CLINICAL RESEARCH

Alcohol and mortality among young men: longitudinal study of Swedish conscripts

SVEN ANDREASSON, PETER ALLEBECK, ANDERS ROMELSJÖ

Abstract

The association between alcohol consumption and 15 year mortality was studied in a cohort of 49 464 Swedish conscripts, mostly aged 18-19. A strong association was found. The relative risk of death among conscripts with a high consumption of alcohol (>250 g/week) was 3·0 (95% confidence interval (2·3 to 4·1) compared with those with moderate consumption (1-100 g/week). After adjustment for social background variables the relative risk was reduced to 2·1 (95% confidence interval 1·4 to 3·2). Among causes of death a strong predominance was found for violent death, suicide or probable suicide being the leading single cause and accounting for 236 (36%) of all deaths. The reported U shaped curve for total mortality was not confirmed, though when violent deaths were excluded a U shaped curve was suggested for other causes of death.

These findings provide important epidemiological data on the drinking habits of young people and the consequences for mortality.

Introduction

The association between alcohol and mortality has been the subject of numerous studies.[1-11] No clear consensus has yet emerged about the role of alcohol in total mortality. Many studies have found a U shaped curve, the lowest mortality being recorded among moderate consumers of alcohol. None of these studies, however, has focused specifically on younger age groups. Evidence suggests that alcohol related mortality may change with age, following the changes in causes of death with age. It is also important to take into account social and other risk factors for early death which are associated with alcohol consumption and which therefore may act as confounders. These data have been lacking in most previous studies.

We have studied the association between alcohol consumption and total as well as cause specific mortality among young men. We aimed particularly at assessing the influence of social background factors in relation to alcohol consumption and mortality.

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Subjects and methods

A questionnaire survey in 1969-70 concerning drug use among military conscripts provided data on alcohol and drug habits, social background, and psychiatric history.[12] A total of 50 465 men were conscripted, of whom 67% were born in 1951, 22% in 1950, and 10% in 1949, and the rest in other years. Only 2-3% of all Swedish men are exempted from conscription.

DRUG HABITS AND SOCIAL BACKGROUND

Two questionnaires were completed at conscription. The first contained 67 questions of a general nature, such as upbringing, school conditions, and personal relationships; 0·4% of conscripts refused to complete this part. The second questionnaire containeed 39 questions which dealt more specifically with use of alcohol and other drugs. The rate of non-response was 1·2%. Complete information on alcohol consumption was therefore obtained from 49 464 conscripts, who were followed up for 15 years.

All conscripts were assessed by a psychologist after a structured interview and psychological tests. Those presenting with psychiatric symptoms were assessed by a psychiatrist and any diagnosis recorded according to the International Classification of Diseases (8th revision).

Alcohol consumption was calculated by combining data on quantity and frequency of consumption of beer, wine, and spirits (see appendix) and expressed as grams of 100% alcohol a week. Information on the alcohol content of all alcoholic beverages available in Sweden in 1969-70 was obtained from the Swedish alcohol retailing monopoly. The cohort was then divided into five groups of alcohol consumption (see table I) based on a slightly modified classification for risk evaluation described by Hollstedt and Rydberg.[13] In their classification consumption of up to 110 g alcohol a week is considered to be associated with low risk. An intermediate group consuming 110-250 g a week is advised caution about their drinking; consumption above 250 g a week is considered hazardous; and people drinking more than 400 g alcohol a week are advised to seek treatment.

TABLE I—*Alcohol consumption at conscription and relative risk of early death compared with moderate consumption (1-100 g alcohol/week)*

Weekly alcohol consumption (g)	No of conscripts	No of deaths	Relative risk of death (total mortality)	95% Confidence interval
0	2 906	28	0·8	0·6 to 1·2
1-100	38 849	463	1·0	—
101-250	6 492	128	1·7	1·4 to 2·0
251-400	822	21	2·1	1·4 to 3·3
>400	395	22	4·8	3·3 to 7·1

This register records all inpatient admissions for psychiatric care in Sweden.

Relative risks of death in different alcohol consumption groups were calculated with 95% confidence intervals according to the test based method described by Miettinen.[14] In order to evaluate the prognostic relevance of various social background factors 10 variables were chosen from the available data (see table III). The effect on the end point (death) was first evaluated by stratified analysis controlling for each background variable separately. Based on this analysis the variables were entered into a logistic regression model in order to study the simultaneous effect of several prognostic factors. These analyses were performed with help of the Biomedical data package (BMDP).

TABLE II—*Mortality/1000 by cause of death and weekly alcohol consumption (g 100% alcohol)*

	Weekly alcohol consumption (g)				
	0 (n=2906)	1-100 (n=38 849)	101-250 (n=6492)	>250 (n=1217)	Total deaths
Violent death	5·8	9·0	15·2	28·8	499
Suicide (E950-959*)	2·4	3·4	4·3	12·3	184
Probable suicide (E980-989*)	0·7	0·7	2·2	6·6	52
Cardiovascular death	1·0	0·4	0·8	0·8	26
Tumours	1·4	1·4	2·0	1·6	74
Other causes of death	1·4	1·1	1·7	4·1	63
Total	9·6	11·9	19·7	35·3	662

*ICD (8th revision) codes.

TABLE III—*Background factors*

Variable	Level	No of conscripts	Relative risk of death compared with level (1) (95% confidence interval)	% Of conscripts consuming >250 g alcohol/week
Cannabis abuse	(1) None	44 065	1·0 —	1·6
	(2) >10 times	1 433	2·0 (1·4 to 2·8)	15·2
Solvent abuse	(1) None	42 652	1·0 —	1·5
	(2) >10 times	949	2·8 (2·0 to 4·0)	21·0
Cigarette smoking	(1) None	20 384	1·0 —	0·7
	(2) 1-5/day	5 679	1·2 (0·9 to 1·5)	1·2
	(3) 6-10/day	10 262	1·3 (1·1 to 1·6)	1·4
	(4) 11-20/day	11 354	1·6 (1·3 to 2·0)	4·7
	(5) >20/day	1 788	2·4 (1·7 to 3·2)	18·2
Ever run away from home*	(1) Never	47 346	1·0 —	2·0
	(2) Once or more	1 699	2·6 (2·0 to 3·4)	14·3
Contact with police or juvenile authorities†	(1) Never	34 789	1·0 —	1·1
	(2) Once or more	14 013	2·3 (1·9 to 2·6)	5·8
Father's drinking habit‡	(1) Never	9 781	1·0 —	1·5
	(2) Rarely	22 311	1·0 (0·8 to 1·2)	1·8
	(3) Sometimes	14 230	1·3 (1·1 to 1·7)	3·2
	(4) Often	2 005	1·7 (1·2 to 2·4)	8·0
School adjustment§	(1) Good	25 171	1·0 —	1·2
	(2) Poor	5 297	2·2 (1·8 to 2·7)	9·4
Social class¶	(1) I	8 044	1·0 —	1·9
	(2) II	14 725	1·1 (0·9 to 1·5)	2·1
	(3) III	24 340	1·3 (1·0 to 1·6)	2·7
Psychiatric diagnosis at conscription‖	(1) No	42 512	1·0 —	1·6
	(2) Yes	5 996	2·3 (2·0 to 2·8)	8·4
Drug treatment for nervous problems**	(1) No	43 359	1·0 —	1·9
	(2) Yes	1 482	3·0 (2·2 to 3·9)	10·9

*Based on question "Have you ever run away from home?"
†Based on question "Have you had any contact with the police or juvenile authorities?"
‡Based on question "How often does your father drink alcohol?"
§Based on question "How did you get on in school?"
¶Based on occupation of father.
‖Based on ICD (8th revision) diagnosis by psychiatrist at conscription. (Of 6220 psychiatric diagnoses, 42% belonged to group neuroses and 22% to group personality disorder; 0·2% belonged to group psychoses.)
**Based on question "Have you ever received drug treatment for nervous problems?"

FOLLOW UP AND ANALYSIS

The cohort was followed up in the national cause of death register till the end of 1983. The register records all deaths among people registered in Sweden and is more than 99% complete. Causes of death were recorded according to the Swedish version of the ICD (8th revision), based on certificates issued by doctors and coded at Statistics Sweden. The necropsy rate was 84%; 70% were forensic necropsies.

In order to check the validity of our questionnaire data the cohort was also followed up in the national register of psychiatric care till the end of 1983.

Results

TOTAL MORTALITY

A total of 2906 (5·9%) of the 49 464 conscripts in the cohort were abstainers—that is, reported no consumption of beer, wine, or spirits (table I). Of the remainder, 38 849 (78·5%) reported consuming up to 100 g alcohol a week (corresponding to roughly 300 ml spirits or six cans (450 ml) of medium strength beer; this last was the dominant alcoholic beverage at the time) and 6492 (13·1%) between 101 and 250 g alcohol a week; 1217 (2·5%)

conscripts consumed over 250 g alcohol a week, of whom 395 (0·8%) drank more than 400 g. Because of the small number of men who reported consuming over 400 g alcohol a week we have in most of our analyses included in the high consumption group all men reporting consumption of over 250 g.

Altogether 662 deaths were recorded during the follow up period, a total mortality of 13·4/1000. There was a strong association between the reported level of alcohol consumption at conscription and total mortality (table II). The relative risk of death among high consumers (>250 g alcohol/week) was 3·0 (95% confidence interval 2·3 to 4·1) compared with moderate consumers (1-100 g/week). Relative risk increased with the level of alcohol consumption and was 4·8 (95% confidence interval 3·3 to 7·1) among those who consumed more than 400 g alcohol/week (table I). Corresponding relative risks (95% confidence intervals) for high consumers compared with abstainers were 3·7 (2·4 to 5·7) and 5·8 (3·5 to 9·5) respectively. As moderate consumption was by far the most common, conscripts in this group served as the reference population in subsequent analyses.

CAUSES OF DEATH

Violent death (ICD (8th revision) codes E800-999) accounted for 499 (75%) of all 662 deaths and included 184 suicides (codes E950-959) and 52 probable suicides (codes E980-989); suicide or probable suicide accounted for 36% of all deaths in the series (table II). Other violent deaths included 172 traffic accidents (26·0% of all deaths), 15 poisonings (2·3%), 14 drownings (2·1%), 12 falls (1·8%), and 10 cases of murder or manslaughter (1·5%). The proportion of violent deaths increased with the level of alcohol consumption (fig 1; table II). In the abstinent group there were 5·8 violent deaths/1000 compared with 28·9/1000 among high consumers.

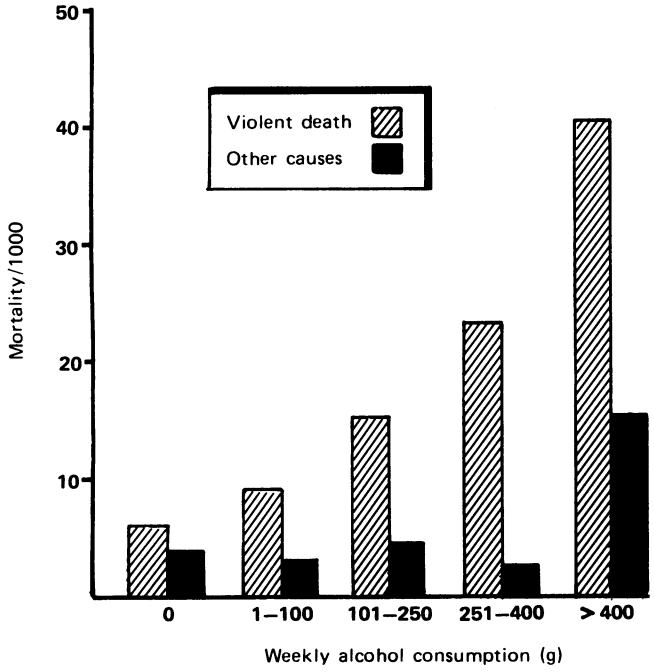

FIG 1—Association between alcohol consumption at conscription and mortality (violent and other deaths) during follow up.

Of the non-violent deaths, tumours accounted for 74 (11·2%) and cardiovascular disease for 26 (3·9%) (table II). The highest mortality from cardiovascular disease was in the abstinent group. Total mortality among abstainers, however, was somewhat lower than among moderate consumers, with a relative risk of 0·8 (95% confidence interval 0·6 to 1·2) (table I).

STATISTICAL ANALYSIS

Several background factors were in themselves associated with an increased risk of early death (table III) and might therefore act as confounders in assessing the role of alcohol in mortality. Stratified analysis was performed controlling for one background factor at a time. The relative risk tended to decrease somewhat in this process but still remained raised.

Multivariate analysis was performed by a stepwise procedure, using a logistic model in which all background factors were considered. Firstly, the variable was identified which best predicted mortality during follow up; this was "contact with police or juvenile authorities" (A). Next the variable or combination of variables was identified which, given A, best predicted additional mortality; this was "psychiatric diagnosis at conscription" (B). Next followed the variable which we were primarily interested in, "alcohol consumption" (C), and, lastly, "number of friends" (D). The variables "parents divorced" (E) and "cannabis abuse" (F) added very little to mortality and were excluded from analysis.

Table IV shows the effects of the different explaining variables on mortality. With increasing alcohol consumption a statistically significant increase in mortality was found. The relative risk of death for consumption above 250 g alcohol a week was reduced, however, from 3·0 to 2·1 when adjustment was made for background factors.

TABLE IV—*Multivariate analysis (baseline variables at conscription predictive of early death in log linear model, controlling simultaneously for other variables)*

Variable	Level	Odds ratio	95% Confidence interval
Contact with police or juvenile authorities	(1) No	1·0	—
	(2) Yes	1·9	1·6 to 2·2
Psychiatric diagnosis at conscription	(1) No	1·0	—
	(2) Yes	1·7	1·4 to 2·1
Weekly alcohol consumption	(1) 0	1·0	—
	(2) 1-100 g	1·1	0·7 to 1·6
	(3) 101-200 g	1·4	0·9 to 2·3
	(4)>200 g	2·2	1·2 to 4·1
No of close friends	(1) >5	1·0	—
	(2) 3-5	1·0	0·6 to 1·8
	(3) 1 or 2	1·6	0·9 to 3·0
	(4) 0	1·7	0·6 to 4·5

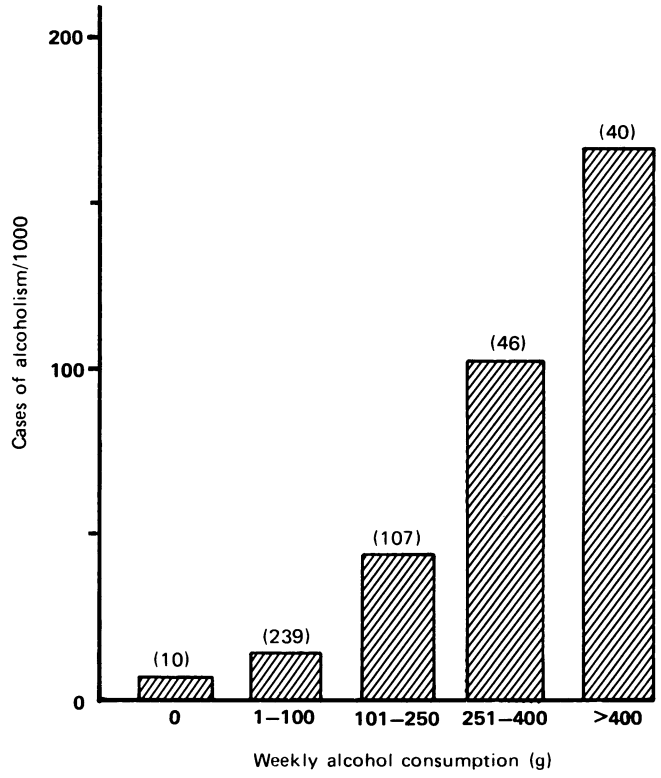

FIG 2—Association between alcohol consumption at conscription and incidence of alcoholism during follow up (numbers of cases in parentheses).

The association between the reported level of alcohol consumption at conscription and the occurrence of hospital admission with a diagnosis of alcoholism (ICD (8th revision) code 303) during the follow up period was studied. A strong association was found (fig 2) when the cohort was matched individually with the national register of psychiatric care.

There was a strong association between the drinking habits of the fathers (as reported by the conscripts) and the level of alcohol consumption among the conscripts (fig 3).

Discussion and conclusions

Reliability of data at conscription survey—There is good cause for scepticism about the accuracy of questionnaire data on alcohol consumption. Considerable underreporting of alcohol consumption has been shown in several studies.[15-18] If this was the case in our study, then the true relative risk of death would be underestimated for high alcohol consumption. On the other hand, when evaluating information from 18 year olds it has been suggested that alcohol consumption may be exaggerated in order to impress. Benson and Holmberg assessed the validity in the Gothenburg part of the same national conscription survey and found that conscripts generally gave correct information concerning drug use and abuse.[19] Rydelius compared data on alcohol consumption obtained by structured in depth interviews of 1004 18 year olds and data obtained anonymously from the same group in the conscription survey during the same year and found a good correlation.[20] The strong association between the reported alcohol consumption at conscription and the incidence of treatment for alcoholism during follow up lends further support to the assumption that the self reported level of alcohol consumption in this cohort was reliable.

Social factors—In the stratified analysis the relative risk of death was reduced when controlled for background factors. This reduction in risk was most likely an effect of the strong interaction among several of the background factors and alcohol consumption. Thus a large proportion of heavy drinkers were characterised by several indicators of psychosocial maladjustment. Of the 1217 conscripts with an alcohol consumption above 250 g a week, 218 (18%) had used cannabis more than 10 times (compared with 752 (1·9%) of the moderate consumers); 199 (16%) had abused solvents more than 10 times (compared with 410 (1·1%)); 243 (20%) had run away from home once or more (compared with 937 (2·4%)); 389 (32%) had been in contact with police or juvenile authorities (compared with 859 (2·2%)); and 497 (40·8%) reported poor school adjustment (compared with 3298 (8·5%)). What emerges is a group exposed to multiple hardships and with a problematic lifestyle in which high alcohol consumption is one factor among many. Not all high consumers of alcohol belonged to this group, however. Interestingly, apparent social adjustment does not protect high alcohol consumers from an increased risk of early death.

Familial factors—The clear association between the consumption pattern of the fathers and the level of alcohol consumption of the conscripts (fig 3) correlated well with a large number of other studies.[26-29] With this followed the expected association with mortality shown in table III. These observations, along with results from other studies, also present a challenge to preventive medicine.

Violent death—Our findings agree with those of several other studies indicating a strong predominance of violent death among the causes of death in youth and early middle age.[21 22] Among the violent deaths a strong association was also found between increasing alcohol consumption and suicide or probable suicide (table II). Among high consumers 18·9/1000 died from this cause compared with 3·1/1000 among abstainers. Suicide was the most common single cause of death in this study. The strong association between alcohol and violent death carries important implications for prevention. Violent death is the leading cause of lost productive years of life.[24 25]

U SHAPED CURVE

In a large number of studies from different countries moderate consumers have been found to have a lower total mortality than abstainers.[2 4 7 8 10] In the Framingham study abstainers were found to have a higher total mortality even compared with people drinking more than 1·8 l pure alcohol a month (corresponding to 390 g/week).[3] These findings of a U shaped curve for mortality have raised the question of possible misclassification, people incorrectly being classified as abstainers owing to underreporting or denial of true alcohol consumption. Misclassification may also occur if former high consumers are classified as abstainers or if abstention is caused by disease. We think that in this cohort of conscripts these sources of misclassification were largely avoided.

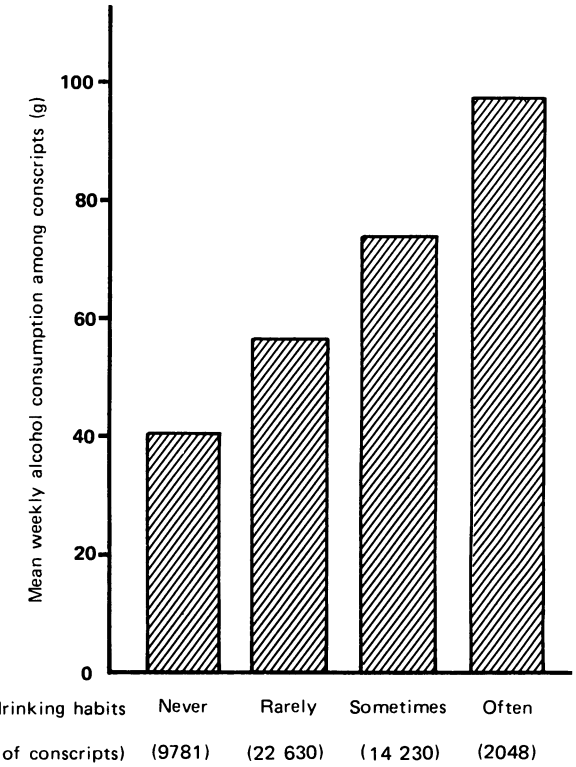

FIG 3—Association between drinking pattern of fathers and alcohol consumption among conscripts.

We did not find a U shaped curve when considering total mortality. Nevertheless, when violent death was excluded a U shaped curve was suggested (fig 1). This was most pronounced for cardiovascular deaths, though there were very few of these in the series. We emphasise that the study was concerned with mortality in youth and early middle age. The predominant causes of death in this age group are in the category of violent death. Violent death is strongly related to alcohol.[21-23] Other studies have dealt mainly with mortality among the middle aged and elderly, in whom the dominant causes of death are associated with cardiovascular disease. The presence or absence of a U shaped curve for total mortality may therefore be an age related phenomenon where the U shape appears when cardiovascular death replaces violent death as the dominant cause. In younger and early middle ages the negative influence of alcohol on mortality in violent death heavily outweighs its possible protective influence on the cardiovascular system.

We are indebted to Sten Kjellsson, of the National Defence Research Institute, for help in utilising the conscription survey data and Åke Svensson, department of mathematical statistics, University of Stockholm, for statistical work.

Appendix

ALCOHOL RELATED QUESTIONS IN CONSCRIPTION SURVEY

(Values in parentheses used in calculating consumption levels)

(1) How often do you drink spirits?*

A couple of times a week	(2·5)
Once a week	(1·0)
Once or twice a month	(0·3)
Less frequently	(0·1)
Never	

(2) How much do you drink when you drink spirits?

More than 350 ml	(37·5)
150-350 ml	(25·0)
50-149 ml	(10·0)
Less than 50 ml	(4·0)
Never drink spirits	

(3) How often do you drink medium strength beer/strong beer?†	
More or less daily	(7·0)
Some time during week	(1·5)
More seldom	(0·5)
Never	
(4) How much do you drink when you drink beer?	
3 Cans (450 ml) or more	(135·0)
2 Cans	(90·0)
1 Can	(45·0)
A glass	(25·0)
Never drink beer	
(5) How often do you drink wine/strong wine?‡	
More or less daily	(7·0)
Some time during week	(1·0)
More seldom	(0·5)
Never	
(6) How much do you drink when you drink wine?	
1 Bottle (750 ml) or more	(75·0)
½-1 Bottle	(58·0)
½ Bottle	(38·0)
A glass	(20·0)
Never drink wine	

*Mean alcohol content 39·9% (by volume).
†Mean alcohol content 4·3% (by volume).
‡Mean alcohol content 13·5% (by volume).

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Prognosis of patients receiving intensive care for lifethreatening medical complications of haematological malignancy

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Abstract

The mortality of patients admitted to intensive care units with haematological malignancy is high. A humane approach to the management of the critically ill as well as efficient use of limited resources requires careful selection of those patients who are most likely to benefit from intensive care. To delineate more accurately the factors influencing outcome in these patients the records of 60 consecutive admissions to the intensive care unit (37 male, 23 female) with haematological malignancy were reviewed retrospectively. Fifty patients were in acute respiratory failure, most commonly (34 patients) with a combination of pneumonia and septicaemic shock. The severity of the acute illness was assessed by the APACHE II (acute physiology and chronic health evaluation II) score and number of organ systems affected. Thirteen patients survived to leave hospital. The mortality of patients with haematological malignancy was consistently higher than predicted from a large validation study of APACHE II in a mixed population of critically ill patients. Moreover, no patient with an APACHE II score of greater than 26 survived. Mortality among the 22 patients with relapsed malignancy (21 deaths), was significantly higher than among the 35 patients at first presentation (26 deaths). On discharge from the intensive care unit all survivors had responded well to chemotherapy and had normal or raised peripheral white cell counts. They included seven patients who had recovered from leucopenia (white cell count $<0{\cdot}5\times10^9$/l). In contrast, 36 of the 47 patients who died were leucopenic at the time of death.

The overall mortality of critically ill patients with haematological malignancy is higher than equivalently ill patients without cancer. The dysfunction of an increasing number of organ systems, an APACHE II score of greater than 30, failure of the malignancy to respond to chemotherapy, and persistent leucopenia all point to a poor outcome.

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Introduction

Recent developments in the use of very myelosuppressive cytotoxic chemotherapy, as well as advances in supportive care, have considerably improved the prognosis of many patients with haematological malignancy, and a large proportion can now be cured.[1] These