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## Limitation of life support: frequency and practice in a London and a Cape Town intensive care unit

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**Abstract Objectives:** To examine the frequency of limiting (withdrawing and withholding) therapy in the intensive care unit (ICU), the grounds for limiting therapy, the people involved in the decisions, the way the decisions are implemented and the patient outcome.

**Design:** Prospective survey. Ethical approval was obtained.

**Setting:** ICUs in tertiary centres in London and Cape Town.

**Patients:** All patients who died or had life support limited.

**Interventions:** Data collection only.

**Results:** There were 65 deaths out of 945 ICU discharges in London and 45 deaths out of 354 ICU discharges in Cape Town. Therapy was limited in 81.5% and 86.7% respectively ( $p = 0.6$ ) of patients who died. The mean ages of patients whose therapy was limited were 60.2 years and 51.9 years ( $p = 0.014$ ) and mean APACHE II scores 18.5 and 22.6 ( $p = 0.19$ ) respectively. The most common reason for limiting therapy in both

centres was multiple organ failure. Both medical and nursing staff were involved in most decisions, which were only implemented once wide consensus had been reached and the families had accepted the situation. Inotropes, ventilation, blood products, and antibiotics were most commonly withdrawn. The mean time from admission to the decision to limit therapy was 11.2 days in London and 9.6 days in Cape Town. The times to outcome (death in all patients) were 13.2 h and 8.1 h respectively.

**Conclusions:** Withdrawal of therapy occurred commonly, most often because of multiple organ failure. Wide consensus was reached before a decision was made, and the time to death was generally short.

**Key words** Critical care · Ethics · Resuscitation orders · Advance directives · Life support withdrawal · Prognosis · Severity of illness index

### Introduction

The practice of limiting (withholding or withdrawing) life support in the intensive care unit (ICU) appears to be gaining more widespread acceptance but varies between ICUs and countries. Life support was withdrawn in less than 50% of patients dying in two ICUs in the United

States [1], while “do not resuscitate” orders preceded 39% of all deaths in another ICU [2]. In Australia the withdrawal rate may be slightly higher: 27 patients had treatment withdrawn or withheld during a period in which 22 other patients died in the ICU, 19 of whom were still receiving curative treatment just prior to death [3]. In 1988 an European survey of attitudes to ethical problems found that withholding life support was practiced by 83%

of respondents, withdrawal by 63% and euthanasia by 36% [4]. In the same year a survey of American intensivists found that 89% of respondents had withheld and 87% had withdrawn life support [5]. More recently, withholding or withdrawing of therapy preceded 64.5% of patients dying in a Canadian ICU [6]. Our impression is that withdrawal occurs more frequently in England and South Africa.

A number of statements on life-sustaining therapy have come from learned bodies [7–16]. Medical reasons for withdrawal of life support include brain death [17], severe neurological dysfunction after 2–7 days of intensive care [18], and failure of three or more organs after more than 4 days of organ failure [19]. Less well defined reasons include an acute illness in a patient with chronic ill health or malignancy, or a single limiting and irreversible organ failure. In some circumstances the intensity of therapy would be limited in a patient with chronic ill health.

As the literature has largely concentrated upon the decision of whether or not to limit therapy, many of the practical details regarding the timing and the mode of withdrawal remain undefined. Current practices in England and South Africa may be guided by the literature but the patient selection, method, and frequency of limiting therapy may be very different from those in the United States, from where most of the literature derives. Thus this prospective study examines the frequency of limiting therapy, the medical grounds for limitation, the people involved in making the decisions, the way these decisions are implemented, and the ICU and hospital patient outcome.

## Materials and methods

This was a prospective study. One investigator at each centre began collecting data whenever a decision was made to withdraw or withhold life support.

### Ethics

This study was approved by the ethics and research committees of the Royal Brompton National Heart and Lung Hospital and the University of Cape Town. The need for informed consent to be included in the study was waived.

### Sites

The Royal Brompton National Heart and Lung Hospital is a tertiary cardiothoracic referral centre; the adult ICU has a capacity of 19 beds and deals principally with immediate post-surgical cardiac and thoracic patients. Other patients admitted include those with adult respiratory distress syndrome, major vascular surgery, and cardiology patients needing mechanical support. The ICU is staffed

by a director and consultants from anaesthetics and thoracic medicine, and the junior staff includes research fellows and three senior house officers. There is 24-h in-house physician cover and there is always a research fellow and a consultant on call. Groote Schuur Hospital is a secondary and tertiary general hospital with approximately 1450 beds. The surgical ICU has 12 beds. The main admission categories are trauma, major elective surgery, surgical emergencies, and liver transplants. Staffing includes a director and a full-time consultant, as well as a rotating anaesthetic consultant. There are four surgical registrars who provide 24-h in-house cover, backed up by a consultant.

### Entry and exclusions

All patients admitted to the adult ICU of the Royal Brompton National Heart and Lung Hospital and the surgical ICU at Groote Schuur Hospital were eligible for entry into this study. There were no exclusions. All patients who died or in whom life support was withdrawn or withheld were entered into the study. In addition the total numbers of admissions and mortality rates of the respective ICUs were analysed.

### Definitions

*Withdrawal of therapy:* The progressive withdrawal or discontinuation of established life-support therapy including intermittent therapy such as haemodialysis.

*Withholding of therapy:* Where a new therapy, necessary for continued life support, was not initiated or where an existing therapy was not escalated (such as increasing the inotrope infusion rate). This included the institution of cardiopulmonary resuscitation (CPR).

*Life support therapy* included: ventilation, inotropes, antibiotics, anti-arrhythmics, dialysis, nutrition, blood or blood products, IV fluids, or any other supportive therapy.

*Organ failure* was defined according to the criteria of Knaus et al. [19].

*Irreversible single-organ failure:* Where an organ system was assessed as incapable of recovering to the extent that would allow independent existence.

It should be noted that in this study, the removal of support from brain dead patients was included in the withdrawal figures.

### Analysis

Data were entered onto a specially designed data sheet and then entered into a microcomputer database (Paradox 4.0, Borland International, Calif., USA) for analysis. Data were analysed both separately and in combination. Comparisons between groups were performing using Fisher's exact test for 2×2 tables and the Mann-Whitney test for non-parametric data. Statistical analysis was performed using InStat 2.04 (GraphPad Software, Calif., USA) and Statgraphics 5.0 (Manugistics, Calif., USA).

## Results

The study ran from July 1993 to March 1994. Demographics and therapy limitation rates in the two centres are shown in Table 1. All patients who had therapy with-

**Table 1** Demographics and withdrawal rates, with statistical comparison where appropriate

	Brompton	Groote Schuur	<i>P</i> value
Study period	9 months	9 months	
ICU discharges	945	354	
ICU deaths	65	45 <sup>a</sup>	
ICU mortality (%)	6.9	10.7	<i>p</i> = 0.028
Limited therapy	53 (81.5%)	39 (86.7%)	<i>p</i> = 0.603
Failed CPR	12	6	
Study patients			
Mean age (years)	60.15 (20–78)	51.9 (18–78)	<i>p</i> = 0.0014
Mean APACHE II	18.53 (8–30) <sup>b</sup>	22.6 (4–45)	<i>p</i> = 0.19

<sup>a</sup> Including seven patients who died in the ward after limiting therapy

<sup>b</sup>APACHE II scores were available on 50 patients (the rest were in ICU for too short a time to be scored)

held or withdrawn died. Overall, therapy was withheld or withdrawn in 92 (86.8%) of 106 patients dying in the ICU. Of these 92 patients, therapy was withheld or not escalated in 25 (27.2%) and withdrawn in 67 (72.8%).

The principal diagnostic categories, reflecting the different ICU patient populations, are shown in Table 2. Discussion of the issue of limiting therapy was usually initiated by ICU medical staff on ward rounds. Nursing

staff and patients' families did not participate in the decision in 8 and 11 cases respectively (Table 3). The most common reason for limiting therapy was multiple organ failure or irreversible single organ failure (Table 4).

Four patterns of treatment limitation, ranging from withholding new or not escalating existing therapy to immediate withdrawal of inotropes and ventilation, were retrospectively identified (Table 5). Table 6 details the

**Table 2** Principal diagnostic categories

	Brompton ( <i>n</i> = 53)	Groote Schuur ( <i>n</i> = 39)
Cardiac surgery	23	0
Pulmonary neoplasm	8	0
Chronic pulmonary disease	6	0
Pneumonia	4	0
Cardiomyopathy	3	0
ARDS	3	0
Myocardial infarction	2	0
Gastrointestinal bleeding	0	3
Pancreatitis	0	3
Vascular surgery	1	4
Trauma	0	11
Abdominal sepsis	0	12
Other sepsis	0	2
Other	3	4

**Table 3** Initiators of withdrawal discussion and subsequent discussants

	Brompton ( <i>n</i> = 53)	Groote Schuur ( <i>n</i> = 39)
Withdrawal initiated by		
ICU physician	51	31
Referring physician	1	2
Family	1	2
Patient	0	1
ICU nurse	0	1
Other consultant	0	2
Decision discussed with		
Registrars	52	39
ICU consultant	53	39
Nurses	51	33
Family	49	32

**Table 4** Reasons for limiting therapy. (OSF organ-system failure according to the criteria of Knaus et al. [19])

Reasons for limiting therapy	Brompton		Groote Schuur	
	No.	%	No.	%
3 OSF <sup>1</sup>	20	37.7	13	33.3
Irreversible Single OSF	10	18.9	0	0
2 OSF, 1 irreversible	8	15.1	0	0
<3 OSF with chronic health/carcinoma	4	7.5	7	17.9
<3 OSF, overwhelming event	6	11.3	7	17.9
Chronic health plus poor prognosis	3	5.7	4	10.3
Brain death	1	1.9	0	0
Poor neurological prognosis	1	1.9	6	15.4
Patient request	0	0	1	2.6
Inoperable sepsis (necrotising fasciitis)	0	0	1	2.6

**Table 5** Patterns of limiting therapy. (I new therapy withheld and/or existing therapy not increased, II new therapy withheld and/or existing therapy not increased followed by withdrawal of ventilation and/or inotropes, III inotropes withdrawn, ventilation continued, IV inotropes and/or ventilation reduced immediately)

	Brompton		Groote Schuur	
	No.	%	No.	%
I	21	39.7	4	10.3
II	13	24.5	13	33.3
III	4	7.5	5	12.8
IV	13	24.5	14	35.9
Not classified	2	3.8	3	7.7

**Table 6** Treatment type withdrawn/withheld (more than one type could be withdrawn in the same patient)

Treatment	Brompton		Groote Schuur	
Inotropes	42	(79.2%)	21	(53.8%)
Ventilation	24	(45.3%)	28	(71.8%)
Dialysis	14	(26.4%)	10	(25.6%)
Antibiotics	10	(18.9%)	21	(53.8%)
Anti-arrhythmics	2	(3.8%)	0	
Total parenteral nutrition	1	(1.9%)	9	(23.1%)
Intravenous fluid boluses	1	(1.9%)	4	(10.3%)
Blood products	2	(3.8%)	22	(56.4%)
Further surgery	3	(5.7%)	4	(10.3%)
Cardioversion	2	(3.8%)	0	
Intra-aortic balloon pump	1	(1.9%)	0	
Ventricular assist device	1	(1.9%)	0	
Enteral feeding	0		1	(2.6%)

**Table 7** Sedation strategies after withdrawal of therapy

	Brompton (n = 53)	Groote Schuur (n = 39)
Benzodiazepines	35	23
Analgesics	48 <sup>a</sup>	22
No sedation	1	11

<sup>a</sup> Diamorphine was commenced in 15 cases

**Table 8** Time course of events with means and ranges

Event	Brompton	Groote Schuur
Admission to decision (days)	11.15 (<1–41)	9.56 (<1–62)
Decision to action (h)	1.36 (0–48)	3.19 (0–24)
Action to death, all (h)	13.22 (<1–96)	11.41 (<1–75)
Action to death, therapy reduced (h)	6.78 (<1–24)	12.86 (<1–75)

therapies actually withdrawn. Table 7 shows sedation strategies after withdrawal of therapy. In both centres sedatives comprised benzodiazepines and analgesics comprised opiates. Figure 1 and Table 8 shows the time course of events.

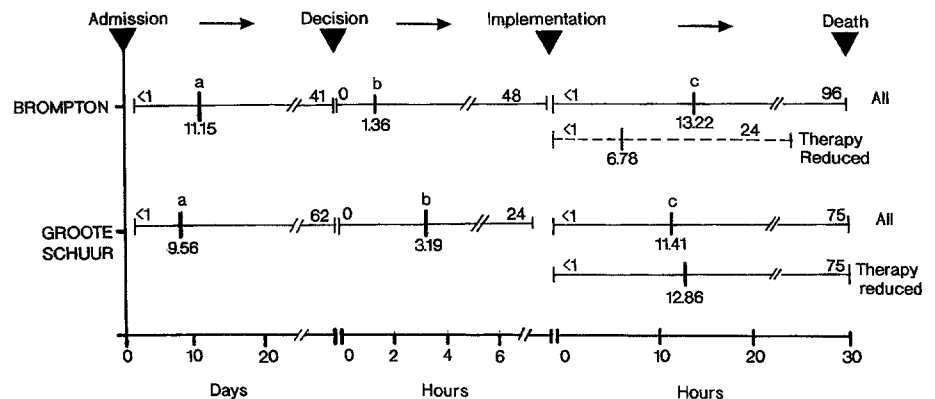
**Discussion**

Patients are usually admitted to the ICU with a hope for recovery. When it becomes clear to ICU staff and the family that this is no longer possible, withdrawing or withholding therapy becomes the only humane solution.

In this study the overall ICU mortality rates were 6.9% at the Brompton Hospital and 10.7% at Groote Schuur Hospital (these centres are not claimed to be representative of the different countries as a whole). The units also have different admission rates and patient profiles (Tables 1, 2). Nevertheless, the incidence of withdrawal or withholding therapy prior to death was very similar. Both units had a policy of incorporating all involved medical and nursing personnel in discussions on limiting therapy, and of keeping the families fully informed. Modes of therapy withdrawal differed somewhat, with a trend to more active withdrawal at Groote Schuur Hospital, but ventilation and inotropes were the most commonly limited therapies in both units.

The mean APACHE II scores were similarly high in both ICUs, but were not used in decisions to limit therapy, being calculated after death. However, organ-sys-

**Fig. 1** Time course of events showing means and ranges of the durations of events – from admission to decision to limit therapy, from decision to implementation, and from implementation to death – for all study patients and for those in whom therapy was only withheld (*ap* = 0.249, *bp* = 0.000005, *cp* = 0.225)



tem failure was commonly used as a criterion for withdrawal, as failure of three or more organ systems from the 4th day of failure onwards were associated with close to 100% mortality even when using 95% confidence intervals [19]. The data of Levy and Bates [18] were also used to identify hopeless neurological prognoses in several cases. There were more cases of irreversible single-organ failure in London, probably owing to the patient selection, with almost all patients having advanced cardiac or respiratory disease.

In essence, there were only two types of death in intensive care: following limitation of therapy or failed CPR. In this study, therapy was limited more often than previously reported [1–3, 6]. This may be partially related to changing trends [15]. Further data come from a retrospective study from the United States which showed that 74% of patients who died in a university hospital had some intervention withheld or withdrawn [20]. This study included both ICU and general ward patients, and 30 of the 70 patients concerned had a principal diagnosis of cancer.

Neither hospital had a written policy on the withdrawal of life support at the time of the study. Discussions about limiting therapy began when the appropriateness of continued intensive therapy was questioned by the ICU staff or the patient's family. Usually the issue of withdrawing life support was first brought into open discussion by the ICU medical staff on ward rounds. A potential source of bias existed in the data collection in that the investigators sometimes had to take part in making decisions on therapy limitation. This was unfortunately unavoidable.

Only one patient in the study participated in discussions about withdrawal of therapy, as none of the others were considered competent. This is in keeping with one previous study [3], while participation figures of 4% [1] and 27% [20] have also been reported. These low proportions reflect the realities and practicalities of the decision-making process (an issue not adequately covered in the published policy statements) and should not be interpreted negatively as being paternalistic or a violation of patient autonomy. Nevertheless, the way physicians value have come to dominate decisions about withdrawal of therapy, and the possible reasons for this, have been reviewed [21].

Advance directives (living wills) have been advocated as a means of preserving patient autonomy and as a way to make decisions about death and withdrawal of life support easier for patients, families, and physicians. In this study, however, the existence of an advance directive for any patient involved was not brought to the attention of ICU staff. Advance directives are not widely used [22], are difficult to implement in acute illnesses and may not be appropriate in the particular circumstances [23–25]. Although there is growing support for the concept of advance directives, many practical aspects of their widespread and appropriate use are at present unclear.

The decision to limit therapy was therefore taken by the ICU staff in discussions involving consultants, junior medical staff and nurses. Despite a policy of involving nursing staff in the discussions, they were not consulted on a number of occasions, mainly in cases where the patient became unsalvageable over a short period of time. The final decision to limit therapy was, however, only made after careful consideration and after consensus had been reached between all parties involved in the decision. Ethical committees were not involved in the decision making process, although expert ethical advice was available at both hospitals.

Families were involved in discussions whenever possible. In most cases the prognostic information was given to them first, with the option of limiting therapy introduced in a later and separate interview. They were then given time to come to terms with the situation. This process usually took a day or two but was hastened in cases where overwhelming events were rapidly overtaking the patient. The family was never allowed to feel that they had to take sole responsibility for making the decision. A refusal to allow withdrawal of life support was rare and always temporary, while any requests to wait until a family member arrived from afar were accommodated if at all possible. One patient at Groote Schuur Hospital had no contactable family up to the time of treatment withdrawal for four-organ failure. In several cases of acute deterioration over hours, such as situations of massive on-going haemorrhage that was not amenable to surgery, a decision was made to withhold further therapy even though no family was present or contactable. This occurred more frequently in Cape Town, probably because most patients were indigent and many families did not have telephones and/or private transport.

Once a decision had been made, a management plan was usually put into effect immediately. The actual therapy withdrawn was most commonly inotropes, followed by ventilation, dialysis, and antibiotics. Blood products, haemodialysis, and vasopressors were shown to be the therapies most likely to be withdrawn in a survey of physicians from the United States, with tube feeds and intravenous fluids the least likely [26]. In the current study, therapies were often withheld or withdrawn sequentially and at rates designed to accommodate the needs of the patient and family. Despite a tendency to more immediate withdrawal of ventilation and inotropes at Groote Schuur Hospital, time from implementation of the decision to death was similar.

When medical treatment is futile, it is the ethical duty of physicians to redirect their efforts towards maximising comfort and dignity both for the patient and the family [27]. The success of intensive care may be measured, *inter alia*, "by the quality of the dying of those in whose interest it is to die" [28]. It is not easy to provide a dignified death in a busy high-technology environment. Most patients in this study received sedatives and/or analgesics

once support was withdrawn, the exceptions being mainly those patients with serious neurological dysfunction. At the Brompton, commencement of diamorphine was often a part of such a fundamental shift in management. In the rare situation where consciousness was compatible with comfort, patients were extubated with minimal sedation and able to be in verbal contact with their families.

Patients were not discharged from the Brompton ICU when therapy was limited, and were only rarely moved at Groote Schuur Hospital. Limited critical care facilities might account for the difference. Wherever possible, they were moved into a single-bedded side room (this was not available in Cape Town). Other studies have shown that the vast majority of patients are not moved to another ward [1, 3, 20]. The suitability of the ICU as the place to provide this terminal care has been questioned [12], but we believe that the bond which develops between families and ICU staff in these situations should be maintained as it helps both parties come to terms with the death and prevents families from feeling abandoned.

The time to death was generally short, with a mean of 13.2 h in London (mean 6.8 h with a maximum of 24 h if therapy was immediately reduced) and 11.4 h in Cape Town. However both of these periods may have been extended by decisions to continue support until family members were all present. We found that it was never

possible to predict how long it would take any individual to die after withdrawal. In some cases the discontinuation of inotropes at high infusion rates led to almost immediate demise, and in other cases there was little change in cardiovascular status for some hours.

In a retrospective study, mean time to death after the decision to forgo therapy was 3.0 days in mechanically ventilated patients [20], while another study demonstrated a mean time to death after terminal weaning of between 0.17 and 2.13 days in different years of observation, with 62% of patients dying within 12 h [29].

Technical excellence has been highly developed in the ICU context. Ethical excellence requires similar attention. An audit of activities, including withholding and withdrawal of treatment and thoughtful sensitive debate contributed to by health care and other professionals, patients and their families, helps to shape a contextual framework of values within which difficult decisions can be made and shared. We have shown that limitation of therapy was common in the ICUs studied and that wide consensus was reached before a decision was made. There were a number of reasons for withholding or withdrawing therapy (not all involving multiple organ failure) with a variety of therapeutic options available, and the time to death was generally short.

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