Long-term mortality after self-inflicted burns

Laura Pompermaier, Ingrid Steinvall, Moustafa Elmasry, Mostafa M. Eladany, Islam Mohamedy Abdelrahman, Mats Fredrikson and Folke Sjöberg

Pompermaier, L., Steinvall, I., Elmasry, M., Eladany, M. M., Abdelrahman, I. M., Fredrikson, M., Sjöberg, F., (2024), Long-term mortality after self-inflicted burns, *Burns*, 50(1), 252-261.
https://doi.org/10.1016/j.burns.2023.09.015

Long-term mortality after self-inflicted burns

Laura Pompermaier MD, PhD[1*], Ingrid Steinvall PhD[1], Moustafa Elmasry MD, PhD[1], Mostafa M Eladany MD, PhD[2], Islam Abdelrahman MD, PhD[1], Mats Fredrikson PhD[3], Folke Sjöberg MD, PhD[1,4]

[1]Department of Hand Surgery, Plastic Surgery and Burns, and Department of Biomedical and Clinical Sciences Linköping University, Linköping, Sweden

[2]Department of Anesthesiology & Intensive Care, Faculty of Medicine, Suez Canal University, Egypt

[3]Department of Biomedical and Clinical Sciences, Linköping University, Linköping, Sweden

[4]Department of Anaesthesiology and Intensive Care, Linköping University, Linköping, Sweden

***Corresponding Author**: Laura Pompermaier, e-mail: laura.pompermaier@liu.se, address The Department of Hand Surgery, Plastic Surgery and Burns, Linköping University Hospital, 58185 Linköping, Sweden. Telephone: +46 724638357. Fax. +46 101033705.

Funding: This study was funded by the department of Hand Surgery, Plastic Surgery and Burns, and Linköping University, Linköping, Sweden.

We have no conflicts of interest.

Abstract

Background: Individuals with self-inflicted burns are a small but consistent group among burn patients, with large injuries and conflicting findings regarding their in-hospital mortality. Overall, burn survivors have a shorter life expectancy, as compared with national controls, but

long-term mortality after self-inflicted burns is understudied. The aim of this retrospective study was to investigate possible differences in long-term mortality among survivors after self-inflicted and accidental burns.

Methods: All adult patients with burns admitted at the Linköping Burn Centre and discharged alive between 2000 and 2017 were included, and end of follow up was April 26, 2021. Those with unknown survival status at that time were excluded. A Cox proportional hazards regression model, adjusted for age and sex, was used to analyse long term mortality.

Results: Among the 930 patients included in this study, 37 had self-inflicted burns. Overall, median follow up period was 8.8 years and crude mortality was 24.7%. After adjustment for age and sex, self-inflicted burns were independently associated with long-term mortality, Hazard Ratio= 2.08 (95% CI 1.13–3.83). Post hoc analysis showed that the effect was most pronounced during the first years after discharge although it was noticeable over the whole study period.

Conclusion: Long-term risk of mortality after discharge from a burn centre was higher in patients with self-inflicted burns than in patients with accidental burns. The effect was noticeable over the whole study period although it was most pronounced during the first years after discharge.

Keywords: Burns, self-inflicted, suicide, long term mortality

Introduction

Worldwide, individuals with self-inflicted burns are a relatively uncommon, but consistent subgroup among burn injuries, counting for approximately less than 3% of all admissions[1-4], and are characterized by larger burn size and higher crude in-hospital mortality, as compared to accidental injuries [5,6].

In-hospital mortality in this subgroup has been largely analysed and with conflicting results, with some authors reporting that patients with self-inflicted burns are not more likely to die of their injuries than those with accidental burns, and some claiming the opposite [1,7-16]. However, few studies have investigated their mortality after discharge. Recently, Gueler et al. have shown that patients with self-inflicted burns after discharge have higher incidence of mental issues, such as anxiety and depression, as compared with accidental injuries, and that self-inflicted burns was an independent factor for mortality two years after discharge [17].

The overrepresentation of mental disorders among individuals with burns is well studied, both as risk-factors and as long-term consequences [18-21]; furthermore, the risk of new self-harm behaviours has been described among those who have survived self-inflicted burns although it is difficult to get a comprehensive overview due to the small numbers and varying results [20,22-26]. Daigeler et al. reported that the proportion of new suicide attempts was 40% (6/15) within one year after a previous self-inflicted burn. None of these new attempts were, however, done by burning, and none died of that second attempt [22]. Ali et al. reported that 21% (12/56) of those surviving a self-inflicted burn had done new attempts after discharge, and that one third of the new attempts were new burns [23]. The increased risk of death by suicide after surviving a first attempt has been shown to decline over time although the time frame is considerable. Jokinen et al. who studied long-term outcome among all adults in Sweden treated in-hospital for the first suicide attempt (regardless type of suicide) found that about 20% of the total

mortality within 10 years was associated with suicide while this proportion was 5% within 40 years after the first attempt [27].

In Scandinavia, suicide attempts among burn survivors have been previously observed [26], and indeed the rates of violent deaths among them were considerably higher than that in the national population. [25]. Furthermore, a Canadian study found that the lifetime risk of suicide attempts among childhood burn survivors was five times higher than the general population [24].

Overall, long-term risk to die is increased among burn survivors as compared with national controls, particularly in elderly [28,29]. Yet, little is known about long-term mortality among individuals with self-inflicted burns. The aim of this paper was therefore to investigate possible differences in long-term mortality among survivors after self-inflicted and accidental burns.

Method

Participants and sampling procedure

In this retrospective study, all in-hospital admissions for acute burns at the Linköping Burn Centre between 2000 and 2017 were screened. Following variables have been prospectively collected in the Burn Unit Database (BUD) and analysed retrospectively: age, sex, cause of injury (scalds, contact, chemical, flame, electricity, other cause), mechanism of burns (accidental, self-inflicted), percentage total body surface area burned (TBSA%), burns depth, and duration of stay at the Burn Unit. Inclusion criteria were adult (18 years and older) patients alive at discharge and known survival status at the end of follow up, which was set to 26th April 2021. Data of death after discharge and up to the end of the follow up was retrieved

from the electronic medical record system. Exclusion criteria were patients who died during the admission for burn treatment and patients with unknown survival status at the end of the follow up, such as those who were citizens of other countries, Swedish inhabitants who emigrated after discharge, or Swedish inhabitants at discharge with unknown location and status at the end of follow up.

Outcomes

Discharge from the burn centre was set as time zero. Outcomes of interest were calculated as following:

Time to event measured among those patients who died before the study end (26th April 2021)= time between date of discharge and date of death.

Follow up time measured among those who were alive at the end of the study (26th April 2021)= time between date of discharge (time zero) and study end.

Years of Life Lost (YLL) measured among those who died before reaching their life expectancy= difference between life expectancy (age) and age at death.

Years of Life Gained (YLG) measured among those who died during the study period but had exceeded their life expectancy before death, and those who were alive at the end of the study and had exceeded their life expectancy at that time= period of years exceeding life expectancy (Figure 1).

Calculated remaining life expectancy (rLE) has previously been used as a method to estimate excess mortality among suicide attempters [27]. National data over life span was retrieved from the open database provided by Statistics Sweden, remaining mean life expectancy by sex and age at the year of discharge was used for calculations [30].

Subgroup analysis of the patients with repeated self-inflicted injuries was performed. All admissions for repeated burns were used as separate events for the calculations done in this subgroup analysis. Each patient with repeated burns was calculated as one patient in the study.

The study was approved by the Regional Ethics Review Board in Linköping, Dnr 2013/341-31.

Statistics

Data have been presented as median (25th–75th centiles) and n (%) unless otherwise stated. Distribution was tested with the Lilliefors test. The significance of differences between groups was assessed using the Mann Whitney U, and the chi-squared tests, or Fisher's exact test when appropriate. A multivariable Cox proportional hazards regression was used to analyse long-term mortality after discharge adjusted for age and sex. Data were analysed with the help of STATA (STATA v12.0, Stata Corp. LP, TX, USA). Probabilities of less than 0.05 were accepted as significant.

Results

A total of 930 patients were included in this study (Figure 2). Overall, median (25^{th} – 75^{th} centile) age at discharge was 47.4 (31.7–62.6) years (min-max 18.0–97.7), 74.8% were male, 4.0% (n= 37) had self-inflicted burns, crude mortality was 24.7%, and median follow up period was 8.8 years (corresponding to 3201 days) (Table 1).

Almost all patients in the group of self-inflicted burns had flame burns (n= 36). Total burn size as well as the size of deep burns were larger, duration of hospital stay was longer, and they showed a more equal sex ratio, as compared to accidental burns. The group of patients with self-inflicted burns were younger at discharge, and thus, their remaining life expectancy

was longer, while those who died during the study period died at younger age. Among those who died after discharge, there was no difference between groups regarding time to event (Table 1). Supplemental Table S1 shows cumulative crude mortality over time (years) after discharge.

Subgroup analysis of those who died before reaching their rLE showed that the proportion was marginally larger among the group of patients with self-inflicted burns (p=0.47) (Figure 3). As compared to patients with accidental burns who died before reaching rLE, the group of those with self-inflicted burns died at younger age, had more than twice as many YLL, median (IQR) were 29.8 (12.5–45.9) YLL and 12.0 (5.1–21.4) YLL, respectively, p=0.007, whereas there were no significant differences in sex ratio, burn size and depth, Baux score, duration of hospital stay, and number of years between discharge and death (Table 2).

Only 26 patients reached and exceeded their life expectancy: nine of them were individuals with accidental burns who were alive at the end of the study, gaining a median (IQR) of 1.3 (0.9–3.5) YLG at that time, and 16 with accidental burns were dead before the end of the follow up, gaining a median (IQR) of 7.4 (3.7–11.0) YLG. The YLG was similar, 7.5 years, for the only one who had died in the group of self-inflicted burns. However, no one in the group of patients with self-inflicted burns who had exceeded their life expectancy was alive at the end of the study (Table 3).

Most of those who were alive at the end of the study had not reached their life expectancy yet. Table 4 shows a similar pattern of differences as for the total study group (Table 1), total burn size as well as the size of deep burns were larger in the group of patients with self-inflicted burns, the duration of hospital stay was longer, and they showed a more equal sex ratio. There was no difference between the groups regarding years between discharge and study end (Table 4).

The risk adjusted long-term mortality analysis (Cox regression) showed that self-inflicted burns was an independent factor with a Hazard Ratio of 2.08 (95% CI 1.13–3.83) (Table 5).

Post hoc analysis showed that the increased risk adjusted mortality in individuals after self-inflicted burns was significant during the first two years after discharge (HR 3.68 and 3.17, p=0.03) as well as during the seventh and eighth years (HR 2.46 and 2.24, p=0.01 and 0.03), the 11th and 16th to 20th years after discharge (HR between 1.95 and 2.08, p values between 0.02 and 0.041). During the years in between (third to sixth years and the ninth to 15th years) there was a tendency of increased risk (HR between 1.84 and 2.69, p values between 0.05 and 0.08). Age at discharge was an independent factor for mortality in all the yearly analyses. HR for age was 1.07 for half of the years and 1.08 for the other half ($p<0.001$). The variable sex was not significant in any of the post hoc analyses. Supplemental Table S2 shows Cox regression HR for patients with self-inflicted burns in a yearly analysis of cumulative mortality over time after discharge. Figure 4 shows the Kaplan-Meier survival estimates by accidental and self-inflicted burns.

The subgroup analysis of patients with a pattern of self-injury behaviour showed two patients, one male and one female, age 31 and 47 years, who taken together had 12 in-hospital admissions for new burns. Median (25th to 75th centile) burn size of all admissions was 0.7% (0.5–2.0) TBSA%, and duration of hospital stay was 2.5 (2.0–7.5) days. The admissions occurred during an extended period; the patient with the most frequent admissions had 9 over 2.7 years while the other patient had 3 admissions over 9.5 months. Both died during the study period (before reaching their rLE) with YLL 30 and 52 years, respectively, one died less than 2 months after the last discharge, and one died 3.6 years after the last discharge.

Discussion

Long-term mortality among patients with self-inflicted burns has rarely been addressed in previous studies, and therefore we aimed to investigate it among those discharged alive from the Linköping Burn Centre during an 18 years long period, finding that self-inflicted burns was an independent factor for increased risk of mortality, as compared to accidental burns. The effect was noticeable over the whole study period although it was most pronounced during the first years after discharge. Ten of the 11 patients who died among the group of self-inflicted burns lost a median of 30 years of life, as compared to the national expected mean lifespan by age, year of birth, and sex, which was more than twice of the 12 years lost among the group of accidental burns who died prematurely.

In a recent study, Gueler et. al followed 125 adults with self-inflicted burns up to ten years after discharge, showing an increased risk of mortality (OR = 4.71, p=0.01) during the first two years after discharge. Furthermore former patients had more anxiety two years after discharge, a higher incidence of suicidal thoughts at five years, and a tendency of worse depression at 10 years after discharge, as compared with individuals discharged after accidental burns, which could explain an higher risk for long-term mortality [17]. In our study, we also found that the increased risk of mortality was most pronounced during the first two years after discharge, although, the effect was evident up to 20 years after. Mean age in our study was somewhat older than that in Gueler et al., 41 years compared with 37 years in their group of patients with self-inflicted burns and 49 years compared with 43 years in their group of patients with accidental burns [17]. One possible reason for difference on long-term mortality findings between our studies could be that they used a logistic regression which makes the analysis susceptible to attrition regarding duration of follow up, including loss of participants during the follow-up period.

Although several attempts have been made to characterise the group of individuals with self-inflicted burns [31-34], getting a comprehensive overview is prevented by the fact that populations can differ substantially between burn centres, and by the relatively small numbers of observation, which hinders to recognize different patterns[9,35]. As example, the smaller burn size observed among our patients differed notably from the size of burns observed in self-inflicted burns treated in burn intensive care [36]. Moreover, only 37 adult patients with self-inflicted burns were discharged from our Burn Centre during the study period, whereas larger numbers could been presented by an American study that included 5253 adults admitted for self-harm burns, merging data from three national databases [31]. The age in the American cohort (43 years) mirrored the age of the group of patients with self-inflicted burns admitted at our centre that included in-hospital deaths (42 years), whereas median age in those discharged alive from our centre was lower (34 years)[31 1]. As previously shown[17], we confirmed flame being the most frequent cause of injury among patients treated for self-inflicted burns, with exception of those patients admitted repeatedly for burns of small size, who get burns with diverse means, such as contact burns, scalds, chemicals, electrical, cold injury, and less frequently flame burns [3,32,35]. The tendency towards a more equal sex ratio among individuals with self-inflicted burns observed in our study has been reported previously [3,6,31,35] although the proportion of female patients can vary considerably (28% to 91%) between countries [6].

Presence of psychiatric comorbidity and suicide attempt have been indicated as two important risk predictor for in-hospital death in these patients [34,37], who even require more surgery, intensive burn care [2,3,32,38] and repeated re-admittances for new burns [3,32]. We agree that severe injuries and high in-hospital mortality might been explained by the intention of suicide in the short perspective, whereas we have some reservation regarding the prediction value on long-term outcome in patients with self-injury behaviour [39]. Only two individuals were

admitted for repeated burns in our study, too few for drawing any conclusion on their long-term outcome. However, the premature deaths (YLL 30 and 52 years) supported the idea that long-term outcome can be similar to that after evident suicide attempts. This is in line with the observation that patients with self-injury behaviour (including minor burns) have increased risk of premature mortality [3,36 39].

Finally, increased mortality among burn survivors has previously been described [25,29] and we found that the increased long-term risk after discharge was even higher in the subgroup of patients with self-inflicted burns. Alcohol and/or substance misuse and mental illness have frequently been observed among both patients with accidental and self-inflicted burns, and in our opinion, they might be the reasons behind the high post burn mortality [18,40]. In particular, the presence of psychiatric disorders among burn survivors increased their risk of self-harm behaviour [20,26,41], and vice versa, higher occurrence of mental disorders and drug or alcohol abuse was observed among young adults who had had severe burns as children, as compared with matched control group [21]. Furthermore, presence of mental disorders among burn survivors had been associated with the severity of the injury [26]. Burn care clinicians should be aware that patients with self-inflicted burns represent an easily identifiable group of patients who are at increased risk to die young. Future research should explore causes of death and implementation of preventive follow-up strategies. It seems reasonable that close multi-professional follow-up should be offered to these patients.

Limitations

The relatively small study sample and the single-centre approach reduces the generalizability of our conclusions. Further, it would have been interesting to stratify for cause of death and to

analyse the effect of coexisting physical and psychiatric morbidity, but unfortunately, we have neither data on cause of death, nor on pre-existing psychiatric disorders, nor information on treatment efforts. Finally, the attempt to use national data over life span to standardise the comparison between individuals with accidental and self-inflicted burns was done with reasonably satisfactory results in the subgroup analysis of those who had died earlier than expected, but the group who had reached and exceeded their expected lifespan was too small and included only one patient with self-inflicted burns. We added these subgroup analyses in the result section as descriptive information and the Cox regression should be considered as the main analysis.

Conclusion

Patients with self-inflicted injuries constitute a small group among all patients with burns admitted for specialized burn care. We found that the long-term risk of mortality after discharge from a burn centre was higher in the subgroup of individuals with self-inflicted burns compared with those with accidental burns. The effect was noticeable over the whole study period although it was most pronounced during the first years after discharge.

References

1. Pompermaier L, Elmasry M, Steinvall I. Self-inflicted burns in a National Swedish Burn Centre: an overview. *Ann Burns Fire Disasters.* 2019;32(4):272-277.
2. Caine P, Tan A, Barnes D, Dziewulski P. Self-inflicted Burns: 10 year review and comparison to national guidelines. *Burns.* 2016;42(1):215-221.
3. George S, Javed M, Hemington-Gorse S, Wilson-Jones N. Epidemiology and financial implications of self-inflicted burns. *Burns.* 2016;42(1):196-201.
4. Smith JM, Fine JR, Romanowski KS, Sen S, Palmieri TL, Greenhalgh DG. Suicide by self-inflicted burns–A persistent psychiatric problem. *Burns.* 2023;49(4):770-774.
5. Laloe V. Patterns of deliberate self-burning in various parts of the world. A review. *Burns.* 2004;30(3):207-215.
6. Palmu R, Isometsa E, Suominen K, Vuola J, Leppavuori A, Lonnqvist J. Self-inflicted burns: an eight year retrospective study in Finland. *Burns.* 2004;30(5):443-447.
7. Rashid A, Gowar JP. A review of the trends of self-inflicted burns. *Burns.* 2004;30(6):573-576.
8. Cornet PA, Niemeijer AS, Figaroa GD, et al. Clinical outcome of patients with self-inflicted burns. *Burns.* 2017;43(4):789-795.
9. Thombs BD, Bresnick MG. Mortality risk and length of stay associated with self-inflicted burn injury: evidence from a national sample of 30,382 adult patients. *Crit Care Med.* 2008;36(1):118-125.
10. Moore EC, Pilcher DV, Bailey MJ, Stephens H, Cleland H. The Burns Evaluation and Mortality Study (BEAMS): predicting deaths in Australian and New Zealand burn patients admitted to intensive care with burns. *J Trauma Acute Care Surg.* 2013;75(2):298-303.
11. Atwell K, Bartley C, Cairns B, Charles A. The epidemiologic characteristics and outcomes following intentional burn injury at a regional burn center. *Burns.* 2020;46(2):441-446.
12. Forster NA, Nunez DG, Zingg M, et al. Attempted suicide by self-immolation is a powerful predictive variable for survival of burn injuries. *J Burn Care Res.* 2012;33(5):642-648.

13. Modjarrad K, McGwin G, Jr., Cross JM, Rue LW, 3rd. The descriptive epidemiology of intentional burns in the United States: an analysis of the National Burn Repository. *Burns.* 2007;33(7):828-832.

14. Yamamoto R, Shibusawa T, Kurihara T, Sasaki J. Self-inflicted Burn Injury Is Independently Associated With Increased Mortality in a More Economically Developed Country: A Propensity Score Matching Analysis. *Journal of Burn Care & Research.* 2019;40(2):228-234.

15. Toppi J, Cleland H, Gabbe B. Severe burns in Australian and New Zealand adults: Epidemiology and burn centre care. *Burns.* 2019;45(6):1456-1461.

16. Duarte DW, Neumann CR, Weber ES. Intentional injuries and patient survival of burns: A 10-year retrospective cohort in southern Brazil. *Burns.* 2015;41(2):271-278.

17. Gueler JR, McMullen K, Kowalske K, et al. Exploratory analysis of long-term physical and mental health morbidity and mortality: A comparison of individuals with self-inflicted versus non-self-inflicted burn injuries. *Burns.* 2020;46(3):531-538.

18. Palmu R, Suominen K, Vuola J, Isometsä E. Mental disorders among acute burn patients. *Burns.* 2010;36(7):1072-1079.

19. Dyster-Aas J, Willebrand M, Wikehult B, Gerdin B, Ekselius L. Major depression and posttraumatic stress disorder symptoms following severe burn injury in relation to lifetime psychiatric morbidity. *J Trauma.* 2008;64(5):1349-1356.

20. Mason SA, Nathens AB, Byrne JP, et al. Association Between Burn Injury and Mental Illness among Burn Survivors: A Population-Based, Self-Matched, Longitudinal Cohort Study. *Journal of the American College of Surgeons.* 2017;225(4):516-524.

21. Meyer WJ, Blakeney P, Thomas CR, Russell W, Robert RS, Holzer CE. Prevalence of major psychiatric illness in young adults who were burned as children. *Psychosomatic medicine.* 2007;69(4):377-382.

22. Daigeler A, Langer S, Hullmann K, et al. A follow-up study of adults with suicidal burns: psychosocial adjustment and quality of life. *J Burn Care Res.* 2009;30(5):844-851.

23. Ali SN, Soueid A, Rao K, Moiemen N. Self-inflicted burns, outcome and cost. *Burns.* 2006;32(4):463-466.

24. Stone J, Gawaziuk JP, Khan S, et al. Outcomes in adult survivors of childhood burn injuries as compared with matched controls. *Journal of Burn Care & Research.* 2016;37(2):e166-e173.

25. Onarheim H, Vindenes HA. High risk for accidental death in previously burn-injured adults. *Burns.* 2005;31(3):297-301.

26. Palmu R, Suominen K, Vuola J, Isometsa E. Mental disorders after burn injury: a prospective study. *Burns.* 2011;37(4):601-609.

27. Jokinen J, Talbäck M, Feychting M, Ahlbom A, Ljung R. Life expectancy after the first suicide attempt. *Acta Psychiatr Scand.* 2018;137(4):287-295.

28. Mason SA, Nathens AB, Byrne JP, et al. Increased Rate of Long-term Mortality Among Burn Survivors: A Population-based Matched Cohort Study. *Ann Surg.* 2018.

29. Firchal EW, Sjoberg F, Fredrikson M, Pompermaier L, Elmasry M, Steinvall I. Long-term survival among elderly after burns compared with national mean remaining life expectancy. *Burns.* 2021.

30. Statistics Sweden. Annual life table for the whole country by year sex and age. https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__BE__BE0101__BE0101I/LivslangdEttariga/. Accessed April 26, 2021.

31. Thombs BD, Bresnick MG, Magyar-Russell G. Who attempts suicide by burning? An analysis of age patterns of mortality by self-inflicted burning in the United States. *Gen Hosp Psychiatry.* 2007;29(3):244-250.

32. Tuohig GM, Saffle JR, Sullivan JJ, Morris S, Lehto S. Self-inflicted patient burns: suicide versus mutilation. *J Burn Care Rehabil.* 1995;16(4):429-436.

33. Sayma M, Booth S, Weller D, Dheansa B. A retrospective study: Can we differentiate between repeat self-inflicted burn patients and those who commit a self-inflicted burn as an individual occurrence? *J Plast Reconstr Aesthet Surg.* 2017;70(11):1675-1680.

34. Titscher A, Lumenta DB, Belke V, Kamolz LP, Frey M. A new diagnostic tool for the classification of patients with self-inflicted burns (SIB): the SIB-Typology and its implications for clinical practice. *Burns.* 2009;35(5):733-737.

35. Pham TN, King JR, Palmieri TL, Greenhalgh DG. Predisposing factors for self-inflicted burns. *J Burn Care Rehabil.* 2003;24(4):223-227.

36. Theodorou P, Phan VT, Weinand C, et al. Suicide by burning: epidemiological and clinical profiles. *Ann Plast Surg.* 2011;66(4):339-343.

37. Moniz P, Casal D, Mavioso C, Videira-Castro J, Angelica-Almeida M. The self-inflicted burns-Typology and its prognostic relevance in a 14-year review of self-inflicted burns in a tertiary referral centre. *Burns.* 2011;37(2):322-327.

38. McAllister M. Multiple meanings of self harm: a critical review. *Int J Ment Health Nurs.* 2003;12(3):177-185.

39. Bergen H, Hawton K, Waters K, et al. Premature death after self-harm: a multicentre cohort study. *The Lancet.* 2012;380(9853):1568-1574.

40. Palmu R, Partonen T, Suominen K, Vuola J, Isometsä E. Alcohol use and smoking in burn patients at the Helsinki Burn Center. *Burns.* 2018;44(1):158-167.

41. Sveen J, Ekselius L, Gerdin B, Willebrand M. A Prospective Longitudinal Study of Posttraumatic Stress Disorder Symptom Trajectories After Burn Injury. *Journal of Trauma and Acute Care Surgery.* 2011;71(6).

Table 1 – Details of patients

	Patients with accidental burns= 893	Patients with self-inflicted burns= 37	P
	N (%)	N (%)	
Sex, male	674 (75%)	22 (59%)	0.03
Burn type			<0.001
Scalds	120 (13%)	0	
Contact burn	95 (11%)	0	
Chemical	62 (7%)	0	
Flame burn	517 (58%)	36 (97%)	
Electricity	50 (6%)	1 (3%)	
Other	49 (5%)	0	
Mortality after discharge	219 (25%)	11 (30%)	0.47
	Median (25^{th} – 75^{th} centiles)	Median (25^{th} – 75^{th} centiles)	
Total burn size, TBSA%	6.0 (2.1–14.5)	15.0 (8.0–35.0)	<0.001
Superficial dermal burns, BSA%	1.2 (0.0–5.5)	2.0 (0.0–5.5)	0.64
Deep dermal burns, BSA%	0.7 (0.0–3.5)	5.0 (2.0–11.5)	<0.001
Full thickness burns, BSA	0.1 (0.0–2.5)	1.3 (0.0–12.0)	0.04
Baux score	58.3 (40.0–76.0)	61.0 (46.9–77.0)	0.29
Duration of hospital stay, days	10.0 (2.0–22.0)	33.0 (17.0–50.0)	<0.001
Age at discharge, years	47.5 (32.0–62.8)	38.3 (27.6–51.5)	0.03
rLE at discharge, years	33.9 (20.6–48.9)	44.0 (30.5–52.6)	0.02
Time variable for cox, days	3201 (1931–4906)	3062 (1873–4317)	0.93
Age at death, years	74.2 (62.2–83.9)	52.1 (33.1–73.8)	0.01
Years after discharge until death	4.4 (1.4–7.6)	4.1 (0.9–10.8)	0.72
Years after discharge among survivors	9.8 (7.1–15.0)	9.1 (7.2–16.6)	0.90

Data are median (25^{th} – 75^{th} centiles) or n (%). Body surface area= BSA. Baux score= age + TBSA%. remaining Life Expectancy= rLE. Time variable for cox regression (follow up time) was calculated as the period between discharge and

study end (for those alive at that time) or time at death. Min–max age at discharge was 18.0–97.7 years in the accidental group and 18.0–77.1 years in the group of self-inflicted burns. Min–max age at death was 29.0–100.5 years in the accidental group and 32.0–88.2 years in the group of self-inflicted burns.

Table 2 – Death before reached rLE

	Accidental burns= 203	Self-inflicted burns= 10	P
Sex, male	145 (71.4%)	7 (70.0%)	0.92
Total burn size, TBSA%	8.0 (3.0–19.0)	12.5 (6.5–36.5)	0.135
Superficial dermal burns, BSA%	0.3 (0.0–3.5)	1.5 (0.0–5.0)	0.774
Deep dermal burns, BSA%	1.0 (0.0–3.5)	4.0 (0.5–17.0)	0.102
Full thickness burns, BSA	2.0 (0.0–7.0)	1.0 (0.0–11.5)	0.762
Baux score	78.7 (63.5–89.0)	73.0 (46.9–86.0)	0.479
Duration of hospital stay, days	17.0 (7.0–32.0)	30.0 (11.0–45.0)	0.124
Age at discharge, years	67.6 (54.3–77.8)	48.1 (31.7–58.2)	0.003
rLE at discharge, years	17.0 (9.9–28.1)	34.9 (23.4–50.3)	0.003
Time variable for cox, days	1476 (443–2682)	1408 (340–2334)	0.924
Age at death, years	73.1 (60.4–83.1)	51.4 (33.1–69.6)	0.004
Years after discharge until death	4.0 (1.2–7.3)	3.9 (0.9–6.4)	0.924
YLL, Years of Life Lost	12.0 (5.1–21.4)	29.8 (12.5–45.9)	0.007

Data are presented as median (25th to 75th centiles) or n (%). Body surface area= BSA. Baux score= age + TBSA%. remaining Life Expectancy= rLE. Min–max age at discharge was 21.7–96.7 years in the accidental group and 26.8–77.1 years in the group of self-inflicted burns. Min–max age at death was 29.0–99.0 years in the accidental group and 32.0–78.9 years in the group of self-inflicted burns.

Table 3 – Reached and exceeded rLE

	Accident		Self-inflicted
	Alive at study end	Dead at study end	Dead at study end
No. of patients	9	16	1
Sex, male	6 (66.7%)	10 (62.5%)	1
Total burn size, TBSA%	3.0 (2.0–3.5)	6.8 (1.8–12.0)	6.0
Superficial dermal burns, BSA%	2.0 (0.0–3.5)	1.0 (0.0–4.0)	2.0
Deep dermal burns, BSA%	0.0 (0.0–0.0)	0.8 (0.0–5.8)	2.0
Full thickness burns, BSA	1.0 (0.0–3.0)	1.5 (0.0–3.0)	2.0
Baux score	81.8 (68.7–83.2)	93.2 (86.2–104.6)	78.3
Duration of hospital stay, days	7.0 (4.0–10.0)	16.5 (5.0–27.5)	34.0
Age at discharge, years	78.5 (66.7–79.3)	86.2 (82.7–90.0)	72.3
rLE at discharge, years	10.2 (8.4–15.9)	5.5 (4.0–7.2)	11.9
Time variable for cox, days	4320 (3629–6107)	2564 (1770–3919)	5793
Age at death, years		93.7 (91.8–95.2)	88.2
Years after discharge until death		7.0 (4.8–10.7)	15.9

YLG, Years of Life Gained*	1.3 (0.9–3.5)	7.4 (3.7–11.0)	7.5
Years after discharge among survivors	11.8 (9.9–16.7)		

Data are presented as median (25th to 75th centiles) or n (%). Body surface area= BSA. Baux score= age + TBSA%. remaining Life Expectancy= rLE. *Years of Life Gained in relation to rLE = the period between the date of life expectancy after discharge and death, among those who died, or the end of the study, among those who were alive. Min–max age at discharge was 63.1–85.4 years in the accidental group alive at study end and 63.6–94.7 years in the accidental group dead at study end. Min–max age at death was 84.2–100.5 years in the accidental group dead at study end.

Table 4 – Alive not reached rLE

	Accident	Self-inflicted	
No. of patients	665	26	P
Sex, male	513 (77.1%)	14 (53.8%)	0.006
Total burn size, TBSA%	5.6 (2.0–13.3)	18.5 (9.0–35.0)	<0.001
Superficial dermal burns, BSA%	1.7 (0.0–6.0)	1.8 (0.0–8.8)	0.71
Deep dermal burns, BSA%	0.5 (0.0–3.5)	7.0 (2.0–11.5)	<0.001
Full thickness burns, BSA	0.0 (0.0–1.5)	0.9 (0.0–13.0)	0.02
Baux score	51.5 (35.2–67.0)	60.5 (41.0–75.8)	0.06
Duration of hospital stay, days	8.0 (2.0–19.0)	37.0 (17.0–51.0)	<0.001
Age at discharge, years	40.9 (27.9–54.5)	34.3 (25.9–49.1)	0.16
rLE at discharge, years	40.3 (27.7–52.8)	47.1 (33.2–54.5)	0.09
Years after discharge among survivors	9.8 (7.1–14.9)	9.1 (7.2–16.6)	0.92

Data are presented as median (25th to 75th centiles) or n (%). Body surface area= BSA. Baux score= age + TBSA%. remaining Life Expectancy= rLE. Min–max age at discharge was 18.0–88.3 years in the accidental group and 18.0–66.2 years in the group of self-inflicted burns.

Table 5 – Multivariable Cox regression for mortality after discharge

	HR	95% CI	p
Age, years	1.08	1.07–1.09	<0.001
Intention, self-inflicted	2.08	1.13–3.83	0.019
Sex, female	0.89	0.67–1.19	0.432

HR, Hazard Ratio. Model p <0.001. Total n=930, mortality 25% (230/930), total time at risk 8877 years.

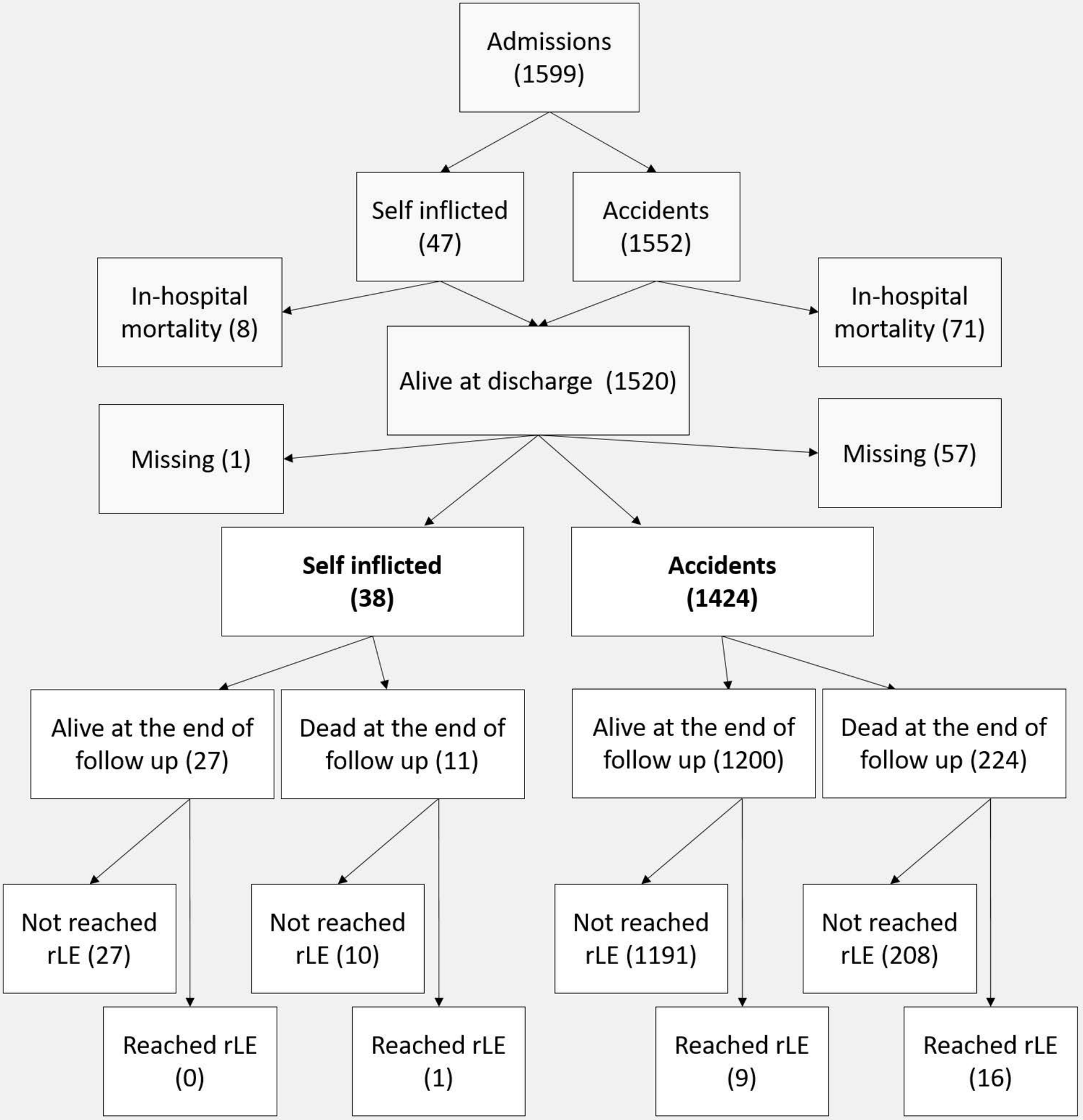
Admissions (1599)
Self inflicted (47)
Accidents (1552)
In-hospital mortality (8)
In-hospital mortality (71)
Alive at discharge (1520)
Missing (1)
Missing (57)
Self inflicted (38)
Accidents (1424)
Alive at the end of follow up (27)
Dead at the end of follow up (11)
Alive at the end of follow up (1200)
Dead at the end of follow up (224)
Not reached rLE (27)
Not reached rLE (10)
Not reached rLE (1191)
Not reached rLE (208)
Reached rLE (0)
Reached rLE (1)
Reached rLE (9)
Reached rLE (16)

Figure 1 – Outline of time related variables and different life patterns over the study period.

Discharge= time zero. YLL= Years of Life Lost. YLG= Years of Life Gained. Study end= 26th April 2021.

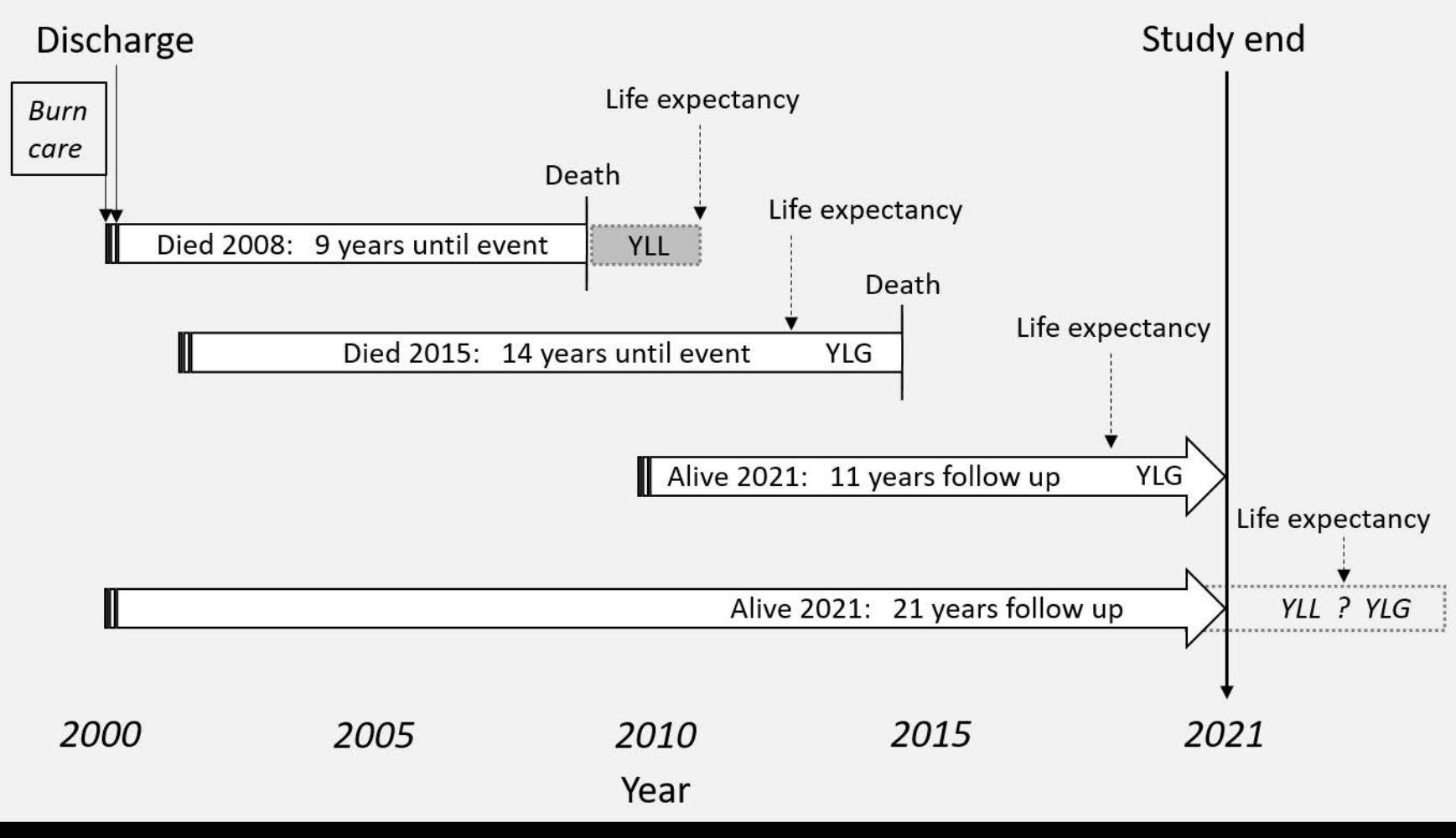
Discharge
Study end
Burn care
Life expectancy
Death
Life expectancy
Died 2008: 9 years until event
YLL
Death
Life expectancy
Died 2015: 14 years until event
YLG
Life expectancy
Alive 2021: 11 years follow up
YLG
Life expectancy
Alive 2021: 21 years follow up
YLL ? YLG
2000
2005
2010
2015
2021
Year

Figure 2 – Selection of patients among those admitted during 2000–2017. Study group n= 930. Missing = patients with unknown survival status; patients from other countries (n=25), Swedish inhabitants who emigrated after discharge (n=9), Swedish inhabitants at discharge with unknown location and status at the end of follow up (n=2). rLE, remaining Life Expectancy.

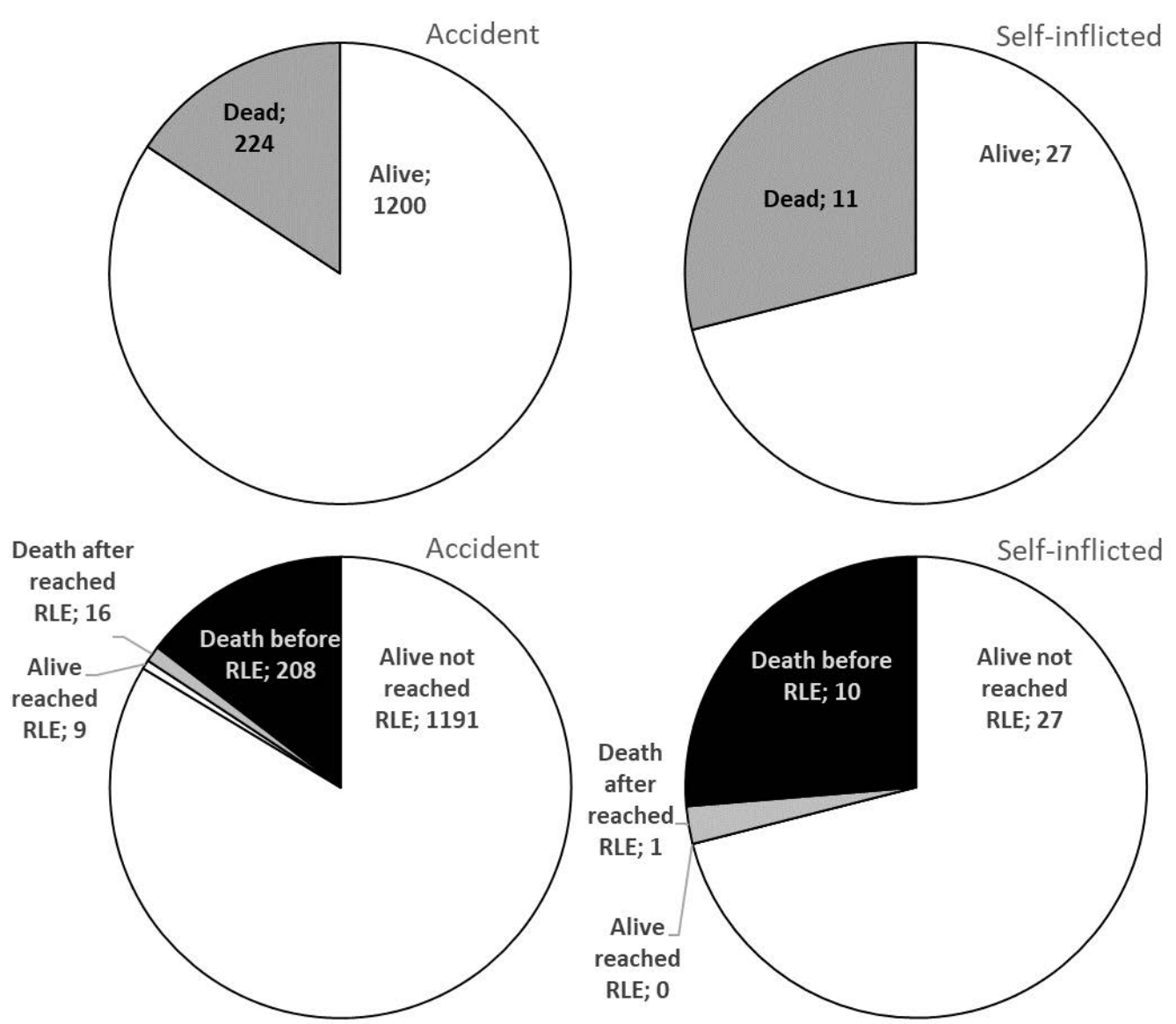
Accident
Dead; 224
Alive; 1200
Self-inflicted
Alive; 27
Dead; 11
Accident
Death after reached RLE; 16
Death before RLE; 208
Alive reached RLE; 9
Alive not reached RLE; 1191
Self-inflicted
Death before RLE; 10
Alive not reached RLE; 27
Death after reached RLE; 1
Alive reached RLE; 0

Figure 3 –The two pie charts in the upper row show crude mortality during the follow up period after discharge from the burn centre: 24.5% among patients with accidental burns and 29.7% among the group of patients with self-inflicted burns (p=0.47). The two pie charts in the lower row show the proportion of death before reaching remaining life expectancy (rLE): 22.7% among patients with accidental burns and 27.0% among those with self-inflicted burns (p=0.54). Three percent in each group of patients (25/868 of those with accidental burns and 1/37 among those with self-inflicted burns) had exceeded their rLE before death or end of the study (p=1.00).

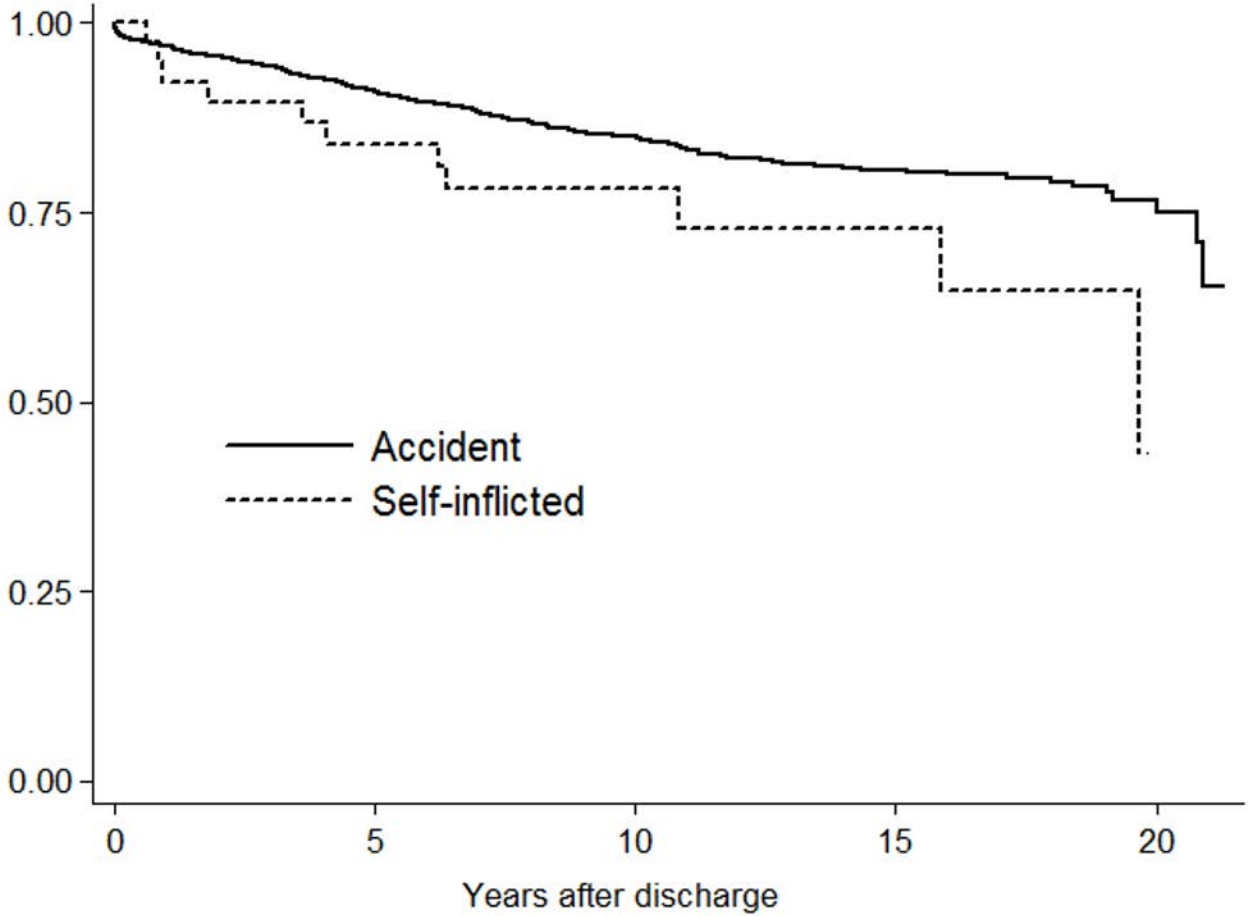
1.00
0.75
0.50
0.25
0.00
Accident
Self-inflicted
0
5
10
15
20
Years after discharge

Figure 4 – Kaplan-Meier survival estimates by intention (accidental burn or self-inflicted). There were 219 (25%) deaths after discharge in the group of patients with accidental burns and 11 (30%) deaths in the group of patients with self-inflicted burns.