Intensive Care Med (2001) 27: 1459–1465
DOI 10.1007/s001340101041

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Gavin Matthew Joynt
Charles David Gomersall
Peggy Tan
Anna Lee
Claudia Ai Yu Cheng
Elisa Lai Yi Wong

Prospective evaluation of patients refused admission to an intensive care unit: triage, futility and outcome

Received: 2 October 2000
Final revision received: 11 June 2001
Accepted: 29 May 2001
Published online: 4 August 2001

This study was funded by the internal departmental research fund.

G. M. Joynt (✉) · C. D. Gomersall · P. Tan · A. Lee · C. A. Y. Cheng · E. L. Y. Wong
Department of Anaesthesia and Intensive Care, Chinese University of Hong Kong, Prince of Wales Hospital, Sha Tin, Hong Kong, P. R. C.
E-mail: gavinmjoynt@cuhk.edu.hk
Phone: +852-26322738
Fax: +852-26372422

Abstract *Objectives:* To evaluate factors associated with decisions to refuse ICU admission and to assess the outcome of refused patients.
Design and setting: Prospective, descriptive evaluation in a multi-disciplinary intensive care unit, university referral hospital.
Patients and participants: All adult emergency referrals over a 7-month period.
Interventions: The number of beds available at the time of referral, the patient's age, gender, diagnosis, mortality probability model score and hospital survival were documented. The outcome of the referral and the reason for refusal were recorded.
Measurements and results: Of 624 patients 388 were admitted and 236 (38%) refused. Reasons for refusal were triage (n = 104), futility (n = 82) and inappropriate referral (too well; n = 50). The standardised mortality ratio (SMR) for refused and admitted groups was 1.24 (95% CI 1.05–1.46) and 0.93 (0.78–1.09) respectively. The SMR ratio (refused SMR/admitted SMR) was highest in the middle range of illness (1.95, 1.19–3.20). Inappropriate referrals had a better than expected outcome despite refusal, with a SMR ratio of 0.39 (0.11–0.99). Excluding inappropriate referrals, multivariate analysis demonstrated that refusal was associated with older age, diagnostic group and severity of illness. Triage decisions were associated with a diagnosis of sepsis, and futility decisions with greater severity of illness and recent cardiac arrest.
Conclusions: Refusal of admission to our ICU is common. Excess mortality of patients refused is most marked in the middle range of severity of illness. Age, diagnostic group, and severity of illness are important in decision making. Strategies should be developed to create admission criteria that would identify patients in the middle range of severity of illness who should benefit most from ICU care.

Keywords Critical care · Admission · Critically ill · Ethics · Prognosis · Mortality

Introduction

Throughout the world there is evidence that the demand for intensive care exceeds supply, and rationing of ICU beds is common [1, 2, 3, 4, 5, 6, 7, 8]. A method of prioritising or triaging patients is therefore necessary [9]. One method of rationing ICU resources is to refuse admission to patients who are judged to be too ill or too well to benefit from intensive care. The patients who are too ill may be refused because ICU care is considered to be of no potential benefit to the individual patient, or because the patient is too ill to justify the use of scarce ICU resources. The outcome of patients referred to, but refused admission to, ICU is not well known [6,

10, 11]. There are also few data regarding the process of deciding which patients should be refused admission, the number of patients refused and the reasons for refusal. We therefore followed up all patients referred to the ICU for emergency admission and attempted to identify factors associated with the decision to refuse admission.

Materials and methods

The study was carried out in a 22-bed multidisciplinary, adult and paediatric ICU serving a 1400-bed hospital from December 1997 to June 1998. During the 7-month period 635 requests for ICU admission were made, and adequate data were collected on 634 requests for 624 patients. Eight patients had two and one three requests. About one-half of the requests were made on the same day as the day of admission to hospital ($n = 321$). Decisions regarding admission were made by a senior ICU staff physician. Approval for the study was obtained from the Clinical Research Ethics Committee of the Chinese University of Hong Kong, who waived the requirement for informed consent.

The general ward nurse patient ratio was 1:6 by day and 1:15 at night, with one house physician, a medical officer and a senior medical officer per ward of 20–30 beds. Daytime staff consisted of four physicians (including one or two ICU specialists) and night staff of a senior ICU trainee or specialist anaesthetist and a trainee, with 24-h ICU specialist cover. Nurse staffing consisted of 4.5 whole-time equivalents per bed. Patients refused admission were not transferred to another ICU except when the ICU had no empty beds and was closed to admissions. No data were collected during these periods. Elective referrals were postponed if no beds were available, but never refused. The average ICU bed occupancy was greater than 90%.

The following were prospectively recorded for all adult patients referred to the ICU: time from hospital admission to ICU referral, number of beds available at time of referral, patient age, gender, diagnosis at time of referral and mortality probability model ($MPMII_0$) score [12]. A data collection card, which included the data for scoring $MPMII_0$, was completed by the senior ICU physician attending the case at the time of referral. One of the investigators not involved in the consultation collected the remaining data for the hour after the consultation. A referral was defined as any ward physician's request for a patient to be assessed for admission to ICU. Referral outcome was documented as admitted or refused, and at the time of consultation reason for refusal was entered. All referred patients were followed up to hospital discharge.

Reasons for refusal were categorised into three possibilities: inappropriate referrals, triage and futility. (a) Under "inappropriate referrals" we included all patients who were too well and therefore expected not to derive benefit from ICU admission. Patients who were too sick were refused for reasons either of triage or of futility. (b) "Triage" is the process of screening patients to determine their relative priority for treatment [9, 13, 14]. In the context of ICU admission and this study, triage is the process of prioritisation for admission based on the perceived magnitude of benefit that could be derived from ICU care. Those refused on the basis of triage were patients who, it was felt, would derive some benefit from ICU care but insufficient benefit to be accorded a high enough priority to meet the admission threshold. It is important to note that while triage attempts to utilise resources in the most effective manner, individual patients' interests are not always met, as triage is based primarily on the ethical principle of distributive justice. (c) The term "futility" is derived from a Greek term meaning useless or incapable of being achieved [15, 16]. ICU admission was considered futile when the physician's judgement was that the individual patient was too sick to benefit from ICU, regardless of bed status. In contrast to triage, a decision of futility of treatment is based only on the individual patient's status, in terms of the principles of beneficence and non-maleficence.

Statistical analysis

All adult patients referred for emergency admission were analysed. If a request occurred more than once, it was prospectively decided to evaluate the last request as it was expected to have the greatest impact on outcome. $MPMII_0$ uses a number of characteristics collected over the hour of assessment combining diagnostic and physiological data to construct a prediction of mortality between 0 and 1. The $MPMII_0$ categories were prospectively chosen to facilitate the use of the logistic regression model: less ill patients (less than 33% chance of mortality), those with a middle range of illness (34–66% mortality), and those with a high level of illness (mortality 67–100%). The number of empty beds at time of referral was categorised into none or only one, two to four, and more than four beds, and age was dichotomised into under 65 vs. 65 years or older.

Logistic regression was used to identify factors associated with decisions to refuse admission. To compare factors associated with the reason for refusal (triage or futility) a secondary analysis was performed. Diagnostic categories were reclassified to reduce the degrees of freedom of the secondary analysis in order to allow for smaller sample size.

The ICU referral group was categorised as admitted or refused. For each group the expected probabilities were ranked and divided into ten sets, and the observed and expected probability of death plotted. An overall standardised mortality ratio (SMR) and 95% confidence intervals (CI) were calculated for admitted and refused groups and each $MPMII_0$ category. The SMR is the ratio of actual to predicted mortality. An SMR of less than 1 suggests that fewer patients died than would have been expected and vice versa. The ratio of SMRs of refused to admitted group was used to compare these two populations and was interpreted as statistically significant if the 95% CI excluded 1.00. Relative risk and 95% CI for hospital mortality was calculated for each of the three refused groups (triage, futile, inappropriate referral).

A Hosmer-Lemeshow goodness-of-fit test was used to assess the overall fit of the logistic regression models. Interactions were tested, but none were found to be significant. The Mann-Whitney U test and Fisher's exact test were used as appropriate. Analyses were performed using the statistical package for social sciences for Windows version 9.0 (SPSS, Chicago, Ill., USA). Data are presented as median and range. A p value less than 0.05 was considered significant.

Results

Of the 624 patients 388 were admitted and 236 (38%) were refused. Reasons for refusal were documented as triage ($n = 104$), futility ($n = 82$) and inappropriate referral ($n = 50$). The median length of stay in ICU was 3 days (range 1–51). Demographic data are presented in Table 1. The number of empty beds at the time of request was the same for refused (median 3.0, range

Table 1 Demographic comparisons between patients admitted and patients refused ICU admission

	Admitted (n = 388)	Refused (n = 236)
Median age (years)	62 (16–96)	71 (20–96)**
Sex: males/females	221/167	153/83*
Diagnosis at time of referral		
Respiratory failure	92 (24%)	62 (26%)
Cardiac failure	56 (14%)	35 (15%)
Trauma	18 (5%)	6 (3%)
Neurological	24 (6%)	12 (5%)
Drug overdose	8 (2%)	5 (2%)
Hypovolaemic/haemorrhagic	6 (2%)	6 (3%)
Metabolic	16 (4%)	8 (3%)
Gastrointestinal	9 (2%)	3 (1%)
Neurosurgical	27 (7%)	23 (10%)
Postoperative/emergency surgery	51 (13%)	13 (6%)
Sepsis	51 (13%)	23 (10%)
Postarrest	16 (4%)	28 (12%)
Neoplasm/other	14 (4%)	12 (5%)
Observed mortality		
Overall	142 (37%)	145 (61%)**
Triage (n = 104)	–	67 (64%)
Futile (n = 82)	–	74 (90%)
Well (n = 50)	–	4 (8%)
Median $MPMII_0$ (range)		
Overall	0.32 (0.02–0.99)	0.47 (0.02–0.99)**
Triage (n = 104)	–	0.46 (0.02–0.97)
Futile (n = 82)	–	0.81 (0.14–0.99)
Well (n = 50)	–	0.13 (0.02–0.79)

*p = 0.05, **p < 0.001

Table 2 Standardised mortality ratio *(SMR)* of patients refused and admitted to ICU for each $MPMII_0$ category (95% CI; *ratio* ratio of refused/admitted)

$MPMII_o$	Refused	Admitted	Ratio
0–0.33 (n = 296)	1.94 (1.31–2.76)	1.32 (0.96–1.76)	1.47 (0.90–2.39)
0.33–0.66 (n = 147)	1.47 (1.03–2.02)	0.75 (0.52–1.05)	1.95 (1.19–3.20)*
> 0.66 (n = 181)	1.02 (0.81–1.28)	0.85 (0.66–1.09)	1.20 (0.85–1.70)

*p < 0.05

0–14) and admitted (median 3.0, range 0–15) patients (p = 0.58). The number of empty beds at the time of request in the too-well (median 3.0, range 0–14), triage (median 3.0, range 0–14) and futile groups (median 2.5, range 0–13) was similar. There were 207 adult elective surgical admissions during the study period, with a hospital mortality of 12/207 (6%). The ICU was full (not able to admit or discharge any cases regardless of their condition or need) on 23 separate occasions, with an average duration of 14 h per occasion. Each period of closure occurred on a separate day; however, on four occasions the ICU was full for more than 24 h, and the period of closure extended into a second day.

Table 3 Relative risk of hospital mortality and standardised mortality ratio *(SMR)* for various patient groups (95% CI)

Group	Hospital mortality	SMR
Admitted	1.00	0.93 (0.78–1.09)
Refused		
Futile	2.47 (2.12–2.86)	1.28 (1.01–1.61)*
Triage	1.76 (1.45–2.14)	1.38 (1.07–1.75)*
Inappropriate referral	0.22 (0.08–0.56)	0.39 (0.11–0.99)*

*p < 0.05

Table 4 Factors associated with the decision to refuse admission to patients who were too sick (triage and futility combined) in the logistic regression model (Hosmer and Lemeshow Goodness-of-fit test, χ^2 = 6.39, df = 8, p = 0.60; 95% CI)

Factor	n	Odds ratio
Age*		
< 65 years	271	1.00
≥65 years	303	2.58 (1.69–3.94)
Sex**		
Male	343	1.00
Female	231	0.70 (0.47–1.05)
Diagnostic group***		
Respiratory failure	147	1.00
Cardiovascular system failure	83	0.53 (0.29–0.99)
Trauma	20	0.24 (0.05–1.12)
Neurological	34	0.84 (0.36–1.97)
Drug overdose	10	0.74 (0.15–3.74)
Hypovolaemic, haemorrhagic	10	0.97 (0.24–3.93)
Metabolic	20	0.58 (0.17–1.95)
Gastrointestinal	12	0.33 (0.08–1.36)
Neurosurgical	47	1.03 (0.50–2.14)
Postoperative, emergency surgery	55	0.12 (0.04–0.35)
Sepsis	69	0.46 (0.23–0.91)
Postarrest	43	1.41 (0.63–3.16)
Neoplasm, other	24	1.23 (0.49–3.13)
$MPMII_0$ group***		
0–0.33	256	1.00
0.34–0.66	140	1.49 (0.89–2.48)
> 0.66	178	2.40 (1.42–4.05)

*p < 0.001, **p < 0.08, ***p < 0.01

The observed versus expected probability of mortality between the groups (admitted versus refused) is shown in Fig. 1. The overall SMR for refused and admitted groups were 1.24 (95% CI 1.05–1.46) and 0.93 (0.78–1.09), respectively. The overall ratio of SMRs was 1.34 (1.05–1.70). The SMR for each $MPMII_0$ category is shown in Table 2. A significant difference between the admitted and refused groups was found in the middle-range $MPMII_0$ category (0.33–0.66). The $MPMII_0$ predicted mortality for the nine initially refused and later admitted patients was 20% at the initial and 33% at the later request. Actual mortality was 60%, suggesting that this small group of patients may have suffered excess mortality, even though eventually admitted to

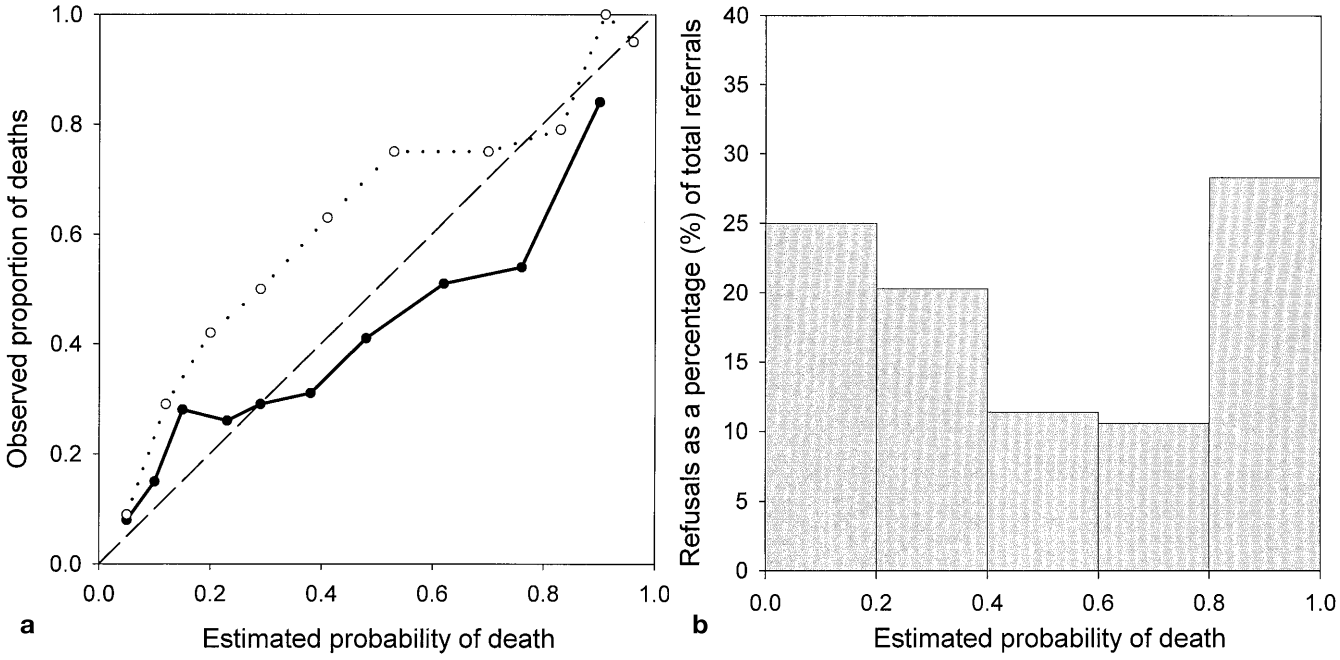

Fig. 1 **a** The observed mortality as a function of estimated probability of mortality of admitted patients *(closed circles)* and refused patients *(open circles)*. Estimated mortality predicted by $MPMII_0$. *Points above dashed line* worse than predicted outcome; *points below dashed line* better than predicted outcome. **b** The percentage of patients refused as a function of estimated probability of mortality by $MPMII_0$. Note: As the difference between the refused and the admitted proportion of deaths increases (**a**), the corresponding proportion of patient refusals decreases (**b**)

ICU. The unadjusted relative risk of mortality for cases refused because of triage, futility and inappropriate referral is shown in Table 3.

Patients who were "too well" were automatically refused (they would not be considered for ICU admission and should never even have been referred – hence the term "inappropriate referral"). A prospective decision was therefore made to analyse factors associated with the reason for refusal in the "too sick" group. Significant factors were older age, diagnostic group and higher $MPMII_0$ (Table 4). If all refusals ("too sick" and "inappropriate referrals") are included together in a single model (Hosmer and Lemeshow $\chi^2 = 5.12$, df = 8, $p = 0.75$), age ($p < 0.001$) and diagnostic group ($p < 0.05$) remain significant factors, but $MPMII_0$ becomes non-significant ($p = 0.34$) as both low and high illness severity is associated with refusal. The "inappropriate referrals" were also analysed separately. In contrast to the "too sick" model, the decision to refuse admission in the "inappropriate referrals" model (Hosmer and Lemeshow $\chi^2 = 4.18$, df = 8, $p = 0.84$), was strongly associated with a *lower* $MPMII_0$ ($p < 0.001$). Although overall diagnostic group is non-significant ($p = 0.65$), the odds ratio for refusal of some diagnostic groups (postoperative, cardiovascular and sepsis), was reversed. Septic patients were more likely to be refused on the basis of triage than futility (Table 5). Conversely, patients referred following cardiac arrest or those most severely ill were more likely to be refused on the basis of futility (Table 5).

The outcome of the eight patients in whom ICU care was considered futile, but who survived to hospital discharge, is presented in Table 6. There were four patients considered too well who subsequently died – one following unexpected massive cerebro-vascular accident, one requested cessation of medical therapy, one suffered sudden aspiration while eating and the last suffered irreversible cardiac arrest in the coronary care unit while awaiting pacemaker insertion for sick sinus syndrome (death occurred 2, 4, 10 and 2 days after ICU referral, respectively).

Discussion

The main findings of this study were that refusal of admission to our ICU is common, and that triaged patients are at an increased risk of mortality. Factors associated with the decision to refuse admission of patients referred to ICU were age, diagnostic group and severity of illness. Excess mortality of patients refused admission was most marked in the middle range of severity of illness.

Table 5 Factors associated with triage compared to futility decisions (reference group) in the logistic regression model (Hosmer and Lemeshow Goodness-of-fit test $\chi^2 = 7.92$, df = 8, $p = 0.44$; 95 % CI)

Factor	*n*	Odds ratio
Age*		
< 65 years	56	1.00
≥65 years	130	1.36 (0.64–2.89)
Diagnostic group**		
Respiratory failure	55	1.00
Cardiac failure	27	3.17 (0.96–10.42)
Trauma, postoperative, emergency surgery	6	2.03 (0.31–13.18)
Neurological/neurosurgical	30	0.57 (0.21–1.50)
Sepsis	18	4.48 (1.08–18.56)
Postarrest	27	0.16 (0.04–0.67)
Other	23	0.49 (0.17–1.39)
$MPMII_0$ group***		
0–0.33	54	1.00
0.34–0.66	46	0.51 (0.20–1.32)
> 0.66	86	0.20 (0.08–0.51)

*$p = 0.43$, **$p < 0.001$, ***$p < 0.01$

Rate of refusal

The rate of refusal of patients referred to our ICU (38 %) was higher than in two previous published studies [6, 10] but lower than that reported in a third [11]. Metcalfe et al. [10] studied patients refused admission to ICU in the United Kingdom and found that 26 % were refused admission to their first-choice ICU. Sprung et al. [6] studied 382 patients referred for admission to an ICU in Israel. Of these, 92 (24 %) were initially refused admission, although 32 were subsequently admitted. Frisho-Lima et al. [11] analysed 144 patients referred for admission to ICU in Israel. Eighty-two (57 %) patients were not admitted, all because of a lack of available beds. Therefore what little data are available support the prevailing opinion that a significant number of patients are refused ICU admission.

Factors associated with refusal

Reasons associated with the decision to refuse admission to patients were age, diagnostic category and severity of illness, although the nature of the association may differ depending on whether "inappropriately referred" patients are included in the logistic regression model. Nevertheless, our findings are similar to those of Sprung et al. [6] who also found that age, admission diagnosis, severity of illness and operative status were important factors. There are, however, some differences between our findings and those of Sprung et al. [6], notably the lack of association between available beds and admission decisions in our study. This may reflect differences in the population and facilities studied. The trend towards a female sexual bias was unexpected in what is generally considered a patriarchal society but may reflect physician bias in view of well known information relating to female longevity.

Underlying reasons for refusals

Metcalfe et al. [10] reported that the majority of patients were refused because of lack of beds, lack of nurses, physicians, equipment, and other reasons. Frisho-Lima et al. [11] stated that official policy was "first-come, first-served", and that cases were refused when beds were full, although after excluding moribund patients and those considered not sick enough. Only Sprung et al. [6] addressed the issue of appropriate resource allocation and triage. Of those refused in their series, 8 patients (9 %) were refused because of lack of beds, 29 (32 %) bad prognosis, 25 (27 %) good prognosis (too well), 4 (4 %) for other reasons and 20 (22 %) were admitted to another ICU. The majority of patients in our series (104 patients, 44 %), were refused on the basis of a triage decision. Admission to ICU was considered futile in 82 (35 %) and 50 (21 %) were too well.

Factors associated with the underlying reasons for refusal (triage and futility)

Triage is the process of sorting referred patients in order of priority [7, 14], so that those refused have the least chance of benefiting from ICU care. However, some are still denied interventions from which they could benefit. This is conceptually different from denying admission to ICU because of perceived futility, which involves a clinical judgement that ICU care will not be successful in achieving a specific benefit (usually survival) for an individual patient. Despite the conceptual difference between triage and futility, practical application of the concept of futility is difficult [17].

To try to understand the decision-making process we performed a sub-analysis of the association between the factors associated with decisions to refuse admission and the reason for the decision i.e. futility or triage (Table 5). The unexpectedly high rate of survival (10 %) among those for whom ICU admission was deemed futile was worrisome (Table 1). This may be a consequence of patients refused on the basis of qualitative futility who might have some chance of surviving despite ICU care being considered futile [18]. Data from Table 6 suggest that some of these patients survived with a poor quality of life as they had not reached a sufficient state of recovery to be discharged home 1 year after ICU referral. An alternative explanation is that doctors are not very good at assessing futility [19, 20, 21]; at least

Table 6 Detailed outcome of the eight patients for whom ICU therapy was considered futile who survived to hospital discharge (*COPD* chronic obstructive pulmonary disease)

Sex	Age (years)	Underlying chronic disease	Referral diagnosis	Premorbid functional state	Ward management	Outcome (1 year follow-up)
M	62	COPD and bronchiectasis	COPD exacerbation	Maximal effort, homebound	Non-invasive ventilation for 2 days	Convalescent hospital, died 7 months after referral
M	76	Ischaemic heart disease and bronchiectasis	Acute pulmonary oedema	Maximal effort, few steps on flat ground	Conservative medical therapy	Convalescent hospital, alive
F	63	Cryptogenic fibrosing alveolitis	Respiratory failure	Chair and bedbound	High concentration oxygen therapy	Convalescent hospital, died 2 days after referral
F	72	COPD and cor pulmonale	COPD exacerbation	Maximal effort, 20 m flat ground	Controlled oxygen therapy	Discharged home, alive
M	66	Hypertension	Severe intracranial haemorrhage	Normal	Extubation and comfort care	Convalescent hospital, died 4 months after referral
F	75	COPD, ischaemic heart disease, myasthena gravis	Community acquired pneumonia	Homebound, oxygen dependent	Controlled oxygen therapy Antibiotics	Discharged home, alive, 24 h nursing care, 9 hospital readmissions
F	86	Congestive heart failure, dementia	Acute myocardial infarction	Partially mobile with assistance	Conservative medical therapy in coronary care unit	Convalescent home, alive
M	49	Hepatitis B cirrhosis and liver mass	Prolonged hypovolaemic cardiac arrest, bleeding liver mass	Cirrhosis classification, Child's C	Immediate hospital transfer at family request	Died within hours of referral and transfer

two patients live at home and could be considered "good" survivors despite being deprived of ICU care. These data highlight the practical difficulty of determining futility as a principle for refusing admission. The descriptive concepts are, however, distinct and while the controversy regarding definition has been vigorously discussed [17], few investigators have described the process or outcome of futility decisions [19, 21].

Outcome of the patients refused ICU admission

We provide data that patients refused on the basis of being too ill (triage and futility) suffer excess mortality. As expected, those patients who were refused admission on the basis of triage had higher predicted mortality and higher observed mortality than those admitted. Even corrected for severity of illness by comparing the SMR ratio, the mortality of the triaged patients was higher (Table 3), which raises important questions about allocation of more resources to reduce potentially preventable deaths. The patients refused on the basis of futility had higher hospital mortality, but a lower SMR than those in the triage group, suggesting that they were less likely to benefit from ICU therapy. Those patients refused on the basis of being too well to justify the use of resources had a lower than predicted mortality, despite not being admitted. Comparison of the SMR (Table 3), and individual review of these cases suggests that there is little to be gained by admitting these relatively well patients to ICU.

The relatively lower refusal rate in our patients with an intermediate severity of illness suggests that we have come some way in achieving the goal of admitting those most likely to benefit (Fig. 1). Future strategies should be developed to create admission criteria that would identify patients in the middle range of severity of illness who could benefit most from ICU care.

Study method and limitations

In this study the $MPMII_0$ score was chosen to reflect severity of illness and as a prognostic score because it can be completed at the time of referral or admission and is not reliant on 24 h of intensive monitoring and multiple blood tests. It is therefore less likely to be affected by ICU admission than other systems such as the Acute Physiology and Chronic Health Evaluation II.

A study of this nature has limitations. Other factors, such as degree of chronic disease, patient preferences and unit type may affect triage decisions [7, 22]. Chronic

disease is accounted for in some measure by $MPMII_0$, but as a single-unit study the effect of type of unit could not be measured. No patient or patient family requested that ICU admission be waived, and therefore the patient's preference as a factor was not tested. There may be some effect of Chinese cultural beliefs on the practice of triage; however, we believe that the basis of these decisions was not specific to Chinese culture as the full-time ICU specialists trained primarily in Western countries. While the above issues should be considered when generalising the results of this study, the results are similar to those previously reported.

References

1. Ip M, Galligan T, Koenig B, Raffin TA (1998) Ethical decision-making in critical care in Hong Kong. Crit Care Med 26: 447–451
2. Scheinkestel CD (1996) The evolution of the intensivist: from health care provider to economic rationist and ethicist. Med J Aust 164: 310–312
3. Vincent JL (1990) European attitudes towards ethical problems in intensive care medicine: results of an ethical questionnaire. Intensive Care Med 16: 256–264
4. Strauss MJ, LoGerfo JP, Yeltatzie JA, Temkin N, Hudson LD (1986) Rationing of intensive care unit services. An everyday occurrence. JAMA 255: 1143–1146
5. Miller DH (1994) The rationing of intensive care. Crit Care Clin 10: 135–143
6. Sprung CL, Geber D, Eidelman LA, Baras M, Pizov R, Nimrod A, Oppenheim A, Epstein L, Cotev S (1999) Evaluation of triage decisions for intensive care admission. Crit Care Med 27: 1073–1079
7. Society of Critical Care Medicine Ethics Committee (1994) Attitudes of critical care medicine professionals concerning distribution of intensive care resources. Crit Care Med 22: 358–362
8. Lyons RA, Wareham K, Hutchings HA, Major E, Ferguson B (2000) Population requirement for adult critical-care beds: a prospective quantitative and qualitative study. Lancet 355: 595–598
9. Task Force of the American College of Critical Care Medicine SCCM (1999) Guidelines for intensive care unit admission, discharge, and triage. Crit Care Med 27: 633–638
10. Metcalfe MA, Sloggett A, McPherson K (1997) Mortality among appropriately referred patients refused admission to intensive-care units. Lancet 350: 7–12
11. Frisho-Lima P, Gurman G, Schapira A, Porath A (1994) Rationing critical care – what happens to patients who are not admitted? Theor Surg 9: 208–211
12. Lemeshow S, Teres D, Klar J, Spitz Avrunin J, Gehlbach SH, Rapoport J (1993) Mortality probability models (MPMII) based on an international cohort of intensive care unit patients. JAMA 270: 2478–2486
13. Anonymous (1994) Dorland's illustrated medical dictionary. Saunders, Philadelphia
14. Society of Critical Care Medicine ethics committee (1994) Consensus statement on the triage of critically ill patients. JAMA 271: 1200–1203
15. Luce JM, Alpers A (2001) End of life care: what do the American courts say? Crit Care Med 29 [Suppl]:N40–N45
16. Ritz R, Straten-Werth G (1999) Withdrawing treatment. In: Webb AR, Shapiro MJ, Singer M, Suter PM (eds) Oxford textbook of critical care. Oxford University Press, Oxford, pp 1039–1040
17. Helft PR, Siegler M, Lantos J (2000) The rise and fall of the futility movement. N Engl J Med 343: 293–296
18. Schneiderman L, Jecker NS, Jonsen AR (1990) Medical futility: its meaning and ethical implications. Ann Intern Med 112: 949–954
19. Rodriguez RM, Wang E, Pearl RG (1997) Prediction of poor outcome of intensive care unit patients admitted from the emergency department. Crit Care Med 25: 1801–1806
20. Curtis JR, Park DR, Krone MR, Pearlman RA (1995) Use of the medical futility rationale in do-not-attempt-resuscitation orders. JAMA 273: 124–128
21. Halevy A, Neal RC, Brody BA (1996) The low frequency of futility in an adult intensive care unit setting. Arch Intern Med 156: 100–104
22. Sax FL, Charlson ME (1987) Utilization of critical care units: a prospective study of physician triage and patient outcome. Arch Intern Med 147: 929–934