MONASH University

BURNS REGISTRY OF AUSTRALIA AND NEW ZEALAND (BRANZ)

ANNUAL REPORT 2019/20

CONTENTS

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FOREWORD

The reporting period for this 11th Annual Report of the Burns Registry of Australia and New Zealand encompasses events having profound impacts on individuals, communities, and nations in which we live.

In addition to our usual review of the year's admissions to all specialist burn services in Australia and New Zealand, we present special reports on people suffering burns as a result of two separate tragedies. On December 9th 2019, the New Zealand Whakaari/White Island volcano erupted, causing a mass casualty event. Nearly all people on the island who survived the eruption had severe burns, requiring many weeks and months of treatment in burn services in New Zealand and Australia. Then, over the ensuing summer, mega fires burned throughout south and eastern Australia, directly killing 34 people and destroying homes, farms, and more than 20% of the nation's forests. Forty patients with severe burn injuries as a result of these bushfires were admitted to specialist burns services around the nation. We present a summary of bushfire-related burn injuries treated in BRANZ hospitals over the last 11 years, and the story of John who survived a massive burn injury in December 2019 and spent more than three months in the Burns Service at the Royal Adelaide Hospital.

As the 2020 year proceeded, the COVID-19 pandemic and resulting lockdowns were associated with significant increases in burn injuries requiring admission to our burns services. This has especially affected children and mostly involved injuries in the home. The extent and nature of the increase will be clearer when we have complete data for the second half of 2020.

As the 2020 year proceeded, the COVID-19 pandemic and resulting lockdowns were associated with significant increases in burn injuries requiring admission to our burns services.

This year has been challenging for our burns clinicians, as it has been for many, and the commitment of the clinicians caring for people with the most serious of injuries has been sustained in large part by the determination of our patients, and the inter-connected community of our burns care colleagues. BRANZ is one of several ongoing collaborative projects across Australian and New Zealand specialist burn servcies, aimed to ensure best practice high quality burn care, and I commend this report to you.

Heather Cleland

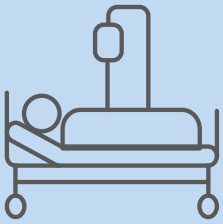
Chair
BRANZ Steering Committee

Jeremy Rawlins

President
Australian and New Zealand Burns Association

YEAR AT A GLANCE

PATIENT



3,367 patients admitted to a burns service in 2019/20 (3,357 in 2018/19)

31 years
median age

36%
occurred on weekend

66% male

MECHANISM

230 patients had major burns in 2019/20 (a 20% increase from the 192 in 2018/19)

42%
of adult burns were due to a flame

52%
of paediatric burns were due to a scald

3%
of burns were the result of intentional self-harming

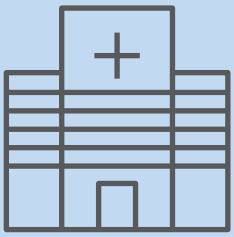
PRE-HOSPITAL MANAGEMENT

23%
of children did not receive the recommended first aid treatment for burn injuries

16%
of children were transported to a BRANZ hospital directly from the scene

19%
of adults were transported to a BRANZ hospital directly from the scene

IN-HOSPITAL OUTCOMES



78%
underwent at least one burn wound management procedure in theatre (76% in 2018/19)

10%
admitted to ICU (8% in 2018/19)

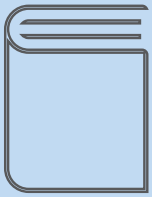
69.1 hours
Median ICU stay (59.5 hours in 2018/19)

4 days
Median hospital stay (3.8 days in 2018/19

32 deaths
(28 deaths in 2018/19)

14%
of patients with a burn exceeding 20% TBSA died (10% in 2018/19)

ACADEMIC OUTPUTS SUPPORTED BY BRANZ DATA



5
peer-reviewed publications

18
conference presentations from abstracts

10
external requests for BRANZ data to be used in ethics-committee approved research projects; 9 requests approved

ABOUT THIS REPORT

This is the eleventh Annual Report prepared for public release by the Burns Registry of Australia and New Zealand (BRANZ). Data collected during the period of July 1st 2019 to June 30th 2020 from 17 specialist burn services in Australia and New Zealand are reflected in this report with a particular focus on the profile, treatment, and in-hospital outcomes of burns admissions in the 2019/20 financial year.

Comparisons with previous years are also presented. As data continue to be updated for new and historic patients in the BRANZ, slight differences in case numbers are expected when compared with previous reports. Where appropriate, data has been compared with the American Burn Association's National Burn Repository (NBR) report of data from 2009 to 2018[1].

1. American Burn Association. National Burn Repository 2019 Update: Report of data from 2009-2018. Chicago, IL, USA.

BACKGROUND

OVERVIEW OF THE BURNS REGISTRY OF AUSTRALIA AND NEW ZEALAND (BRANZ)

The Burns Registry of Australia and New Zealand (BRANZ) is a clinical quality registry that captures epidemiological, quality of care, and in-hospital outcome data for adult and paediatric burns patients treated in Australian and New Zealand. The Registry is a collaboration between the Australian and New Zealand Burn Association (ANZBA) and Monash University, Department of Epidemiology and Preventive Medicine (DEPM).

Since July 2016, all 17 specialist burn services in Australia and New Zealand have contributed data to the Registry (Figure 1). An 18th burn service began contributing data in July 2019.

Figure 1 – Contributing Hospitals across Australia and New Zealand

INCLUSION AND EXCLUSION CRITERIA

The BRANZ captures data about all first admissions to an Australian or New Zealand specialist burn service within 28 days of injury where a burn is the principal reason for admission and any of the following criteria are met:

- The patient is admitted to hospital for a period of 24 hours or more; OR
- The patient is admitted to hospital for less than 24 hours but requires a burn wound management procedure in theatre; OR
- The patient dies within 24 hours of presentation to the specialist burn service.

The Registry also collects data on all readmissions to a specialist burn service that occur within 28 days of discharge from the initial admission.

Desquamating skin conditions such as Stevens-Johnson Syndrome and Toxic Epidermal Necrolysis (TENS) are excluded from the Registry. Extravasation injuries are also excluded from the Registry.

DATA METHODOLOGY AND QUALITY ASSURANCE

Data collection is the responsibility of the participating services. Patient data are retrieved from medical records and existing hospital information systems and entered into the web-based database. International Classification of Disease version 10, Australian Modification (ICD-10-AM) diagnostic and procedural codes are predominantly retrieved electronically from hospital information systems and submitted for uploading to BRANZ.

To ensure all burns data coordinators and collectors designated to collect data for the registry are collecting data in a standardised manner, formal training sessions are held when data collectors commence work. ‘Refresher’ training sessions and ad hoc informal training sessions are available as required.

To maximise data completeness, services run their own data completeness reports prior to the central extraction of data for the quarterly and annual reports. Manual checking of data occurs at each reporting deadline, and quality assurance review and checks for reliability and validity are planned to ensure BRANZ produces high quality data. Completeness of data by service is also provided in the quarterly reports to enable individual services to track their data completeness relative to other participating services.

BRANZ SPECIAL FOCUS REPORT - AUSTRALIAN BLACK SUMMER BUSHFIRES

REGISTRY DATA

The unique nature and characteristics of the Australian climate and habitat increases the risk of bushfires across the summer season. In the summer of 2019/20, now known as the Black Summer, Australia had its worst season for bushfires on record. More than 20 million hectares of land was burnt, 3,000 homes were destroyed, and more than 3 billion animals were killed or displaced. The effects of the Black Summer are reflected in the workload recorded across the burn services contributing to BRANZ.

From July 2009 to June 2020, there were 32,230 patients recorded by the BRANZ. One hundred and four patients (0.3% of all admissions) had injuries caused by bushfires over this 11-year period. The 2019/20 reporting period had the greatest number of patients injured by bushfires (n = 40), accounting for more than one third of all bushfire admissions since the inception of the registry. Two-thirds of bushfire-related admissions (n = 26) during the 2019/20 reporting periods occurred in December 2019 and January 2020.

Table 1 – Bushfire-Related Admissions by Reporting Period, 2009/10 to 2019/20

	CONTRIBUTING SERVICES	ADMISSIONS	BUSHFIRE-RELATED ADMISSIONS
2009/10	12	2,179	9
2010/11	15	2,491	< 5
2011/12	15	2,806	8
2012/13	16	2,770	9
2013/14	16	2,845	5
2014/15	16	2,771	11
2015/16	16	2,902	7
2016/17	17	3,310	5
2017/18	17	3,460	< 5
2018/19	17	3,342	6
2019/20	17	3,354	40
TOTAL		**32,230**	**104**

Most patients with bushfire-related burns were male and the median age of bushfire-related burns patients was 52 years. Two-thirds of all bushfire-related injuries occurred either on farms or at the home/usual place of residence. The median TBSA of bushfire-related burns was 7.8%, which is higher than the median TBSA of all burns recorded by BRANZ (3% across all patients). Approximately one in six patients had documented suspicion of inhalation injury in addition to their cutaneous burn. More than half of the bushfire-related burns patients were referred to a BRANZ hospital via a non-BRANZ hospital. Three in four bushfire-related burns patients underwent a wound management procedure in theatre, while one in three patients were admitted to the ICU. The latter statistic is important with respect to the relative cost implications of treating bushfire-related injuries compared to other modes of injury. The median length of stay for bushfire-related burns patients was 7.9 days. Seven percent of patients with a bushfire-related burn died in-hospital. This figure is higher than the overall burn-related mortality rate within BRANZ, which is approximately 1%.

During the 2019/20 reporting period, the median age of patients with bushfire-related burns was greater than patients admitted over the previous decade. Compared to the previous 10-year period, a greater proportion of bushfire-related burns occurred at the home or usual place of residence in the 2019/20 reporting period. Prior to the 2019/20 reporting period, farms were the most common place of injury for bushfire-related burns. While the Black Summer cohort were significantly older than patients from previous years, there was no evidence of any differences with respect to injury severity, in-hospital management, and in-hospital outcomes between patients admitted with bushfire-related burns in the last 12 months compared to the previous decade.

Table 2 – Characteristics and Outcomes of Bushfire-Related Burns

	2009/10 TO 2019/20	2009/10 TO 2018/19	2019/20 ONLY	p-value
Gender				0.80
Male	87 (83.7%)	54 (84%)	33 (83%)	
Female	17 (16.3%)	10 (16%)	7 (18%)	
Age, median (IQR) years	52.0 (35.0, 63.0)	45.0 (30.0, 60.0)	59.0 (50.5, 68.0)	<0.001
Place of injury				<0.001
Home	34 (33.3%)	12 (19%)	22 (56%)	
Farm	34 (33.3%)	27 (43%)	7 (18%)	
Other place	34 (33.3%)	24 (38%)	10 (26%)	
TBSA, median (IQR) %	7.8 (4.0, 21.0)	8.0 (4.0, 20.0)	5.5 (4.0, 21.6)	0.27
Inhalation injury	17 (16.3%)	12 (19%)	5 (13%)	0.40
Admission source				0.12
Scene of injury via ambulance	31 (29.8%)	17 (27%)	14 (35%)	
Other hospital	59 (56.7%)	35 (55%)	24 (60%)	
Other source	14 (13.5%)	12 (19%)	< 5	
Time to admission, median (IQR) hours	16.8 (5.0, 51.7)	9.2 (4.6, 51.7)	18.5 (5.3, 48.9)	0.57
Theatre Admission	81 (77.9%)	50 (78%)	31 (78%)	0.94
ICU admission	35 (33.7%)	24 (38%)	11 (28%)	0.29
ICU LOS median (IQR) days	65.7 (20.8, 451)	63.7 (23.1, 385)	276 (11.6, 456)	0.83
LOS, median (IQR) days	7.9 (3.1, 19.3)	7.9 (3.0, 19.3)	7.4 (3.5, 21.1)	0.85

Excludes missing data.
ICU = intensive care unit, IQR = interquartile range, LOS = length of stay, TBSA = total body surface area.

JOHN'S STORY

The South Australian 2019-2020 bushfire season started two weeks earlier than usual on the 11th of November 2019 and continued through January 2020. This period was characterised by 14 catastrophic fire risk days and 31 total fire ban events, the most since this rating category was introduced to South Australia in 2010-11. Friday December 20th was one of the 14 catastrophic fire risk days. South Australia had already experienced two significant bush fire events, and the weather forecast was an overnight minimum of 34°C with a predicted maximum of 44°C. Adelaide Hills local identity John was one of many residents who lost his home and possessions that day. Read on to hear John's experience with the South Australian bushfires.

Former Oakbank chairman John with RAH Burn Service Clinical Practice Consultant nurse Stuart Harper and RAH Advance Nurse Unit Manager Natalia Adanichkin. Picture: Matt Turner. Source adelaidenow.com.au

At 9.17am on Friday December 20th, a fire started in the Cuddle Creek region of the Adelaide Hills. Having raced through the heavily wooded terrain, the fire reached the town of Woodside by 12.50pm. Like many other residents, John enacted his bushfire plan to defend his home and property from the rapidly approaching flames.

By mid-afternoon John was exhausted. Seeing the taps had melted on the series of high-pressure hoses he had installed, he knew his fire defence system was useless and that he needed to abandon the property. The 76-year old climbed aboard his tractor, fitted with a small firefighting unit, and attempted to escape the inferno.

But he didn't get far.

"There was a motorbike only about five metres away from me and it exploded in a massive ball of flames… And that's all I remember until I woke up here," John recalled from the Royal Adelaide Hospital (RAH) Burns Service.

Following the explosion, John was found unconscious and slumped over his tractor by a neighbour who had been fighting the fires at a nearby property. The neighbour knew that John had stayed to fight the fires himself, but grew concerned when John failed to answer his phone.

John's neighbour pulled John off the tractor and dragged him to safety before calling an ambulance. Although John was breathing, he was otherwise non-responsive. While waiting for the ambulance, John's neighbour began pumping water on him – a lifesaving act.

After approximately 20 minutes a police officer arrived. The ambulance had been turned back due to the bushfires. It was up to John's neighbour and the police officer to get John—and themselves—to safety.

John was taken to the closest hospital at Mt Barker. He was later transferred to the Burn Service at the RAH, where a formal assessment determined John sustained burns to 42% of his body, with 24% being full thickness. Full thickness burns are a severe type of burn injury where all layers of the skin are destroyed.

Due to the severity of his injuries, John spent more than two weeks in the ICU. For most of this time he was ventilated and required special equipment to help him continue to breathe.

"Those first days were horrific," explained John. "Unfortunately, or fortunately, I was unconscious for the first 14 days, until I came out of the ICU." Following the initial sedation in the ICU, John reported that "the agony went on and on with no sense of day or night. You're just drifting, struggling to regain a grip on reality, completely non-compos and hallucinating constantly."

During his 95-day stay at the RAH, John required a total of nine operations. He was transferred to Strathalbyn Hospital in the Adelaide Hills for rehabilitation, but has returned to the RAH for management of an infected wound on his leg and surgery to release scar contractures. John continues to receive outpatient scar management, physiotherapy, and occupational therapy as required.

John now plays an active role in supporting other burn injury survivors, acting as a mentor in the RAH Burn Service's inpatient peer support program. He has also spoken at charity events for the Josh Deegan Foundation, which raises funds for to support the training of Burns Link Nurses and Therapists who provide ongoing care and therapy needs to patients in rural and remote areas.

Locally, he has been supported by the Adelaide Hills community and horse racing fraternity at Oakbank. He has begun to rebuild his house, is back on a tractor (albeit with reversing cameras and against medical advice!), and plans to be riding motorbikes again!

* Portions of this story first appeared in The Advertiser (adelaidenow.com.au)

BRANZ SPECIAL FOCUS REPORT - WHAKAARI/WHITE ISLAND VOLCANIC ERUPTION

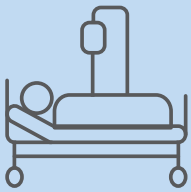
BRANZ SPECIAL FOCUS REPORT – WHAKAARI/WHITE ISLAND VOLCANIC ERUPTION

On December 9th 2019, the volcanic island Whakaari/White Island erupted. Forty-seven people, mostly tourists, were reported to be on the island at the time of the explosion. Twenty-two people lost their lives, with the remaining 25 people sustaining serious injuries[2]. The final patients involved in the eruption were discharged from the National Burns Centre (Middlemore Hospital, Auckland) on April 6, 2020[3].

Treating the patients caught in the eruption was a highly collaborative effort for the Australian and New Zealand burns community. Patients were managed at the National Burns Centre, the three regional New Zealand burn services (Waikato Hospital, Hamilton; Hutt Hospital, Lower Hutt, Wellington; and Christchurch Hospital, Christchurch), and two Australian services (The Alfred Hospital, Melbourne, Victoria; and Concord Repatriation General Hospital, Concord, New South Wales). The collaborative effort involved video conferencing and Australian surgeons and nurses visiting New Zealand at various stages to support their New Zealand colleagues[4].

Twenty-one patients caught in the eruption were registered on the BRANZ. Not all patients involved in the Whakaari/White Island were eligible for inclusion on the registry (see *Inclusion and Exclusion Criteria*, page 7). In addition, some early in-hospital deaths relating to Whakaari/White Island have not been included in the BRANZ as there were no surviving family members who could be informed about the registry and agree to their inclusion on the registry. Therefore, the data presented here is not a complete representation of all victims of the Whakaari/White Island eruption.

PATIENT



21
patients involved in the Whakaari/White Island were captured by the BRANZ

57%
of patients were female

44 years
mean age

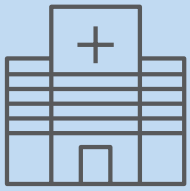
MECHANISM AND INJURY

43%
of patients had a chemical burn caused by sulphuric acid, hydrofluoric acid, and/or hydrochloric acid

86%
of burns affected more than 20% of total body surface area

56%
of patients had also sustained an inhalation injury

IN-HOSPITAL OUTCOMES



95%
of patients underwent a burn wound management procedure in theatre

86%
of patients were admitted to an intensive care unit

20 days
mean hospital stay

2. New Zealand Police Media Release, November 26, 2020. https://www.police.govt.nz/news/release/whakaari-white-island-eruption-22nd-death
3. New Zealand Ministry of Health news article, April 6 2020. https://www.health.govt.nz/news-media/news-items/whakaari-white-island-final-patients-discharged-national-burn-centre
4. 'Two tragedies push burn surgeons to the limit', *Surgical News* Volume 21 Issue 1. https://umbraco.surgeons.org/media/4996/janfeb_2020_surgicalnews_final_web.pdf

PATIENT DEMOGRAPHICS

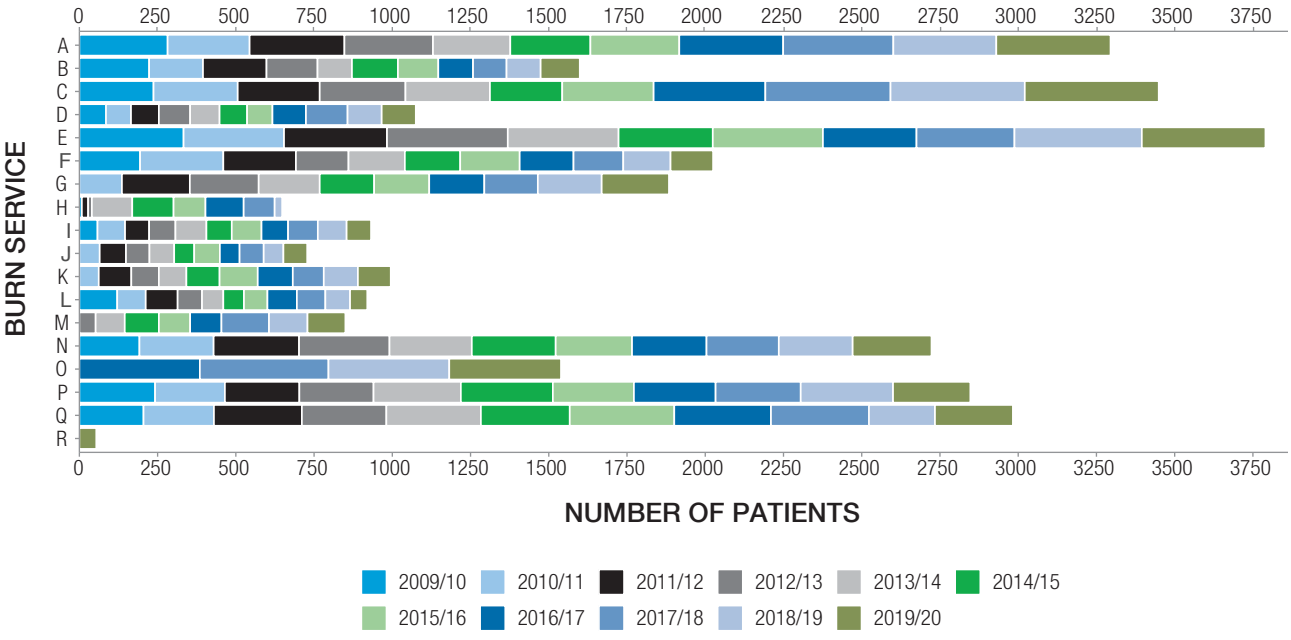
BURNS PATIENT NUMBERS IN BRANZ

The number of patients registered by the BRANZ during each reporting period from July 2009 to June 2020, along with the number of services contributing data to the registry, are reported in Table 3. An upward trend in the number of patients registered each year was observed from July 2009 to June 2012 as more services began contributing to the registry. The number of patients remained relatively stable from July 2012 to June 2015, before another upward trend occurred as the final specialist service began contributing data. There was a decrease in the number of registered patients during the 2018/19 reporting period; this is likely due to one service not submitting data in 2019 for administrative reasons. The number of patients admitted to each service from July 2009 to June 2020 are presented in Figure 2.

Table 3 – Number of Registered BRANZ Patients by Reporting Period, 2009/10 to 2019/20

	CONTRIBUTING SERVICES	PATIENTS
2009/10	12	2,182
2010/11	15	2,497
2011/12	15	2,814
2012/13	16	2,779
2013/14	16	2,850
2014/15	16	2,778
2015/16	16	2,918
2016/17	17	3,323
2017/18	17	3,475
2018/19	17	3,357
2019/20	17	3,367

Figure 2 – Number of Registered BRANZ Patients by Service and Reporting Period, 2009/10 to 2019/20



AGE AND GENDER PROFILE OF PATIENTS REGISTERED BY BRANZ

Within BRANZ, age at the time of burn injury is calculated using the date of birth and the date of injury. Patients are classified as either paediatric patients (15 years of age and under) or adult patients (16 years of age and older) based on their age at the time of burn injury. The proportion of paediatric patients registered by the BRANZ increased from July 2009 to June 2015, before declining from July 2015 to the end of the current reporting period (Table 4). The average age of registered patients from July 2009 to June 2020 was 30.3 (standard deviation [SD] = 23.3) years.

Table 4 – Demographic Profile of Registered BRANZ Patients, 2009/10 to 2019/20

	TOTAL	PAEDIATRIC PATIENTS (0-15 YEARS)			ADULT PATIENTS (≥ 16 YEARS)		
	NUMBER	NUMBER	%	AGE MEAN (SD)	NUMBER	%	AGE MEAN (SD)
2009/10	2,182	587	26.9	3.8 (4.4)	1,595	73.1	40.5 (18.2)
2010/11	2,497	770	30.8	4.3 (4.6)	1,727	69.2	39.5 (17.9)
2011/12	2,814	894	31.8	4.3 (4.5)	1,920	68.2	41.5 (18.6)
2012/13	2,779	875	31.5	4.4 (4.5)	1,904	68.5	41.2 (18.3)
2013/14	2,850	1,028	36.1	4.2 (4.5)	1,822	63.9	41.6 (18.0)
2014/15	2,778	1,018	36.6	4.3 (4.5)	1,760	63.4	42.6 (18.4)
2015/16	2,918	962	33.0	4.3 (4.4)	1,954	67.0	41.8 (18.1)
2016/17	3,323	994	29.9	4.2 (4.5)	2,328	70.1	42.6 (18.7)
2017/18	3,475	1,004	28.9	4.3 (4.5)	2,469	71.1	42.7 (18.1)
2018/19	3,357	931	27.7	4.2 (4.4)	2,426	72.3	42.9 (18.3)
2019/20	3,367	924	27.4	4.3 (4.4)	2,443	72.6	43.2 (17.8)
TOTAL	**32,335**	**9,987**	**30.9**	**4.2 (4.5)**	**22,348**	**69.1**	**42.0 (18.3)**

Age data were recorded for all patients registered by the BRANZ during the 2019/20 reporting period. Of the 3,367 patients with age data, 924 were paediatric patients and 2,443 were adult patients. The number of paediatric and adult patients admitted to each designated burn service during the 2019/20 reporting period are presented in Figure 3.

Figure 3 – Number of Paediatric and Adult Registered BRANZ Patients by Service, 2019/20

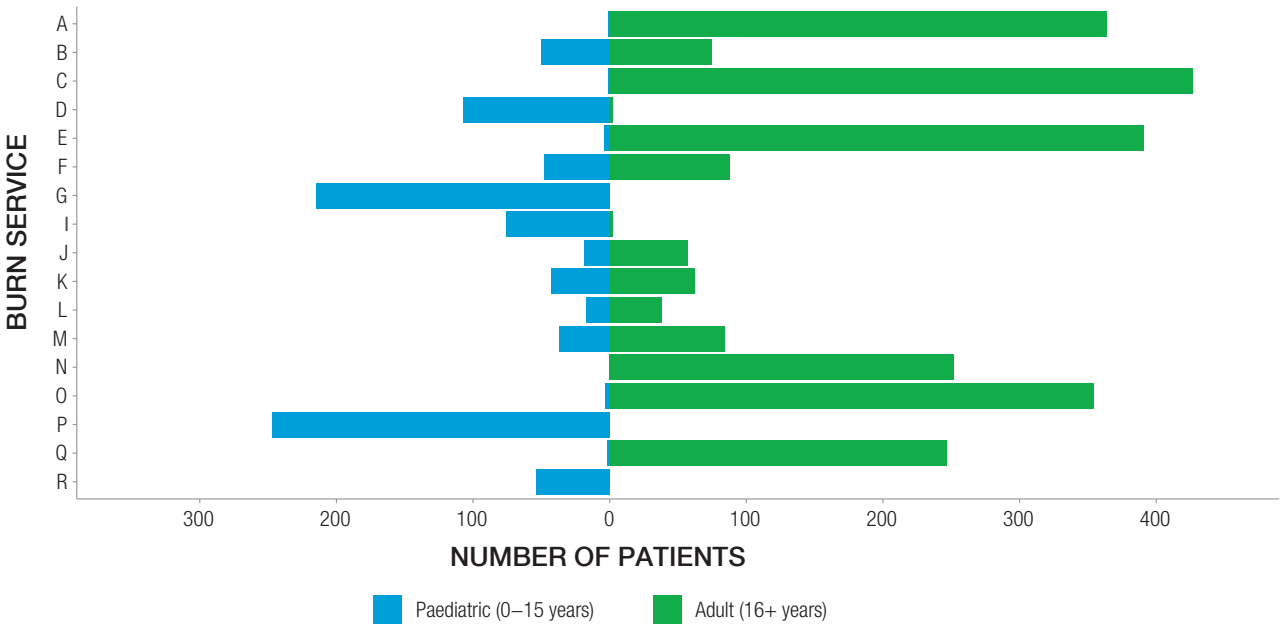
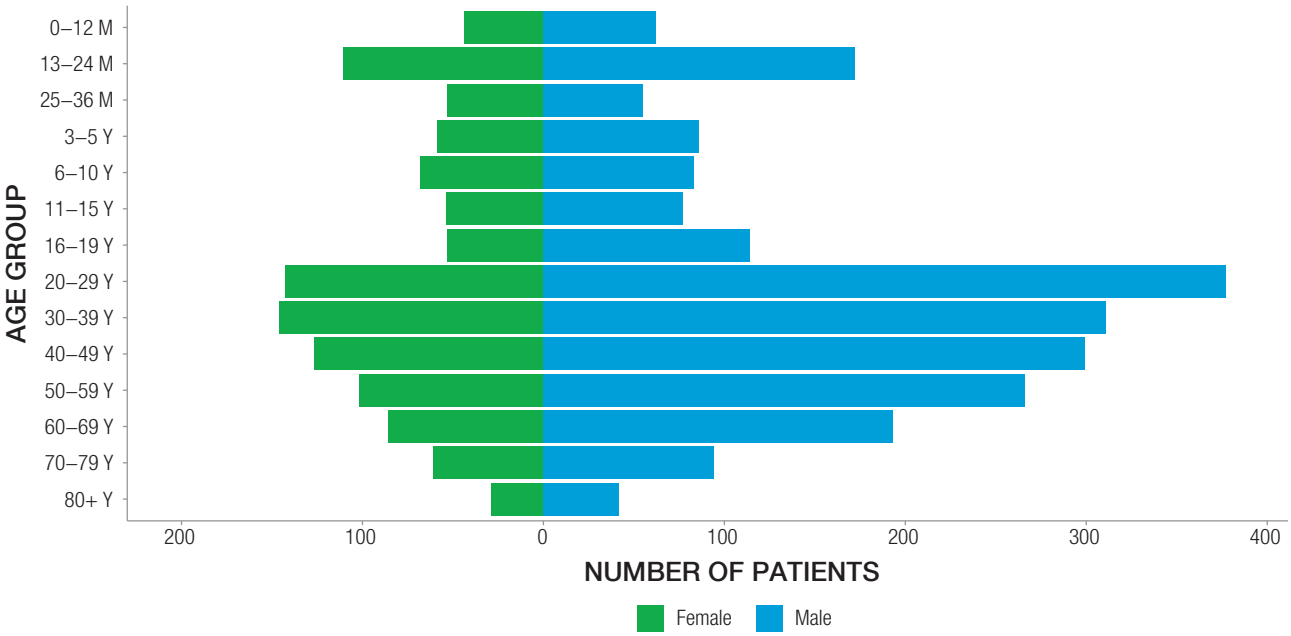


Figure 4 shows the distribution of patients by gender for BRANZ registered patients from July 2019 to June 2020. Two thirds of all cases were males, and males represented the majority of cases in all age groups. Thirty percent of all paediatric cases were aged one to two years, while 21% of all adult cases were aged 20 to 29 years. These findings are consistent with previous BRANZ reporting periods. These figures are also consistent with data from the NBR, where admissions in males are predominant and the adult burn incidence declines with age[5].

Figure 4 – Number of Registered BRANZ Patients by Age Group and Gender, 2019/20



5. American Burn Association. National Burn Repository 2019 Update: Report of data from 2009-2018. Chicago, IL,

ETHNICITY DISTRIBUTION OF PATIENTS REGISTERED BY BRANZ

Australian services routinely collect the patient's country of birth, whereas New Zealand services record patient ethnicity. Within the BRANZ, ethnicity is defined as the ethnic group, or groups, which a person identifies with or feels they belong to. Ethnicity is a measure of cultural affiliation, as opposed to race, nationality, or citizenship. Therefore, the data are reported separately for the New Zealand and Australian burn services. In 2019/20, the BRANZ recorded 2,929 admissions to Australian burn services and 438 admissions to New Zealand burn services.

Region of birth data were missing for 30 cases at Australian burn services during the 2019/20 reporting period. Where the region of birth data was complete, the majority of cases admitted to Australian burn services were born in Australia (Table 5).

Ethnicity data were missing for 71 New Zealand cases during the 2019/20 reporting period. Where data were complete, the majority of cases admitted to New Zealand burn services were New Zealanders not of Māori descent (Table 5). A further 35% of cases were New Zealand Māori.

Table 5 – Region of Birth and Ethnicity Data for Patients Admitted to Australian and New Zealand Burn Services, 2019/20

AUSTRALIAN SERVICES			NEW ZEALAND SERVICES		
REGION OF BIRTH	NUMBER	%	ETHNICITY	NUMBER	%
Australian Peoples	2,354	81	New Zealander	193	53
North-West European	120	4	New Zealand Māori	130	35
Southern and Central Asian	74	3	Other Pacific Island	14	4
South-East Asian	66	2	Samoan	13	4
Southern and Eastern European	59	2	Australian	10	3
New Zealand Peoples	58	2	Tongan	< 5	< 2
North-East Asian	56	2	Cook Island Māori	< 5	< 1
North African and Middle Eastern	34	1	Pacific Island NEC	< 5	< 1
Sub-Saharan African	32	1			
Oceanian (other)	27	1			
People of the Americas	19	1			

NEC = not elsewhere classified.

Australian burn services also collect data to identify whether the patient is of Aboriginal, South Sea Islander, or Torres Strait Islander descent or not. Patients are recorded as an Australian Aboriginal if they are indigenous to the Australian continent, identify as Aboriginal, and are accepted as such by the community which they are associated with. A similar definition is used for patients of Torres Strait Islander descent, should they be indigenous to the Torres Strait Islands.

Indigenous status data were missing for 36 registered Australian patients during the 2019/20 reporting period. Where the Indigenous status data were complete, less than 10% of cases identified as Aboriginal and Torres Strait Islander.

Table 6 displays the number and rate of burn injury resulting in a burn service admission per 100,000 people for Aboriginal and Torres Strait Islander and non-Indigenous individuals during the 2019/20 reporting period. The rate of admission to Australian burn services for the Aboriginal and Torres Strait Islander population was more than double of the rate of the non-Indigenous population. The increased rate of burn injuries in the Aboriginal and Torres Strait Islander population is consistent with previous Annual Reports.

Table 6 – Number and Rate of Burn Injury per 100,000 People by Indigenous Status, 2019/20

INDIGENOUS STATUS	NUMBER	RATE
Aboriginal and Torres Strait Islander	221	27.7
Non-Indigenous	2,097	9.0
TOTAL	**2,318**	**9.6**

Estimated resident population data obtained from the Australian Bureau of Statistics[6].

FUNDING PROFILE OF PATIENTS REGISTERED BY BRANZ

Most cases admitted to Australian burn services were funded by the Australian Health Care Agreement ("Medicare"; n = 2,216, 80.7%). A further 8% of the admissions to Australian burn services (n = 231) were covered under the relevant workers compensation scheme in each state or territory and eight percent of the admissions to Australian burn services (n = 231) were funded through various private health insurance schemes. Examples of other sources of funding in cases admitted to Australian burn services were compulsory third party motor vehicle insurance, the Department of Veterans Affairs, the Department of Defence, and reciprocal health care agreements.

Ninety-nine percent of cases admitted to New Zealand burn services were funded by the Accident Compensation Corporation (n = 432) which is the comprehensive, no-fault personal injury insurance scheme for all New Zealand residents and visitors to the country. Other sources of funding of cases admitted to New Zealand burn services were the Ministry of Health, Surgical Services Contract, and private health insurers.

6. https://www.abs.gov.au/ausstats/abs@.nsf/mf/3238.0.55.001

GEOGRAPHIC PROFILE OF PATIENTS REGISTERED BY BRANZ (AUSTRALIAN SITES ONLY)

Consistent with previous years, over half (55%) of burn injury events resulting in burns admissions to Australian burn services occurred in major cities according to the Australian Bureau of Statistics Classification of Remoteness[7]. A further 40% occurred in regional Australia, and five percent in remote areas. Compared to major Australian cities, the rate of burn injury per 100,000 people is higher in regional and remote areas. The rate of burn injury was higher in Indigenous people for each remoteness region, with the exception of very remote Australia.

Table 7 – Rate of Burn Injury per 100,000 People by Australian Remoteness Area, 2019/20

REGION	INDIGENOUS		NON-INDIGENOUS		COMBINED	
	NUMBER	RATE	NUMBER	RATE	NUMBER	RATE
Major Cities of Australia	36	14.8	1,096	7.1	1,132	6.4
Inner Regional Australia	46	29.6	471	12.4	517	11.8
Outer Regional Australia	70	54.7	334	19.7	404	19.7
Remote Australia	21	52.2	61	28.9	82	28.1
Very Remote Australia	17	21.4	21	22.5	38	18.9
TOTAL	**190**	**29.4**	**1,983**	**9.3**	**2,173**	**8.8**

Estimated resident population data obtained from the Australian Bureau of Statistics[8]

7. Australian Bureau of Statistics. 1216.0 - Australian Standard Geographical Classification. 2005.
8. https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3218.02016/17?OpenDocument and https://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/2075.0Main%20Features202016?opendocument&tabname=Summary&prodno=2075.0&issue=2016&num=&view=

BURN INJURY EVENT DATA

CAUSE OF INJURY

In 2019/20, most patients sustained a flame burn (34%). The top three causes of burn injury (flame burns, scalds, and contact burns) accounted for 87% of all injuries. Recent data from the American Burn Association's National Burn Repository also identified scalds and flame burns as the most common aetiology, accounting for 72% of burns between them[9]. "Other" causes of burn injuries include radiant heat, electrical burns, and burns due to pressurised air or gas.

The most common cause of burn injury amongst paediatric patients was scalds (52%), followed by contact (25%) and flame burns (11%). Scalds were the most common cause of injury across all paediatric age groups (Table 8). This is consistent with previous reporting periods.

Table 8 – Primary Cause of Burn Injury in Registered BRANZ Paediatric Patients, 2019/20

PRIMARY CAUSE	0-12 M	13-24 M	25-36 M	3-5 Y	6-10 Y	11-15 Y	TOTAL	%
Scald	64	207	60	51	58	42	482	52
Contact	33	62	28	42	39	28	232	25
Flame	< 10	< 10	< 10	24	27	39	102	11
Friction	< 10	< 10	13	21	21	11	75	8
Chemical	< 10	< 10	< 10	< 10	< 10	< 10	10	1
Radiant Heat	< 10	< 10	< 10	< 10	< 10	< 10	< 10	1
Electrical	< 10	< 10	< 10	< 10	< 10	< 10	< 10	1
Pressurised gas/air	< 10	< 10	< 10	< 10	< 10	< 10	< 10	1
Other cause	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1
TOTAL	**106**	**282**	**108**	**144**	**151**	**131**	**922**	**100**

The most common cause of burn injury amongst adult patients was flame burns (42%), followed by scalds (26%) and contact burns (18%). Flame burns were the most common cause of injury in patients aged 16-69 years; scalds were the most common cause of injury in patients aged 70 years and older (Table 9).

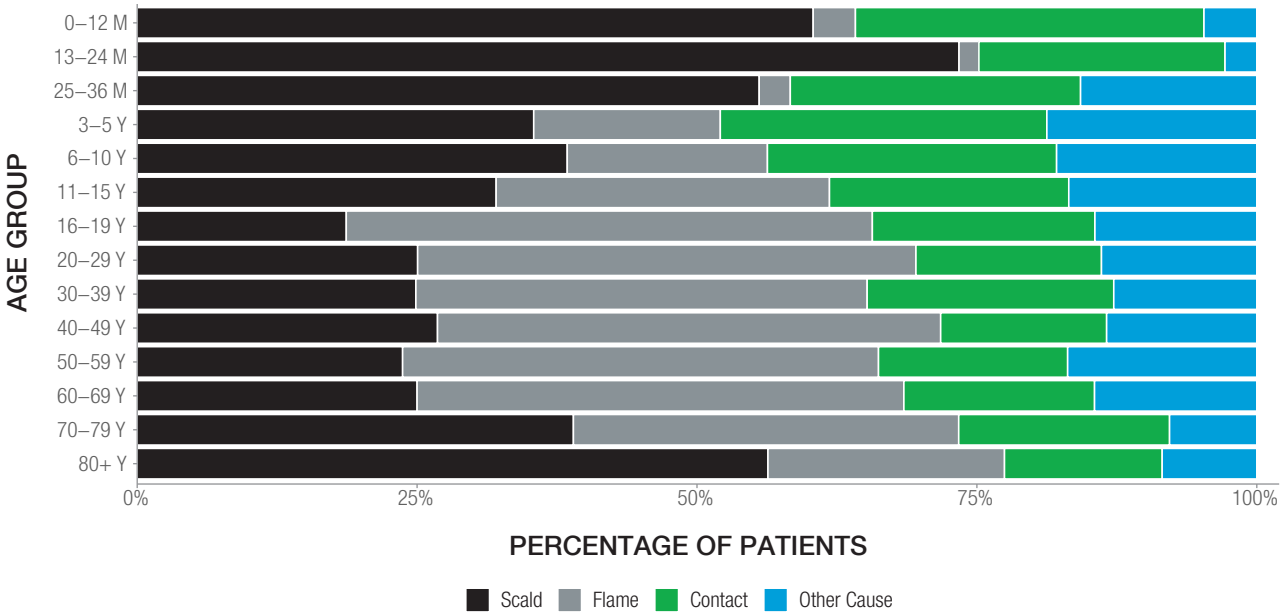
Table 9 – Primary Cause of Burn Injury in Registered BRANZ Adult Patients, 2019/20

PRIMARY CAUSE	16-19 Y	20-29 Y	30-39 Y	40-49 Y	50-59 Y	60-69 Y	70-79 Y	≥ 80 Y	Total	%
Flame	78	231	183	191	156	120	53	15	1,027	42
Scald	31	130	113	114	87	69	60	40	644	26
Contact	33	86	100	63	62	47	29	10	430	18
Chemical	10	37	23	26	29	19	< 10	< 10	148	6
Friction	< 10	13	13	12	10	< 10	< 10	< 10	62	3
Radiant Heat	< 10	< 10	11	12	15	< 10	< 10	< 10	62	3
Electrical	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	42	2
Cooling	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1
Other cause	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1
Pressurised gas/air	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1
TOTAL	**166**	**519**	**454**	**425**	**367**	**276**	**154**	**71**	**2,432**	**100**

9. American Burn Association. National Burn Repository 2019 Update: Report of data from 2009-2018. Chicago, IL, USA.

The change in the distribution of the primary cause of burn injury by age group is perhaps best visualised by Figure 5. Scalds account for the majority of burns in children under the age of three years, at which point there is an increase in flame burns. It is not until the age of 70 when there is an upward trend in the proportion of scalds and a decline in the proportion of flame burns.

Figure 5 – Primary Cause of Injury for Registered BRANZ Patients by Age Group, 2019/20



The most common sub-causes of paediatric and adult burn injuries are shown in Tables 10 and 11. These sub-causes accounted for 81% of all paediatric cases and 65% of all adult cases. In paediatric cases, hot beverages were the most common sub-cause, followed by water from a saucepan, kettle, jug, billy, or urn. In adult cases, flames from a campfire, bonfire, or burn off were the most common sub-cause, followed by scalds from fat or oil. The most common sub-causes of burn injury in both adult and paediatric patients have been consistent each year.

Table 10 – Primary Sub-cause of Burn Injury in Registered BRANZ Paediatric Patients, 2019/20

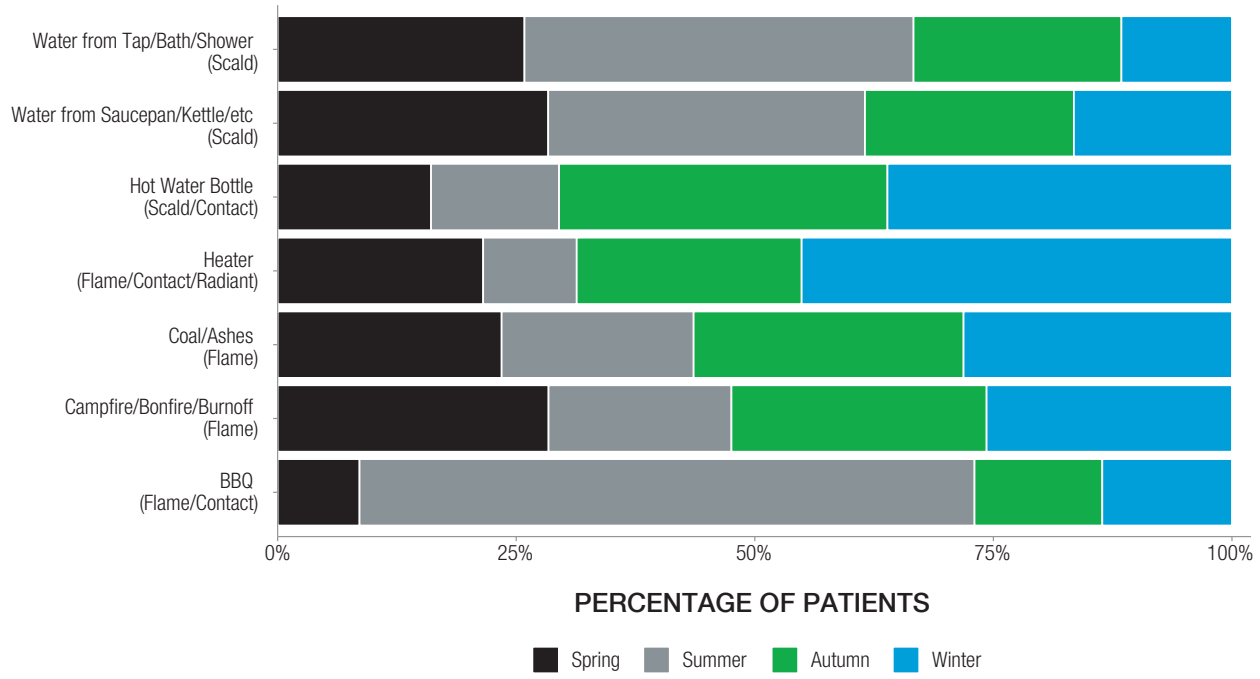
PRIMARY CAUSE	SUB-CAUSE	NUMBER	%
Scald	Hot beverages (e.g., tea, coffee)	176	19
Scald	Water from saucepan, kettle, jug, billy, or urn	129	14
Contact	Coals or ashes	85	9
Scald	Food (liquid or solid)	72	8
Contact	Vehicle exhaust	48	5
Scald	Fat or oil	36	4
Friction	Treadmill	33	4
Flame	Campfire, bonfire, or burn off	32	4
Friction	Vehicle or motorbike	23	3
Flame	Lighter or matches	21	2
Scald	Water from tap, bath, or shower	20	2
Contact	Iron	18	2
Contact	Hot/Metal	16	2
Scald	Other	14	2
Contact	Heater	13	1

Table 11 – Primary Sub-cause of Burn Injury in Registered BRANZ Adult Patients, 2019/20

PRIMARY CAUSE	SUB-CAUSE	NUMBER	%
Flame	Campfire, bonfire, or burn off	327	14
Scald	Fat or oil	166	7
Scald	Water from saucepan, kettle, jug, billy, or urn	111	5
Flame	Other source	110	5
Scald	Food (liquid or solid)	104	4
Contact	Coals or ashes	98	4
Chemical	Alkali substances	92	4
Flame	Other source	75	3
Flame	Vehicle or engine parts	74	3
Flame	Gas or gas bottle	70	3
Contact	Hot metal	66	3
Flame	Welder or grinder	64	3
Contact	Vehicle exhaust	62	3
Scald	Hot beverages (e.g., tea, coffee)	59	2
Flame	Lighter or matches	58	2

Examining the impact of the changing seasons on burn cause can help guide burns prevention strategies and resource utilisation. Whether the burn occurred during summer, autumn, winter, or spring months was determined using the date of injury. Patterns of seasonal variations were mainly observed in relation to burn injuries caused by heaters, hot water bottles, and barbeques. That is, a greater number of burns caused by heaters and hot water bottles have occurred in the winter months, while a greater number of burns involving barbeques occur in the summer months. In contrast, there are some injury causes that do not display seasonal variation. For example, scalds by water from a saucepan, bottle, etc. occur in similar numbers regardless of the season.

Figure 6 – Seasonal Trends in Burn Injury Cause for Registered BRANZ Patients, 2019/20



ACCELERANT USE (FLAME INJURIES ONLY)

An accelerant was used to ignite or enhance the flame in 54% of flame burn cases during the 2019/20 reporting period. Petrol was the most common accelerant, used in 57% of flame burns involving an accelerant.

PLACE OF INJURY

The place of injury for all cases registered during the 2019/20 reporting period are presented in Tables 12 and 13. Almost two-thirds of burn injuries occurred in the home, consistent with previous reporting years.

Table 12 – Place of Burn Injury in Registered BRANZ Paediatric Patients, 2019/20

PLACE OF INJURY	NUMBER	%
Home or usual residence	658	76
Place for recreation	61	7
Other residence	49	6
Street and highway	44	5
Farm	16	2
Trade and service area	7	1
Other specified place	27	3
TOTAL	**862**	**100**

Excludes missing data.

Table 13 – Place of Burn Injury in Registered BRANZ Adult Patients, 2019/20

PLACE OF INJURY	NUMBER	%
Home or usual residence	1,381	60
Other residence	186	8
Trade and service area	161	7
Place for recreation	156	7
Street and highway	142	6
Industrial and construction area	131	6
Farm	61	3
Other specified place	100	4
TOTAL	**2,318**	**100**

Excludes missing data.

For burn injuries that occurred in the home, 48% of paediatric burns and 29% of adult burns occurred in the kitchen. The second most common area for paediatric burns was the living room, playroom, or family room (18%). For adults, it was the garden or yard (24%). This distribution reflects the differences in the primary cause of injury between paediatric and adult burns patients.

ACTIVITY AT TIME OF INJURY

The five most common activities resulting in burn injuries for adult and paediatric patients during the 2019/20 reporting period are presented in Table 14. This is consistent with previous reporting periods. Being near a person cooking, playing, or participating in another leisure activity were the most common activities at the time of in paediatric patients. The most common activities resulting in a burn injury in adults were participating in a leisure activity, cooking, and working for income. These figures are similar to the previous reporting period.

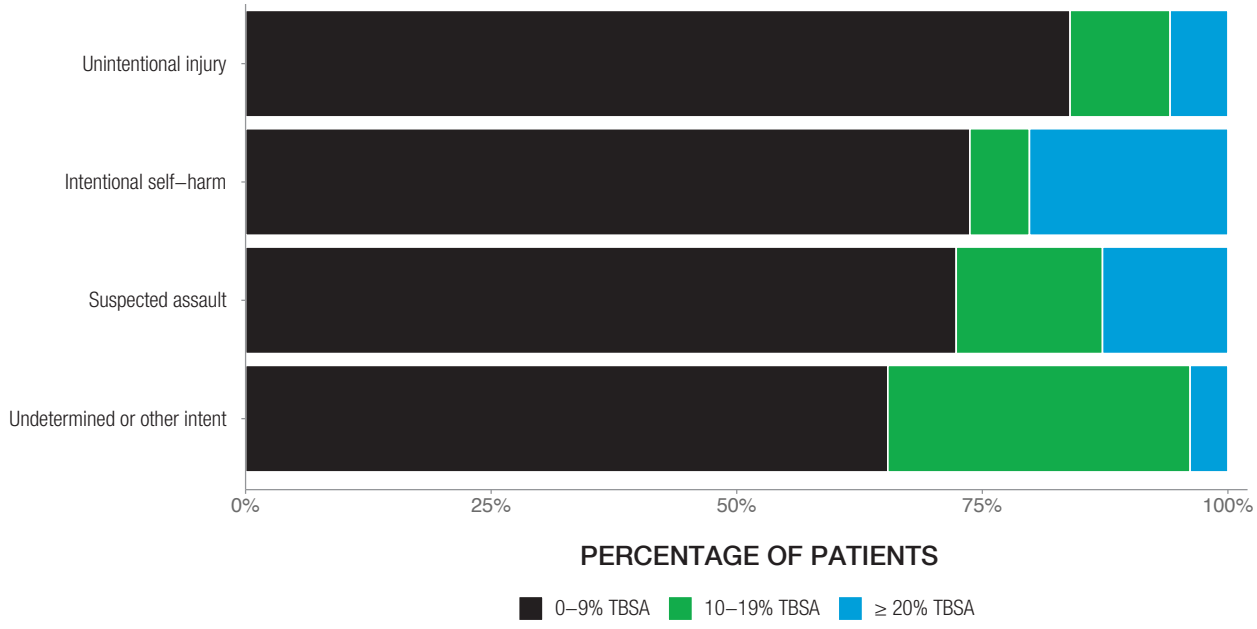
Table 14 – Five Most Common Activities at Time of Injury in Registered BRANZ Patients, 2019/20

PAEDIATRIC PATIENTS (0-15 YEARS)			ADULT PATIENTS (≥ 16 YEARS)		
ACTIVITY	NUMBER	%	ACTIVITY	NUMBER	%
Near person cooking	267	30	Leisure activity	461	20
Playing	258	30	Cooking	428	18
Leisure activity	154	18	Working for income	323	14
Cooking	45	5	Sleeping or resting	183	8
Other specified activity	33	4	Other specified activity	172	7

INJURY INTENT

Within BRANZ, the injury intent is recorded as the option that best characterises the potential intent in the occurrence of injury on the basis of the information available at the time it is recorded. During the 2019/20 reporting period the majority of burns patients (95%) sustained their injury during unintentional events. Intentional self-harm accounted for three percent of all cases. The remaining cases included assaults, adverse effects or complications of medical treatment, or the intent was unknown. This distribution of injury intent is consistent with previous reporting periods. Compared to unintentional burn injuries, a higher proportion of intentional self-harm injuries were greater than 20% TBSA (20% versus 6%).

Figure 7 – Injury Intent by Burn Size for Registered BRANZ Patients, 2019/20



A smaller proportion of burn injuries in Aboriginal and Torres Strait Islander patients were unintentional (89%) compared to non-Indigenous Australians (95%). A greater proportion of burn injuries in Aboriginal and Torres Strait Islander arose through suspected assault (5%) compared to non-Indigenous Australians (1%).

DAY AND TIME OF INJURY

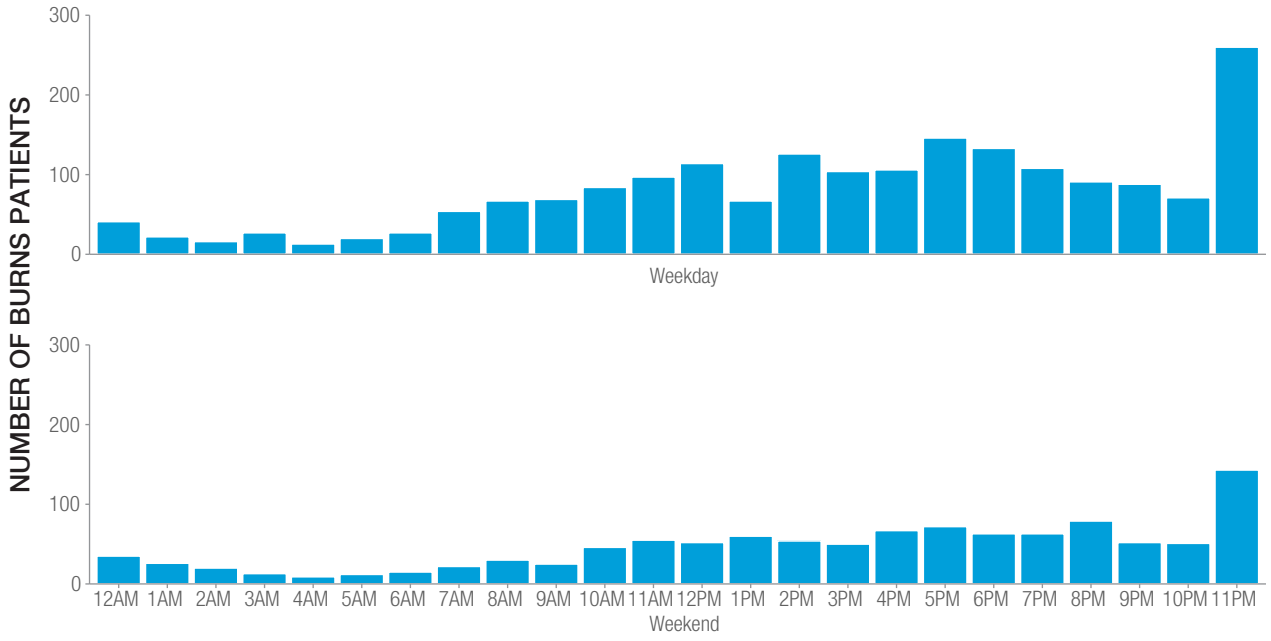
Consistent with other types of trauma, burn injuries occurred more frequently on weekends (36% of patients). The greatest proportion of injuries occurred on a Saturday (20%; Table 15).

Table 15 – Burn Injuries Occurring on Each Day of the Week, 2019/20

DAY	NUMBER	%
Monday	422	12
Tuesday	427	13
Wednesday	408	12
Thursday	378	11
Friday	505	15
Saturday	667	20
Sunday	556	17

Of the cases with a known time of injury, 10% occurred between the hours of 12AM and 6AM, 19% occurred between 4PM and 7PM, while 13% occurred between 11PM and 12AM. Further investigation of the distribution of the time of injury is required, especially the number of patients admitted between 11PM and 12AM.

Figure 8 – Time of Injury for Registered BRANZ Patients, 2019/20



Excludes patients where time of injury is unknown
Injuries occurring at midnight are entered as 23:59 the preceding day or 00:01 the following day

INJURY SEVERITY

PERCENTAGE TOTAL BODY SURFACE AREA (%TBSA)

A burn less than 5% TBSA was recorded for 65% of cases, and a burn less than 10% TBSA was recorded in 83% of cases. This is consistent with previous Annual Reports. For paediatric patients, almost 90% of patients sustained a burn of less than 10% TBSA, while less than 3% sustained a burn greater than 20% TBSA. Two percent of adult cases involved a burn affecting 50% or more of the TBSA.

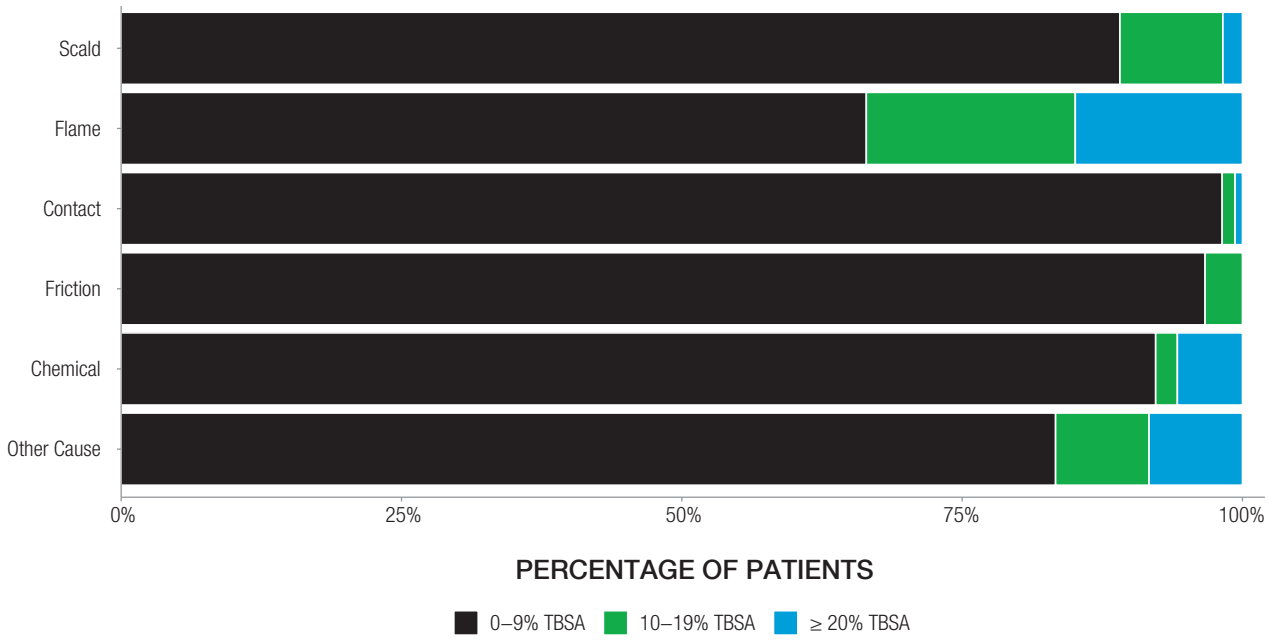
Table 16 – Percentage Total Body Surface Area Burned by Age Group, 2019/20

% TBSA CATEGORY	PAEDIATRIC PATIENTS (0-15 YEARS)		ADULT PATIENTS (≥ 16 YEARS)	
	NUMBER	%	NUMBER	%
0-4.9%	544	65	1,546	65
5-9.9%	186	22	404	17
10-19.9%	79	10	251	11
20-49.9%	19	2	148	6
≥ 50%	< 5	< 1	37	2

Excludes patients where TBSA data was missing or not stated.

The distribution of burn injury cause varied according to the primary cause of the burn (Figure 9). For example, 98% of contact burns were less than 10% TBSA. In contrast, a third of flame burns exceeded 10% TBSA.

Figure 9 – Percentage Total Body Surface Area Burnt by Injury Cause, 2019/20



The median burn size for Aboriginal and Torres Strait Islander patients was 2%, while the median burn size was 3% for non-Indigenous patients. Larger burns were more common in non-Indigenous Australian patients compared to Aboriginal and Torres Strait Islander patients.

Table 17 – Percentage Total Body Surface Area Burnt by Indigenous Status, 2019/20

% TBSA CATEGORY	ABORIGINAL AND TORRES STRAIT ISLANDER		NON-INDIGENOUS	
	NUMBER	%	NUMBER	%
0-4.9%	131	68	1,326	66
5-9.9%	19	10	386	19
10-19.9%	27	14	198	9
20-49.9%	12	6	90	5
≥ 50%	5	2	13	1

BURN DEPTH

As described in previous Annual Reports, updates to the BRANZ database implemented in July 2010 allowed for greater accuracy of reporting burn depth. The BRANZ reports on burn depth by documenting the presence of injuries involving superficial, mid-dermal, deep dermal, and full thickness burns. Note that it is possible for a patient to have burns of multiple depths.

Burn depth was recorded for 95% of admissions during the 2019/20 reporting period. This is consistent with previous reporting periods. Of these, 43% had superficial burns, 50% had mid-dermal burns, and 42% had deep dermal burns. A full thickness burn was documented for 37% of cases, which is an increase on the previous reporting period (35% in 2018/19). Of the cases with a full thickness burn, the size of the full thickness burn area was known in 88% of cases. For the cases where the size of the full thickness burn area was known, 89% of patients had full thickness burns on less than 10% of their body, while 6% of patients had full thickness burns on 20% or more of their body.

INHALATION INJURY

Burns to the oropharynx and upper airway can result in swelling and possible airway obstruction within the first few hours after injury. Inhalation injury is suspected on the basis of a history of mechanism of injury, smoke exposure, clinical presentation, and diagnostic investigations. Inhalation injuries are associated with increased morbidity and mortality. An inhalation injury is recorded in the BRANZ if it is documented in the patient's medical record. There is currently no consensus globally or across BRANZ sites for diagnostic criteria and classification of severity of inhalation injuries[10]. Inhalation injuries are more common in adults compared to paediatric patients; documentation of an inhalation injury was recorded for 6% of adult patients and 1% of paediatric patients. A higher proportion of inhalation injuries in adults is consistent with flame being the most common cause of burn injury in adults. Twelve percent of patients who sustained an inhalation injury died during their admission.

10. Tracy LM, Dyson K, Le Mercier L, Cleland H, McInnes JA, Cameron PA, Singer Y, Edgar DW, Darton A, & Gabbe BJ. Variation in documented inhalation injury rates following burn injury in Australia and New Zealand. Injury. 2020;51(5):1152-1157.

DRUG AND ALCOHOL INVOLVEMENT

Routine testing of blood for alcohol or drug involvement is not uniform across BRANZ participating services. Therefore, the information collected by BRANZ is based on medical record documentation of suspicion of, or known, alcohol and/or drug involvement. This includes instances where there was confirmed or suspicion of alcohol and/or drugs contributing to the patient sustaining the burn injury; as well as children who were burnt as an indirect result of the parent or caregiver being under the influence of drugs and/or alcohol.

Twelve percent of adult cases for the 2019/20 reporting period did not have a valid response to the documented suspicion of drug or alcohol involvement field. Where data were valid, 23% of cases had clinical documentation indicating there was confirmation or suspicion of alcohol and/or drugs contributing to the patient sustaining the burn injury. This is consistent with the previous reporting period.

PRE-HOSPITAL MANAGEMENT OF BURN INJURIES

BURNS FIRST AID TREATMENT

Burn cooling is critical in the initial first aid response to a burn injury. Applying cool running water to the burn for 20 minutes within three hours of sustaining the injury reduces the area and depth of the burn[11].

There are three data fields relating to burns first aid treatment in the registry. The first question asks "Was any first aid applied to the burn wound?" with the possible responses being "yes", "no", and "not stated/ inadequately described". If patients received first aid, a follow-up question asks "Was the first aid applied 20 minutes of cool running water within three hours of injury?" with the same three responses. A free text field is also available to document any additional information regarding first aid. Based on the responses to these questions, patients were categorised into one of three comparator groups: (1) no first aid, (2) non-gold standard first aid – where first aid was applied but not 20 minutes of cool running water within three hours of injury, and (3) gold standard first aid – where cool running water was applied to the burn injury for at least 20 minutes within three hours of injury.

Consistent with the previous reporting period, 79% of all cases during the 2019/20 reporting period were reported to have received some kind of first aid following the burn injury. A higher proportion of paediatric patients received some form of first aid than adult and older adult patients, which is consistent with previous reporting periods. Gold standard first aid was applied in 77% of paediatric cases and 58% of adult cases.

Table 18 – Documented Standard of First Aid Following Burn Injury by Age Group, 2019/20

	PAEDIATRIC PATIENTS (0-15 YEARS)		ADULT PATIENTS (≥ 16 YEARS)	
	NUMBER	%	NUMBER	%
No first aid	92	10.9	541	24.5
Inadequate first aid	33	12.1	391	17.7
Gold standard first aid	111	77.1	1,281	57.9

A smaller proportion of Aboriginal and Torres Strait Islander patients received gold standard first aid following burn injury compared to non-Indigenous Australians. Similarly, a greater proportion of Aboriginal and Torres Strait Islander Australians did not receive any first aid for the for their burn injury compared to non-Indigenous Australians.

Table 19 – Documented Standard of First Aid Following Burn Injury by Indigenous Status, 2019/20

	ABORIGINAL AND TORRES STRAIT ISLANDER		NON INDIGENOUS AUSTRALIANS	
	NUMBER	%	NUMBER	%
No first aid	59	29.1	375	19.4
Inadequate first aid	102	16.3	304	15.7
Gold standard first aid	652	54.7	1,259	65.0

11. Bartlett N, Yuan J, Holland AJ et al. Optimum duration for cooling an acute scald contact burn injury in a porcine model. Journal of Burn Care & Research. 2008;29(5):828-834.
Cuttle L, Kempf M, Liu PY et al. The optimum duration and delay of first aid treatment for deep partial thickness burns. Burns. 2010;36(5):673-679.
Wood FM, Phillips M, Jovic T et al. Water first aid is beneficial in humans post-burn: Evidence from a bi-national cohort study. PLoS One. 2016;11(1):e0147259.
Yuan J, Wu C, Holland AJ et al. Assessment of cooling on an acute scald burn injury in a porcine model. Journal of Burn Care & Research. 2007;28(3):514-520.

REFERRAL SOURCE TO BURNS SERVICE

Consistent with previous Annual Reports, approximately half of both the paediatric and adult patients were transferred to a specialist burn service via another hospital. Sixteen percent of paediatric and 19% of adult patients arrives at the burns service directly from the scene via ambulance (Table 20).

Table 20 – Referral Source to Burns Service for Registered BRANZ Patients by Age Group, 2019/20

	PAEDIATRIC PATIENTS (0-15 YEARS)		ADULT PATIENTS (≥ 16 YEARS)	
	NUMBER	%	NUMBER	%
Scene via ambulance	151	16	457	19
Other hospital	463	50	1,059	43
General practitioner	52	6	151	6
Self-presentation	96	10	140	6
Emergency department	0	0	193	8
Outpatients	107	12	365	15
Other source	55	6	78	3

HOW LONG DID IT TAKE FOR BURNS PATIENTS TO BE ADMITTED TO A SPECIALIST BURN SERVICE?

The time taken for burns patient to be admitted from the scene of the burn injury to a BRANZ hospital significantly influences initial medical and surgical management of burn injuries. Given the centralised structure of specialist burn services across Australia and New Zealand, and the geographical size and distances required to travel to a burns service and mode of transfer, identifying a standardised acceptable transfer time for benchmarking has been challenging in some states. The BRANZ therefore collects data on the length of time taken to admission from time of injury. This data will assist in developing acceptable timeframes for admission of patients to a specialist burn service, identify if pre-burn service care was appropriate, and monitor outcomes of care where there have been delays.

It is recognized that delayed admission may constitute appropriate care for specific injuries and in specific environments. The median (IQR) time from injury to admission to a BRANZ hospital was 22 (4-142) hours for paediatric patients and 32 (6-135 hours) for adult patients. This is a slight decrease compared to the previous reporting period (23 [4-173] hours for paediatric and 37 [6-140] hours for adult patients in 2018/19).

The initial treatment of burns patient is critical for reducing the risk of complications, poor long-term outcomes, and mortality. The ANZBA advocates that referring hospitals consult with the burn service as soon as possible to assist with the initial treatment plan and in triaging the patients requiring transfer. A burn size greater than 20% TBSA in adult cases and greater than 15% TBSA in paediatric cases can be considered as a major burn.

Figures 10 and 11 show the median time from injury to admission for major paediatric and adult cases for each reporting year. The median values for time to admission for both paediatric and adult cases have remained consistent over the life of the registry.

For adult cases with a burn affecting at least 20% TBSA, 38% of patients arrived at a specialist burn service directly from the scene within 2 hours of injury, and 91% arrived directly from the scene within 7 hours of injury. In paediatric cases transferred directly from the scene to a specialist burn service with a burn of at least 15% TBSA, 59% of cases arrived within 2 hours of injury and 72% of cases arrived within 3 hours of injury.

Figure 10 – Time to Admission for Major Paediatric Burns by Reporting Period, 2009/10 to 2019/20

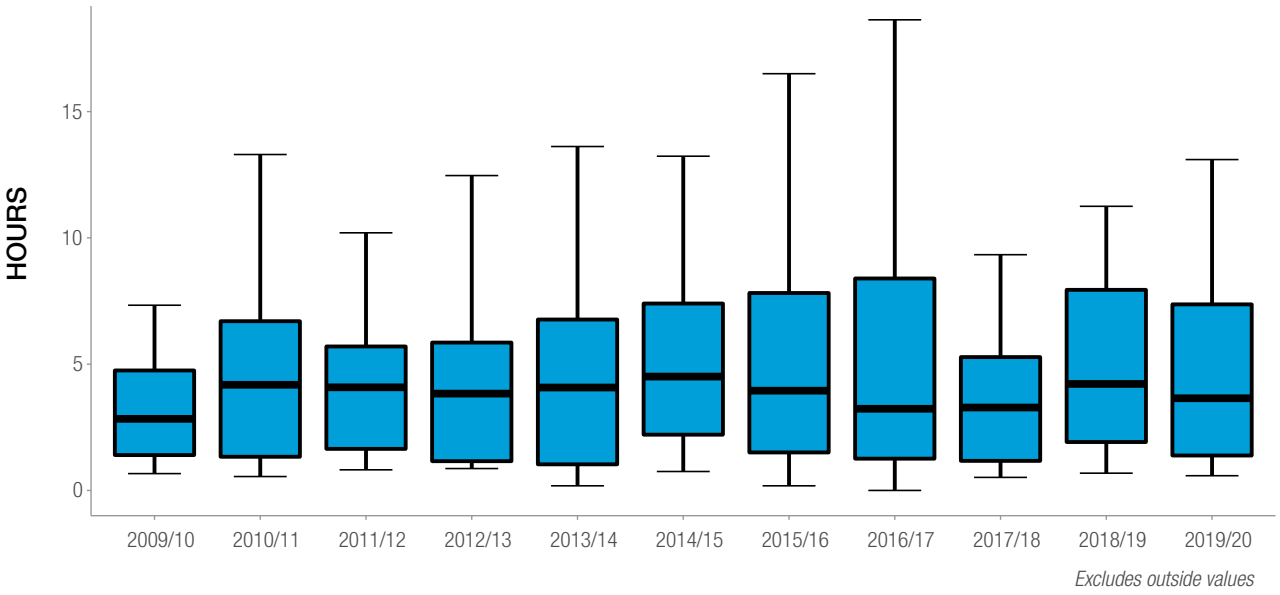


Figure 11 – Time to Admission for Major Adult Burns by Reporting Period, 2009/10 to 2019/20

BURN SERVICE PERFORMANCE

The following pages provide information on the various process and outcome indicators collected by the registry. The first process and outcome indicators were implemented in 2009. A major review and revision of quality indicators in 2016 resulted in a revised and extended quality indicator dataset[12].

WOUND ASSESSMENT

The definitive burn wound assessment is defined as the burn assessment documented by a senior burns clinician within 72 hours of admission. A definitive wound assessment was documented within 72 hours of admission in 92% of paediatric cases and 97% of adult cases in the 2019/20 reporting period. The paediatric figure has declined compared to the previous reporting period (97% in 2018/19), while the adult figure has remained consistent. For paediatric cases, the burn registrar recorded the burn wound assessment within 72 hours of admission in 56% of cases, followed by the burns consultant (14%), burn care nurse coordinator or nurse practitioner (6%), and burns fellow (2%). For adult cases, the burn wound assessment was completed by the burns registrar in 32% of cases, the burns consultant in 31% of cases, and the burn care nurse coordinator or nurse practitioner in 6% of cases.

THEATRE ADMISSIONS

The BRANZ collects data on whether patients underwent a burn management procedure in theatre to better understand wound management practices within Australia and New Zealand. This understanding will serve as a foundation to identify best practices in the surgical management of burn injuries. Note that each patient may have multiple burn wound management procedures, but data is only collected for the first surgical episode of a particular wound closure procedure (e.g., use of dermal reconstructive product, use of skin cell product, etc.). It is possible that multiple procedures are performed in the same theatre episode.

Sixty-eight percent of all cases underwent at least one burn wound management procedure in an operating theatre during the 2019/20 reporting period, a decline from the 76% of cases in the previous reporting period. The proportion of paediatric patients who underwent a burn wound management procedure in theatre (68%) was similar to that of adult patients (68%), which is also inconsistent with previous reporting periods. Usually a greater proportion of adult patients undergo a burn wound management procedure in theatre.

Table 21 outlines the percentages of paediatric and adult patients that underwent particular burn wound management procedures in theatre. There are age-related differences in the proportion of patients undergoing different procedures. For example, debridement and skin grafting is more common in adult patients compared to paediatric patients, while undergoing a dressing change in theatre is more common in paediatric patients compared to their older counterparts.

12. Gong J, Singer Y, Cleland H, Wood F, Cameron P, Tracy LM, & Gabbe BJ. Driving improved burns care and patient outcomes through clinical registry data: A review of quality indicators in the Burns Registry of Australia and New Zealand. Burns 2021; 47(1):1553-1561.

Table 21 – Burn Wound Management Procedures by Age Group, 2019/20

	PAEDIATRIC PATIENTS (0-15 YEARS)		ADULT PATIENTS (≥ 16 YEARS)	
PROCEDURES RELATING TO DEBRIDEMENT	**NUMBER**	**%**	**NUMBER**	**%**
Debridement only	251	36	416	22
Debridement and temporary skin closure product e.g. Biobrane™	77	11	372	20
Debridement and dermal reconstructive product e.g. Integra™ or other biodegradable temporising matrix	9	1	22	1
Debridement and skin cell product	96	14	193	10
Debridement and skin grafting	328	47	1,333	70
Debridement and temporary skin closure with cadaver skin	< 5	< 1	71	4
OTHER PROCEDURES				
Dressing change in theatre only	98	14	27	1
Escharotomy, fasciotomy, amputation	< 5	< 1	25	1
Other procedure	15	2	43	2

For cases where a full thickness burn was recorded, 71% of paediatric cases and 85% of adult cases underwent debridement and skin grafting. Compared to previous reporting periods, this represents a slight decrease for paediatric patients and is consistent for adult patients (78% of paediatric cases in 2018/19).

The median (IQR) time from injury to first grafting was 11 (5-15) days for paediatric cases, which is consistent with the previous year. The median (IQR) time from injury to first grafting was 7 (4-11) days for adult patients, which is consistent with previous reporting periods.

PHYSICAL FUNCTIONING ASSESSMENT

Rehabilitation following burn injury requires a coordinated approach from a specialised multi-disciplinary team to minimise the consequences of burns, such as scarring, contractures and loss of function[13]. Allied health burn clinicians are responsible for assessing burns patients and commencing rehabilitation as early as possible, ideally in the acute treatment phase. The registry collects data on whether patients with a length of stay greater than 48 hours have a physical functioning assessment by a physiotherapist or occupational therapist within 48 hours of admission.

Of the paediatric patients who had a length of stay exceeding 48 hours in the 2019/20 reporting period, 63% received a physical functioning assessment within 48 hours of admission. This is consistent with the previous reporting period. Ninety-five percent of adult patients with a length of stay exceeding 48 hours received a physical functioning assessment within 48 hours of admission, an increase on the previous reporting period (91% in 2018/19).

13. Australian and New Zealand Burns Association & Joanna Briggs Institute. Burn Trauma Rehabilitation: Allied Health Professional Allied Health Practice Guidelines. Philadelphia, PA; 2014.

ENTERAL AND PARENTERAL FEEDING

Burn injury increases the body's metabolic requirements. The early provision of an adequate supply of nutrients is considered crucial in reducing the effects of metabolic abnormalities[14], and in reducing the risk of gastrointestinal dysfunction. The registry collects data on whether patients with major burns receive supplemental nutrition within 24 hours of arrival at the burn service.

Eight-five percent of paediatric patients with major burns commenced enteral or parenteral nutrition within 24 hours of admission, which is an increase on the previous reporting period (63% in 2018/19). Seventy-five percent of adult patients with major burns commenced enteral or parenteral nutrition within 24 hours of admission, which is also an increase on the previous reporting period (70% in 2018/19).

RENAL IMPAIRMENT

Acute renal failure can develop during the early resuscitation stage in treating a burn injury and is associated with complications and poor outcomes in severe burn injury[15]. Calculating RIFLE criteria[16] from serum creatinine and estimated glomerular filtration rate (eGFR) is a quantifiable and valid measure of renal function, and an indication of prognosis. A negative change in excess of 25% of eGFR relative to a baseline measurement is considered indicative of a risk of kidney injury as per the RIFLE criteria. The registry collects data on baseline (within 24 hours of admission) and lowest (within 72 hours of admission) values eGFR and can subsequently identify the risk of kidney injury as per the RIFLE criteria. While acute renal impairment may be an indicator of suboptimal resuscitation, there are significant difficulties with establishing baseline renal function in burns patients.

Of the patients with at least two valid data points for eGFR, 5% of paediatric cases and 3% of adult cases were deemed to be at risk of kidney injury and failure during the 2019/20 reporting period. This is an increase in paediatric cases from the previous reporting period (4% in 2018/19), while the figure remained stable for adult patients.

POSITIVE BLOOD CULTURES

Bloodstream infection is associated with increased risk of mortality in burns patients[17]. Blood cultures are used to detect infections that may spread through the bloodstream of patients such as bacteraemia and septicaemia. The registry collects data on if blood cultures were collected for patients during their admission and whether these cultures were positive or negative.

A blood culture was collected during 10% of paediatric admissions and 13% of adult admissions during the 2019/20 reporting period. This was an increase for paediatric admissions (9% in 2018/19) but a decrease for adult admissions (14% in 2018/19). Where blood cultures were collected, positive cultures were identified for 13% of paediatric cases (an increase from 7% in 2018/19) and 17% in adult cases (an increase from 15% in 2018/19).

14. Wasiak J, Cleland H, Jeffery R. Early versus delayed enteral nutrition support for burn injuries. Cochrane Database Syst Rev. 2006;(3):CD005489.
15. Mosier MJ, Pham TN, Klein MB, Gibran NS, Arnoldo BD, Gamelli RL, et al. Early acute kidney injury predicts progressive renal dysfunction and higher mortality in severely burned adults. Journal of burn care & research. 2010;31(1):83-92.
16. Kidney Health Australia. The eGFR Calculator 2019 [Available from: https://kidney.org.au/health-professionals/detect/calculator-and-tools].
17. Patel BM, Paratz JD, Mallet A et al. Characteristics of bloodstream infections in burn patients: An 11-year retrospective study. Burns. 2012;38(5):685-690.

MULTI-DRUG RESISTANT ORGANISMS

The presence of multi-drug resistant organisms (MROs) can be an indicator of hand hygiene practices and the overuse of antibiotics. The registry collects data on four MROs: Methicillin-resistant Staphylococcus Aureus (MRSA), Vancomycin-resistant Enterococcus (VRE), Carbapenem-resistant Pseudomonas (CRP), and Carbapenem-resistant Enterobacter (CRE).

During the 2019/20 reporting period, 5% of paediatric patients had a positive swab for MRSA, while less than 1% of cases had a positive swab for each of the other three MROs. The proportion of patients with a positive swab for MRSA increased compared to the previous reporting period (2% in 2018/19), while results for the remaining MROs were consistent with the previous reporting period.

For adult patients, 3% of cases had a positive swab for MRSA, a decrease from the 9% reported in the previous year. Consistent with previous reporting periods, less than 1% of adult patients had a positive swab for each of the other three MROs.

PAIN ASSESSMENT

Pain is often the most frequent complaint following burn injury. The assessment of pain is vital in determining the most effective management. Early intervention minimises the risk of long-term sequelae such as chronic pain. As a sign of good quality care, it is reasonable to expect that a patient who has been admitted for a burn injury should have an assessment of their pain within 24 hours of admission. The pain assessment should be completed using one of the following validated tools: the short-form McGill questionnaire[18], the short- or long-form of the Brief Pain Inventory[19], the Pain Disability Index[20], a numeric rating scale, a verbal descriptor scale, a pain thermometer, a visual analogue scale, or a pictorial pain scale such as the FACES pain scale.

Eighty-nine percent of paediatric patients received a validated pain assessment within 24 hours of admission during the 2018/19 reporting period, a decrease on the 95% of patients from the previous reporting period. Ninety-seven percent of adult patients received a validated pain assessment during the same period, an increase on the 91% reported during the 2018/19 reporting year.

DIAGRAM USE IN BURN SIZE ASSESSMENT

Specialised burn care includes an accurate estimation of the percentage TBSA burned. The percentage TBSA of the burn is used to determine the severity of the burn and accurately calculate the fluid resuscitation requirements. The Lund Browder chart[21] and the Wallace rule of nines diagram[22] are accepted tools used in the estimation of TBSA percentage. The registry collects data on whether an accepted tool was accurately used to calculate the size of the burn without restriction; that is, all patients should have a response to this data field.

Sixty-nine percent of all patients in the 2019/20 reporting period had their burn size assessed using an accepted tool, a decrease from the 73% of patients in 2018/19. Sixty-four percent of paediatric patients had their burn size assessed using a Lund Browder chart or Wallace rule of nines diagram during the current reporting period, a slight decrease from the 66% reported in 2018/19. Seventy-percent of adults had their burn size appropriately assessed, a decrease on the 74% reported in the previous year.

18. Cleeland CS, Ryan KM. Pain assessment: Global use of the Brief Pain Inventory. Annals of the Academy of Medicine, Singapore. 1994;23(2):129-38.
19. Melzack R. The short-form McGill Pain Questionnaire. Pain. 1987;30(2):191-7.
20. Tait RC, Chibnall JT, Krause S. The Pain Disability Index: psychometric properties. Pain. 1990;40(2):171-82.
21. Lund CC, Browder NC. The estimation of areas of burns. Surgery Gynecology and Obstetrics. 1944;79:352..
22. Victorian Adult Burns Service. Wallace Rule of Nine – Adults 2019 [Available from: https://www.vicburns.org.au/burn-assessment-overview/burn-tbsa/rule-of-nine/].

MALNUTRITION RISK SCREENING

A significant proportion of patients admitted to hospital are at risk of malnutrition. Each year, patients in Australian hospitals experience more than 5,400 episodes of hospital-acquired malnutrition, which have been associated with increased hospital length of stay and associated healthcare costs[23]. For patients with burn injuries, malnutrition is associated with a range of complications and can delay wound healing and closure.

Malnutrition screening of all patients is recognised best practice. It identifies vulnerable patients who are, or may be, at risk of malnutrition to enable the commencement of a preventive management plan. In Australia, malnutrition risk screening of all patients on admission is a key performance measure for all healthcare organisations, including those housing burns services[24]. This information aligns with the Australian Commission on Safety and Quality in Health Care's (ACSQHC) National Safety and Quality Health Service (NSQHS) Standards (second edition), in particular the Comprehensive Care Standard 7, to support the delivery of safe patient care[25].

Where patients have a length of stay exceeding 24 hours, the registry collects data on whether the patient was screened for the risk of malnutrition within 24 hours of admission. During the 2019/20 reporting period, 60% of paediatric patients and 86% of adult patients with a length of stay exceeding 24 hours had a malnutrition risk assessment completed within 24 hours of admission. These are both increases from the previous reporting period (57% and 80% for paediatric and adult admissions, respectively).

FORMULA USE IN FLUID REQUIREMENT ESTIMATION

Specialised burn care includes an accurate estimation of fluid resuscitation requirements in severe burns. Adequate fluid resuscitation remains a cornerstone of quality early burn care, as it restores circulating blood volume, preserves vital organs, and maintains tissue perfusion. The registry collects data on whether there was evidence or documentation that an accepted formula (either the modified Parkland formula[26] or the modified Brooke formula[27]) were used to estimate the fluid resuscitation requirements of patients with major burns within 24 hours of admission to the burns service.

In the 2019/20 reporting period there was evidence that an accepted formula was used in 89% of paediatric patients with a major burn, a decrease from the 91% reported in 2018/19. Ninety-eight percent of adult patients had a formula used to calculate their fluid resuscitation requirements in 2019/20, an increase on the 86% reported in the previous year.

VENOUS THROMBOEMBOLISM PROPHYLAXIS

Venous thromboembolic events (e.g., deep venous thrombosis, pulmonary emboli) are a significant risk for all hospitalised patients, but burns patients are at a theoretically higher risk of having such an event[28]. Venous thromboembolic prophylaxis is used in adult burns patients to prevent venous thrombosis and pulmonary embolism. Commonly prescribed medications for venous thromboembolism prophylaxis include enoxaparin, heparin, and warfarin. The registry collects data on whether prophylaxis was prescribed for patients over the age of 16. Seventy percent of adult patients received venous thromboembolism prophylaxis during the 2019/20 reporting period, consistent with the previous year.

23. Independent Hospital Pricing Authority. Activity Based Funding Admitted Patient Care 2015-16, acute admitted episodes, excluding same day
24. Australian Commission on Safety and Quality in Health Care. Selected best practices and suggestions for improvement for clinicians and health system managers: Hospital-acquired complication 13 – Malnutrition. Available from **https://www.safetyandquality.gov.au/sites/default/files/migrated/Malnutrition-detailed-fact-sheet.pdf.**
25. Australian Commission on Safety and Quality in Health Care. National Safety and Quality Health Service Standards, Second edition. Available from **https://www.safetyandquality.gov.au/sites/default/files/migrated/National-Safety-and-Quality-Health-Service-Standards-second-edition.pdf.**
26. Haberal M, SAbali AES, Karakayali H. Fluid management in major burn injuries. Indian J Plast Surg. 2010;43:S29-36.
27. Zodda D. Calculated decisions: Parkland formula for burns. Emerg Med Pract. 2018;20:S1-2.
28. Pannucci CJ, Obi AT, Timmins BH, Cochran AL. Venous Thromboembolism in Patients with Thermal Injury: A Review of Risk Assessment Tools and Current Knowledge on the Effectiveness and Risks of Mechanical and Chemical Prophylaxis. Clinics in plastic surgery. 2017;44:573-81.

WEIGHT RECORDED AND WEIGHT LOSS

Weight loss following burn injury can affect patient outcomes in terms of healing potential and rehabilitation outcomes. Extended length of stay is associated with weight loss and associated poorer outcomes[29]. In severe burn injury, some degree of weight loss may be unavoidable. It is necessary to develop an understanding of treatment factors that minimise weight loss and the degree to which weight loss and loss of lean body mass is avoidable. The registry collects data on whether patients with a length of stay exceeding 14 days have their weight recorded within three to five days of their admission (to account for the significant fluctuations in weight due to fluid resuscitation within the initial 72 hours after injury) and whether their weight is then recorded on a weekly basis.

For paediatric patients with a length of stay exceeding two weeks during the 2019/20 reporting period, their weight was recorded within three to five days of admission in 86% of cases (a decrease from 92% of cases in the previous reporting period) and recorded on a weekly basis for 58% of cases (a decrease from 63% reported in the previous year). Thirty-five percent of paediatric patients lost weight during their hospital admission in the 2019/20 reporting period, an increase from the 20% reported during the 2018/19 reporting period. The median amount of weight lost by paediatric patients in the 2019/20 reporting period was 0.9kg.

For adult patients with a length of stay exceeding two weeks during the 2019/20 reporting period, their weight was recorded within three to five days of admission in 62% of cases (a decrease from 65% in the previous reporting period) and recorded on a weekly basis for 40% of patients (an increase on the 39% in the previous reporting period). Fifty-seven percent of adult patients lost weight during their admission in the 2019/20 reporting period; the median amount of weight lost was 4kg.

29. Khorasani EN, Mansouri F. Effect of early enteral nutrition on morbidity and mortality in children with burns. Burns. 2010;36(7):1067-71.

HOSPITAL OUTCOMES FOLLOWING BURN INJURY

This section describes the hospital outcomes of burn care, including ICU admissions, complications during the episode of care, length of stay, discharge disposition, and readmissions.

ICU ADMISSIONS

Critical care management and mechanical ventilation may be required after burn injury[30]. An ICU admission was recorded in six percent of paediatric cases and 11% of adult cases during the 2019/20 reporting period. These are both increases compared to the previous year (4% and 10% for paediatric and adult cases in 2018/19, respectively). Forty-four percent of major paediatric burns were admitted to the ICU during the current reporting period (an increase from 40% in 2018/19), while 76% of major adult burns patients were admitted to the ICU (an increase from 64% in the previous year).

ICU LENGTH OF STAY

The median (IQR) ICU length of stay for paediatric patients during the 2019/20 reporting period was 63 (23-228) hours, an increase on the previous reporting year. For adults, the median ICU length of stay was 70 (27-208) hours, an increase on the 65 (24-229) hours reported in the previous year.

MECHANICAL VENTILATION IN ICU

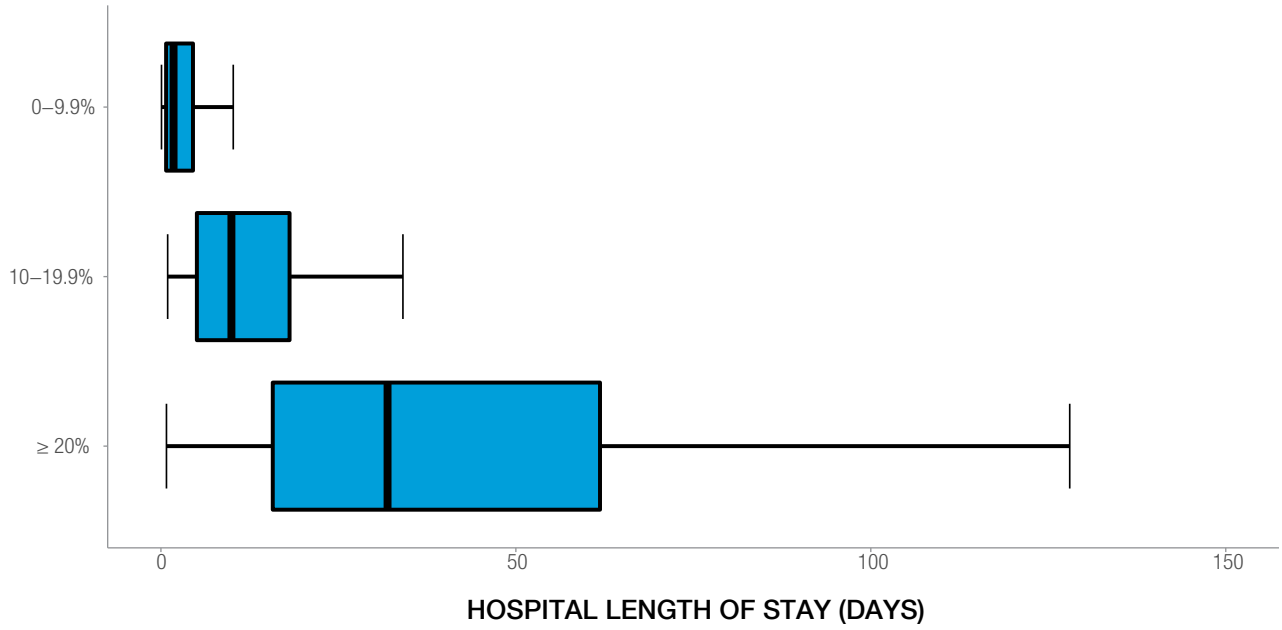
During the 2019/20 reporting period 65% of paediatric patients who were admitted to the ICU were placed on a mechanical ventilation, spending a median (IQR) of 58 (16-243) hours on the ventilator. The proportion of paediatric patients placed on a ventilator is consistent with the previous reporting period, but the median time spent on a ventilator is a decrease on the previous year (median 69 hours in 2018/19). Seventy-eight percent of adult patients admitted to the ICU received mechanical ventilation, an increase from the 77% reported in the previous year. The median (IQR) time spent on a ventilator by adult patients was 58 (18-183) hours, an increase on the previous year (42 [16-181] in 2018/19).

30. Palmieri TL. What's new in critical care of the burn-injured patient? Clinics in plastic surgery. 2009;36(4):607-15 and Wang Y, Tang HT, Xia ZF, Zhu SH, Ma B, Wei W, et al. Factors affecting survival in adult patients with massive burns. Burns. 2010;36(1):57-64.

HOSPITAL LENGTH OF STAY

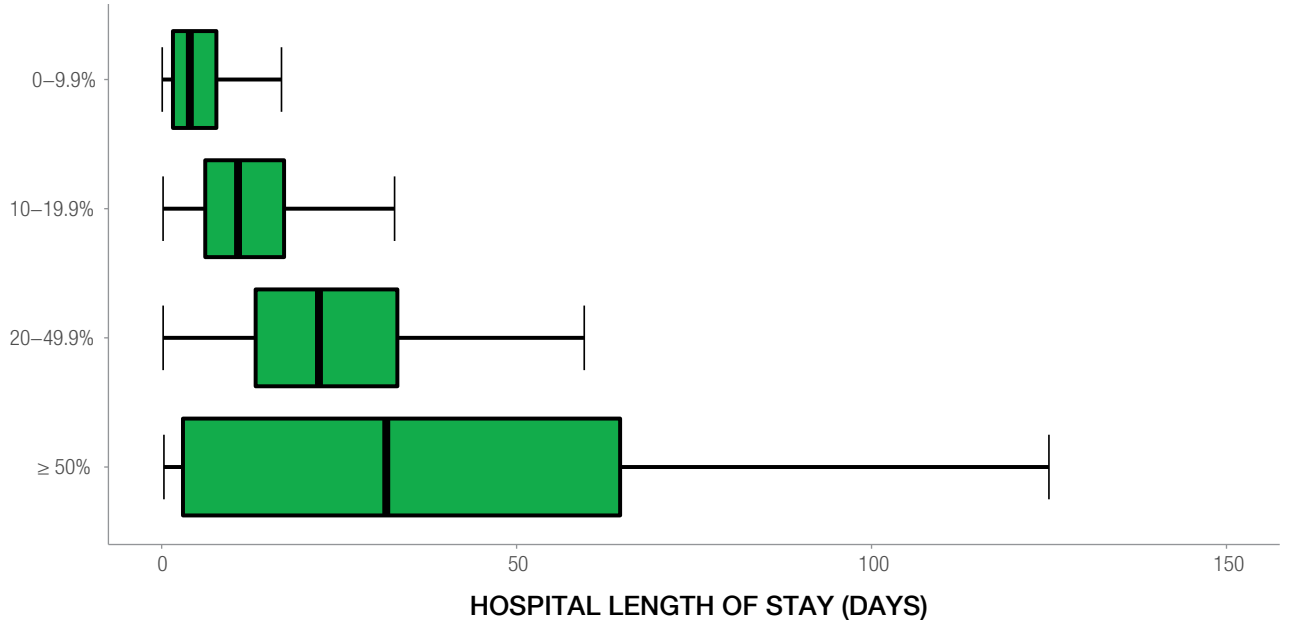
The length of admission is associated with increased case complexity, and is impacted by treatment protocols[31]. All cases were included in the length of stay analysis. The median (IQR) hospital length of stay for all patients was 4 (2-9 days), consistent with the previous reporting period. Paediatric patients (median [IQR] 2 [1-6] days) had a shorter median length of stay compared to adult patients (5 [2-10] days). These values have remained consistent over the previous reporting periods. Figures 12 and 13 show the distribution in hospital length of stay by %TBSA group for paediatric and adult burns patients for the 2019/20 reporting period. In both cases the hospital length of stay increases with increasing TBSA. The median hospital length of stay for adult patients with a burn affecting at least 50% TBSA is similar to that for a 20-49.9% TBSA burn due to the shorter stays for patients who die in hospital as a result of their injuries (Figure 14). There were no adult patients with a burn affecting less than 10% TBSA who died in hospital during the current reporting period.

Figure 12 – Distribution of Hospital Length of Stay by TBSA Group in Paediatric Burns Patients, 2019/20



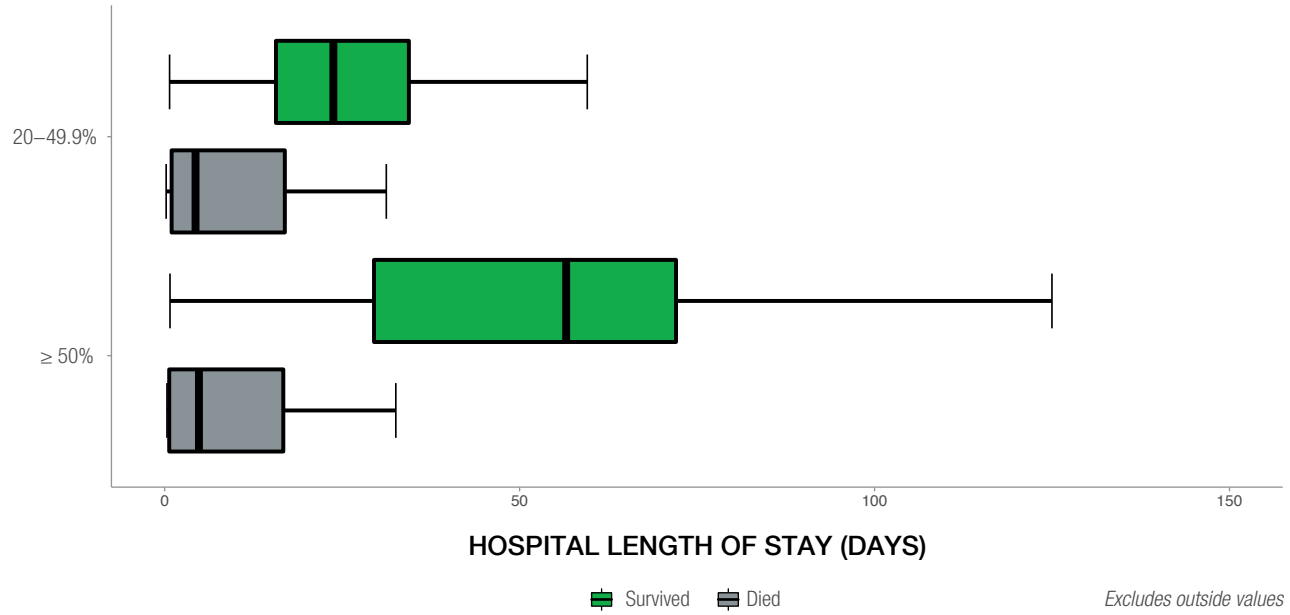
31. Pereira C, Murphy K, Herndon D. Outcome measures in burn care. Is mortality dead? Burns. 2004;30(8):761-71.

Figure 13 – Distribution of Hospital Length of Stay by TBSA Group in Adult Burns Patients, 2019/20



Excludes outside values

Figure 14 – Distribution of Hospital Length of Stay by TBSA Group and Mortality Status in Adult Major Burns Patients, 2019/20

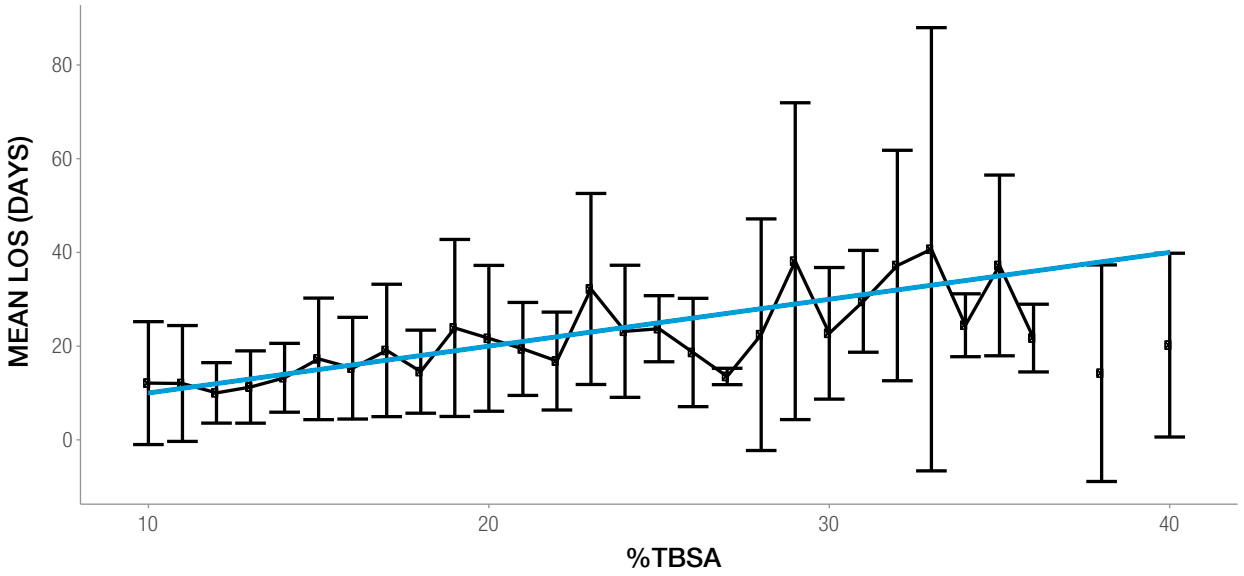


Excludes outside values

In adult patients, the predicted length of stay by %TBSA for burns between ten and 50% is one day per %TBSA burned[32]. Figure 15 shows the relationship between the size of the burn and the mean length of stay, increasing in one percent units of burn size, in adults over the current reporting period. The error bars represent the standard deviation of the length of stay, while the blue line represents the expected length of stay based on the one day per percentage of TBSA burned theory. For the majority of cases the registry data is consistent with the notion of the length of stay increasing by one day for each additional percentage of body surface area burned. The actual length of stay data deviates from the expected data for burns greater than 35% TBSA. This may relate to the association between %TBSA, mortality, and length of stay presented in Figure 14.

32. Related to Gillespie R, Carroll W, Dimick AR, et al. Diagnosis-related groupings (DRGs) and wound closure: roundtable discussion. J Burn Care Rehabil. 1987;8:199-209.

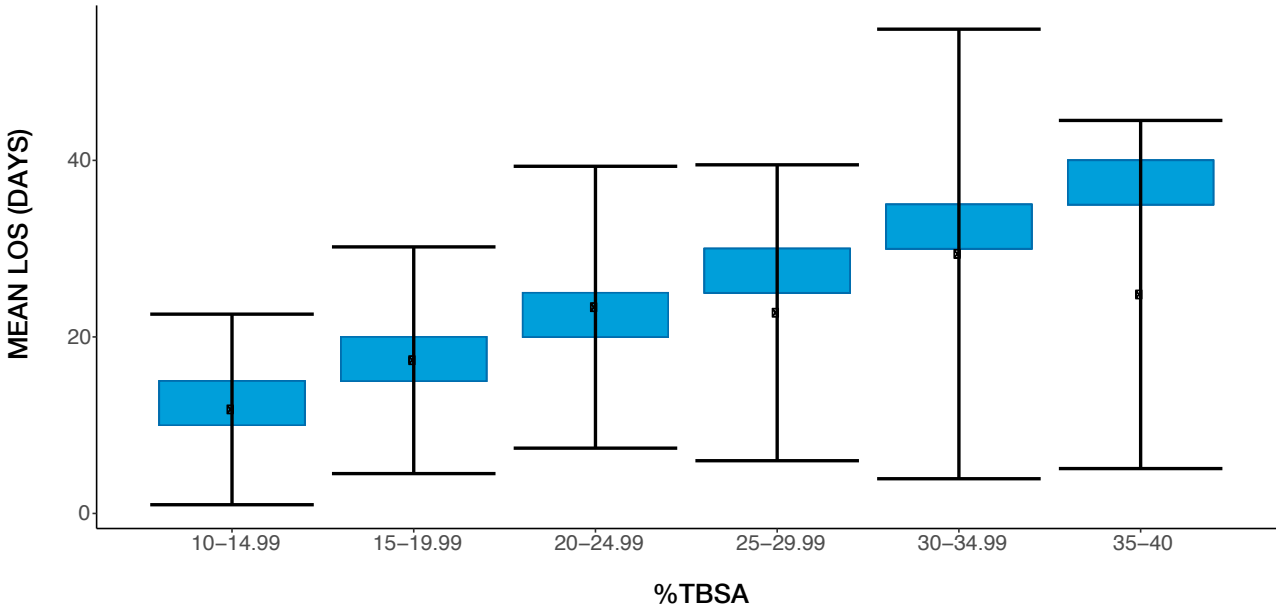
Figure 15 – Burn Size and Mean Length of Stay in Adult Burns Patients, 2019/20



Blue line represents the expected LOS based on the one day per percentage of TBSA burned theory
Error bars represent standard deviation

Figure 16 shows the relationship between the size of the burn and the mean length of stay, increasing in five percent units of burn size, in adults over the past year. The error bars represent the standard deviation of the length of stay, while the blue rectangles represent the predicted length of stay based on the one day per percentage of TBSA burned theory. During 2019/20 the median length of stay fell within the 'target' range for burns under 25% TBSA, at which point the in-hospital length of stay fell beneath the 'target' range. This is a change compared to the previous reporting period, where the length of stay for burns > 30% TBSA exceeded the 'target' range.

Figure 16 – Burn Size Groups and Mean Length of Stay in Adult Burns Patients, 2019/20



Blue rectangles represents the expected LOS based on the one day per percentage of TBSA burned theory

DISCHARGE DISPOSITION (FOR PATIENTS SURVIVING TO DISCHARGE)

Most patients (85%) were discharged to their home or usual place of residence during the 2019/20 reporting period. This observation has been consistent for the duration of the registry. Very few patients (~1% per year) left against medical advice.

Table 22 – Discharge Disposition for Surviving BRANZ Patients, 2019/20

	NUMBER	%
Home or usual residence	2,843	85
Hospital in the Home	114	3
Other acute hospital	101	3
Inpatient rehabilitation facility	51	2
Left against medical advice	40	1
Other healthcare accommodation	34	1
Another BRANZ hospital	23	< 1
Psychiatric hospital or unit	11	< 1
Statistical discharge	9	< 1
Other destination	107	3

IN-HOSPITAL DEATHS

In-hospital deaths following burn injury are uncommon in high-income countries such as Australia and the United States. One percent of patients died in-hospital during the 2019/20 reporting period, an increase on the previous reporting period (< 1% in 2018/19). The proportion of patients who died increased with increasing burn size. Of the 40 patients with a burn of 50% TBSA or greater, 14 (35%) died. Of the patients who died, 60% had an inhalation injury.

The registry records the reason for death for patients who die in-hospital. Multi-system organ failure was the most common cause of death during the 2019/20 reporting period (33%), followed by burns shock (30%).

Of the patients who died during their hospital stay during the 2019/20 reporting period, active treatment was not commenced in 45% of patients, a decrease from the previous reporting period (65% in 2018/19). Active treatment was commenced but later ceased for a further 34% of cases. For patients who died in-hospital and where the length of stay was known during the 2019/20 reporting period, 31% of patients died within 24 hours of admission.

READMISSIONS

During the 2019/20 reporting period 123 paediatric cases (13%) were readmitted to a specialist burns service within 28 days of discharge. Of these cases, 80% were reported as being a planned readmission. This pattern is consistent with previous reporting years. This is reflective of the common practice and workflow for paediatric patients to be discharged early and readmitted for planned acute burn wound management procedures such as skin grafting.

Consistent with past reporting years, the readmission rate was lower for adults. Only four percent of adult cases experienced a readmission within 28 days of discharge. In contrast to the paediatric patients, 59% of these cases were reported as ‘unplanned’ for wound healing issues or wound infection (increasing from 46% in 2018/19). For adult cases, it is more typical for patients to remain as inpatients until the majority of the acute burn wound management procedures are completed. Fewer cases have planned readmissions for acute burn management procedures. This outcome quality indicator was developed to identify cases where the readmission was unplanned, or arose from an unexpected complication. We hope that poor outcomes in terms of readmission may be able to be linked to processes of care, which can be improved in the future.

APPENDICES

APPENDIX A FIGURE AND TABLE HEADERS

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APPENDIX B INVESTIGATORS AND STAFF

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APPENDIX C HOSPITALS WITH ETHICS COMMITTEE APPROVAL

Collection of potentially re-identifiable patient level data from each of the hospitals and health services is conducted under strict National Health and Medical Research Council guidelines and national and Victorian privacy legislation. Ethics committee approval for the registry was obtained from Monash University Human Research Ethics Committee.

Approval for burns data collection has also been actively sought from all BRANZ hospitals. All 18 specialist burns units have ethics approval to submit data to BRANZ. Of these sites, six sites treat paediatric patients only, six sites treat adult patients only, and six sites treat both paediatric and adult patients.

Service	Location	Treats
The Alfred Hospital	Melbourne, Victoria	Adults
The Royal Children's Hospital	Melbourne, Victoria	Paediatrics
Perth Children's Hospital	Western Australia	Paediatrics
Fiona Stanley Hospital	Perth, Western Australia	Adults
Royal North Shore Hospital	New South Wales	Adults
Concord General Repatriation Hospital	New South Wales	Adults
Children's Hospital at Westmead	New South Wales	Paediatrics
Women's & Children's Hospital	Adelaide, South Australia	Paediatrics
Royal Adelaide Hospital	Adelaide, South Australia	Adults
Royal Brisbane and Women's Hospital	Queensland	Adults
Queensland Children's Hospital	Queensland	Paediatrics
Townsville University Hospital	Queensland	Paediatrics
Royal Hobart Hospital	Hobart, Tasmania	Adults & Paediatrics
Royal Darwin Hospital	Darwin, Northern Territory	Adults & Paediatrics
Middlemore Hospital	Auckland, New Zealand	Adults & Paediatrics
Christchurch Hospital	Christchurch, New Zealand	Adults & Paediatrics
Waikato Hospital	Hamilton, New Zealand	Adults & Paediatrics
Hutt Hospital	Hutt, New Zealand	Adults & Paediatrics

APPENDIX D PUBLICATIONS AND PRESENTATION LIST FOR 2019/20

During the 2019/20 reporting period, BRANZ data was presented in the five peer-reviewed manuscripts and included in 18 conference presentations selected from abstracts. Note that some reports, publications, and presentations listed below may overlap with prior or subsequent annual reports given that outputs may be accepted and then finalised (published/presented) across subsequent financial years.

ARTICLES

Spronk, I., Edgar, D.W., van Barr, M.E., Wood, F.W., Van Loey, N.E.E., Middelkoop, E., Renneberg, B., Oster, C., Orwelius, L., Moi, A.L., Nieuwenhuis, M., van der Vlies, C.H., Polinder, S., & Haagsma, J.A. (2020). Improved and standardized method for assessing years lived with disability after burns and its application to estimate the non-fatal burden of disease of burn injuries in Australia, New Zealand and the Netherlands. BMC Public Health, 20: Article 121. **Link to abstract.**

Tracy, L.M., Edgar, D.W., Schrale, R., Cleland, H., & Gabbe, B.J., On behalf of the BRANZ Adult Long Term Outcomes pilot, project participating sites, and working party (accepted 18/09/2019). Predictors of itch and pain in the 12 months following burn injury: Findings from the Burns Registry of Australia and New Zealand. Burns & Trauma. **Link to abstract.**

Gong, J., Singer, Y., Cleland, H., Wood, F., Cameron, P., Tracy, L.M., & Gabbe, B.J. (accepted 16/01/2020). Driving improved burns care and patient outcomes through clinical registry data: A review of quality indicators in the Burns Registry of Australia and New Zealand. Burns. **Link to abstract.**

Tracy, L.M., Dyson, K., Le Mercier, L., Cleland, H., McInnes, J.A., Cameron, P.A., Singer, Y., Edgar, D.W., Darton, A., & Gabbe, B.J. (accepted 16/11/2019). Variation in documented inhalation injury rates following burn injury in Australia and New Zealand. Injury. **Link to abstract.**

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

CONFERENCE PRESENTATIONS

Tracy, L.M., Cameron, P., Singer, Y., Earnest, A., Cleland, H., & Gabbe, B.J. Does chemoprophylaxis prevent venous thromboembolism in burns patients? Findings from the Burns Registry of Australia and New Zealand [Oral Presentation]. Monash University Faculty of Medicine, Nursing and Health Sciences Early Career Researcher Symposium, Caulfield, Australia. 28 October 2019.

Stanley, G., Jacinto, D., & Williams, J-K. The Epidemiology of Accelerant-Related Burns in the NT: A 9-Year Retrospective Cohort Study [Impact and Poster Presentation]. 43rd Annual Scientific Meeting of the Australian and New Zealand Burns Association, Hobart, Australia. 15 – 18 October 2019.

Ryder, C., Mackean, T., Hunter, K., Rogers, K., Gabbe B., Holland, A., & Ivers, R. Inequities in Burn Injuries for Aboriginal and Torres Strait Islander Children. [Poster Presentation]. 43rd Annual Scientific Meeting of the Australian and New Zealand Burns Association, Hobart, Australia. 15 – 18 October 2019.

Tracy, L.M., Cameron, P., Singer, Y., Earnest, A., Cleland, H., & Gabbe, B.J. Does chemoprophylaxis prevent venous thromboembolism in burns patients? Findings from the Burns Registry of Australia and New Zealand [Oral Presentation]. 43rd Annual Scientific Meeting of the Australian and New Zealand Burns Association, Hobart, Australia. 15 – 18 October 2019.

Tracy, L.M., Singer, Y., Schrale, R., Gong, J., Wood, F., Darton, A., Edgar, D., Kumis, R., Cleland, H., & Gabbe, B.J. Characteristics and Management of Burns in Older Adults [Oral Presentation]. 43rd Annual Scientific Meeting of the Australian and New Zealand Burns Association, Hobart, Australia. 15 – 18 October 2019.

Tracy, L.M., Singer, Y., Gong, J., Cleland, H., Cameron, P., Wood, F., Perrett, T., & Gabbe, B.J., On behalf of the BRANZ HCF Project Advisory Committee. An Update on BQIP: Driving Improved Burn Care Through Registry Data [Oral Presentation]. 43rd Annual Scientific Meeting of the Australian and New Zealand Burns Association, Hobart, Australia. 15 – 18 October 2019.

Gong, J., Edgar, D., Wood, F., Singer, Y., Tracy, L.M., & Gabbe, B.J. Regional variations in burns first aid treatment. Does where you live relate to morality? [Poster Presentation]. 43rd Annual Scientific Meeting of the Australian and New Zealand Burns Association, Hobart, Australia. 15 – 18 October 2019.

Singer, Y., Raby, E., Padiglione, A., Wood, F., Menezes, H., Tracy, L.M., Gabbe, B.J., & Cleland, H. A Wicked Problem: The Burn Wound Swabbing Conundrum [Oral Presentation]. 43rd Annual Scientific Meeting of the Australian and New Zealand Burns Association, Hobart, Australia. 15 – 18 October 2019.

Singer, Y., Raby, E., Padiglione, A., Tracy, L.M., Gabbe, B.J., Perrett, T., Cleland, H., & Wood, F. Positive Blood Cultures in a Burn Cohort: Findings from the Burns Registry of Australia and New Zealand [Impact and Poster Presentation]. 43rd Annual Scientific Meeting of the Australian and New Zealand Burns Association, Hobart, Australia. 15 – 18 October 2019.

Gong, J., Edgar, D., Wood, F., Singer, Y., Tracy, L.M., & Gabbe, B.J. Regional variations in burns first aid treatment. Does where you live relate to morality? [Oral Presentation]. 23rd Annual Scientific Meeting of the Australasian Trauma Society, Sydney, Australia. 3 – 6 October 2019.

Tracy, L.M., Cameron, P., Singer, Y., Earnest, A., Cleland, H., & Gabbe, B.J. Does chemoprophylaxis prevent venous thromboembolism in burns patients? Findings from the Burns Registry of Australia and New Zealand [Oral Presentation]. 23rd Annual Scientific Meeting of the Australasian Trauma Society, Sydney, Australia. 3 – 6 October 2019.

Singer, Y., Cleland, H., Gabbe, B.J., & Tracy, L.M. Hidden Dangers: Tap Water Scalds in Australia and New Zealand [Oral Presentation]. 12th World Plumbing Conference, Melbourne, Australia. 11 – 13 September 2019.

Brekke, R., Sivertsen, A., Almeland, S., Eldhuset, A., Okland, B.O., Gabbe, B.J., Tracy, L.M., Singer, Y., & Cleland, H. (2019). The Development of a Norwegian Burns Registry [Oral Presentation]. 18th European Burns Association Congress, Helsinki, Finland.

Tracy, L.M., Singer, Y., Peck, M., Bessey, P.Q., Phillips, B., McInnes, J., Cleland, H., & Gabbe, B.J. (2019). Comparison of International Burn Injury Data [Oral Presentation]. 18th European Burns Association Congress, Helsinki, Finland.

Cleland, H., Singer, Y., Gabbe, B.J., Cameron, P., Wood, F., Perrett, T., & Tracy, L.M. (2019). Time to First Excisional Debridement: Findings from the Burns Registry of Australia and New Zealand [Oral Presentation]. 18th European Burns Association Congress, Helsinki, Finland.

Singer, Y., Tracy, L.M., Gong, J., Cleland, H., Cameron, P., Wood, F., Perrett, T., Gabbe, B.J., On behalf of the BRANZ HCF Project Advisory Committee (2019). BQIP: Driving Improved Burn Care Through Registry Data [Oral Presentation]. 18th European Burns Association Congress, Helsinki, Finland.

Cleland, H., Singer, Y., Tracy, L.M., Gong, J., Cameron, P., Wood, F., Perrett, T., & Gabbe, B.J., On behalf of the BRANZ HCF Project Advisory Committee (2019). BQIP: Driving Improved Data Care Through Burn Registry Data [Oral Presentation]. 12th Asia Pacific Burns Congress, Singapore.

Cleland, H., Singer, Y., Gabbe, B.J., Cameron, P., Wood, F., Perrett, T., & Tracy, L.M., On behalf of the BRANZ HCF Project Advisory Committee (2019). Time to first excisional debridement: Findings from the Burns Registry of Australia and New Zealand (BRANZ) [Oral Presentation]. 12th Asia Pacific Burns Congress, Singapore.

APPENDIX E CRITERIA FOR SPECIALISED BURNS TREATMENT

The following criteria are endorsed by the Australian & New Zealand Burn Association in assessing whether burns require treatment in a specialised burns unit (ANZBA 2004):

- Burns greater than 10% of total body surface area (TBSA);
- Burns greater than 5% TBSA in children;
- Full-thickness burns greater than 5% TBSA;
- Burns to special areas (i.e., face, hands, feet, genitalia, perineum, and major joints);
- Electrical burns;
- Chemical burns;
- Burns with an association inhalation injury;
- Circumferential burns of the limbs or chest;
- Burns in the very young, very old, or pregnant;
- Burns in people with pre-existing medical disorders that could complicate management, prolong recovery, or increase mortality;
- Burns associated with major trauma; and
- Non-accidental burns

MONASH University

Burns Registry of Australia and New Zealand, Monash University

Requests for information from the registry are welcome.

Requests should be made to:

Burns Registry of Australia and New Zealand
Pre-Hospital Emergency and Trauma Research Unit
School of Public Health and Preventive Medicine

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Phone: +61 3 9903 0288
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monash.edu/medicine/sphpm/branz

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