Exclusion from resuscitation

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Summary

Resuscitation was attempted for 156 (19.9%) of the 783 cases in St Thomas's Hospital, aged 16 or over, who suffered first cardiac or respiratory arrest of the current admission during the year to 13 April 1987. Seventeen (11%) of the 156 were discharged alive from hospital after resuscitation. All seventeen had been active outside the home before admission, and all except one remained so after discharge.

The factors which were associated with exclusion from resuscitation attempts are analysed. Most accorded with known prognostic factors, but resuscitation was attempted for some persons who seemed to have little chance of benefiting from resuscitation attempts. Routine collection, analysis, and dissemination of information on pre-arrest characteristics in relation to their outcome, on which clinicians can base their decision to with-hold resuscitation in the event of an arrest, is recommended.

Introduction

This study was undertaken to assess factors determining exclusion from resuscitation in a UK hospital in which patients may be excluded from resuscitation before arrest occurs, but which has no centrally determined criteria for the decision. All patients are eligible for resuscitation unless individually excluded by the decision of the clinical team responsible, often but not always recorded by them in the nursing notes. Factors affecting the outcome of attempted resuscitation were also analysed.

Practice in the UK varies between attempts to resuscitate all patients undergoing cardiopulmonary arrest[1] to exclusion of many patients. The Royal College of Physicians has suggested exclusion from resuscitation for 'patients whose lives are drawing naturally to a close because of irreversible diseases'[2], and Baskett[3] suggests that 'Ideally, resuscitation should be attempted only in patients who have a very high chance of successful revival for a comfortable and contented existence.'

There are no systematic British studies of pre-arrest factors as predictors of exclusion from resuscitation or of the outcome of attempted resuscitation. In the USA, Bedell *et al.*[4] found that pneumonia, cancer, a 'homebound lifestyle' before admission, hypotension, and renal failure were significantly associated with death in hospital following a resuscitation attempt, and another observational study has supported the prognostic value of 'homebound lifestyle' before admission[5]. Bedell *et al.*[6] have also compared patients who suffered arrest, but were designated not for resuscitation and were not given a resuscitation attempt, with patients given a resuscitation attempt. Those not resuscitated were significantly more likely to be older, to have malignancy or an abnormal mental status, and significantly less likely to have acute myocardial infarction, stroke, or chronic obstructive pulmonary disease than patients who were given a resuscitation attempt.

Definition of terms

Inpatient

A patient for whom a full medical assessment ('clerking') was documented before the onset of arrest.

Arrest

An episode of cessation of respiration or of circulation, expected to cause death if not treated, irrespective of the cause or of any action taken. Planned ventilation or cardiac bypass was excluded from the definition of arrest; a patient on planned ventilation would thus suffer 'arrest' only in the event of a cardiac arrest, and one on cardiac bypass only in the event of their failing to re-establish circulation after bypass was withdrawn.

Resuscitation attempt

Attempts to reverse an arrest, by whatever method.

Methods

The medical and nursing notes of all inpatients aged 16 or over who suffered arrest in St Thomas's Hospital from 14 April 1986 to 13 April 1987 formed the material for the study. Arrests were identified from the records of the crash call team, the intensive therapy unit (ITU), and case notes supplied by the inpatient office and the hospital mortuary, through which the notes of all patients dying in St Thomas's pass.

A standard form was used to record details of past history, current diagnosis, current observations, full blood count, urea and electrolytes, and liver function tests, similar to the details recorded in a routine medical 'clerking'. For patients given resuscitation, an additional form was completed, which described the timing of the arrest, the electrocardiographic mechanism first recorded after arrest, and whether the patient was alive or dead at the end of the procedure. A further form was used to record the degree of activity after discharge from hospital for those who were discharged alive after a resuscitation attempt, or the date and time of their death if they died in hospital.

The data were analysed, using the statistical packages MINITAB[7] for simple analyses and GLIM[8] for multiple logistic regression, for pre-arrest differences between patients given resuscitation and those who died without an attempt at resuscitation,

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and between those who survived to discharge following resuscitation and those who did not. Fisher's exact test was used to test associations in univariate analysis.

Results

Figure 1 shows the outcome for patients suffering arrest over the one year study period. During the year, 783 cases of first arrest of the current admission were identified among inpatients aged 16 or over. One person suffered such an event during two admissions, leaving the hospital alive after both; he was the only patient with two arrests in the study. One hundred and fifty-six (19.9%) of the cases were given a resuscitation attempt, attended on the ITU by an ITU senior house officer and an ITU nurse, with further assistance as required, and usually by the crash team elsewhere.

The crash team includes the duty physician, duty anaesthetist, a technician, and a senior nurse. This study did not, however, aim to analyse the activity of the crash team; in the same period, the hospital switchboard recorded 506 calls to the crash team, 273 from locations other than casualty or the children's wards.

At the end of the 156 attempts at resuscitation, 68 (44%) cases had an effective circulation, the rest being declared dead; 17 cases (16 persons) were discharged alive from St Thomas's. The success rate of the 156 attempts at resuscitation is thus 10.9%, with 95% confidence limits of 6.0-15.8%; 17 (25%) of the 68 cases successfully restored to a stable circulation left hospital alive. All except one of those discharged alive were documented as being capable of independent outside activity after discharge; the exception was mentally alert and engaging in vigorous rehabilitation for hemiplegia.

Results relating to simple relationships between clinical characteristics and exclusion from resuscitation are given in Table 1, results from multifactorial analysis in Table 2. Exclusion from resuscitation was less likely for patients who had been active outside the home before admission, for male patients and for

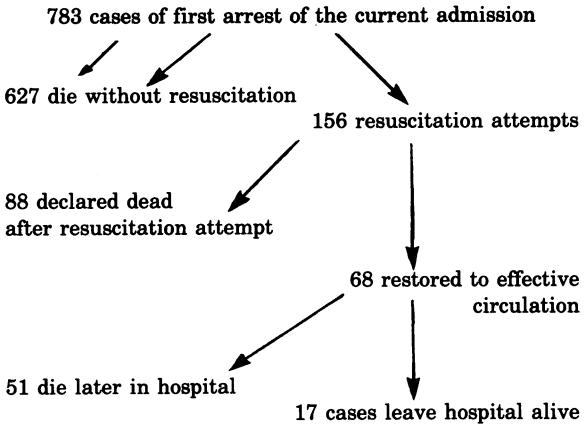

Figure 1. Flow diagram for patients suffering arrest

patients with a past history of hypertension, and for patients in the operating theatre or ITU, or elsewhere in the hospital when a doctor was present at the time of arrest. It was more likely in patients with a current diagnosis of incurable malignancy, dementia, or pneumonia of any sort, or with a past or current diagnosis of cerebrovascular accident. Resuscitation was nevertheless attempted in 21 patients with incurable malignancy and three with dementia; none of these patients survived to discharge.

Certain factors were significantly associated in descriptive analysis with exclusion from resuscitation, but not in multifactorial analysis. They therefore seemed to be accounted for by other factors. They are given in Table 3; the other factors included in the multifactorial analysis are given in Table 4.

Patient age was not a significant predictor of an attempt at resuscitation, and the data did not suggest that other factors including the blood results, and observations of temperature, blood pressure, jugular venous pulse, pulmonary oedema, and urine output, had any predictive value. Both the blood results and the observations could not be determined from the available notes for a large proportion of the patients. The wishes of the patient or relatives are likely to have been taken into account in many cases, but these

Table 1. Factors associated (2P < 0.05) with exclusion from resuscitation in both simple and multifactorial analysis

	Number of cases of first arrest: *Resuscitation not attempted*	*Resuscitation attempted*	*Total*
Total	627	156	783
Patient active outside home in the six weeks before admission	169	102	271
(not known)	17	16	33
Male sex	323	107	430
Past history includes hypertension	68	29	97
Current diagnoses include			
Acute cerebrovascular accident (within the last four weeks)	77	4	81
Serious chest infection/pneumonia●	162	15	177
Dementia■	43	3	46
Malignancy thought incurable	301	21	322
Doctor present at the time of arrest	6	11	17
Location of arrest			
In operating theatre	3	12	15
In the intensive therapy unit	44	49	93

●All forms of pneumonia, lobar or bronchial, are included.
■Defined as irreversible disorientation, from any cause.

Table 2. Adjusted odds ratios, with their 95% confidence limits, of factors associated (2P <0.05) with exclusion from resuscitation in both simple and multifactorial analysis

Factor	*Adjusted odds ratio*	*95% confidence limits*
Patient active outside home in the six weeks before admission	0.33	0.19-0.54
Male sex	0.52	0.31-0.87
Past history includes hypertension	0.41	0.20-0.82
Current diagnoses include		
Acute cerebrovascular accident within the last four weeks:	7.0	2.2-22.7
Serious chest infection/pneumonia●	3.7	1.7-7.8
Dementia■	22.0	3.8-127.2
Malignancy thought to be incurable	7.0	3.6-14.0
Doctor present at the time of arrest	0.10	0.03-0.34
Location of arrest		
In operating theatre	0.12	0.03-0.51
In the intensive therapy unit	0.23	0.12-0.44

●All forms of pneumonia, lobar or bronchial, are included.
■Defined as irreversible disorientation, from any cause.
An odds ratio greater than unity for a given characteristic indicates that a patient with this characteristic was more likely not to receive a resuscitation attempt.

were recorded in the available notes on three occasions only, and on these occasions did not appear to change the medical team's decision.

The only pre-arrest factor found significantly to predict survival to discharge among those given resuscitation was the patient's degree of activity before admission; in the six weeks before admission, all of the 17 cases surviving to discharge had been active outside the home, compared with 85 out of the 123 (69%) who died in hospital after a resuscitation attempt and whose level of activity before admission was known. This was significant, $P<0.05$, both in simple analysis and in multifactorial analysis including all the factors given in Tables 2, 3, and 4. It did not predict the short-term success of resuscitation attempts.

The electrocardiographic findings, immediately after arrest, of the 17 cases (16 persons) who eventually left hospital alive included five cases of ventricular fibrillation, five of asystole, three of ventricular tachycardia, and one each of bradycardia and electromechanical dissociation; in two cases the electrocardiographic findings were not available for analysis. However, these findings seem consistent with the suggestion that the survivors represented true cases of arrest, and would have been very unlikely to survive without resuscitation.

Discussion

The data are subject to limitations; in particular, ascertainment of eligible cases of arrest may have been incomplete. This applies particularly to patients in the intensive therapy unit, where arrest is more commonplace and possibly less likely to be recorded in the notes. A bias towards the more serious cases of arrest is thus likely; more perfect ascertainment might show a higher success rate and, possibly, different 'predictive' factors. Previous studies are presumably subject to similar biases, but insufficient information is available to make meaningful comparisons.

The pre-arrest factors which are associated with exclusion from resuscitation in this study agree in general with the prognostic indicators found by Bedell *et al*[4]. However, attempts to resuscitate also seemed

Table 3. Factors significantly associated in simple analysis with exclusion from resuscitation, but not in multifactorial analysis

Emergency admission (rather than routine)
Patient had a general anaesthetic in the six weeks before arrest
Patient not in recovery room
Patient recorded as being cachectic
Past history includes dementia
Current diagnoses do not include
angina
myocardial infarction within the past four weeks
malignancy thought to be curable
Past history does not include
myocardial infarction
angina
previous cardiopulmonary resuscitation

Table 4. Pre-arrest factors included in the multivariate analysis, but which seemed to have no significant predictive value in either multifactorial or unifactorial analysis

Age of the patient
Current diagnoses include
alcoholism
serious infection other than pneumonia
respiratory failure
renal failure
Past history includes
peripheral vascular disease
congestive cardiac failure
chronic obstructive airways disease

A diagnosis of cardiac failure was a significant predictor of exclusion in multivariate analysis, but not in simple analysis (adjusted odds ratio 2.5, 95% confidence limits 1.3-5.0).

to be affected by factors not obviously related to the probability of a successful outcome. Patients who suffered arrest while a doctor was present, or in the ITU or in the operating theatres, were particularly likely to be given a resuscitation attempt. As this is an observational rather than experimental study, it is possible that observed correlations may have been caused by other important factors, in particular disease severity, on which full and standardized information was not routinely available from the notes and which could not, therefore, be taken fully into account in the analysis. The correlations of a resuscitation attempt with male sex and with a history of hypertension have no intuitively obvious rational explanation.

Some cases were noted in which it might have been better not to attempt resuscitation; 11 of 72 (15%) patients given resuscitation on the wards had a diagnosis of incurable malignancy, none of whom survived to discharge. Only one of these cases had a 'not for resuscitation' order documented in the available case notes. In most of these and in some other cases, the impression gained from the notes was that the medical team did not think a resuscitation attempt appropriate, but had failed, perhaps because they had not anticipated that arrest would occur so soon, to inform the nursing staff of their decision. Better attention to communication might help to reduce the number of such cases.

Resuscitation attempts are a sufficiently rare event for most clinical firms that they may find it difficult to estimate accurately the survival chances of a patient following arrest. Conversely, although the crash team is called to a relatively large number of arrests, it attends them only briefly, and does not normally undertake further follow-up.

Routine collection and analysis of information on pre-arrest characteristics of patients given resuscitation, in relation to their outcome, and its dissemination to the medical staff concerned, is therefore recommended. This would ensure that the clinicians responsible for 'do-not-resuscitate' orders could routinely be given as much useful information as possible about the survival chances of their patients in the event of an arrest.

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