Intensive Care Med (2011) 37:831–838
DOI 10.1007/s00134-011-2137-0

ORIGINAL

Lotti Orwelius
Carl Bäckman
Mats Fredrikson
Eva Simonsson
Peter Nordlund
Anders Samuelsson
Folke Sjöberg

Social integration: an important factor for health-related quality of life after critical illness

Received: 30 April 2010
Accepted: 13 January 2011
Published online: 12 February 2011

L. Orwelius (✉) · A. Samuelsson · F. Sjöberg
Department of Intensive Care, Linköping University/University Hospital of Linköping, Linköping, Sweden
e-mail: lotti.orvelius@lio.se
Tel.: +46-13-223651
Fax: +46-13-222836

F. Sjöberg
Department of Burns, Hand and Plastic Surgery, Linköping University/University Hospital of Linköping, Linköping, Sweden

L. Orwelius · A. Samuelsson
Department of Medical and Health, Linköping University/University Hospital of Linköping, Linköping, Sweden

C. Bäckman · M. Fredrikson · F. Sjöberg
Department of Clinical and Experimental Medicine, Linköping University/University Hospital of Linköping, Linköping, Sweden

C. Bäckman
Department of Anaesthesia and Intensive Care, Vrinnevi Hospital, Norrköping, Sweden

E. Simonsson · P. Nordlund
Department of Anaesthesia and Intensive Care, Ryhov Hospital, Jönköping, Sweden

Abstract *Objectives:* To examine to what extent availability of social integration affects health-related quality of life (HRQoL) in former intensive care unit (ICU) patients and how it relates to corresponding findings in a general reference group. *Design:* Controlled, multicenter, prospective, explorative study. *Setting and patients:* HRQoL data (SF-36) were collected from three combined medical and surgical ICUs in the south-east of Sweden. Social integration was assessed by the Availability of Social Integration (AVSI) instrument (seven questions related to the social interaction of the patient). As reference group, a random sample ($n = 6{,}093$) of people from the uptake area of the hospitals was used. Social integration (AVSI), HRQoL (SF-36), and comorbidity were examined also in the reference group. *Interventions:* None. *Measurements and results:* The level of social integration significantly affected HRQoL for the former ICU patients, whereas no such effect was seen for the general reference group. For the ICU patients, social integration affected HRQoL to a larger extent than age, sex, and the ICU-related factors examined, but to a lower extent than the pre-existing diseases. *Conclusions:* For a comprehensive assessment of HRQoL in former ICU patients, it is mandatory to include the effect of social integration.

Keywords Availability of social integration (AVSI) · Health-related quality of life · Comorbidity · Intensive care · Follow-up

Introduction

Health-related quality of life (HRQoL) is one and possibly the most important follow-up measure that is used to assess outcome after critical care [1, 2]. A decreased HRQoL has repeatedly been shown for former ICU patients both short and long term after critical care and compared with a general population [3–5]. Focus in such studies has been directed at factors believed to be important for this outcome. The most commonly stressed are age, sex, duration of stay on the ICU, Acute Physiology And Chronic Health Evaluation (APACHE) II score and time on ventilator [1]. Also, it has recently been claimed that pre-existing disease is more important than

the others listed and of a magnitude comparable to these factors taken together [6]. This finding was made when a large control population was used and adjusted for co-morbidities. In that study approximately 50% of the decrease in HRQoL was ascribed to co-morbidities together with the other factors (age, sex, duration of stay on the ICU, APACHE II score and time on ventilator).

It may then be concluded that yet more factors must contribute to the HRQoL situation for these patients. In HRQoL research outside the field of critical care, it has been shown that factors such as social integration, coping and socio-economic factors (marital state, education, immigrant status) also may be important for the HRQoL experience [7–9].

The concept of availability of social integration (AVSI) was primarily developed in the mid-1970s with the emergence of a new field of scientific research and initially was used in the mental health literature [10]. From this research, the role of social relationships, especially integration, was emphasised as a buffer against negative health effects, and furthermore it was argued that social integration maintains or sustains the organism by promoting adaptive behaviour of neuroendocrine responses in the face of stress or other health hazards. Risk factors of importance for the lack of social integration and health include the following: younger age, older age in women, lower occupational grade, less education, lower social class, immigrant status, more symptoms of ill health, smoking, and more frequent use of alcohol [11, 12]. More socially isolated or less socially integrated individuals are less healthy, both psychologically and physically, and are more likely to die [7, 13]. Research has indicated that psychosocial counselling during and after stressful procedures, such as critical care, can decrease the associated level of stress and improve the recovery process [14, 15]. Recently this has become a focus of research interest during intensive care [16, 17], however, it is not widely used for this purpose after the period of intensive care and discharge from the hospital.

The aim of this study was to examine to what extent social integration patterns affect HRQoL outcome in the 6 month follow-up of critically ill patients and to examine if the effects differ between the ICU patients and the general population.

Materials and methods

Design

This prospective, multicenter study took place in three mixed medical-surgical ICUs, one university and two general hospitals, in south-east Sweden. They have a regional referral area covering roughly 1 million people. Patients with primary coronary disease, those recovering after heart surgery and neurosurgery, neonates, or patients with burns are treated in other specialised units and were excluded from this study. The ICUs admit 500–750 patients annually and nearly all admissions are emergencies. The most common primary diagnoses are multiple trauma, sepsis, and disturbances in respiratory or circulatory systems.

Participants

This study is part of a large study previously published [6, 18]. In short, all patients aged 18 years and older who were consecutively admitted to the ICUs between 2000 and 2004, remained in the ICU for more than 24 h, were alive 6 months after discharge from hospital, and consented to participate in the study were included. Patients who were readmitted were included only on their first admission. We sent information and a request to participate to each patient by mail, together with a structured questionnaire and a preaddressed and prepaid envelope. Patients who had not responded within about 10 days were contacted by telephone by one of the investigators (L.O., E.S. or C.B.), which was predetermined. If telephone or first mailing achieved no answer, two reminders were sent out (at 3 and 6 weeks). The clinical databases in each hospital were used to extract patient data.

Data from a public health survey of the county of Östergötland were used for comparison of availability of social integration, HRQoL and comorbidity. This reference group consisted of a random sample of the general population living in the uptake area of the hospitals. That survey was undertaken for the purpose of monitoring the general health of this population in a different study and was completed during 1999 [12].

The study was approved by the Committee for Ethical Research at the University of Health in Linköping.

Questionnaires and instruments

A set of structured questionnaires was mailed to the study population 6 months after discharge from hospital. The questionnaire contained questions about the patients' background [(civil state, children living at home, born in Sweden or not, education, employment before and after admission to the ICU, sick leave before and 6 months after discharge from the ICU and hospital, and pre-existing disease (self-reported diagnosis)]. The questionnaire asked, "Have you had any significant illness, reduced body function or other medical problem and did you have it for more than 6 months prior to the ICU period?" with the answer either "yes" or "no". Further, this question also had the following specified illness alternatives: "cancer; diabetes; heart failure; asthma/

allergy; rheumatic-gastrointestinal, blood, kidney, psychiatric, neurological disease; thyroid or any other metabolic disturbance; or any other long term illness". The last alternative was an open question with a slot for free text.

Availability of social integration (AVSI)

The instrument AVSI [19] was used to assess social integration patterns. AVSI was developed in the beginning of the 1980s and has been validated and found reliable (internal consistency 0.71; test re-test 0.75; stability of scores over time 0.84–0.87, range 4–12 months) [19] and used repeatedly in examinations of social structure in patient populations [20–22]. Furthermore one of these studies [22] involves the reference group also used in the present study. This instrument is one of four subscales in the extensive instrument known as the Interview Schedule for Social Interaction (ISSI) [19]. AVSI has been translated into Swedish and has been found to be a reliable instrument in this context as well [11]. In the Swedish setting it has been used in epidemiological research [12]. It comprises seven questions. In six of them, respondents are asked how many persons they receive support from, for example "These days, how many people with similar interests do you have contact with?" with six answer alternatives ranging from no one to more than 15. One question is to be answered yes or no: "Other than those at home, do you have someone you can turn to if you are in trouble? Someone that you can meet easily and that you trust and that really can help you when you have hard times?" The questions generate a summed score index with a scale ranging from 6 (the worst score) to 36 (best score).

Health-related quality of life

The Medical Outcome Short Form 36 (SF-36) was chosen for the evaluation of HRQoL [23, 24]. The instrument is internationally well known and has often been used [25]. SF-36 has previously been applied in intensive care [6, 26–28] and has recently been recommended as one of the best-suited instruments for measuring HRQoL in trials in critical care [29].

SF-36 has been translated into Swedish and validated in a representative sample [30]. It has 36 questions and generates a health profile of eight sub-scale scores [24, 30]. These eight scores were aggregated to form two commonly used summary scores: the physical component (PCS) and the mental component (MCS).

Statistics

Data are presented descriptively (mean, 95% confidence intervals) using parametric statistics (one-way analysis of variance) and non-parametric statistics (Pearson's chi-squared test). Linear regression analysis, adjusted for sex and age, was used to evaluate the independent effects of APACHE II scores on admission, length of stays in ICU and hospital, diagnoses on admission, time on ventilator, marital state, level of education, born in Sweden or not, age, sex, social support and pre-existing disease on HRQoL (component summary scores) among the patients. Only standard statistical methods were used [31]. Further, when ICU survivors were compared with the reference group, survivors older than 74 years were excluded since the reference population did not include subjects older than 74 years.

The Statistical Package for the Social Sciences (SPSS, version 17.0, Chicago, IL, USA) was used for the statistical analyses. Probabilities of <0.05 were accepted as significant.

Results

Clinical and socio-demographic characteristics of the patients

During the study period, 5,306 patients were admitted to the ICUs. Of these a total of 1,663 (31%) patients met the inclusion criteria. After two reminders, 980 patients (59%) answered the questionnaire (Fig. 1).

The group who did not respond at all in the study [$n = 683$ (41%)] differed from the group who responded in that there were fewer men ($p = 0.02$), higher average APACHE II score ($p = 0.04$), shorter length of stay in the ICU ($p < 0.0001$), shorter time on ventilator ($p < 0.0001$) and fewer gastrointestinal diagnoses on admission ($p = 0.02$) (Table 1).

For the reference group, questionnaires were initially sent out to 10,000 people. After two reminders, 6,093 (61%) had responded [12]. Apart from lower percentages of immigrants and single households, the responders in the reference group differed only marginally from the reference population of the county [12]. The reference group was younger ($p < 0.001$), included more women ($p < 0.001$), had a higher rate of marriage/cohabitation ($p < 0.001$) and employment ($p < 0.001$), and had a lower rate of comorbidity (51%) ($p < 0.001$) than the ICU group, after adjusting for age in the ICU group (age < 74 years) [$n = 780$ (80%)] (Table 2).

Availability of social integration

The former ICU patients reported significantly lower mean scores in availability of social integration than the reference group, 19.8 (SD 6.3) compared with 20.7 (SD 5.8) ($p < 0.001$). In Table 3 the comparison between the

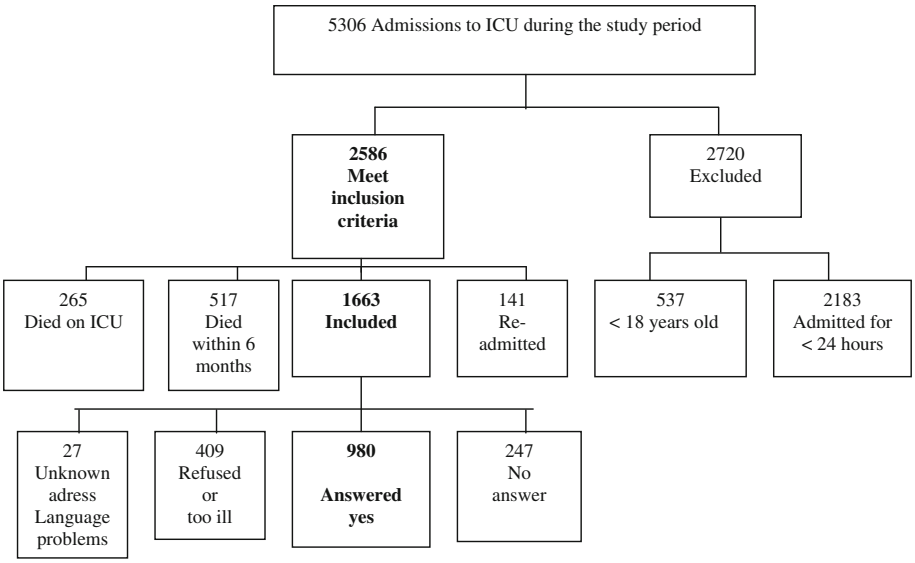

Fig. 1 Outline of the study protocol

Table 1 Clinical characteristics on admission of the patients in the study group and the non-responders group

	Study group ($n = 980$)	Non-responders ($n = 683$)	p value[a]
Male/female	567/413 (58)	357/326 (52)	0.02
Age (years)	58.2 (18.2)	57.7 (19.6)	0.54
APACHE II score	15.6 (7.7)	16.3 (7.6)	0.04
Stay in ICU (h)	123.1 (167.8)	93.1 (105.5)	<0.001
Stay in hospital (days)	15.0 (19.6)	14.8 (19.9)	0.85
Time on ventilator (h)	62.0 (154.2)	33.5 (81.6)	<0.001
Diagnosis on admission to ICU			0.02
Multiple trauma	117 (12)	69 (10)	
Sepsis	82 (8)	53 (8)	
Gastrointestinal disease	204 (21)	104 (15)	
Respiratory disease	196 (20)	147 (22)	
Miscellaneous	381 (39)	309 (45)	
Pre-existing diseases	725 (74)		
Cancer	116 (16)		
Diabetes	131 (13)		
Cardiovascular	203 (28)		
Gastrointestinal	122 (17)		
Miscellaneous	628 (64)		
No. of diseases			
0	256 (26.1)		
1	418 (42.7)		
2	190 (19.4)		
≥3	116 (11.8)		

Data are number (%) or mean (SD)
APACHE II Acute Physiology and Chronic Health Evaluation score, *ICU* intensive care unit
[a] Between the group that answered at 6 months and non-responders

individuals with or without comorbidity in each study group is shown. The ICU patients with pre-existing diseases reported significantly lower mean scores in availability of social integration compared with the ICU patients who were healthy before the intensive care period. For the reference group there were no differences in availability of social integration between the individuals with comorbidity or not. Significant differences in availability of social integration were also seen between the ICU patients with pre-existing diseases compared with the reference group with comorbidity. Between the healthy former ICU patients and the healthy reference group, there were no differences in availability of social integration (Table 3).

Health-related quality of life

The reference group scored a significantly higher HRQoL than the ICU patients for all eight dimensions of the SF-

Table 2 Socio-demographic characteristics of patients in the study group <74 years and the reference group

Characteristic	ICU group ($n = 780$)	Reference group ($n = 6,093$)	p value
Male gender	444 (57)	2,822 (46)	<0.001
Age (years)	52.5 (15.8)	46.4 (15.1)	<0.001
Education			0.060
Basic school	273 (35)	1,757 (29)	
High school/university	187 (24)	1,350 (23)	
Marital state			<0.001
Single	231 (30)	1,312 (22)	
Married/cohabiting	496 (64)	4,114 (74)	
Widow/widower	42 (6)	275 (5)	
Children at home	172 (22)	2,316 (39)	<0.001
Employment			
Before ICU			<0.001
Employed	367 (50)	3,538 (59)	
Retired	297 (40)	1,132 (19)	
Student	27 (4)	396 (7)	
Other	51 (7)	945 (16)	
6 months after ICU			
Employed	293 (41)		
Retired	330 (47)		
Student	25 (4)		
Other	60 (8)		
Sick leave			
Before ICU	109 (14)	75 (1)	<0.001
Reported sick leave 100%	71 (65)	64 (85)	
Reported sick leave <100%	25 (35)	11 (15)	
6 months after ICU	196 (25)		
Reported sick leave 100%	153 (78)		
Reported sick leave <100%	31 (22)		
Pre-existing diseases	568 (73)	3,095 (51)	<0.001
Cancer	86 (15)	32 (0.5)	
Diabetes	102 (18)	95 (2)	
Cardiovascular	131 (23)	810 (13)	
Gastrointestinal	89 (16)	306 (5)	
Miscellaneous	503 (88)	1,968 (32)	
No. of diseases			
0	212 (28)	2,998 (49)	
1	346 (44)	1,919 (32)	
2	135 (17)	604 (10)	
≥3	89 (11)	572 (9)	

Not all patients answered all questions
Data are number (%) or mean (SD)

36 ($p < 0.001$) and for the summary component scores, with mean score differences between 6.9 (mental health) and 34.8 (physical health).

The PCS summary component score mean was 39.1 (SD 12.7) for the ICU patient group and 50.0 (SD 9.6) for the reference group ($p < 0.001$). The MCS summary component score was 45.0 (SD 13.4) for the ICU patient group and 49.0 (SD 10.6) for the reference group ($p < 0.001$). The summary component scores were used in a multiple linear regression analysis to evaluate the effect of availability of social integration (AVSI score), APACHE II score at admission to the ICU, length of stay in ICU and in hospital, diagnoses on admission to the ICU, time on ventilator, marital status, education, born in Sweden or not, gender, age and pre-existing disease (Table 4). The results demonstrate that availability of social integration significantly affected HRQoL both physically and mentally to a greater extent than age, sex, years of education, marital state or immigrant status, but to a lesser extent than pre-existing diseases. Further availability of social integration significantly affected HRQoL to a greater extent than ICU-related factors, APACHE II score, length of stay in ICU or time spent on ventilator. Of the ICU-related factors examined, only the ICU admission diagnoses affected HRQoL more than the availability of social integration.

ICU patients with lower mean AVSI scores and younger age had lower physical and mental component scores. The magnitude of this effect was smaller compared with the effects of pre-existing diseases. Longer duration of stay in the hospital was associated with lower physical component score, and being single/widow/widower was associated with a lower mental component score (Table 4).

Discussion

The new and important finding of this study is that availability of social integration patterns affects HRQoL for former ICU patients, and this effect, albeit smaller than that of pre-existing diseases, needs to be acknowledged in studies trying to comprehensively picture HRQoL in former ICU patients.

The cohort used in this study is a part of a large study that has previously been examined from several different perspectives [6, 18, 26]. Health-related quality of life has been examined short and long term. In these investigations, the cohort was found to be comparable to other general ICU follow-up studies in Scandinavia and in northern Europe. Also the background characteristics

Table 3 Comparison of social support (mean score) between ICU patients <74 years and the general population with or without comorbidity

Social support	ICU patient	Reference group	p value[b]
With comorbidity	19.3 (SD 6.4)	20.6 (SD 5.7)	0.020
Healthy	21.0 (SD 6.0)	20.7 (SD 5.8)	0.416
p value[a] (95% CI)	0.001 (−2.61 to −0.68)	0.507 (−0.39 to 0.19)	

Social support summed index score from 6 (worst score) to 36 (best score)
[a] Between heathy and not healthy in each group
[b] Between ICU patients and the general population with or without comorbidity

Table 4 SF-36 summed score multiple regression analysis, (linear) final model (95% confidence interval for *B*) ($n = 980$)

Source	PCS		MCS	
	p value	*B*	*p* value	*B*
APACHE II score	0.32	0.05 (−0.05 to 0.16)	0.80	0.02 (−0.72 to 0.52)
LoS ICU	0.012	−0.006 (−0.01 to −0.001)	0.93	0.001 (−0.009 to 0.01)
LoS hospital	0.011	−0.05 (−0.09 to −0.01)	0.67	−0.01 (−0.05 to 0.03)
Diagnosis	<0.001	1.10 (0.58–1.63)	0.77	−0.09 (−0.71 to 0.52)
Time on ventilator	0.65	0.002 (−0.01 to 0.01)	0.16	0.004 (−0.002 to 0.01)
Marital state (living alone)	0.82	0.18 (−1.35 to 1.70)	0.003	−1.89 (−3.13 to −0.64)
Education				
Basic school	0.61	0.43 (−1.22 to 2.08)	0.14	1.32 (−0.42 to 3.05)
High school/university	0.45	0.67 (−1.06 to 2.40)	0.47	−0.80 (−2.98 to 1.37)
Born in Sweden	0.58	0.74 (1.90 to −3.39)	0.41	1.27 (−1.74 to 4.28)
Sex (male)	0.32	0.74 (−0.72 to 2.20)	0.56	0.51 (−1.18 to 2.19)
Age	<0.001	−0.17 (−0.22 to −0.13)	<0.001	0.11 (0.07–0.16)
AVSI	<0.001	0.26 (0.14–0.38)	<0.001	0.59 (0.46–0.73)
Pre-existing disease	<0.001	−9.3 (−10.94 to −7.68)	<0.001	−5.76 (−7.62 to −3.89)

Adjusted for age and sex, *B* values are unstandardized

PCS Physical component summary score, *MCS* mental component summary score, *SF-36* Short-Form 36 score, *APACHE* Acute Physiological and Chronic Health Evaluation score, *LoS* length of stay, *AVSI* Availability of Social Integration score

(APACHE II, LoS, diagnoses) are similar in comparison [3, 27, 32]. It may therefore be assumed that the findings presented in this study regarding the effects of social support are valid also for other units in this part of the world.

Although in the present study the APACHE II scores were higher in the non-responders group, LoS in ICU and time on ventilator were higher in the study group. This suggests that the study group comprises patients with relevant ICU-related illnesses.

Very interestingly, when comparing the availability of social integration values of the present ICU groups with a control population from the uptake areas of the ICU units, it is evident that the ICU population has a significantly decreased (approximately 10%) AVSI score. As anticipated we found a significant effect on AVSI score of age but not sex [7]. Thus, it needs to be appreciated that a significant, and most probably the largest, effect on the AVSI score for this patient group is the effect of pre-existing disease. This was also evident as an interaction in the statistical analysis. Despite this, a significant effect of AVSI score on HRQoL remained after controlling for the effect of pre-existing disease and age. This finding suggests that AVSI score has an effect on HRQoL beyond what is registered due to effects of pre-existing disease. This stresses that AVSI score is important when a comprehensive HRQoL examination is being done on former ICU patients or any other population. Furthermore, of the socio-economic factors examined, only marital state (living alone) was found to have an effect on HRQoL, and this effect was small.

There are a number of factors that may affect the conclusions of this study. First is the number of patients studied. Although done in a less populated area of Sweden, 980 patients were recruited to this study, which makes it a very large study in this field of research.

Second, from a social perspective Sweden is a homogenous country [12]. This leads to the fact that variations in AVSI scores in populations examined are rather small as was experienced also in this study [11, 12]. The relevance of the present findings may then be larger in countries with larger social differences where adjustments of the effects of social network on the outcome of HRQoL may be more important [33]. The fact that the reference group was examined a few years prior to the study group may have influenced the results. Also this effect is most probably minor in the Swedish setting.

Third, another confounding factor is that it is difficult to examine the effects of socio-economic factors in this rather homogenous population. However, although we did not have specific income data, other often-examined socio-economic variables, i.e., marital status, education, employment, immigrant status and sick leave, were examined and adjusted for.

Fourth, and very importantly, when examining effects of the availability of social integration patterns there is as yet no consensus as to what measure to use [34, 35]. This makes it difficult to compare the outcomes of different studies. For example the AVSI score instrument used in the present study is a quantitative measure of social integration. It does not assess the quality of the social relationships and the corresponding support provided. However, those assessing quantitative aspects of social integration have claimed this approach to be more readily applicable, and the questions are more easily and quickly understood and answered. They have also found that the data predict physical illness in prospective studies. The psychometric properties, however, are unknown [36].

Fifth, a complicating fact is that many factors of the population studied are known to affect AVSI score and possibly the opposite applies as well. That is, pre-existing disease, age, sex and marital state are all known to be important for the social integration pattern [11, 12]. It is difficult then to know which effect is cause–effect-related as all of these are known to affect social integration, while at the same time several of them have strong effects on HRQoL. We believe however, that when adjusting for such effects by multiple regression techniques, the conclusions are still valid.

Last, a limitation of the present study is the response rate of 59%, which on one hand is an acceptable rate for postal questionnaires, but on the other hand there is a risk that the non-responders could include more individuals with lower social integration. The latter is at least in theory plausible.

Conclusions

The novel finding in this study is that the social integration patterns among former ICU patients were found to affect HRQoL, and therefore social integration needs to be examined in parallel when comprehensive studies on HRQoL in these populations are undertaken. Furthermore, this effect is larger than that of any of the ICU-related factors but smaller than that of pre-existing diseases.

Acknowledgments This study was supported, in part, by a grant from The Health Research Council in the South-East of Sweden (FORSS) F2002-207, F2004-204, FORSS-5515, and the County Council of Östergötland, Sweden.

Conflict of interest None of the co-authors have any financial interests to disclose.

References

1. Dowdy DW, Eid MP, Sedrakyan A, Mendez-Tellez PA, Pronovost PJ, Herridge MS, Needham DM (2005) Quality of life in adult survivors of critical illness: a systematic review of the literature. Intensive Care Med 31:611–620
2. Antonelli M, Azoulay E, Bonten M, Chastre J, Citerio G, Conti G, De Backer D, Lemaire Fo, Gerlach H, Hedenstierna G, Joannidis M, Macrae D, Mancebo J, Maggiore SM, Mebazaa A, Preiser J-C, Pugin Jm, Wernerman J, Zhang H (2010) Year in review in Intensive Care Medicine 2009: I. Pneumonia and infections, sepsis, outcome, acute renal failure and acid base, nutrition and glycaemic control. Intensive Care Med 36:196–209
3. Flaatten H, Kvale R (2001) Survival and quality of life 12 years after ICU. A comparison with the general Norwegian population. Intensive Care Med 27:1005–1011
4. Kvåle R, Ulvik A, Flaatten H (2003) Follow-up after intensive care: a single center study. Intensive Care Med 29:2149–2156
5. Granja C, Cabral G, Pinto AT, Costa-Pereira A (2002) Quality of life 6-months after cardiac arrest. Resuscitation 55:37–44
6. Orwelius L, Nordlund A, Edell-Gustafsson U, Simonsson E, Nordlund P, Kristenson M, Bendtsen P, Sjoberg F (2005) Role of pre-existing disease in patients' perceptions of health-related quality of life after intensive care. Crit Care Med 33:1557–1564
7. House JS, Landis KR, Umberson D (1988) Social relationships and health. Science 241:540–545
8. Berkman LF, Syme LS (1979) Social networks, host resistance, and mortality: a nine-year follow-up study of Alameda county residents. Am J Epidemiol 109:186–204
9. Sjögren E (2005) Psychosocial factors in adult life—in relation to gender biological markers of stress and self-rated health. Linköping University, Linköping, Sweden
10. Caplan G (1974) Support systems and community mental health. Behavioral Publications, New York
11. Undén A-L, Orth-Gomér K (1989) Development of a social support instrument for use in population surveys. Soc Sci Med 29:1387–1392
12. Ekberg K, Noorlind Brage H, Dastserri ME (2000) Östgötens hälsa och miljö (Health and environment in Östergötland) (in Swedish). Centre for Public Health, County Council of Östergötland, Sweden
13. Suchyta M, Beck C, Key C, Jephson A, Hopkins R (2008) Substance dependence and psychiatric disorders are related to outcomes in a mixed ICU population. Intensive Care Med 34:2264–2267
14. Lynch JJ (1979) The broken heart. Basic Books, New York
15. Myhren H, Toien K, Ekeberg O, Karlsson S, Sandvik L, Stockland O (2009) Patients' memory and psychological distress after ICU stay compared with expectations of the relatives. Intensive Care Med 35:2078–2086
16. Deja M, Denke C, Weber-Carstens S, Schröder J, Pille CE, Hokema F, Falke KJ, Kaisers U (2006) Social support during intensive care unit stay might improve mental impairment and consequently health-related quality of life in survivors of severe acute respiratory distress syndrome. Critical Care 10:R147 (doi:10.1186/cc5070)
17. Rubenfeld GD (2009) Improving clinical trials of long-term outcomes. Crit Care Med 37(1 Suppl):S112–S116
18. Orwelius L, Nordlund A, Nordlund P, Simonsson E, Bäckman C, Samuelsson A, Sjöberg F (2010) Pre-existing disease: the most important factor for health related quality of life long-term after critical illness: a prospective, longitudinal, multicentre trial. Crit Care 14:R67
19. Henderson S, Duncan-Jones P, Byrne DG, Scott R (1980) Measuring social relationships: the interview schedule for social interaction. Psychol Med 10:723–734
20. Sjögren E, Leanderson P, Kristenson M (2006) Diurnal saliva cortisol levels and relations to psychosocial factors in a population sample of middle-aged Swedish men and women. Intern J Behav Med 13:193–200
21. Kristenson M, Kucinskiene Z, Bergdahl B, Calkauskas H, Urmonas V, Orth-Gomér K (1998) Increased psychosocial strain in Lithuanian versus Swedish men: the LiVicordia study. Psychosom Med 60:277–282

22. Sjögren E, Kristenson M, Linquestgroup T (2006) Can gender differences in psychosocial factors be explained by socioeconomic status? Scand J Public Helath 34:59–68
23. McHorney CA, Ware JE Jr, Raczek AE (1993) The MOS 36-item short-form health survey (SF-36): II. Psychometric and clinical tests of validity in measuring physical and mental health constructs. Med Care 31:247–263
24. Ware JE Jr, Sherbourne CD (1992) The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care 30:473–483
25. Garratt A, Schmidt L, Mackintosh A et al (2002) Quality of life measurement: bibliographic study of patient assessed health outcome measures. BMJ 324:1417
26. Orwelius L, Nordlund A, Nordlund P, Edell-Gustafsson U, Sjoberg F (2008) Prevalence of sleep disturbances and long-term reduced health-related quality of life after critical care: a prospective multicenter cohort study. Crit Care 12:R97
27. Eddleston J, White P, Guthrie E (2000) Survival, morbidity, and quality of life after discharge from intensive care. Crit Care Med 28:2293–2299
28. Graf J, Koch M, Dujardin R et al (2003) Health-related quality of life before, 1 month after, and 9 months after intensive care in medical cardiovascular and pulmonary patients. Crit Care Med 31:2163–2169
29. Angus DC, Carlet J (2003) Surviving intensive care: a report from the 2002 Brussels Roundtable. Intensive Care Med 29:368–377
30. Sullivan M, Karlsson J, Ware JE Jr (1995) The Swedish SF-36 health survey—I. Evaluation of data quality, scaling assumptions, reliability and construct validity across general populations in Sweden. Soc Sci Med 41:1349–1358
31. Altman DG (1991) Practical statistics for medical research. Chapman & Hall, London
32. Vedio A, Chinn S, Warburton F, Griffiths M, Leach R, Treacher D (2000) Assessment of survival and quality of life after discharge from a teaching hospital general intensive care unit. Clinical Intensive Care 11:39–46
33. Antonelli M, Azoulay E, Bonten M, Chastre J, Citerio G, Conti G, De Backer D, Lemaire Fo, Gerlach H, Hedenstierna G, Joannidis M, Macrae D, Mancebo J, Maggiore SM, Mebazaa A, Preiser J-C, Pugin JM, Wernerman J, Zhang H (2010) Year in review in Intensive Care Medicine 2009: II. Neurology, cardiovascular, experimental, pharmacology and sedation, communication and teaching. Intensive Care Med 36:412–427
34. Thoits P (1982) Conceptual, methodological, and theoretical problems in studying social support as a buffer against life stress. J Health Soc Behav 23:145–159
35. Schwarzer R (1989) Social support and health: a metaanalysis. Psychol Health 3:1–15
36. Orth-Gomer K, Undén A-L (1987) The measurement of social support in population surveys. Soc Sci Med 24:83–94