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N.B.: When citing this work, cite the original article.

Original Publication:

Laura Pompermaier, Ingrid Steinvall, Mats Fredrikson and Folke Sjöberg, Inclusion of coexisting morbidity in a TBSA% and age based model for the prediction of mortality after burns does not increase its predictive power, 2015, Burns, (41), 8, 1868-1876.

<http://dx.doi.org/10.1016/j.burns.2015.09.017>

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Postprint available at: Linköping University Electronic Press

<http://urn.kb.se/resolve?urn=urn:nbn:se:liu:diva-124131>

Inclusion of coexisting morbidity in a TBSA% and age based model for the prediction of mortality after burns does not increase its predictive power

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Abstract

Introduction: Several models for predicting mortality have been developed for patients with burns, and the most commonly-used are based on age and total body surface area (TBSA %). They often show good predictive precision as depicted by high values for area under the receiver operating characteristic curves (AUC). However the effect of coexisting morbidity on such prediction models has not to our knowledge been thoroughly examined. We hypothesised that adding it to a previously published model (based on age, TBSA%, full

thickness burns, sex, and need for mechanical ventilation) would further improve its predictive power.

Methods: We studied 772 patients admitted during the period 1997-2008 to the Linköping University Hospital National Burn Centre with any type of burns. We defined coexisting morbidity as any of the medical conditions listed in the Charlson list, as well as psychiatric disorders or drug or alcohol misuse. We added coexisting medical conditions to the model for predicting mortality (age, TBSA%, and need for mechanical ventilation) to find out if it improved the model as assessed by changes in deviances between the models.

Results: Mean (SD) age and TBSA % was 35 (26) years and 13 (17) %, respectively. Among 725 patients who survived, 105 (14%) had one or more coexisting condition, compared with 28 (60%) among those 47 who died. The presence of coexisting conditions increased with age ($p<0.001$) among patients with burns. The AUC of the mortality prediction model in this study, based on the variables age, TBSA%, and need for mechanical ventilation was 0.980 ($n=772$); after inclusion of coexisting morbidity in the model, the AUC improved only marginally, to 0.986. The model was not significantly better either.

Conclusion: Adding coexisting morbidity to a model for prediction of mortality after a burn based on age, TBSA%, and the need for mechanical ventilation did not significantly improve its predictive value. This is probably because coexisting morbidity is automatically adjusted for by age in the original model.

Introduction

During recent decades, mortality after burns has decreased considerably [1-5]. There are many reasons for this which are related both to advances in intensive care [2, 6], and to the introduction of modern surgical techniques [7, 8]. However, mortality remains an important indicator of quality of life after burn care, and many models have been developed to predict

the risk [5, 9-14] and to provide a baseline. The timely identification of risk factors in such models might help clinicians to reduce the mortality after burns further.

In 1961 Baux published a simple and effective formula to predict mortality after burns: “percentage mortality = age + percentage of total body surface area burned (TBSA %)” . Since then several models have been developed and many different variables have been introduced. Mortality increases with age and the size of the burn, and inhalation injury often worsens the prognosis [5, 9, 10, 15, 16]. The role of sex, however, is conflicting [5, 17-23]. Clinical observations have suggested that the patient’s coexisting diseases may play an important part in the likelihood of survival after a burn, but their impact on the risk of death is controversial [15, 19, 20, 24-26] and deserves further examination. However, we think that a limitation in many models is the lack of proper data about coexisting diseases, and we hypothesised that adding the information to a model with otherwise good predictive ability [10] could further improve the model.

The aim of the present study was therefore to investigate the effect of adding the factor coexisting morbidity to a model that predicts mortality, which includes age, TBSA%, and the need for artificial ventilation (Galeiras model) [10] in a larger sample of burned patients from one national burn unit in Sweden. We have a unique opportunity to assess coexisting morbidity, as all contacts with health care are recorded in the Swedish National Patient Registry (NPR) [27].

Methods

Sources of data

Since 1993 all patients with burns admitted to the Linköping University Hospital Burn Centre have been prospectively recorded in the local Burn Unit Database. Among the variables are age, sex, date of admission, type of burn (scald, contact with a hot object, friction, open

flame including explosion caused by fire, electricity, chemical injury, or radiation), size of burn (TBSA % and full thickness burns, FTB %), duration of stay, need of mechanical ventilation during the first 72 hours after admission, and death by any cause during admission [28].

Since 1987 all Swedish inpatient events in public hospitals have been recorded centrally in the Swedish National Inpatient Register [27]. In case of death the cause is recorded in the Cause of Death Register. The variables recorded in the Inpatient Register that have been used in this study were: coexisting morbidity, duration of survival after the burn and, in case of death, the cause.

The data are tracked by the unique Swedish date of birth combined with a social security number to a specific Personal Identity Number [29].

Details of patients

All the patients admitted between 1 January 1997 and 31 December 2008 for new burns (thermal, electrical, or chemical) were included, while admissions for skin diseases were excluded. All the patients were recorded in the Burn Unit Database.

To obtain as accurate a picture of coexisting morbidity as possible we requested information from the National Patient Registry about the group being studied between 1 January 1987 and 31 December 2008, for at least 10 years before the actual burn.

A total of 831 patients were admitted to the Burn Unit during the observation period, 59 of whom were not registered on the National Registry because they were foreigners. A total of 772 patients were therefore included in the analysis.

Coexisting diseases

Coexisting diseases were defined as those medical conditions recorded for each patient up to and including admission to the Burn Unit. All diagnoses are reported in the Registry according to the International Classification of Diseases-9 (ICD-9) from 1987 to 1996 and ICD-10 from 1997 onwards. A new method was developed in 1987 to evaluate the impact of coexisting morbid conditions on the risk of mortality prospectively [30]. A weighted index or Charlson Index (from 1 to 6) was attributed to every disease seen, and conditions with a higher index implied a higher risk of mortality. Since then we have used the Charlson Index as a prognostic indicator. The conditions described in the original article [30] have been successively classified in 17 diagnostic categories and the diagnoses, initially reported in ICD-9 codes, have also been validated for ICD-10 [31] (Table A.1).

Psychiatric disorders, even drug and alcohol misuse, are not included in the Charlson Index. The overrepresentation of mental disorders or alcoholism in burned patients is well known, [32-34] and so the effect on mortality was also evaluated. We therefore added 4 groups to the 17 Charlson conditions: mild mental illness, serious mental illness, drug misuse, and alcohol misuse (Table A.2). In our definition, serious mental illness includes major depression, schizophrenia, bipolar disorder, serious obsessive compulsive disorder, panic disorder, post-traumatic stress disorder, and borderline personality disorder, as suggested from the American National Alliance on Mental Illness.

Statistical analysis

Data are presented as mean (SD) or median (10th -90th centile) and 95% CI. We used the Mann-Whitney U test to test for statistically significant differences between groups concerning continuous variables, and for nominal dichotomous variables we used Fisher's exact test. These analyses were made with the help of Statistica (v.10, StatSoft Inc. USA). We made multivariable logistic regression analyses using STATA (STATA v.12.0, Stata Corporation. LP, TX, USA). Probabilities of less than 0.05 were accepted as significant. The

calibration was assessed using the Hosmer-Lemeshow goodness-of-fit statistic. All statistical tests were two-tailed.

We calculated the AUC for the following models: Galeiras's [10], the combination of Galeiras's and Charlson's Index, and finally the combination of Galeiras's model, Charlson's Index, and psychiatric disorders (mild and severe).

The models was also compared by calculating the deviance between the log likelihood (LL) for Galeiras's model and the LL for the combination of Galeiras's model and Charlson's Index, and finally the LL for the combination of Galeiras's model, Charlson's Index, and psychiatric disorders by using the Chi square distribution.

Results

Characteristics of patients and their coexisting conditions are shown in Tables 1 and 2. The incidence of various medical conditions for patients who survived and those who died is shown in Table 3. Table 4 presents effect on mortality of Charlson's conditions or psychiatric disorders or substance misuse. Table 5 reports characteristics of patients according to the variables categorised in the Galeiras model, in relationship to the survival status. Finally, Table 6 shows Galeiras model combined with Charlson Index and psychiatric disorders.

Effect of coexisting conditions on the prediction of mortality

We find that severe psychiatric disorders, alcohol misuse and drug misuse were significantly associated with mortality, whereas mild psychiatric disorders were not (Table 3). The Charlson Index in combination with psychiatric disorders, alcohol and drug misuse was associated with mortality, but of the psychiatric disorders, only severe psychiatric conditions were significant (Table 4). Pre-existing Charlson's conditions alone were significantly associated with mortality (95%CI, 1.60-2.43, $p < 0.001$), whereas it lost significance in

combination with Galeiras model and severe psychiatric disorders (Table 6). Both Galeiras original model with our data and the combination of Galeiras's and Charlson's Index have an AUC of 0.980, the combination of Galeiras model with Charlson's Index and psychiatric disorders has an AUC of 0.986. A comparison between the models showed that adding Charlson index to the Galeiras model did not improve the model significantly, $p=0.15$. Adding both Charlson and psychiatric disorders did not either make a model that was significantly better than just using Galeiras, $p=0.06$.

Discussion

The strength of this study is the amount and quality of information about patients with burns admitted to one of the burn centres in Scandinavia over a period of 12 consecutive years; data are obtained from fitting together two detailed registries: the Burns Unit Database and the Swedish National Patients Registry. The description of our patients is therefore accurate and the risk of omitting information about coexisting diseases has been reduced because we report medical conditions that were recorded for at least 10 years before the burn.

A limitation of retrospective studies of data from registries lies in the accuracy of the original reporting; this is a variable related to the individual accuracy of whoever records the data, and is therefore difficult to account for. Since 1947 every person permanently resident in Sweden has had a personal identity number (PIN) [29]; since 2000 those who intend stay in Sweden for less than one year receive not a PIN but a coordination number. The data collected in the Swedish Patients Register is based only on the PIN, so those with a coordination number (such as tourists or refugees without a residence permit) will not be included. However, the percentage of missing values for all variables reported during the study period is 7%. A total of 831 patients were registered in the Burns Unit Database, 59 of who were missing from the National Patients Registry. The Burns Unit

Database, and consequently our analysis, does not concern people who were burned but died before admission to hospital.

The 772 patients admitted to Linköping University Hospital with burns between 1997 and 2008 were mainly young and healthy with moderately severe burns, and most were men. Mortality was low (6%) and limited to those over 40 years old (except one under 30 who died of extensive and severe burns). The low mortality rate should be acknowledged as a potential study limitation, since it limits the statistical power. Thus, a multicenter study with larger number of patients would be justified to ascertain the validity of our results. However, our finding that age, size and depth of burn and need for mechanical ventilation had adverse effects on the patient's chance of survival is in accordance with previously published results [10] and this consistency suggests that our results are not due to chance alone.

Children less than 10 years old were the largest age group (23%), and they have few coexisting conditions (7%) or just one condition, and none died. However, we think that the size of the burn, together with its management and that of any complications, are more important for the outcome in children than any pre-existing medical condition. This was confirmed by Kraft et al [35] who showed that regardless of coexisting morbidity, mortality in children increases significantly with the size of the burn, and a TBSA of 62% is a crucial threshold. Fortunately the severity of burns in our youngest sample was restricted, mean (SD) TBSA was 7.7 (8.9) % and full thickness burn 1.2 (6.0) %, and this explains the outcome.

Because it seems to be accepted that coexisting morbidity increases with age in the general population, we investigated whether it holds true for patients with burns. We found that people with pre-existing conditions tend to be appreciably older (mean age 57 years, SD 25) than healthy people (mean age 30, SD 24), and patients who survive burns are usually healthier than those who do not, with presence of coexisting conditions in 14

respectively 60% of patients. Cerebrovascular diseases are the most common among those listed by Charlson; most of those patients who survive are otherwise healthy, whereas many of those who do not survive have heart disease or diabetes, and nearly 15% of them have some form of malignancy (Table A.3). It is still true that Charlson's coexisting conditions are related to mortality, but to a lesser extent than age, size of burn, and need for mechanical ventilation.

Thombs et al [24] showed in a large American study that metastatic cancer increased in-hospital mortality after burns, but we do not know if the cancer or the burn was the ultimate cause of death. However, the comparison is interesting and the results unexpected: heart and renal diseases have similar adverse effects on survival after burns, both in Sweden and across the Atlantic; diabetes, dementia, and ulcers are associated with worse outcomes in Sweden but they do not have the same impact on mortality in the US, where, instead HIV/AIDS and obesity are an unfavourable impact on prognosis but are not present (or not reported) in our registries [24]. The differences in the range of diseases can depend on social and cultural factors, but probably it is the difference in the size of the samples that influences the results most (Table A.3).

Our data confirm observations made in previous studies [24, 33, 34], and our clinical experience: the real curse for people with burns is a psychiatric condition or substance misuse. Charlson did not include the effect of psychiatric disorders or drug or alcohol consumption in her analysis, probably because these conditions were not common in the group that she studied (women with primary breast carcinoma) [30]. Because of the lack of a published validated system for the classification and scoring of mental diseases, we decided to analyse those diagnoses found in the Diagnostic and Statistical Manual of Mental Disorders, 4th ed. that we arbitrarily considered to be relevant to our patients. However, although mental disorders are important in patients with burns, we found that these have a small effect on

prognosis. In particular, the presence of severe psychiatric disorders leads to serious consequences for people with burns; alcohol misuse is over-represented among those who died, but contrary to the findings of other authors [16, 24], its effect in our patients was not significantly fatal. Instead, mild psychiatric disturbances seemed to have a protective effect, both alone and in combination with severe psychiatric conditions, but this outcome lacks statistical significance and deserves further investigations.

We can certainly confirm the validity of Galeiras's [10] equation: given the finding that our prediction is so close to that of Galeiras, it supports the robustness of their prediction, both using the original and the fitted Galeiras model. Surprisingly (and in contradiction of our hypothesis) we found that coexisting morbidity does not improve the predictive value of mortality in Galeiras's series: we used the equation with the addition of variables from the Charlson Index, or psychiatric disorders, or both together, but failed to show a substantial improvement. More precisely, inclusion of pre-existing medical conditions increased the predictive power of the model minimally, but not significantly. We confirmed what had already been verified by older samples [15]: that age alone, independent of coexisting conditions, increases the risk of mortality in hospital. However, age is one of the factors used in Galeiras's equation and, as is evident from our tables, coexisting morbidities are already adjusted for in the original model by age.

A new and interesting perspective in calculation of mortality risk in elderly with burns is the consideration of biological rather than chronological age. Masud et al. [36] assigned a frailty score (between 1 and 7) [37] to each patient over 65 years old and with TBSA greater than 10% admitted to an intensive care unit during a 4 years period. Interestingly, survivors had significantly lower frailty score than non survivors. Unfortunately, we cannot verify the effect of frailty on our burn population, because our data

are collected retrospectively and our database does not contain the information necessary to score frailty.

Conclusions

Age, TBSA%, and percentage of full-thickness burns undoubtedly have an impact on the risk of mortality among burned patients. We have confirmed the strong predictive value of Galeiras's model for the prediction of mortality in our series of patients. However, adding coexisting morbidity to Galeiras's model did not improve the prediction of mortality among our burned patients and using Galeiras original model with our data predicted mortality almost as good as fitting a new model to our data.

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TABLE 1. Personal and clinical details of patients who survived and those who died.

	Total	Patients who survived	Patients who died	p value
Total, n	772	725(94)	47(6)	
Female sex, n *	233 (30)	214 (30)	19 (40)	0.16
Age, years**	34 (1-72)	31 (1-67)	72 (46-89)	<0.0001
TBSA %**	7.5(1-34)	6 (0.75-29.5)	40.5 (12-89)	<0.0001
Full thickness burns %**	0.25 (0-18)	0 (0-13)	30.5(2-85.5)	<0.0001
Required mechanical ventilation, n *	161(21)	123(17)	38(81)	<0.0001
One or more coexisting condition, n *	133 (17)	105 (14)	28 (60)	<0.0001

Data are number (%) or median (10th -90th centile). TBSA %= total body surface area. *Fisher´s exact test. **Mann-Whitney U tests

TABLE 2. Personal and clinical details of patients with and without coexisting morbidity.

	Total	Patients with coexisting morbidity	Patients without coexisting morbidity	p value
Total, n	772	133(17)	639(83)	
Female sex, n*	233 (30)	48(36%)	185 (29)	0.13
Age, years**	34 (1-72)	64 (15-85)	28 (1-62)	<0.0001
TBSA %**	7.5 (1-34)	9.4 (1-43)	7 (1-33)	0.09
Full thickness burns %**	0.3 (0-18)	2 (0-35.5)	0 (0-14)	<0.0001
Required mechanical ventilation, n*	161 (21)	44 (33)	117 (18)	0.0001
Patients who died*	47 (6)	28 (21)	19 (3)	<0.0001

Data are number (%) or median (10th -90th centile). TBSA %= total body surface area. *Fisher's exact test. ** Mann-Whitney U tests.

TABLE 3. Frequency of different coexisting conditions in relationship to the survival status

Comorbidities	Total	Patients who survived	Patients who died	p value*
All	772	725	47	
Myocardial infarction	22(3)	16(2)	6(13)	0.002
Congestive heart failure	14(2)	9(1)	5(11)	0.002
Peripheral vascular disease	7(1)	7(1)	0(0)	1
Cerebrovascular disease	32(4)	23(3)	9(19)	<0.001
Dementia	4(1)	1(0)	3(6)	0.002
Chronic pulmonary disease	25(3)	23(3)	2(4)	0.92
Connective tissue disease	8(1)	7(1)	1(2)	0.80
Ulcer disease	8(1)	5(1)	3(6)	0.02
Mild liver disease	11(1)	9(1)	2(4)	0.28
Diabetes	27(3)	21(3)	6(13)	0.008
Diabetes with end organ damage	6(1)	4(1)	2(4)	0.092
Hemiplegia or paraplegia	6(1)	6(1)	0(0)	1
Moderate to severe renal disease	10(1)	5(1)	5(11)	<0.001
Cancer	19(2)	12(2)	7(15)	<0.001
Moderate to severe liver disease	3(0)	2(0)	1(2)	0.34
Metastatic solid tumour	1(0)	0(0)	1(2)	0.12
HIV / AIDS	0	0	0	NN
Psychiatric disorders,				
None	669(87)	634(87)	35(74)	
Mild	37(5)	35(5)	2(4)	1**
Severe	32(4)	24(3)	8(17)	<0.001**
Mild+Severe	34(4)	32(4)	2(4)	1**
Alcohol abuse	69(9)	60(8)	9(19)	0.036
Drug abuse	23(3)	19(3)	4(9)	0.09

Data are number (%). * p value compares frequencies of each pre-existing conditions between survivors and deaths, with the Fisher's exact test. ** The p values are calculated with those who did not have any psychiatric disorder as reference.

TABLE 4. Logistic regression for mortality analysing the effect of Charlson Index, psychiatric disorders or substance misuse.

	Coefficient	SE	p value	OR	95%CI
Charlson Index	2.16	0.33	<0.001	8.71	4.54-16.7
Psychiatric disorders					
None				1	
Mild	-0.54	0.78	0.49	0.58	0.12-2.71
Severe	1.58	0.52	0.003	4.86	1.74–13.6
Mild+ Severe	-0.62	0.81	0.44	0.54	0.11-2.60
Alcohol misuse	0.23	0.49	0.64	1.26	0.48-3.27
Drug misuse	0.05	0.70	0.95	1.05	0.26-4.11
Constant	-3.59	0.25	<0.001		

Model pseudo $R^2 = 0.16$, log likelihood = -148.2, n=772.

TABLE 5. Personal and clinical details of patients who survived and those who died, using categorised variables according to the Galeiras model.

	Total	Patients who survived	Patients who died
Total	772	725	47
Female sex	233	214	19
Required mechanical ventilation*	161	123	38
Age in years			
< 40	435	434	1
40-59	183	171	12
60-79	107	89	18
≥80	47	31	16
TBSA burned %			
< 20	603	596	7
20-39	109	94	15
40-59	38	25	13
60-79	10	6	4
≥ 80	12	4	8
Full thickness burns %			
<10	647	636	11
10-19	54	48	6
20-59	60	39	21
≥60	11	2	9

Data are number.* Individuals who required mechanical ventilation within 72 h after admission.
TBSA%= total body surface area.

TABLE 6. Logistic regression with the mortality by Galeiras model combined with Charlson Index and psychiatric disorders, all patients.

	Coefficient	SE	p value	OR	95%CI
Female sex	0.37	0.61	0.54	1.45	0.44-4.76
Required mechanical ventilation	3.29	0.81	<0.001	26.8	5.46-131
Age					
0-39 years	-4.07	1.47	0.006	0.02	0.001-0.31
40-59 years				1.00	
60-79 years	2.92	0.88	0.001	18.6	3.30-105
80 years and older	4.98	1.14	<0.001	145	15.4-1365
TBSA%					
0-19%				1.00	
20-39%	0.57	0.81	0.48	1.76	0.36-8.53
40-59%	4.49	1.11	<0.001	89.4	10.2-784
60-79%	2.23	1.48	0.13	9.28	0.50-170
80% and more	3.02	2.08	0.15	20.6	0.35-1214
Full thickness burns %					
0-9%				1	
10-19%	-0.44	0.78	0.57	0.64	0.14-2.98
20-59%	0.50	0.77	0.52	1.65	0.36-7.49
60% and more	4.67	2.23	0.04	106	1.34-8394
Charlson Index	1.11	0.59	0.06	3.04	0.95-9.74
Psychiatric disorders					
None				1	
Mild	-2.29	1.19	0.06	0.10	0.01-1.04
Severe	1.82	0.90	0.04	6.19	1.06-35.9
Mild+Severe	0.98	1.26	0.43	2.66	0.22-31.3
Constant	-8.01	1.22	<0.001		

Model pseudo R2 = 0.70, log likelihood = -53.3, n=772.

Fig. 1. Area under curve (AUC) for following mortality prediction models: **Galeiras** with variables age, TBSA%, FTB%, gender and MV; **Galeiras + Charlson**: combination of Galeiras model and Charlson Index; **Galeiras + Charlson + psych. disorders**: combination of Galeiras model with Charlson Index and psychiatric disorders (mild and severe).

TABLE A.1 Diagnostic categories, Charlson Weighted Index, ICD-9-SE and ICD-10-SE Codes

Conditions	Charlson Weighted Index	ICD-9-SE	ICD-10-SE
Myocardial infarct	1	410,412,411C	I21,I22,I23,I241,I252,U98
Congestive heart failure	1	428	I50,I110,I130
Peripheral vascular disease	1	441,443A-443X,785E,V434	I70-I74,I77
Cerebrovascular disease	1	430-438	I6,G45-46
Dementia	1	290,291C	F00-F03,F051,F10.7A,G30
Chronic pulmonary disorders	1	49,500-505	J4,J60-J67,J68.4,J70.1,J70.3,J84.1,J92.0,J96.1,J98.2,J98.3
Connective tissue disease	1	710,714A-710C,517,725	M05,M06,M08,M09,M30-M36,D86
Peptic ulcer	1	531-534	K22.1,K25-K28
Mild liver disease	1	571	B18,K700,K701-K703,K709,K71,K73,K74,K760
Diabetes	1	250A,250C,250G,251C	E100,E101,E106A,E109,E110,E111,E119
Diabetes with complications	2	250D-250F	E10.2-E10.8,E11.2-E11.8
Hemiplegia	2	342,344B	G81,G82
Renal disease	2	582,583A,583B,583C,583E,583G,583H,583W,583X,585,586,588	I12,I13,N00-N05,N07,N11,N14,N17-N19,Q61
Cancer	2	14,15,16,170,171,172,174,175,176,179,18,190,191,192,193,194,195,20	C00-C75,C81-C85,C88,C90,C91-C95,C96

Metastatic cancer	3	196-199	C76-C80
Severe liver disease	3	572	B15.0,B16.0,B16.2,B19.0,K70.4,K72,K76.6, K76.7,I85
HIV/ AIDS	6	079J,279K	B20-B24,Z219

TABLE A.2 Psychiatric diagnostic categories, ICD-9-SE and ICD-10-SE codes

Conditions	ICD-9-SE	ICD-10-SE
Severe psychiatric diagnoses	293A-B, 293W, 294A, 295, 295A-H, 295W, 295X, 296A-H, 296W, 297, 297B-D, 297W, 297X, 298, 298A-E, 298W, 298X, 299A, 299X, 300A-B, 300D-F, 301A-E, 307B, 307F, 308D, 310A, 311, 318A-C, 333E	F049, F050, F058, F060-066, F068, F200-206, F208-209, F219, F220, F228, F229, F230-233, F238, F239, F249, F250-252, F258, F259, F289, F299-302, F308-323, F328-334, F338-340, F410-413, F418-422, F428-430, F500-503, F600, F601, F605, F681, F710, F711, F718-721, F728-731, F738-840, F842
Mild psychiatric diagnoses,	293X, 296X, 299B, 299W, 300B, 300C, 300E, 300G, 300H, 300W, 300X, 301F-H, 301W, 301X, 302C-E, 302G, 302H, 302W, 302X, 306F, 307A, 307C-H, 307W, 307X, 309A, 309C-E, 309W, 309X, 310B, 310C, 310W, 310X, 312D, 312W, 312X, 313A-D, 313W, 313X, 314A, 314J, 314W, 314X, 315A-E, 315W, 315X, 316, 317, 319, 332B, 333A-D, 333F-H, 333W, 333X, 347, 607W, 608W, 625A, 625W, 780A, 780F, 780X, 787G, 799X, 995C, V15W, V61B, V61C, V61W, V61X, V62C-E, V62W, V65C, V71A	F059, F067, F070-F072, F078, F079, F099, F300, F341, F348, F349, F38, F380, F381, F388, F399, F400, F401-409, F431, F432, F438-454, F458, F459, F480, F481, F488, F489, F504, F505, F508, F509, F510-515, F518-F531, F538, F539, F549, F599, F602-609, F619-621, F628-633, F638, F639, F640, F648, F649, F652-654, F658, F659, F660-662, F668, F669, F680, F682, F699-701, F708, F709, F780, F781, F788-791, F798-803, F808-813, F818, F819, F829, F839, F841, F843-845, F848, F849, F889, F899-901, F908-913, F918-920, F928-933, F938-942, F948-952, F958,

F959, F980-986, F988, F989, F999,
G210, G211, G240, G251, G259,
G470, G471, G474, G479, N484,
N508, N941, N948, R159, R418,
R699, T749, T887, Z032, Z558,
Z567, Z600, Z603, Z634, Z637-
639, Z728, Z765, Z911

Alcohol misuse

303A, 305A, 303X, 291, 291A-
291F, 291W, 291X

F100-F109

Drugs misuse

292, 292A-C, 292W, 292X, 304,
304A-H, 304W, 304X, 305C-H,
305X

F110- F169, F180-F199, F559

TABLE A.3. Presence of coexisting medical conditions in different age group.

Pre-existing medical conditions	Total	Survivors	Age groups, years									
			0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	>90
All	772	725	175	93	82	85	89	94	62	45	34	13
Myocardial infarct	22	16	0	0	0	0	1	0	8	4	6	3
Congestive heart failure	14	9	0	0	0	0	0	1	2	5	5	1
Peripheral vascular disease	7	7	1	0	0	0	0	0	1	4	1	0
Cerebrovascular disease	32	23	0	0	0	1	1	5	8	9	6	2
Dementia	4	1	0	0	0	0	1	0	0	2	1	0
Chronic pulmonary disease	25	23	9	3	0	0	5	1	1	3	3	0
Connective tissue disease	8	7	1	0	0	0	1	2	2	1	1	0
Ulcer disease	8	5	0	0	0	0	1	1	5	0	1	0
Mild liver disease	11	9	0	0	1	2	4	1	2	1	0	0
Diabetes	27	21	0	2	1	0	3	3	6	5	5	2
Diabetes with end organ damage	6	4	0	0	0	0	0	0	3	1	2	0
Hemiplegia	6	6	0	0	1	1	1	1	2	0	0	0
Renal disease	10	5	1	1	0	0	0	0	1	5	1	1
Cancer	19	12	0	0	0	0	0	2	5	2	7	3
Moderate or severe liver disease	3	2	0	0	0	0	0	2	0	1	0	0
Metastatic solid tumor	1	0	0	0	0	0	0	0	0	0	1	0
HIV/ AIDS	0	0	0	0	0	0	0	0	0	0	0	0
Severe psychiatric disorders	66	56	0	2	10	6	17	17	11	2	0	1
Mild psychiatric disorders	71	67	4	8	11	6	17	9	9	4	3	0
Alcohol misuse	69	60	0	4	4	7	22	19	8	5	0	0
Drugs misuse	23	19	0	0	5	3	9	2	3	1	0	0

Data are number, n.