INJURY RESEARCH & STATISTICS

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Needs and opportunities for improved surveillance of burns

Commonwealth Department of Health and Aged Care

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Needs And Opportunities For Improved Surveillance Of Burns

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Injury Research and Statistics Series

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October 1998

Australian Institute of Health and Welfare
Canberra

AIHW cat. no. INJCAT 28

This publication is part of the Australian Institute of Health and Welfare's Injury Research and Statistics Series. A complete list of the Institute's publications is available from the Publications Unit, Australian Institute of Health and Welfare, GPO Box 570, Canberra ACT 2601, or via the Institute's web site (http://www.aihw.gov.au).

Electronic copies of publications in this series can be downloaded from the Research Centre for Injury Studies web site (http://www.nisu.flinders.edu.au)

ISSN 1444-3791

ISBN 1 74024 065 0

Suggested citation

O'Connor P, Cripps R. 1998 Needs And Opportunities For Improved Surveillance Of Burns. Injury Research and Statistics Series. Adelaide: AIHW (AIHW cat no. INJCAT 28).

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Published by Australian Institute of Health and Welfare

Printed by Endeavour Print

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Executive Summary

This investigation of the needs and opportunities for improved surveillance of burns was motivated by a number of factors:

1. Recognition of the importance of burns as a national injury priority.
2. Consideration of the information needs for prevention and other purposes.
3. Awareness of the deficiencies in existing data systems concerning burns for these purposes.
4. The potential for an improved system of surveillance based on reporting from the small number of specialist units for the treatment of burns.
5. The potential for application of the experience of the Research Centre for Injury Studies in developing injury registers, such as the spinal cord injury register, to the successful implementation of a burns data collection.

Through a process of national consultation with Burn Units, the report documented a range of information needs concerning:

1. the development and monitoring of injury policy and programs, including the National Health Goals and Targets and the development and assessment of programs for burn prevention and control.
2. Research into the causes and prevention of burns
3. Service planning
4. Monitoring of the quality of care.

Assessment of available data revealed limitations in fulfilling these information needs. For example, whilst the routine hospital separations data provides nationally consistent information that can be used for monitoring of trends in burn injury, it is limited in the type of information recorded. It provides no detailed information on the mechanisms and factors of burn injury, which are data needed for the development of prevention programs.

Whilst most Burn Units maintain some form of data collection, there is a lack of national uniformity and consistency in the variables, coding and reporting levels. Clinical data is often missing. Furthermore, the continuity of the operation of these collections suffers from insufficient resourcing in most places and, given that additional resources are most unlikely, a more efficient and cost-effective approach is needed.

The report outlines a possible model for such an improved system. A minimum data set was identified (see Appendix 2). Initially focussed on severe cases (ie. burns greater than or equal to 10% total body surface area), a minimum of data could be collected at the Burn Unit with uploading of additional information (eg. ICD-10-AM, and external cause, codes) on these cases from the hospital separations database. The planned uploading process (see item 5 on page 19 of the report) would require that patient identified data is made available. Identified data would also required for future research studies involving, for example, assessment of survival post-discharge. This can only be determined accurately and completely through linkage with the National Deaths Index, maintained by the Australian Institute of Health and Welfare, which requires such data for linkage. Those units that are well resourced could collect all data, including data beyond the minimum data set, directly at the Burn Unit.

Consideration of these and other issues led the Australian and New Zealand Burns Association, at its September '98 meeting, to decide to proceed to develop an improved data system based on a common minimum data set. Piloting at one or more Burn Units early in 1999 was agreed.

Need for improved information on burns

Information requirement

The need for the monitoring of burns can be justified in personal, social and economic terms. Very severe burns are very costly, as indicated by Bruce Davey in an article published in the ANZBA Bulletin[1]. He describes a case having 75 per cent Total Body Surface Area (TBSA) full thickness burns where the inpatient costs alone totalled $500,000, and this excluded the costs of rehabilitation required for a further 12 to 24 months. Rehabilitation and other treatments often span decades. Scarring can have a profound impact on the psychological adjustment and physical functional capacity of the individual, which affects their level of participation in community life. A literature review, based on the Medline database, identified few studies of the personal, social and economic costs of burns and few epidemiological studies.

The need for improved information on burns was identified through consultation with stakeholders (see list in Appendix 1). Four types of need were identified:

1. Development and monitoring of injury policy and programs.
2. Research into the causes and prevention of burns.
3. Service planning.
4. The monitoring of quality of care.

It became clear that the information required for the last of these needs reflected, at the present time, largely local issues and priorities outside the scope of interest of a national approach to data development and standardisation. The emphasis in this review, therefore, focussed mainly on the first three needs.

1. Development and monitoring of injury policy and programs

National Health Goals & Targets

Injury was first recognised as a national health priority in 1986[2]. Subsequently, national goals and targets were devised for reducing the incidence and impact of injury on health. Included in the set of eighteen targets published in the *Better Health Outcomes for Australians*[3] report were two concerning burns. The selected indicators for these targets, published in the *First Report on National Health Priority Areas (NHPA)*[4], are listed below:

Indicators:

- Death rate for injury resulting from fire, burns and scalds among people aged 55 years and over (ICD-9 E890-899, E924.0). Year 2000 Target: 50% reduction on 1992 baseline rate of 1.2 deaths per 100,000 of persons aged 55 years and over.
- Hospital separations rate for injury resulting from fire, burns and scalds among children aged 0-4 years (ICD-9 E890-899, E924.0). Year 2000 Target: 20% reduction on 1991/92 baseline rates of 167/100,000 for males and 127/100,000 for females of persons aged 0-4 years.

Data required for the monitoring of these indicators is available from the mortality and morbidity databases of the Research Centre for Injury Studies (RCIS) at Flinders University.

The goals and targets for injury prevention and control are not static and will develop as the understanding of injury, and its prevention and control, improves. The indicators chosen for burns reflect the available information and will develop as this information improves. Improved surveillance information should contribute to the further development of the goals and targets for injury prevention and control.

Information required for the development and assessment of policy and programs for the prevention and control of burns

In order to achieve the targeted reductions in burns specified above, and to achieve effective prevention and control more generally, information is required for policy development and program planning and evaluation. The information need can be determined from the following three pivotal questions:

1. What is the problem?
2. How can it be prevented or controlled?
3. How can program outcomes be evaluated?

Fundamental to the identification of the problem is the epidemiological analysis of injury data relating to person, time, place and circumstance. Information is required on incidence and prevalence and should not be restricted to a narrow severity range. The cost burden of injury may well be weighted toward the many low severity cases that are not admitted to hospital and cases that do not die from injury.

The standard data items required for surveillance and hospital separations have been detailed in the National Data Standard for Injury Surveillance (NDS-IS)[5] and the National Health Data Dictionary (NHDD)[6]. Extension beyond this general data set is required to more completely describe the features of a particular injury type and for effective input in prevention and evaluation studies. For example, an important additional component of a surveillance system focussing on burns concerns the type of first aid applied immediately at the scene, which is known to affect burn severity and is a focus of community education programs.

Analysis of surveillance data, especially from a structured narrative, can give clues to the prevention and control of injury and is usually an important component for evaluating policy and programs. Review of the international scientific literature is also fundamental to the development of prevention programs.

2. Research into the causes and prevention of burns

The information required for research into the causes and prevention of burns cannot be fully specified, as the need is not static. As our understanding develops, so too do our questions. Typical questions for injury research include the following:

1. What is the aetiology?
2. What is the agent?
3. What is the mode of delivery?
4. How can the agent or mode of delivery be altered such that a burn is prevented or controlled?

Application of these questions to scalds might deliver the following answers:

1. Aetiology: Elderly person burned in bath at nursing home after losing consciousness due to change of medication.
2. Agent: Hot water.
3. Mode of delivery: Bath in nursing home.
4. Control: Reduce hot water temperatures in nursing homes and improve monitoring of effects of changes in medication.

A data system focussing on injury surveillance can go some way toward answering questions of this type. The structured narrative, ICD-9-CM[7] codes and injury mechanism factor codes that form a part of the NDS-IS are designed to focus on these questions.

Whilst surveillance information can go some way to meeting the needs of research questions, often further information is needed, generally collected through special studies. The capability of a surveillance system to facilitate this in-depth research, for example through identification of cases for a case-control study, is a major benefit.

An example of an expected future burn research question that focuses attention on information needs is the evaluation of the installation of smoke detectors in homes. Monitoring of surveillance data on the number of people burned in house fires over time, during a period of increasing prevalence of smoke alarms, would assist in evaluating the impact of the prevention measure. This would be a fairly crude measure, however, due to the potential for confounding due to changes in exposure; for example, a lower incidence of house fires for other reasons, and other potential factors. Other research methodologies could be developed to improve the crude measure. A case-control study, which identified the presence of a working smoke alarm in the homes of person burned and not burned in house fires, would be a stronger test of the prevention measure. A burns surveillance system could identify cases for such a study. Controls would need to be identified in another way, for example, from the Fire Department register of house fires. The determination of the presence or absence of a smoke alarm would best be the subject of a follow-up interview, rather than forming a part of the routine hospital burns surveillance system. Analysis of the impact of smoke alarms on the relative risk of a burn would need to control for extraneous variables and confounders, for example demographic variables, a number of which would be available from the surveillance data set.

Another example concerns domestic water temperature. The Australian National Plumbing Code (1995) AS 3500[8] specifies a maximum allowable delivery temperature of hot water to sanitary fittings. The effectiveness of this standard could be assessed through a case-control study. Cases could be identified through the hospital burns surveillance system (ie. persons scalded from domestic hot water) and have their water temperature and compliance with the Code determined through a site survey. Controls from the community (eg. neighbours of the cases) could have their water temperature and compliance surveyed.

3. Service planning

Information is needed on trends and breakdowns in burn injury for the planning of services. The data must provide a reliable indicator of incidence and prevalence and enable breakdowns into clinically and demographically meaningful groupings, eg. paediatric cases, elderly cases, remote area cases, cases with complications such as infection, deep burn cases,

cases with burns over a high percentage of TBSA, and grafted cases. The capability for the mapping of injury occurrence, and the relationships between place of residence, place of injury and place of treatment, has been highlighted by some stakeholders. A need for information on patient mix by Diagnostic Related Group (DRG) was also identified to facilitate assessment of reimbursement under casemix.

4. Monitoring of quality of care

Information is needed for monitoring the quality of patient care. The information that is needed for general surveillance of indicators of patient care (eg. annual incidence of complications) is less detailed and can suffer a less timely availability than the information needed for direct patient care or Ward management. The presence of a particular type of complication for a patient, or an increasing incidence of a particular type of infection on the Ward, may indicate the need for immediate control measures. Special information systems are needed to monitor quality of care at this level. The routine surveillance information can supplement the information available but cannot fulfil all information needs. Recognition of this fact has led some States to extend the surveillance data set of the Australian Spinal Cord Injury Register[9] with a clinical module focussing in more detail on patient care.

Availability of information

The descriptive epidemiology of burns, as reflected in existing data sources, is not routinely reported in a concise format. Furthermore there are limitations in the scope of available information that restrict its utility for the development and prioritisation of policy and programs and for program evaluation.

1. Mortality

Characteristics of mortality data

The currently available mortality data has a number of limitations for the epidemiological analysis of burns. Until recently (January 1997), ICD-9 diagnosis codes for 'Nature of injury and poisoning' were not coded from the death certificates. Consequently, it has not been possible to report on the depth or total body surface area of burn by body part. It is expected that late in 1998 the Australian Bureau of Statistics will publish information based on ICD-9 codes for the first time.

The 'External cause' of injury and poisoning is coded from death certificates where the cause of death has been stated to be an injury. Consequently, the main types of burn injury are identified (ie. flame and fire burns, scalds, chemical burns and contact burns) and human intent is also available. However, electrical burns and burns from radiant heat, inhalation and explosion are not so readily identified through 'External cause' codes. There are many non-burn codes, which have a burn as a possible injury type. For example, code E831 (accident to watercraft causing other injury) includes 'burn while ship on fire' but the burn sub-group cannot be separately identified. Table 1 presents a non-exhaustive list of codes where this type of problem is evident.

Table 1: List of 'External cause' codes including burns where the burn sub-group is not separately identifiable

External cause code	Description
831	Accident to watercraft causing other injury
837	Explosion, fire, or burning in watercraft
919	Accidents caused by machinery
923	Accident caused by explosive material
925	Accident caused by electric current

Detailed information on injury mechanisms and factors, place of injury and activity when injured is not currently available from the deaths data. This lack of information limits the utility of the data for prevention research. A limited range of demographic data items is available. The implementation of the National Coronial Information System[10] will attend to some of these limitations (being piloted in the ACT at the time of writing).

Of concern is the potential failure to identify injury deaths where death has resulted from failure of a body system or from co-morbidities subsequent to injury. The authors are not aware of any study of this issue. A pilot study by the authors conducted using data from one State failed to find in the injury deaths data a high proportion of burns cases that died in hospital. Furthermore, the study found that the unidentified cases had a higher average length of stay in hospital prior to death suggesting that as the time from admission to death increases, the probability of failure to identify cases as burn injury deaths increases. Cause of death for the unidentified deaths was not examined but it is hypothesised that the late deaths would be stated to be due to the failure of a body system or a co-morbidity because injury itself ceases to be considered. Without further assessment of this potential source of under-enumeration and systematic bias in the identification of burns deaths, it is not clear whether the available deaths data provide accurate incidence information or useful indicator level data.

Statistical profile

A descriptive statistical profile of burns deaths using available data is presented in Table 1 and Figure 1 (based on ICD-9 E-codes 890-899, 924.0, 924.8, 924.9). It is evident that burns constitute a small proportion of all injury deaths, have a low rate and have apparently declined steadily since 1994 for both males and females.

Figure 1 suggests that the elderly may have higher rates of death from burns. However these rates are subject to large confidence intervals based on the Poisson distribution because the number of burn deaths in a single year is small.

Table 2: Key indicators of fires, flames and scalds deaths, Australia 1995*

Indicator	Males	Females	Persons
Cases	79	54	133
Percent of all injury deaths	1.5%	2.4%	1.8%
Crude rate/100,000 pop	0.9	0.6	0.7
Age-adjusted rate/100,000 pop	0.9	0.6	0.7
Change in adj. rate since 1994	-15.6%	-7.3%	-9.7%
Average years lost before age 75 yrs	35	33	34

* Source: (Bordeaux S and Harrison JE, 1998)[11]

House fires were the dominant cause of burn deaths in 1995 (69%) and a third of the deaths from this cause were children aged less than 15 years. "Clothing ignition" accounted for a

small percentage of burn deaths (9%) and none of these deaths involved children. Periodic peaks in certain causes of burn death have been noted over time, for example, from bush fires.

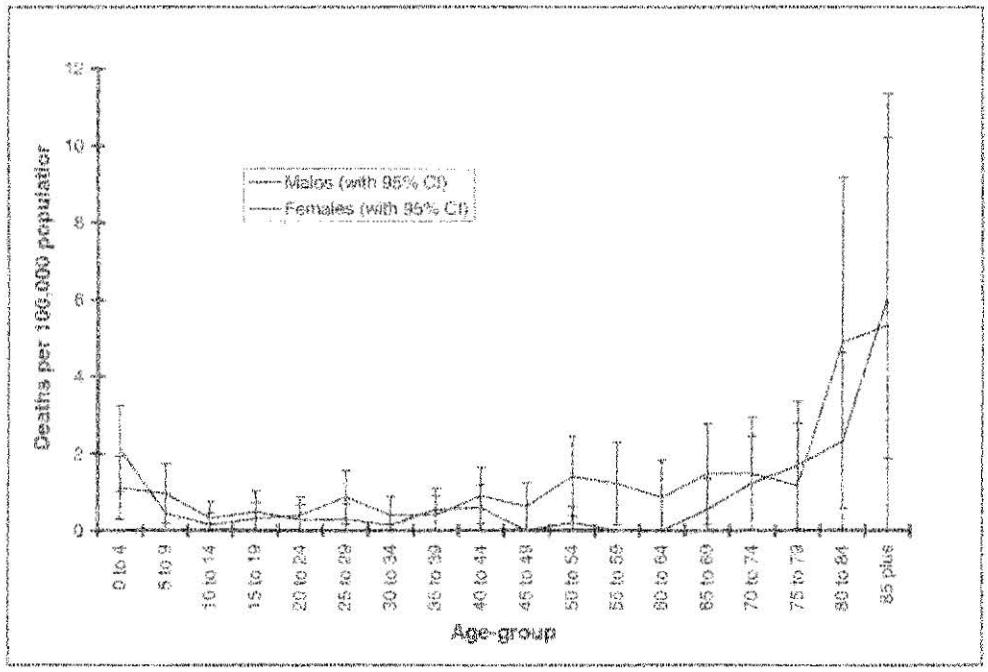

Figure 1: Age-specific rates of deaths from fires, flames and scalds, by sex, Australia 1995. Source: (Bordeaux S and Harrison JE, 1998)[11]

Report on indicator:

A target stated in the NHPA report[4] is to reduce the 1992 rate of 2.4 deaths per 100,000 due to burns and scalds for person's aged 55 or more by 50% by the year 2000. The 1995 rate for this age group was 1.3 deaths per 100,000, 44% below the 1992 rate. Based on the trend chart presented in Figure 2 it has been concluded that this target appears to be achievable[5].

2. Morbidity (non-fatal)

Characteristics of morbidity data

Non-fatal morbidity from injury covers the injury severity spectrum. The severity range is commonly viewed from a service perspective ranging from:

Hospital Admission - Emergency Department Attendance - GP Visit - Other

A version of the Australian injury pyramid reported by Harrison[12] (Figure 3). He states "Data enabling description of the numerous and sometimes disabling, costly and resource-intensive injuries which do not result in death or admission to a hospital remains fragmentary". At national level, the available information is currently limited to Hospital Morbidity data. Hospital Emergency Department data from an earlier data collection is available to the National Injury Surveillance Unit (NISU) and there is a development project under-way to assess methods for a potential new collection.

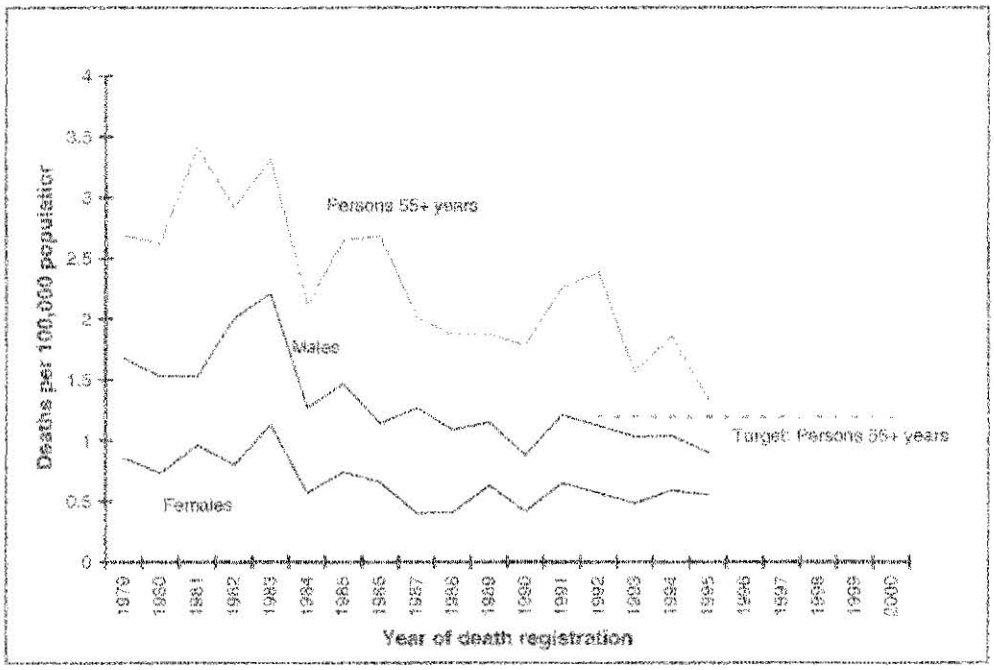

Figure 2: Age-adjusted rates of deaths from fires, flames and scalds, by sex, Australia 1979-95. Source: (Bordeaux S and Harrison JE, 1998)[11]

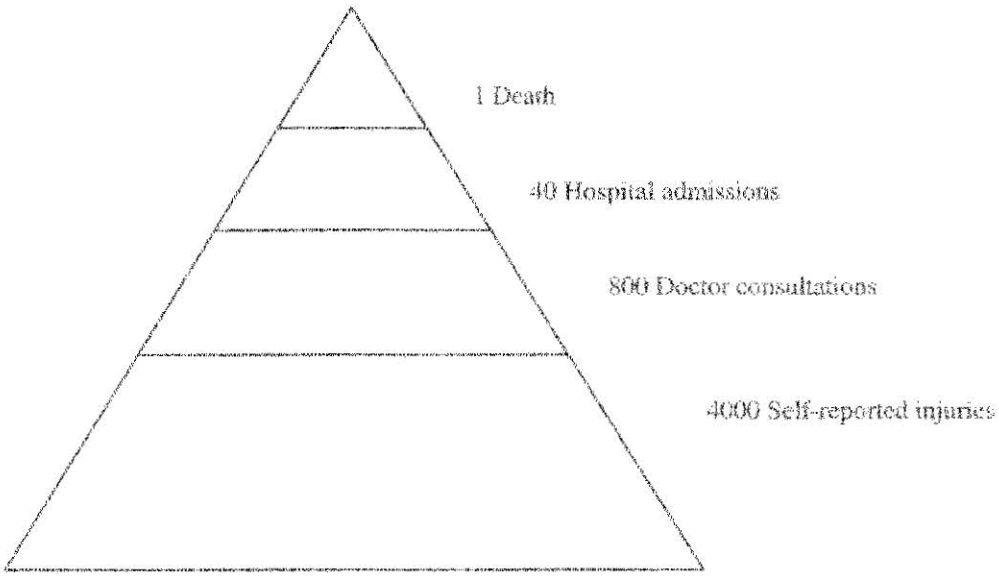

Figure 3 Australian Injury Pyramid

Hospital morbidity data

Unlike death data, hospital morbidity data includes ICD-9 (and more recently ICD-10-AM) diagnosis codes for the 'Principal diagnosis' and 'Additional diagnoses'. This enables reporting of the depth and total body surface area of burn by body part. In addition, it identifies any existing co-morbidities. Procedures are also coded which is important for the identification of grafting and other necessary treatments. 'External cause' codes which enable

the intent to be identified (accident, suicide, homicide etc.) along with the broad type of injury, late effects of injury, and complications and misadventure are included as well as a fuller range of demographic data items. However, as with the death data, detailed information on injury mechanisms and factors, place of injury and activity when injured is not currently generally available from the hospital morbidity data which limits the utility of the data for prevention research.

In all States, an 'External cause' code is applied where the 'Principal diagnosis' is an injury or poisoning code. In addition, in recent years in most States an 'External cause' code is applied whenever an 'Additional diagnosis' is an injury or poisoning code.

A pilot study, by the authors, involving an internal analysis of injury data supplied by one State suggested that care is needed when using hospital morbidity data to determine the incidence of new cases of burns. Multiple admissions from a single burn injury event are common (eg. a new case may receive treatment and grafting for a burn, be discharged, and then re-appear a number of times for further burn care at one or more hospitals). A RCIS report, under development, has developed a 'model indicator' for injury that is designed to distinguish new incident cases from repeat admissions. We tested the model against a gold standard data set where the new burn cases had been distinguished from repeat admissions on the basis of a case by case analysis and found that whilst the model predicted the annual number of new incidents, and also broad patterns by age and sex, very closely, there was evidence of problems with model sensitivity and specificity at the case level. This issue warrants a more definitive study than could be conducted.

A further difficulty in using hospital morbidity data concerns changes over time in hospital servicing and case management and administration which can be reflected in changing rates of hospital admission from injury unrelated to the 'real' trend in the injury incidence rate. For example, there is reportedly a trend for burns to be managed without hospital admission through outpatient's clinics, where possible. This does not, however, apply to severe burns. Therefore, trends in burns generally will be more affected by this management policy and, therefore, could be less reliable as an injury indicator than trends for severe burns. There are other reasons to expect that trends for severe burns will be generally less affected by changing hospital policies.

Figures 4 and 5 present recent trends in burns broken down by the size of the area of burn for deep burns (ie. full-thickness and deep full-thickness burns) and burns of any depth, for admissions identified as new incident cases by the 'model indicator' referred to above. NSW data is not included in these figures because the data available to this Centre for this State was not comparable from 1993/94 to 1995/96. The severe burns are those that are either large (ie. covering a high percentage of the body surface area) or both. From Figure 4, it is apparent that the number of large burns (ie. greater than or equal to 30% total body surface area) declined in 1994/95 and 1995/96 relative to 1993/94. However, the trends for smaller burns, and burns of any size, were all increasing sharply over the period. From Figure 5, it is apparent that the number of severe burns (ie. deep burns over at least 10% of the total body surface area) showed no consistent trend between 1993/94 and 1995/96. However, the trend for smaller deep burns, and deep burns of any size, was sharply increasing over the period. From this information it is clear that the trend in burn injury is difficult to interpret. If the trend in severe burns is more reliable, then from the information presented, it is uncertain whether there has been any consistent decline from 1993/94. The trend in total burn injury hospitalisation should be interpreted very cautiously.

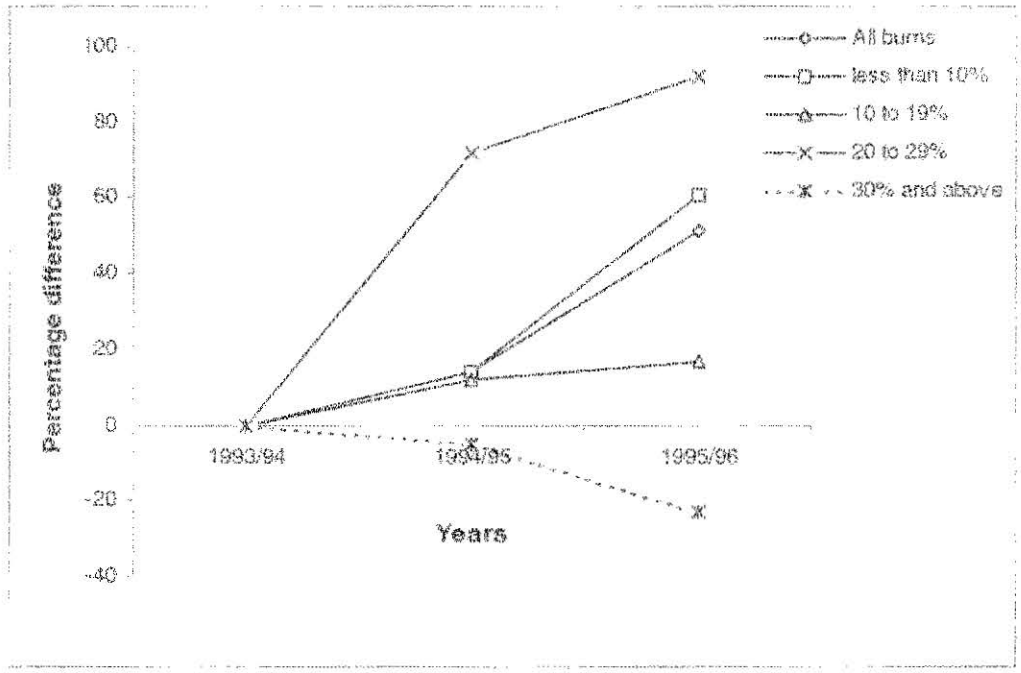

Figure 4: Percentage difference in number of estimated incident cases reported for burns of any depth, Australia (excludes NSW), 1993–96

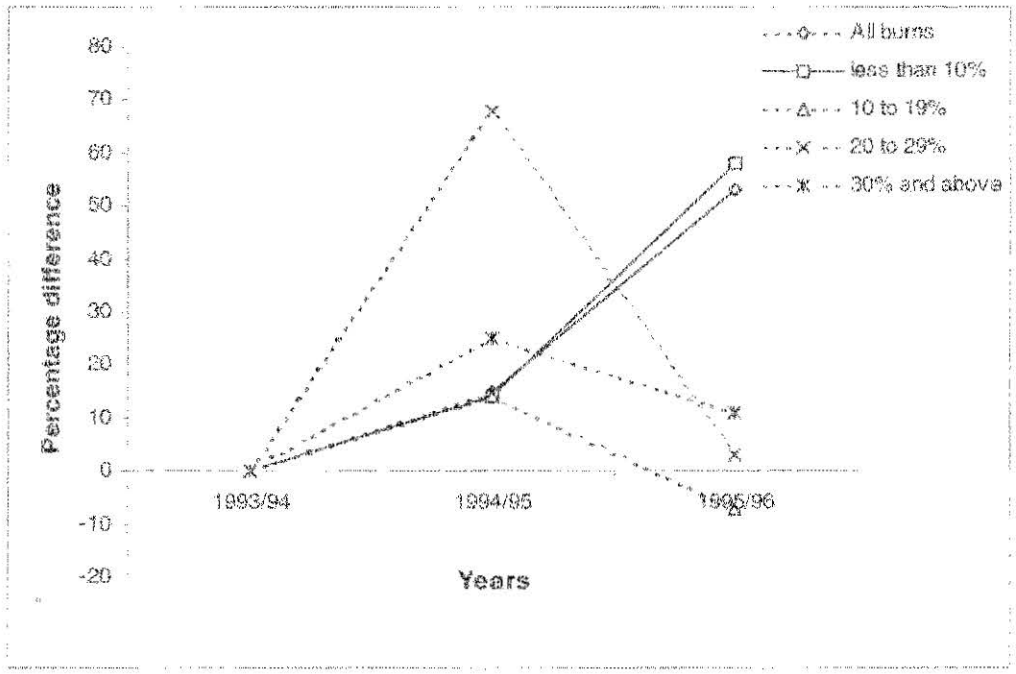

Figure 5: Percentage difference in number of estimated incident cases reported for deep burns, Australia (excludes NSW), 1993–96

Burns Data Collections

At the time of writing this paper, there were 13 state based specialist centres for the treatment of burns, although changes were under consideration in NSW (Table 3).

Table 3: Hospitals with a Burns Unit

State	Specialist centres
New South Wales	Concord Hospital
	Royal North Shore
	Westmead
	Royal Alexandra Hospital for Children
Victoria	Alfred Hospital
	Royal Children's Hospital
Queensland	Royal Brisbane Hospital
	Royal Children's Hospital
Western Australia	Royal Perth Hospital
	Princess Margaret Hospital (children)
South Australia	Royal Adelaide Hospital
	Adelaide Children's Hospital
Tasmania	Royal Hobart Hospital

Most of the Burns Units (BUs) maintain a burns data collection based primarily on admissions. Some include outpatient attendances and one links with an emergency department injury surveillance collection. A review of the data collections revealed many common data items. The registers are not currently operating primarily to provide incidence data. The emphasis is more on treatment and service type information, especially on surgical services. In a number of the systems, readmissions are not distinguished from new cases. Data definitions are not always clear and concepts such as type of burn, mechanisms and factors are intermixed within a single classification.

Statistical information was not readily available from some of these collections. In the absence of this information, the hospital morbidity data and other data available to the RCIS was used to provide a profile of the burns admissions of hospitals that had BUs and other hospitals.

Analysis of hospital morbidity data (admissions identified as new incident cases by the 'model indicator' referred to above) indicates that the hospitals with Burn Units cover the range from minor burns admissions (0-10% TBSA with any depth of burn) to very severe admissions (30% + TBSA deep burns), and are skewed to severe burns admissions (Table 4).* They treat over one third of all burns admissions nationally, whether deep burns or burns of any severity. The BU hospitals treat over three quarters of the very severe burns cases ie. 45 of 59 cases nationally in 1995/96 where TBSA deep burns is 30% or more (Table 5).

Table 4: Cases attending hospitals with a Burn Unit (BU) as a proportion of all burns cases, estimated incident cases, Australia 1995/96

	Burns of any depth*			Deep burns**		
%TBSA	BU hospitals	All cases	Proportion	BU hospitals	All cases	Proportion
0+	1878	5167	0.36	1876	5153	0.36
10+	489	1010	0.48	161	287	0.56
20+	222	371	0.60	71	108	0.66
30+	105	154	0.68	45	59	0.76

*49 cases not BU cases

** 14 cases not BU cases

* Not all burns cases referred to a hospital with a specialised Burn Unit will actually be treated in that Unit.

Table 5: Large deep burns: cases attending hospitals with a Burn Unit as a percentage of all cases by State of hospital location, estimated incident cases, Australia 1995/96

	LARGE DEEP BURNS*								
%TBSA	NSW	VIC	QLD	WA	SA	TAS	NT	ACT	TOTAL
Burns Units	13	14	3	8	6	1			45
All	19	14	10	8	6	1		1	59
Percentage	68	100	30	100	100	100			76

* Refers to deep burns covering at least 30% of the total body surface area

Analysis of the representativeness of new incident cases (identified by the 'model indicator) admitted to hospitals with a BU and other hospitals revealed statistically significant differences on age and sex (Tables 6 and 7). However, the differences in the profiles of BU hospitals and other hospitals on these variables were not substantial, with the exception that a higher proportion of young children with burns were admitted to a BU hospital. Assessment of differences on these variables within TBSA categories for burns of any depth and deep burns, revealed consistent age and sex differences only in the TBSA range 0-9% ie. small burns (Table 8). For other TBSA categories, the age and sex differences of BU hospitals and other hospitals were not substantial for burns of any depth nor for deep burns.

Table 6: Burns injury for Burn Unit hospitals and other hospitals by age group, estimated incident cases, Australia 1995/96

	Burn Unit hospital cases		Other hospital cases		Group Total	
Age group	Count	Col %	Count	Col %	Count	Col %
0-4	653	38	644	19	1297	25
5-9	116	7	134	4	250	5
10-14	121	7	213	6	334	7
15-24	243	14	706	20	949	18
25-34	205	12	627	18	832	16
35-54	250	15	749	22	999	19
55-64	50	3	156	5	206	4
65-74	41	2	130	4	171	3
75 +	32	2	108	3	140	3
Group Total	1711	100	3467	100	5178	100

Chi square=297, df=8, sig=.00

Table 7: Burns injury for Burn Unit hospitals and other hospitals by sex, estimated incident cases, Australia 1995/96

	Burns Unit hospital cases		Other hospital cases		Group Total	
	Count	Col %	Count	Col %	Count	Col %
Male	1145	67	2462	71	3607	70
Female	566	33	1005	29	1571	30
Group Total	1711	100	3467	100	5178	100

Chi-square=8.89, df=1, sig=.00

Table 8: Results of Chi-square tests comparing the number of estimated incident cases of burns for Burn Unit hospitals and other hospitals on the basis of age and sex for burns of any depth and deep burns

Variable	Chi-square	Degress of Freedom	Significance
AGE			
Burns of any depth			
0-9%	238.26	8	.00
10-19%	24.20	8	.00
20-29%	3.97	4	.41
30% +	7.33	4	.12
Deep burns			
0-9%	223.96	8	.00
10-19%	15.19	8	.06
20-29%	.95	4	.92
30% +	3.82	4	.43
SEX			
Burns of any depth			
0-9%	14.64	1	.00
10-19%	0.00	1	1.00
20-29%	0.05	1	.82
30% +	0.46	1	.50
Deep burns			
0-9%	10.67	1	.00
10-19%	.04	1	.84
20-29%	.18	1	.67
30% +	1.10	1	.30

The Directors of the BUs report that in spite of a skew to the severe burns cases and children, the mechanisms, factors and other parameters of injury amongst their cases would cover the range existing within the population of hospital admission from burns and could be representative. This cannot be tested directly with the data available to the RCIS. An indirect test of representativeness can be undertaken using Emergency Department data available to the RCIS. Given that it is known that BUs tend to get higher severity cases, an equivalence in the distribution of mechanisms and factors across severity would be relevant to the question of representativeness of Burns Unit cases. ISIS data was assessed using two indicators of severity: (a) full thickness versus partial thickness burns and (b) treatment severity indicator based on outcome of ED episode of care (ie. admitted, transferred and died versus discharged after treatment in ED). Analysis of data demonstrates that the distribution of the mechanisms of high severity burns and low severity burns, using these indicators, are significantly different from a statistical viewpoint, with 'flame burns' being more frequent, and 'splashed hot liquid' being less frequent in high severity cases (Tables 9 and 10). However, the proportions are similar for most of the mechanisms.

Based on this analysis, it seems that whilst the cases admitted to BUs are skewed to the higher severity cases, they are reasonably representative on the basis of age and sex for all except small burns (ie less than 10% TBSA), and are probably reasonably representative in respect to mechanisms and factors of injury. They provide near complete national coverage of very severe burns (ie. deep burns of TBSA 30% plus). Burns Unit data could, therefore, be useful for prevention research if detailed information on burns is collected. Given that BUs provide only partial coverage of the population of hospital admissions for burns and obviously lesser coverage of the population of all burns of any severity, such a data collection

could not provide national incidence data except for high severity cases (TBSA 30%+, deep burns or burns of any depth).

Table 9: Mechanism of injury by treatment severity indicator, ISIS data

	Admitted, transferred or died		Discharged after ED treatment		Total	
Mechanism	N	%	N	%	N	%
Ingested	86	3	34	0	120	1
Splashed sprayed or sprinkled	58	2	233	3	291	3
Touched victim moving dry heat	291	9	1870	25	2161	20
Touched object moving dry heat	74	2	254	3	328	3
Exposure to flame	428	13	337	4	765	7
Exposure to radiant heat	54	2	358	5	412	4
Splashed hot liquid	1637	51	3277	43	4914	46
Immersed in hot liquid	260	8	203	3	463	4
Exposure to steam or vapour	1	0	48	1	49	1
Exposure to mains	53	2	31	0	84	1
Exposure to other electrical current	39	1	47	1	86	1
Sun	34	1	273	4	307	3
Other	168	5	658	9	826	8
Total	3183	100	7623	100	10806	100

Table 10: Mechanism of injury by depth of burn, ISIS data

	Full thickness		Partial thickness		Total	
Mechanism	N	%	N	%	N	%
Ingested	6	1	62	1	68	1
Splashed sprayed or sprinkled	21	2	264	3	285	3
Touched victim moving dry heat	223	17	1933	21	2156	21
Touched object moving dry heat	59	5	268	3	327	3
Exposure to flame	231	18	515	6	746	7
Exposure to radiant heat	52	4	355	4	407	4
Splashed hot liquid	487	38	4420	48	4907	47
Immersed in hot liquid	73	6	390	4	463	4
Exposure to steam or vapour	1	0	48	1	49	1
Exposure to mains	22	2	28	0	50	1
Exposure to other electrical current	18	1	36	0	54	1
Sun	23	2	283	3	306	3
Other	72	6	527	6	599	6
Total	1288	100	9129	100	10417	100

Statistical profile

Hospital morbidity data

A descriptive statistical profile of burns hospitalisations using available data, with incident case identification based on the 'model indicator', is presented in Table 11 and Figures 6 and 7. It is evident that burns hospitalisations are quite numerous, especially for males, but constitute a small proportion of all injury hospitalisations. Significant State differences in the age-adjusted rate of burns were evident.

The burn rate in young children is substantially higher than for other age groups. The profile of burns in this group and in the later peak age group of young adults (20-24 years) warrant further analysis.

Assessment of intent indicated that 97% of the cases that had a burn diagnosis code in any diagnosis field had an 'External cause' code indicating an accidental cause (Table 12).

Amongst cases having a burn as the Principal Diagnosis only 66% had an 'External cause' code in the range covered by the national thermal injury target (ie. E890-899, E924.0). Table 13 lists the 'External cause' codes outside this range. In particular, the substantial number of caustic and corrosive burns, and burns from electric currents and explosive materials warrants attention. A similar result was found for burns coded to the Additional Diagnosis fields. Given the large proportion of burns cases not within the scope of the injury target the monitoring of trends in burns probably should be expanded beyond this scope.

Table 11: Key indicators of burns, Australia 1995/96*

Indicator	Males	Females	Persons
Cases	4442	1968	6410
Percent of injury hospitalisations**	1.2%	0.06%	1.8%
Crude rate/100,000 pop	49.1	21.5	35.2
Age-adjusted rate/100,000 pop	49.4	21.8	35.7

* Based on cases with a ICD-9-CM burn diagnosis code (940-949) in any diagnosis field.
** Refers to estimated incident cases identified by the 'model indicator'.

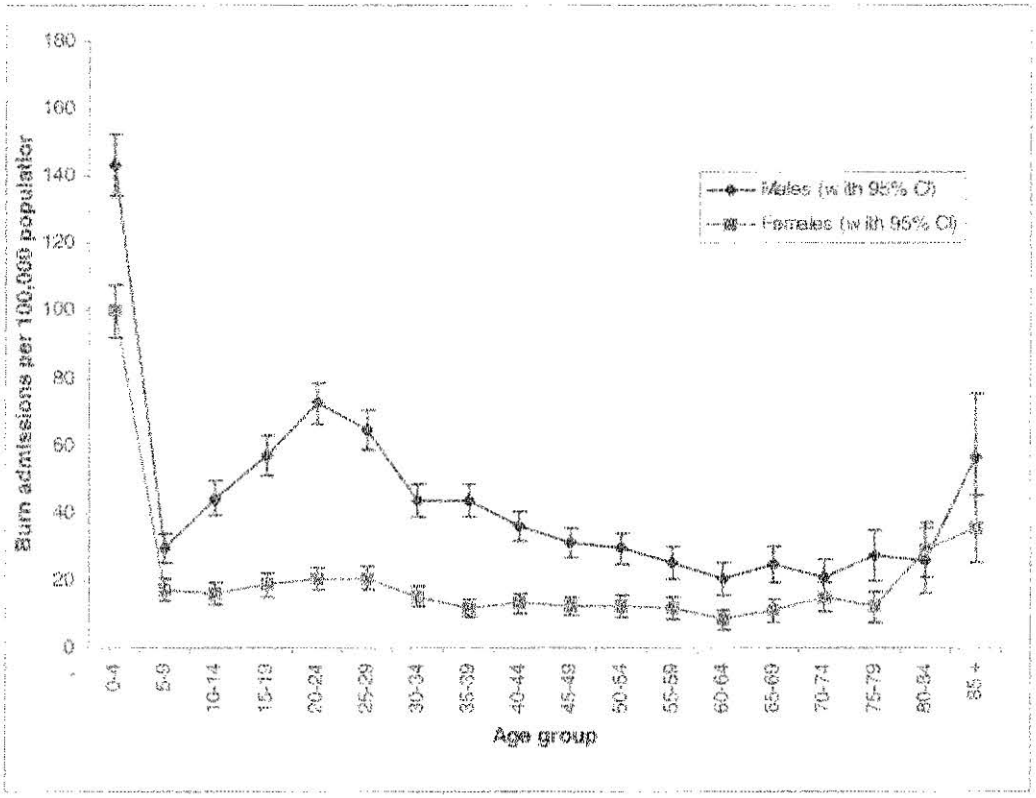

Figure 6: Age-specific rate of burns of any size by sex, estimated incident cases, Australia 1995/96*

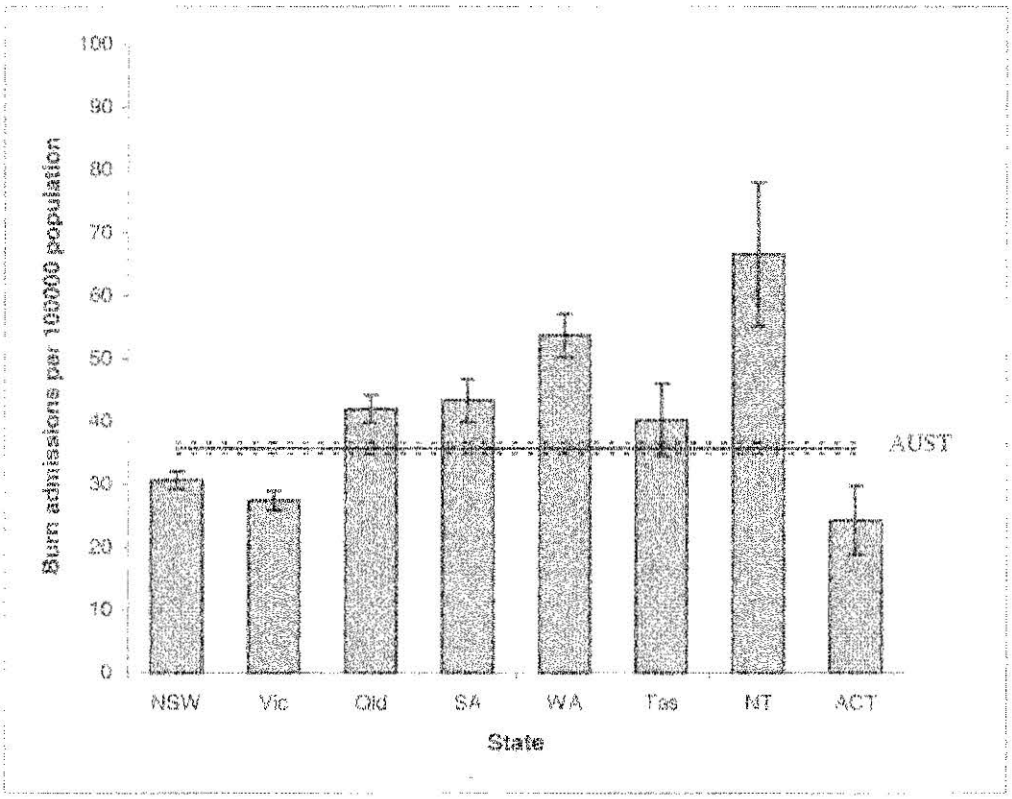

Figure 7: Incidence rate of burns of any depth by State (age adjusted), estimated incident cases, Australia 1995/96

Table 12: Injury intent for burns, estimated incident cases, Australia 1995/96

	Frequency	%
Accident	6233	97
Intentional self harm	92	1
Assault (ie. sexual assault, maltreatment by parent or guardian and other assault)	71	1
Undetermined intent	14	0
Total	6410	100

Report on indicators:

A report on the indicator for burns hospitalisations is in preparation and will not be reported here.

Table 13: Cases having a burn as the 'Principal diagnosis' and an 'External cause' code outside the range covered by the national injury target (ie. E890-899, E924.0), estimated incident cases, Australia 1995/96

Cause group	Number of cases	Percentage
Other and unspecified accidents caused by hot substances or objects, caustic or corrosive material, and steam (E924.8 & E 924.9)	676	33
Accident by caustic and corrosive substance (E924.1)	412	20
Accident caused by electric current (E925)	216	11
Accident caused by explosive material (E923)	198	10
Transport accident (E800-848)	128	6
Other & unspecified environmental & accidental causes (E928)	62	3
Accident caused by explosion of pressure vessel (E921)	60	3
Poisoning (E850-869)	50	2
Accidents by machinery (E919)	40	2
Exposure to radiation (E926)	30	1
Falls (E880-888)	16	1
Other	169	8
Total	2057	100

Data gaps

Based on the discussion presented in this report, there appears to be a need for an improved national data base on burns for use in the development and monitoring of injury policy and programs, for research into the causes and prevention of burns and for service planning, and for other needs. The available mortality and morbidity data cannot service all needs. These data sets have some limitations with respect to the scope and type of the information available. The future redevelopment of the 'National Coronial Information System' may attend to the limitations in the mortality data. Further analysis is required to determine the extent to which hospital morbidity data can be used for monitoring the national health priorities in respect to burns. Attention should focus on the inconsistencies in the recent time series trends of burns hospitalisations across severity reported here. Research into the causes and prevention of burns requires information beyond the type included in the hospital morbidity data, particularly information on mechanisms and factors of injury and more detailed information on the injury event (eg. time, place and activity) and exposure to risk.

A data collection based on cases admitted to Burns Unit hospitals would provide nearly complete national coverage of very severe burns suggesting that it may provide the basis for reliable national monitoring of this group. Whilst cases admitted to Burn Unit hospitals tend to have a higher severity than cases admitted to other hospitals, they are reasonably representative on the basis of age and sex for all except small burns (ie. Less than 10% TBSA), and are probably also reasonably representative in respect to mechanisms and factors of injury. Extension of the routine hospital morbidity data, already collected at these hospitals (covered by the NHDD), to include information required for routine injury surveillance (covered by the NDS-IS) and special burns surveillance, would substantially improve the available information for research into the causes and prevention of burns and for the development of prevention programs.

The opportunities for the establishment of an improved Australian burns database were assessed in consultation with the Burn Units.

Opportunities for establishment of an improved Australian burns database

Level of interest and commitment

The Directors and staff of the Burn Units were generally very supportive of the idea of development of an Australian Burns Research Database (ABRD). However, they were concerned to ensure that the workload was manageable within existing resources.

Feasibility of a common collection

It was considered that the feasibility of an ABRD depended on reaching agreement on a range of factors including:

1. The common data set.
2. The appropriate case selection criteria, which balanced the need for information with the costs and difficulties in collecting information.
3. The routine reports and information services to be provided.
4. Resourcing of the collection (staff and other).
5. The data collection process.
6. The various approval processes. Ethics Committee approval to release identified data to a central processing agency.

1. Data items

The data set proposed for further consideration is presented in Appendix 2. This was determined after a review and discussion of the existing data collections of Burn Units and reference to the National Data Standards for Injury Surveillance (NDS-IS[5]), the National Health Data Dictionary and the International Society of Burn Injuries/WHO Burn Registry[13]. All of the existing Burn Unit data collections would need to be modified or extended to some extent to comply with this data set.

It needs to be considered that all, or most of, the component of the data set that conforms to the NDS-IS would be readily available in those hospitals that have implemented injury surveillance in the Emergency Department.

2. Case selection

A data collection based on all burns greater than or equal to 10% total body surface area would, based on the analyses conducted in this report, seem to offer a reasonably representative series of cases for research purposes and be useful for national monitoring of very severe burns. It would deliver about 500 new incident cases annually (excludes re-admissions) which is an average of less than one case per Unit per week. The authors of the present report considered that a collection of this size could only be maintained within existing resources if the data required was very minimal. It was considered that the best way to keep data collection to a minimum was for an ABRD to interface with the existing hospital morbidity system within each hospital. The routine demographic and clinical data could be collected from the hospital morbidity system without the need to duplicate this at the Burns Unit. The items that would need to be collected at Unit level are detailed in Appendix 2.

3. Routine reports and information services

The proposed routine reports and information services are outlined in Appendix 3. These equate with the reports and services applying to the Australian Spinal Cord Injury Register (ASCIR) managed by the RCIS. This should not be taken to imply that the RCIS would necessarily be providing these services.

4. Resources

External data processing would be required on an on-going basis for some Burn Units and probably for all Units initially. It is envisaged that the Burn Units would be responsible for funding their own data collection. As the data set would provide the basis for research studies, and possibly external grant funding, staff having a view of the potential future uses of the data may readily accept the data collection role. In the experience of the RCIS, based on the Australian Spinal Cord Injury Register, nursing staff or clerical staff are often more reliable at collecting data than Registrars provided that the required input information is readily available. Removing the need to collect clinical information at the Unit level reduces the need for specialist knowledge. The clinical information is added by interfacing the collection with the hospital morbidity database.

5. Data collection process

It is considered that the most practical process for the collection of the required information is a two step process:

1. Minimum data is collected at Unit level and transferred in electronic or hard copy format to a central processing authority having experience with health data systems issues.
2. Each quarter, the patient list (Unit Record Number, name, date of birth and date of admission) is provided back to the Unit in electronic format and referred to the hospital information services branch for down loading of the clinical and other information required from the hospital morbidity database. It should be possible for the information services branch to write a single program to be run each month. The information would be provided to the central processing authority for entry to the ABRD to complete the patient record.

In Units that can develop and maintain their own data system (ie. data collection, data entry, validation and reporting), the complete patient records could be provided to the central processing authority each quarter.

6. Approval processes

There are a number of approval processes required before an ABRD can be established:

1. This report needs to be considered by the Australian and New Zealand Burns Association (ANZBA) as the peak body for burns. In particular, the Board of ANZBA will need to agree to a minimum data set, case selection criteria, and other features outlined above. The next annual meeting of ANZBA is being held in September in Sydney. The President of ANZBA has agreed to place this matter on the agenda.
2. Individual hospital ethics committees must agree to the provision of information to the central processing agency.
3. The data collection process and data flow need to be agreed, particularly with respect to who will collect the information, and the role of the hospital information services branch.

Proposed time frame for the development of an ABRD

If ANZBA endorsed a proposal for an ABRD at its September meeting, it could be expected that hospital ethics committees could have made their decision by the end of 1998. Piloting in at least one Unit would be necessary to test elements of the system (eg. the proposed data flow incorporating hospital admissions data). Only if all Units were able to participate, and were able to demonstrate that the data collection processes and data flow were agreed to, would the RCIS consider what role it might play in such a data system and this would be subject to negotiation with an appropriate authority concerning funding of its involvement and other issues.

Addendum

ANZBA endorsed the development of the uniform national core data collection at its September meeting and a pilot study is being developed (see Appendix 4).

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Appendix 1

List of stakeholders consulted

New South Wales

Mr. P. Kennedy, Burns Unit, Concord Hospital
Mr. H. Martin, President ANZBA, Burns Unit, New Children's Hospital
Mr. J. Vandervord, North Shore Medical Centre
Ms. D. Dickson, Burns Unit, Royal Alexandra Hospital for Children

Victoria

Mr. E.J. Keogh, Burns Unit, Royal Children's Hospital
Mr. R. Judson, Burns Unit, Alfred Hospital
Dr. I. Hastey, Burns Unit, Alfred Hospital
Mr. Cameron Barnes, Head Medical Records

Queensland

Mr. S. Pegg, Burns Unit, Royal Brisbane Hospital
Ms. Pam Dias, Burns Unit, Royal Brisbane Hospital
Ms. S. King, Vice President ANZBA
Ms. M. Ross, Information Management, Qld Health
Ms. C. Thomas, Burns Unit, Royal Children's Hospital

Western Australia

Dr. F. Wood, Burns Unit, Royal Perth Hospital

South Australia

Dr. B. Davey, Burns Unit, Women's and Children's Hospital
Ms. K. Woods, Burns Unit, Women's and Children's Hospital
Ms. N. Parrent, Coding Manager, Women's and Children's Hospital
Ms. S. Kavanah, Burns Unit, Royal Adelaide Hospital

Tasmania

Dr. R. Brodribb, Burns Unit, Royal Hobart Hospital

Appendix 2

Proposed minimum data set for surveillance of burns

Item	Data definition	Source of information	
		Burns Centre	Hospital Morbidity Database
Identifiers			
Establishment identifier	NHDD P1 (derived from name of Burns Centre)		✓
Person identifier	NHDD P2	✓	
Person surname	Text	✓	
Person first name	Text	✓	
Person middle initial	Text	✓	
Demographic			
Sex	NHDD P4	✓	
Date of birth	NHDD P5	✓	
Country of birth	NHDD P6		✓
Aboriginality	NHDD P7		✓
Marital status	NHDD P8		✓
Area of usual residence	NHDD P9		✓
Employment status	NHDD P14		✓
Occupation	NHDD P15		✓
Highest education level attained	Codes to be decided. An option is provided below: 1. Primary 2. Secondary 3. Trade/Tertiary	✓	
Service and administrative			
Compensation status	NHDD P18		✓
Source of compensation	Codes to be decided. An option is provided below: 1. Motor accident compensation 2. Workers compensation 3. Public liability cover 4. Consumer product related civil action 5. Other	✓	
Admission date	NHDD P24	✓	
Discharge date	NHDD P26		✓
Mode of separation	NHDD P31		✓
Clinical & Public health			
Principal diagnosis	NHDD P35 (Provides percent TBSA and body regions. Also useful for assessment of mechanism of injury in combination with 'External cause code')		✓
Additional diagnoses	NHDD P36 (Provides percent TBSA and body regions, as well as co-morbidities and complications. Also useful for assessment of mechanism of injury in combination with 'External cause code')		✓
External cause of injury	NHDD P39 (Provides 'Intent' and, in combination with P35, also provides 'Major mechanism of injury')		✓
Principal procedure	NHDD P37 (Identifies grafting and other procedures)		✓
Additional procedures	NHDD P38 (Identifies grafting and other procedures)		✓
Diagnosis related group	NHDD P41		✓
Narrative description of injury event	NHDD P73	✓	
Place of injury occurrence	NHDD P40 (Equates with NDS-IS-level 2, item	✓	✓

	3A eg. home, school. Could be extended to NDS-IS-level 2, item 3B to identify part of place eg. bathroom. If extended, would need to be collected by BU.		
Address of injury occurrence	Street, suburb and postcode (Provides for mapping of place of injury and comparison with area of residence)	✓	
Activity when injured	NHDD P76		✓
Other items requiring further assessment			
Thermal injury factor	Need to develop short list. An option is provided in the table below. More detail would be provided in the 'Narrative description of injury event'.	✓	
First aid measures taken immediately at scene	Codes to be decided. An option is provided below: 1. None 2. Cool water 3. Ice 4. Other	✓	

Thermal injury factor (draft for discussion)

1 Chemical
11 Acid
12 Alkali
13 Organic

2 Scald
21 Water from:
- 211 Cup/mug
- 212 Teapot
- 213 Kettle/jug
- 214 Saucepan
- 215 Tap
- 216 Basin
- 217 Bath
- 218 Shower

22 Steam
23 Fat/oil
24 Syrup/sugary liquid
25 Molten metal

3 Flame
31 Petrol
32 Kerosene
33 Diesel
34 Methylated spirits
35 Clothes
36 House fire
37 Open fire

4 Contact
41 Car exhaust pipe
42 Hot metal/welding
43 Iron
44 Stove
45 Hooplates
46 Heater
47 Plastic
48 Bitumen/Tar
49 Coals/ashes

5 Electrical
51 DC
52 240V AC
53 415V AC
54 High tension
55 Flash

6 Explosion
61 Gas
62 Petrol
63 Other solvent

7 Radiant heat
71 Sun
72 Heater/lamp
73 Fire place

8 Other
81 Friction
82 Inhalation
83 Radiation

9 Not known

Appendix 3

Proposed reports and information services

Reports

Two types of annual routine reports are envisaged (1) annual report on administration of the ABRD (2) annual statistical report on the incidence of burns admissions generally (from Hospital Morbidity system) and including a detailed profile of severe burns (from the ABRD). These reports are modelled on the reports from the Australian Spinal Cord Injury Register available for perusal on the RCIS web site (http://www.nisu.flinders.edu.au).

Information services

The nature of the information services required would probably equate with those of the RCIS. ANZBA may wish to undertake this service. As already discussed, the involvement of the RCIS is dependent on a number of factors. If the RCIS was involved in the management of the database it could place aggregated data on its web site which includes a data search engine to facilitate user data enquiries. In addition, it could handle ad-hoc data requests from BUs. Charges would probably be required for more detailed and complicated enquiries to offset costs. These would be in accordance with the RCIS charging policy.

Appendix 4

ANZBA endorsement of the Australian Burns Research Database

AUSTRALIAN AND NEW ZEALAND
BURN ASSOCIATION

PO Box 123, Red Hill Qld 4059
38 D'Estrange Terrace, Kelvin Grove Qld 4051
Tel: (07) 3872 2250 Fax: (07) 3856 4727

23 November 1998

Mr Peter O'Connor
Research Centre for Injury Studies
National Injury Surveillance Unit
Flinders University of South Australia
Mark Oliphant Building
Laffer Drive
Bedford Park SA 5042

Dear Peter:

RE: Australian Burns Research Database

At the most recent Board meeting, September 1st, 1998 of the Australian & New Zealand Burn Association Ltd, it was resolved that a working party be formed to establish a trial program for national burns data collection. Elected members of this working party were Dr Michael Muller, Royal Brisbane Hospital, Dr Munderere, RN, Waikato Hospital, New Zealand, and myself. The general consensus was support for uniform national core data collection as an adjunct to existing individual burn unit data collection systems.

At this stage we are looking at implementation of a trial during the months of February and March, 1999, with a small selected number of burn units. As discussed, we need to establish hospital ethics committee approval for the program and we need to finalise the data collection format in order to advance the project as soon as possible.

I look forward to working with you further to establish this trial program.

Yours sincerely,

SANDRA KING
President
Australian & New Zealand Burn Association Ltd

INJURY & RESEARCH STATISTICS

This report presents the findings of an investigation of the needs and opportunities for improved surveillance of burns in Australia. An assessment of available data revealed limitations in fulfilling information needs.

Through a process of national consultation with Burn Units, a model for an improved national data system was determined. The Australian and New Zealand Burns Association decided to proceed to develop the improved data system based on a common minimum data set provided by the AIHW National Injury Surveillance Unit (NISU) of the Flinders University Research Centre for Injury Studies. The database will be managed by the AIHW NISU.

needs and opportunities for improved surveillance of burns