days

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Space for comments / observations

# Form 2

## Stage 2: Box 2 in-depth review

Teams have found it useful to include primary care in this review.

Chart Identifier

1) Could the patient have received care outside of hospital?

- No
- Yes with the support they already had in the community
- Yes with additional support already available in the community  
(the patient wasn't receiving this support)
- Yes with additional support which isn't currently available

If Yes, how many days did the patient stay in hospital when they could have received care within the community?

 days

What additional support would have been required?

2) Is there evidence of poor communication between primary and secondary care?

- Yes  no  maybe

If Yes or Maybe, describe the problem

3) Did the admission take place out-of-hours?

- Yes  no

4) Did the patient have an end of life care plan?

- 

5) If no, should the patient have had an end of life care plan?

- 

6) Did the patient have an advance directive?

- 

7) If yes, was the patients preferred place of death in the acute hospital?

- 

If not in the acute hospital, describe where

8) Is there evidence of clinicians not listening to patient's preferences for treatment and/ or terminal care?

- 

Space for comments

# Form 3

## Stage 3: Box 4 in-depth review

Chart Identifier

Admitting Diagnosis

Discharge Diagnosis

1) If admitting diagnosis differed from the discharge diagnosis was there evidence of planning failures in the first 48 hours that may have contributed to death?

Yes      no      maybe  
       

2) Is there evidence of lack of clinical observations being carried out on the ward (not often enough and / or misses out key observations like respiratory rates)?

3) Is there evidence of a lack of responsiveness to nursing concerns by physicians caring for the patient?

4) Did this lack of responsiveness play a factor in the death?

5) Was there a transfer to Intensive Care prior to death?

If No, should the patient have received / been transferred for intensive care?

In the first 24 hours

Later during their stay

6) Was there a transfer to high dependency care prior to death?

If No, should the patient have received / been transferred for high dependency care?

In the first 24 hours

Later during their stay

7) Was there a change to terminal care or do not resuscitate (DNR)?

Terminal Care    DNR    Neither  
       

If Yes, how many days into the admission did this occur?

days

8) Is there evidence of an adverse event that occurred in the proximity of the progression to death (see the IHI Global Trigger Tool Kit a guide for adverse events to look for)

Yes      no      maybe  
   

What was the trigger?

9) Is there evidence of miscommunication occurring between health care professionals?

If Yes or Maybe describe:

Space for comments

# Resources

## Dr Fosters

Hospital Standardised Mortality Rates updated annually on the Dr Foster's website available on:  
<http://www.drfooster.com/>

## Intensive Care Society Level of Critical Care<sup>3</sup>

Levels of Critical Care - Intensive Care Society. 2002 available from:  
<http://www.ics.ac.uk/downloads/icsstandards-levelsofca.pdf>

[http://www.modern.nhs.uk/criticalcare/5021/7117/icsstandards-levels%20caren\\_m%20non-member.pdf](http://www.modern.nhs.uk/criticalcare/5021/7117/icsstandards-levels%20caren_m%20non-member.pdf)

## IHI Global Trigger Tool

This is attached as a prompt for the sort issues you may be interested in identifying through your reviews. It's best to keep your reviews simple; we recommend that you limit additional information collected to a few pertinent issues that are locally relevant.

## Box 3a/3b Care bundles and tight glycaemic control

Ventilator Care Bundle [http://www.modern.nhs.uk/scripts/default.asp?site\\_id=20&id=13201](http://www.modern.nhs.uk/scripts/default.asp?site_id=20&id=13201)

Sepsis Care bundle <http://www.ihl.org/IHI/Topics/CriticalCare/Sepsis/EmergingContent/SepsisBundle.htm>

## Sepsis Guidelines

<http://www.ihl.org/NR/rdonlyres/041CE21E-98ED-4EE6-980A-678E475158E0/812/SepsisGuidelines.pdf>

Tight Glycaemic Control. See Sepsis Guidelines

Van den Berghe G, Wouters P, Weekers F, et al: Intensive insulin therapy in the critically ill patients. *N Engl J Med* 2001; 345: 1359–1367

Finney SJ, Zekveld C, Elia A, et al: Glucose control and mortality in critically ill patients. *JAMA* 2003; 2041–2047

Van den Berghe G, Wouters PJ, Bouillon R, et al: Outcome benefit of intensive insulin therapy in the critically ill: Insulin dose versus glycemic control. *Crit Care Med* 2003; 31:359–366

## Pursuing Perfection

Information about the Pursuing Perfection Programme available on:

<http://www.modern.nhs.uk/pursuingperfection>

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# References

<sup>1</sup> Jarman et al (1999) Explaining differences in English hospital death rates using routinely collected data *British Medical Journal*;318:1515–20

<sup>2</sup> Move Your Dot: Measuring, Evaluating and Reducing Hospital Mortality Rates - Institute for Health Care Improvement. Innovation Series 2003

<sup>3</sup> Levels of Critical Care - Intensive Care Society. 2002