

SPUMS Annual Scientific Meeting 2004

Surf Life Saving Australia

Peter J Fenner

Key words

Drowning, rescue, resuscitation, first aid, history, review article, general interest

Abstract

(Fenner PJ. Surf Life Saving Australia. *SPUMS J.* 2005; 35: 33-43.)

Surf Life Saving Australia (SLSA) is one of the greatest voluntary organisations in the world. Over almost a century, nearly half a million rescues have been performed. Currently some 22,000 volunteers patrol the Australian surf beaches each weekend. In recent years a professional arm was also introduced to SLSA, where lifeguards patrol the beach every day. SLSA members are expert at rescue and resuscitation of drowning victims, with results that are better than any other published figures. This standard is achieved by comprehensive training, annual examination updates, and by the use of some of the best rescue equipment available. To keep surf lifesavers fit for their task, they are encouraged to enter and train for competitive events that are held at all levels of the organisation right to the national Surf Life Saving Championships, the largest annual sporting event in Australia; an event needing major first-aid and medical coverage to reduce injury morbidity.

Introduction

Volunteer members of Surf Life Saving Australia (SLSA) have been patrolling surf beaches in Australia for almost a hundred years. HRH Prince Philip, Patron of Surf Life Saving Australia, has described the organisation as “*one of the greatest humanitarian organisations in the world*”.

There are currently some 22,000 active volunteer surf lifesavers throughout Australia patrolling many popular beaches Australia-wide. These patrol areas are set up in sections of the beach where the surf is as safe as possible, and are delineated by red and yellow patrol flags placed at each end. The public are then encouraged to swim in these protected, patrolled areas, carefully watched by lifesavers to ensure their safety. These volunteers have been singularly successful, with no-one drowning between the flags since SLSA was founded in 1906.

Surf lifesavers must be a minimum of 15 years old, be competent swimmers and have skills in rescue, resuscitation and first aid. This is achieved by a minimum time of 20 hours' intensive training. They then undertake a written and practical examination, to ensure their skills are of sufficiently high standard. If they pass they are awarded their Bronze Medallion, which qualifies them to voluntarily patrol a beach. SLSA is probably the only organisation in the world where 15-year-olds on patrol regularly place their own life at risk, to be able to save others.

The syllabus for the Bronze Medallion includes knowledge of the surf; local council laws for beaches; and first aid to a

basic first-aid-certificate standard with particular emphasis on marine envenomation, as stings (mainly *Physalia sp.* – the ‘Bluebottle’) are the most common requirement for first-aid treatment in surf life saving. The resuscitation training includes both one- and two-person resuscitation, for children and adults, as lifesavers usually operate in a team situation. This standard must then be updated and examined every year. At the age of 16 years, members are encouraged to proceed to advanced resuscitation, when oxygen provision via bag/valve/mask is introduced. Oxygen use and storage is very safe, with no problems or incidents in SLSA use.

Surf lifesavers' skills and success rates in resuscitating people are legendary, with the best published statistics in the world for successful rescues and resuscitation.^{1,2} This high success rate is achieved and maintained by regular skill updates each year, all to the same standard as the original Bronze Medallion exam. This yearly proficiency test must be completed satisfactorily before a surf lifesaver can start the new season on patrol.

The organisation is continually assessing new equipment for its efficiency, and to ensure it is ‘user friendly’. If it passes this stringent testing, it is introduced, making SLSA one of the best-equipped surf-rescue associations in the world.

Surf lifesavers' strength, skill and knowledge of the surf are sharpened by regular competition and training in all grades; from inter-club competition, through state and national championships, and even to international competition, where Australian surf lifesavers have been exceptionally successful over many years.

Origins of surf life saving

In 1902 it was still against the law to enter the ocean during daylight hours in Australia! Then William Gocher, the editor of a local Sydney paper, announced he was going to swim at Manly Beach to challenge this law. There were crowds to see him enter the water and when police failed to charge him, similar action by many local residents forced a change in the law, and people were allowed free access to enter the ocean. Unfortunately, with the usual surf conditions, together with the inexperience of most bathers in this environment, many were caught in rips (see below) or knocked over by waves and drowned. To counter this, groups of volunteers 'patrolled' the beach to watch for those in trouble. From this group of volunteers the Bondi Beach Surf Bathing Association was formed in 1906 and this was the basis for the development of Australian surf life saving clubs and the Surf Life Saving Association of Australia, now known as Surf Life Saving Australia (SLSA).

Surf lifesavers/lifeguards

There is often confusion about the definition or description of lifesavers and lifeguards. In Australia, surf lifesavers are volunteers, who patrol the beaches whenever possible, although usually just the weekends. Surf lifeguards are the professional arm of Surf Life Saving Australia whose occupation is patrolling the beach. They may provide a beach presence all day, up to seven days a week, although volunteer lifesavers often cover or assist in the weekend duties. The presence of some lifeguards may be seasonal, varying with the weather, beach visitations (much higher in school holidays) and the various coastal local councils.

Surf patrols

Most patrols consist of a minimum of three lifesavers, but often there are six, based in the area between the patrol flags. The flags, contrary to popular belief, are placed as far apart as possible, providing an area that the patrolling lifesavers can cover safely, but between any dangers, such as rips or sandbanks.

In surf conditions, particularly with breaking waves, large amounts of water are driven to shore, which must then return out to sea. This 'extra' volume of water usually travels sideways along a beach (a 'side sweep') and at certain points where sweeps meet from both directions, large volumes of water are swiftly carried out to sea. This body of dangerous seagoing water is referred to as a 'rip' (Figure 1). Frequently on either side of the rip is a sandbank just under the surface of the water. Swimmers often find themselves being carried sideways in a sweep, and then rapidly propelled out to sea. A 'rip' is referred to as an 'undertow' in some countries.

A good patrol captain will space his team for maximum efficiency: one lifesaver is usually stationed in an elevated tower, one in the central enclosure set up on the beach,

where equipment such as portable oxygen and first-aid supplies are stationed, and at least one lifesaver is down at the water's edge, equipped with a rescue tube ready for instant rescue. Rescue boards are usually available at specific locations, ready for immediate use. Often this location is at the middle and each end of the patrol area, alongside the flags, so that they are quickly available for use, both inside and outside the flags.

Patrols frequently have a mobile unit roving along the beach to try to keep watch on swimmers outside the flags. This unit may be an inshore rescue boat (IRB or 'rubber duck', Figure 2), a personalised watercraft (PWC, Figure 3), or a four-wheeled bike. All carry life-saving equipment for easy transport to areas outside the patrolled area.

An innovation in the last few years, to extend the efficient scanning of long stretches of beach, or beaches away from the patrolled area, has been the installation of video cameras. These have been placed on top of some of the taller buildings on the Gold Coast, giving them excellent coverage of a large area; they are proving to be very effective, checking for potential or current problems. A trained console operator watches a screen and can direct the cameras in most directions, and even zoom in to areas where more detail may be required. The closest surf lifesavers can then be directed by radio to any area of concern.

Surf rescues

At the end of the 2003–2004 season (May), some 484,000 people had been rescued since Surf Life Saving Australia first started in 1906: an amazing figure. In 2006, now dedicated as the Year of the Lifesaver and the centenary of the SLSA organisation, this figure may be up around the 500,000 mark.

During the 2002–2003 season (September–May), a typical season, there were 9,448 rescues. These rescues are achieved in a number of ways and using various types of equipment and are described in descending count of rescues.

Figure 1
A 'rip' on a surf beach; large volumes of water are swiftly carried out to sea in the central, calmer area



RESCUE TUBE (Figure 4) – 1,957 rescues

The tube is towed behind the rescuer, who wears swim fins to swim faster and to assist with a stronger kick for the rescue. On reaching the victim, the tube is then wrapped around the victim underneath their arms to support them. They can either be towed back to shore, or supported until further help is available. Despite requiring considerable skill, a victim can even be given expired air resuscitation (EAR) in deep water, using the mouth-to-nose method, thus preventing water entering the airway.

IRB (Figure 2) – 1,947 rescues

The craft is quick and highly manoeuvrable, and is currently regarded as the most useful tool for rescues in the surf. Although an IRB is a very efficient and popular craft, many crew injuries also occur from their high speed and manoeuvrability in rough seas. These features are essential for taking advantage of that brief period between wave sets to quickly rescue the victim, pull them into the IRB and then accelerate quickly out of the danger zone before the whole boat, crew and rescued victim are up-ended in the rough surf. This technique needs a lot of practice and can easily lead to crew injury.

Figure 2**An inshore rescue boat (IRB; ‘rubber duck’)****RESCUE BOARD (Figure 5) – 1,844 rescues**

These are large surf boards that are paddled out to rescue the victim, who is then manoeuvred onto the middle of the board. They are long enough for the rescuer to lie on the back of the board to paddle it back to shore.

NO GEAR – 1,626 rescues

Usually the lifesaver wades or swims to the person with no rescue aid. This type of rescue can be dangerous and is not encouraged, unless the rescue pick-up is in shallow water with no swimming necessary.

PWC (Figure 3) – 777 rescues

This craft is often referred to as a ‘jet ski’, although this is, in fact, a registered trademark of just one manufacturer. It is becoming very popular, as it is small, light and highly manoeuvrable, and can be controlled by one person only (ideal for the single professional lifeguard). For rescues it has a small, floating ‘mat’, or tray that is towed behind. The driver approaches the victim and slows, but maintains some momentum, using this to assist as the victim is grasped (usually by the arm) and skilfully scooped, or ‘flipped’ on to the floating mat. They can be brought quickly back to shore and resuscitated, if necessary. Some PWCs carry two people, making the rescue much easier, with the assistant able to perform the rescue and then support the victim on the floating mat. PWCs are becoming very successful and useful in Australia, and are in common use by Hawaiian lifeguards with amazing records of success and safety. They cause far fewer injuries than the IRB and will probably become the main rescue tool in the future.

Figure 3**A personalised watercraft (PWC)**

Figure 4
Rescue tube



JET RESCUE BOAT (JRB)/OFFSHORE RESCUE BOAT (ORB) – 293 rescues

These are larger boats that operate mainly in the ‘blue zone’, away from the breaking surf. Because of their jet propulsion system they can be beached and launched from the beach if necessary.

SURFBOATS – 52 rescues

The surfboat is rowed by four surf lifesavers, with a sweep standing in the rear to manoeuvre it. The surfboat is well

known in competition, but it does have a rescue capacity. Many years ago, before the advent of the faster IRB, it was fitted with a reel, line and belt, situated at the bow should a rescue be necessary.

SURF SKI – 21 rescues

Fibreglass skis, like open, flat kayaks, are specially designed for rescue work, although not in common use.

HELICOPTER – 7 rescues

Surf rescue helicopters do not rescue many people and are mainly used for transport of victims to hospital. They usually fly patrols, searching for or spotting swimmers in difficulty, or in dangerous situations. They can then direct other rescuers into the right area. However, when a rescue is necessary in areas of difficult access, or further out to sea, a specially trained crewman can jump out and secure the victim, who is then winched up into the helicopter and transported to hospital. Helicopters are very expensive to run and depend heavily on sponsorship.

OTHER RESCUES – 924

The surf reel, once the famous symbol of SLSA, has now been phased out as a rescue tool, as it could be so dangerous. Surf lifesavers have actually drowned attempting a rescue when the line was snagged and they were unable to release the mechanism securing them to the belt. However, there have been some remarkable rescues in the past, with beltmen swimming some 800 metres out through huge surf, needing two surf lines tied together (400 m standard line length) where no boat or surf board could get past the break. The beltman has then supported the patient until a larger boat was able to leave a safer path out to sea from a river, or harbour.

History of resuscitation in SLSA (Table 1)

Prior to the 1960s, surf lifesavers used the Eves rocker – a barrel on which the victim is rolled backwards and forwards to try to empty the lungs. Later the Sylvester-Brock and Holger-Nielsen techniques were used until these were all

Figure 5
Rescue board



Table 1
The medical contribution to SLSA

1960 The 1960 International Convention on Life Saving Techniques in Sydney led to the first recommendations on teaching expired air resuscitation (EAR) and cardiopulmonary resuscitation (CPR) in life saving. These were introduced into Australia with the publication of the 1961 *Surf Life Saving Australia (SLSA) training handbook*.

1964 National Medical Advisers, Drs Coppleson, Bennett and Clifton gave further specific advice on EAR and CPR, and discussed the use of apparatus for the supply of oxygen. These recommendations were incorporated into the next training manual.

1970 A National Medical Panel was formed and endorsed, with the Chairman being the National Medical Officer (NMO) for SLSA. Dr Warren Gunner was the inaugural Chairman; he remained in this position until 1993. This first meeting of the National Medical Panel also introduced CPR teaching for all Bronze Medallion holders, 15 years of age and over.

1973–1975 Professor Don Harrison, then Chairman of the World Lifesaving Medical Panel, became the NMO, and was responsible for the introduction of oxygen via the Oxy-Viva™, together with the Advanced Resuscitation Certificate, a brilliant move that still has not reached all other first-aid providers to date. Certified advanced resuscitation techniques were taught and introduced at the same time, with the oxygen supplied either as a supplement for a breathing victim, or through the Royal Melbourne (RM) Head in the Oxy-Viva™ for the non-breathing victim. Masks were introduced for all surf lifesavers, who were taught to use them for all resuscitation cases.

1975–1982 Professor Tess Brophy (later Crammond) was appointed as the NMO.

1982–1996 Dr Ian Mackie was appointed as the NMO.

1985 The new Australian Standard required manufacturers to stop production of the RM Head. After some research Ian Mackie initiated the adoption of the bag-valve-mask set up, combined with the Air-Viva™ resuscitator. The potentially dangerous (in inexperienced hands) RM Head was abandoned.

1988 The National Medical Panel meeting was held on the Gold Coast in conjunction with the World Lifesaving Congress and Championships with a major recommendation for surf lifesavers to be offered immunisation against Hepatitis B.

1991 Ian Mackie introduced the rigid, adjustable cervical brace for the management of suspected neck injuries. Release of the Marine Stinger Guide (SLSA Innovation Award for the author, Peter Fenner).

1992 Peter Fenner (then Surf Life Saving Queensland First Aid Officer) obtains special permission from the Queensland Department of Health for bronchodilators to be introduced and kept in the first-aid room for acute asthma treatment; other States quickly followed.

1995 Semi-automated defibrillators (SAEDs) first trialled in surf life saving: a world first and another SLSA Innovation Award for the author, Peter Fenner.

1996–2004 Dr Peter Fenner appointed as the NMO.

1997 The first defibrillation by a volunteer surf lifesaver was successfully performed on the beach on the third shock, with the patient still alive and well today.¹

1998 Introduction of defibrillators to SLSA (with third SLSA Innovation Award for the author).

2002 Oropharyngeal airways were introduced to Advanced Resuscitation Certificate holders, together with a new handbook on training.

2003 Introduction of the spinal board (with concomitant use of the spinal collar). Fenner, with the assistance of a talented team of experts, including Dr John Lennard, Surf Life Saving New South Wales Medical Officer, developed and adapted techniques to secure standing victims, who walk out of the surf complaining of neck pain, and, of course, for the prone victim who may or may not be conscious and/or breathing. Their introduction was based on the experience of the USA lifeguards, who had used spinal boards for a number of years.

phased out in 1961 and cardiopulmonary resuscitation with mouth-to-mouth and external cardiac compression was introduced.

SLSA members are competent resuscitators, as each year they are fully re-examined in their resuscitation, or advanced resuscitation, technique and timing. Accurate resuscitation statistics are available back to at least 1973. The results were first published in 1998, and updated in subsequent publications.^{1,2,4-6}

Drowning and resuscitation

The extent of the drowning problem on Australian surf beaches is illustrated by the age-related data for 1992 to 1997, during which time there were 162 deaths (Figure 6). The distribution of drownings over the season follows the temperature trend, with the highest incidence of drownings corresponding with the summer Christmas school holidays, even though the majority of victims are not children. Many families take their annual vacation at this time, to take advantage of clement weather, as well as the traditional school holiday period.

An almost constant 80% of the total rescues performed by surf lifesavers are on males, with the highest-risk age group being those aged 18–30 (the ‘daring’ ones), paralleling the fatality data (Figure 6). An assessment of a beach and the patrol area shows that families stay mainly inside the flags, whereas those furthest from the patrol area are usually young males (personal observation and research).

Because of the large volume and speed of the water moving out to sea, the area of a rip is often noticeably calmer than the breaking surf waves on either side of it. Often, inexperienced people wanting to swim may spot an area in rough surf where it is much smoother and where waves do not break as hard, making it look more appealing for

Table 2
Success rates of resuscitation with increasing distance from patrolled areas (n = 154)

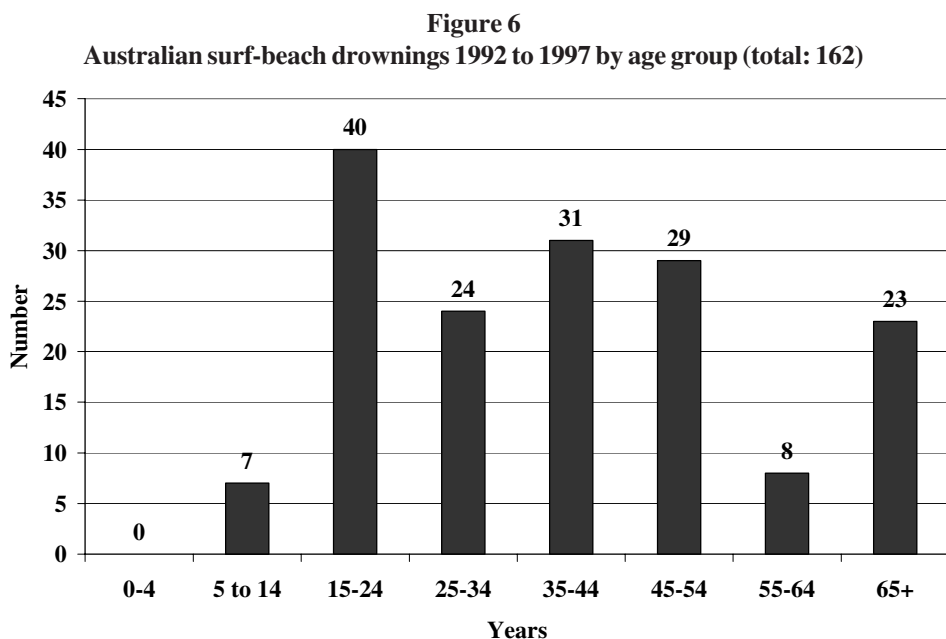
Distance from clubhouse (m)	<200	200 to 399	400 to 799	800 to 999	>1000
Success rates	31/39	38/51	13/22	5/13	14/29
Percentage	79.5	74.5	59.1	38.5	48.3

swimming. As well as being swept sideways by sweep currents, others enter directly into the rip area as it looks so calm and safe compared with the surrounding surf and are carried rapidly several hundred metres out to sea.

Rips are the greatest single cause of rescues, resuscitations and drownings, up to 43% of drowning deaths occurring in these rapid outward-flowing sea currents. The majority of victims (62.5%) drown within a kilometre of a life-saving service, indicating that these people chose to bathe adjacent to rather than within the patrolled area.

Statistical analysis of victims for whom the place of residence was available, showed that in 2002–2003, 19.5% were international tourists, 63.4% were Australian residents who lived more than 50 kilometres inland, while 17% lived within 10 kilometres of where they drowned. Those who live inland and international tourists have usually never encountered surf conditions, and up to 15% of international tourists who drown in the surf do so within 24 hours of reaching Australia. After a long struggle to introduce them, teaching videos are now shown on some incoming international commercial flights, advising tourists to swim in patrolled areas, and of the danger of rips.

In the patrolled area up to 92.5% of victims are successfully



resuscitated. The success rate falls off exponentially with distance from the patrolled area: within 200 metres there is an 80% success rate, at 400 metres 75%, and from 400 to 800 metres a 59% success rate (Table 2). Logistic regression analysis of distance against resuscitation outcome shows that the odds of a successful resuscitation were 79% lower for resuscitations taking place 800 m or more from the club house than for resuscitations that took place within 200 m of the club house ($P = 0.002$).

Almost 55% of victims vomit, largely because they swallow seawater, and resuscitation success is reduced when vomiting is present.² In 40% of cases achieving a good airway causes difficulty, although 76% of the cases have no material present in the airway. It was this difficulty that encouraged the author to introduce oropharyngeal airways into SLSA training in 2002. Despite the difficulties of reaching and retrieving victims, 60% of them are reached within three minutes. In 25% the time to the first breath is between just one and three minutes, whilst 50% received their first breath of EAR within five to 10 minutes.

In the statistics up to 1999, facemasks were rarely used, as they had not been promoted for safety in resuscitation. However, in current teaching of resuscitation in SLSA, the emphasis has been taken off ‘mouth-to-mouth’ resuscitation and placed on ‘mouth-to-mask’ resuscitation. A mask and gloves are now kept in ‘bum bags’ that surf lifesavers wear on their waist for quick and easy access, whilst on patrol.

Semi-automated defibrillators (SAEDs) were introduced into surf life saving in 1995 by the author. SAEDs had been used successfully thirteen times up until the end of the 2003 season. In nine cases surf lifesavers were able to defibrillate the victim, whilst in four cases the SLSA SAED was used by

ambulance officers when they arrived at the scene. There were nine survivals to hospital, of whom seven were discharged alive. No follow-up details are available, but it is understood these survivors are fit and well. Current information on defibrillation proves it should be completed within eight minutes, as a successful outcome is less likely after that. However, two cases have taken significantly longer: in Noosa 27 minutes, and a remote area of Victoria 40 minutes, before actual defibrillation; both showing the standard of resuscitation that surf lifesavers can achieve in maintaining efficient CPR.

Rescues

Not everyone who has been rescued will need resuscitating, and so rescues and resuscitations have been compared separately. By 1997, there was a much higher ratio of rescued victims who did not need resuscitating. This is partly due to the faster IRBs, and also to the greater emphasis on new skills such as scanning; the skills needed in watching the beach and surf for people who may be in trouble, or who may be placing themselves in a risky situation if not prevented.⁷ This trend in a reduced proportion of those needing resuscitation compared with rescue continues.

The proportion of all rescues compared with all resuscitations varies between age groups (Figure 7). The 0–15 age group represented 22% of the total rescues but just 2% of the resuscitations. The 60+ age group made up 5.3% of the rescues and 11.9% of the resuscitations.

The older groups contain a higher percentage of those needing resuscitation – increasing statistically in a linear fashion ($P < 0.00001$) – so over 91% of the over 60s need resuscitation (Figure 8).

Figure 7
The age distribution of all rescues and of all resuscitations expressed as percentages of the totals



Table 3
Level of supervision observed during a single day on a popular Gold Coast beach by an experienced surf lifesaver;
54.6% of 119 children had poor or inadequate supervision

Supervision level	Number	Percentage
1a. Adult with child with active involvement	20	16.8
1b. Adult with child no/minimal active involvement	10	8.4
2a. Adult close to child (in water) with active involvement	16	13.5
2b. Adult close to child (in water) no/minimal active involvement	2	1.7
3a. Adult at water's edge, close supervision and/or involvement	18	15.1
3b. Adult at water's edge, no/minimal supervision and/or involvement	11	9.2
4a. Adult distant, observation/supervision maintained	22	18.5
4b. Adult distant, no/minimal observation maintained	13	10.9
5a. Adult presence not able to be identified	7	5.9
5b. Adult definitely not present	0	
Total	119	
Supervised (1a, 2a, 3a)		45.4
Low-level supervision (1b, 2b, 4a)		28.6
Very-low-level (inadequate) supervision (3b, 4b)		20.1
No supervision (5a, 5b)		5.9

Alcohol was present in 10.4% of rescues and 19.7% of the resuscitation cases; drugs were noted to be present in 2.2% of the rescues, and 5.0% of resuscitation cases, this difference being statistically significant ($P < 0.001$).¹

Children on surf beaches

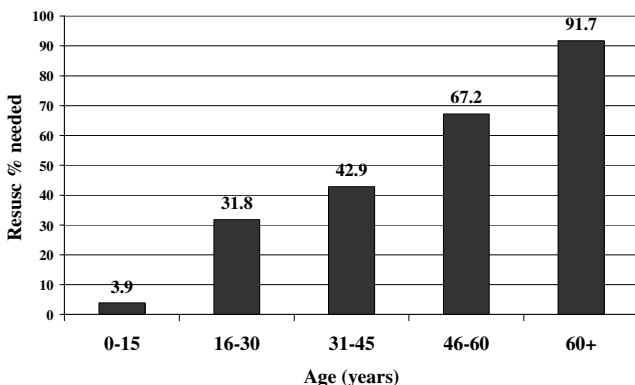
Unlike general statistics for drowning, infants do not figure in surf drowning statistics. However, a small but sad proportion of deaths on surf beaches occur in children less than 10 years old; mainly due to poor parental supervision. Some of these deaths occur when a youngster is in the charge of minors at the time of the incident, some even when the young victim is less than a kilometre from a patrolled area.

Parents need to educate their children to swim only between the red and yellow patrol flags. Also they need to be present and watchful of their children, even when they are swimming in a patrolled area. Children drown silently and with little apparent motion other than a side flailing of their arms, almost as if they are playing in the water. The only obvious visual effect is that the head is extended and they recurrently bob under the water, briefly inhaling and exhaling in the surface interval, with no time to call for help, until within 20 to 60 seconds they finally remain submerged.⁸

A visual survey on children assessed as 10 years old or younger, arranged by the author, was conducted by Peter Dawes over several hours on a busy Gold Coast beach. Numbers were small, and although further trials were planned they were never completed but really need to be. This small survey gives an idea of the inadequate supervision of children in a dangerous beach situation (Table 3). The groups in the table are self-explanatory and show that only 45.4% of children are suitably supervised at the beach, 28.6% are poorly supervised and 26.1% had negligible or no supervision. This gives a staggering figure that 54.6% of the children on this surf beach were in danger of wandering into the surf and quickly drowning unless the surf lifesavers were able to spot them almost immediately; a very difficult task on a beach with thousands of people and a patrolled area where many hundreds of people may be gathered.

Figure 8

Rescues needing resuscitation according to age group (%); the need for resuscitation increases considerably with increasing age



Web-based reporting of SLSA statistics

Before the author resigned as the National Medical Officer in late 2004, sponsorship was arranged with a private trust

to set up a website database for surf-orientated statistics. It enables data to be entered directly by any surf-club member in Australia (but requires specific approval from at least one appointed person in each club). Reported drowning statistics can be inaccurate, as surf lifesavers patrol the beaches only at set times and days, and so further data are now retrieved from the national coroner information system through the Monash University National Centre for Coronial Information. This ensures that SLSA surf-drowning fatality statistics are accurate, and that no deaths by surf drowning occurring outside normal patrol hours are missed. As well as the data on drownings, rescue and resuscitation cases, marine stings and even injuries are to be included.

These data are being integrated with physical current data in a risk-based analysis of all the beaches in Australia for physical and geographical risks.⁸ Working with SLSA, Professor Andy Short of the University of New South Wales has now personally visited 6,895 of some 9,000 beaches around Australia with approximately 30,000 kilometres of coast. By 2004 data had been published on three States (Queensland, New South Wales and Victoria) with the other States' data following shortly. The database will be further extended, combining physical and geographical risks with surf drownings, rescues and resuscitation cases. Data on wave height from the wave buoys anchored off the coast of Australia will then be added and, hopefully, wind speed and direction from weather balloons and other data sources. Injuries and marine stings may be added as funding and means permit.

The purpose of this new database is not only to provide good risk analysis of a beach to cover all these entities, but also, in the future, to be able to predict the safety of various beaches in various wind and weather conditions. This will enable surf life saving clubs to best deploy their patrol members, either moving them to other beaches *in toto*, or, if possible, splitting them to provide sufficient patrol members for a number of safer, nearby beaches. This would be an excellent resource tool.

Research on scanning techniques for observing an area, and the largest area safe to monitor, was implemented in 1998, after single lifeguards observing a large number of patrons spread over a wide area expressed concerns. Despite input from most of the aquatic safety organisations around the world, it was discovered that no organisation's technique had any scientific, evidence-based content. Research into the existing literature and ideas was conducted, resulting in the publication of the first scientific article on the techniques of scanning.⁷ There had been a previous excellent study of the speed and manner in which people drown, all captured on video by Pia.⁹ This provided some excellent information on which to base calculations for the scanning techniques that were to be taught to SLSA members.

Shark kits

Professor Tess Crammond (née Brophy) introduced 'shark

Figure 9
Surfboat competitors at the Australian Surf Life Saving Championships



kits' to surf life saving clubs in the early 1980s, after a number of shark attacks on the Queensland coast. They contained instruments and dressings that could be used for injuries from a shark attack, or other severe lacerations, e.g., from propellers. Doctors also used them for road traffic accidents if they occurred close to surf life saving clubs. Crammond arranged for Queensland hospitals to replace sterile dressings, intravenous fluids and autoclave the instruments annually. However, this cost grew so great the service had to be ceased, and the kits were removed from the great majority of surf clubs in about 1998.

Australian Surf Life Saving Championships

To keep surf lifesavers fit for their patrols and possible rescues, they are encouraged to train, with their interest retained by regular competition. Surf carnivals are held throughout the season, usually starting in late September. Local competitions lead to state championships and, at the end of the season, the Australian Surf Life Saving Championships are held.

Figure 10
Belt race competitors at the Australian Surf Life Saving Championships



There are:

- six days of competitive events, from heats to finals
- more than 7,000 competitors, of whom some 750 are 'Masters' (30–80+ years)
- 450 officials to run and judge all the events
- 60,000 or so spectators, especially on the Saturday and Sunday when the major finals events take place
- over 100 VIPs in the grandstand on the Saturday and about 300 on the Sunday
- 90–100 TV crew for filming all the events for national TV
- 28 IRBs to assist in placing buoys and maintaining their correct position and distance; to serve as rescue craft for any competitor needing assistance; and, often, for a judge to sit in to assist in placing and identifying competitors
- three jet rescue boats for water safety (and cameras)
- six PWCs for lifesavers and water safety and three or four on which a cameraman sits as passenger for close-up water shots.

On average about 200 or more surf clubs out of the possible 356 clubs all round Australia send competitors. The Australian Surf Life Saving Championships are the largest annual event in Australia. The largest overall is the Olympics, followed by the Commonwealth Games and the Australian Surf Life Saving Championships is the third largest in the world.

When the whole carnival is under way, it occupies some 1.6 kilometres of beach; the venue for the past 10 years has been Broadbeach on the Gold Coast. The events are spectacular with very competent and skilled competitors, making for impressive viewing. However, with rough surf often present there are injuries, and consequently a good contingent of medical and first-aid personnel are needed.

FIRST-AID FACILITIES

The first-aid facilities consist of three large, demountable buildings or cabins, with a central covered-in area. The medical officer, the safety coordinator and the nursing sister are in the central cabin. This is a busy area where many treatments take place. Equipment includes two emergency beds, defibrillators, electrocardiograph, pulse oximeter, sphygmomanometers, full resuscitation gear with oxygen, drugs and suture packs, and most of the materials needed in a busy general-practice centre or even an emergency department! The huge quantities of first-aid supplies are usually totally depleted by the end of the event.

In the second cabin are another three beds and four chairs for treating injuries, and the third cabin houses the physiotherapist, who is kept very busy at all times through the carnival. The physiotherapy area is equipped to usual practice standards. A covered area in front of these cabins is used for those awaiting treatment, and those undergoing simple treatments, such as the application of ice for sprains and strains.

A four-wheel-drive transport vehicle is essential and its cabin is long enough to carry a stretcher and resuscitation gear. In addition, at least one four-wheel-drive motorbike can very quickly deliver a first responder and a small amount of essential equipment to any area where it may be needed.

The safety coordinator also has a driver and crew in another well-equipped four-wheel-drive truck and his own four-wheel-drive bike. There are at least two first aiders at the first-aid base, and two first aiders manning each of seven first-aid treatment tents on the beach. For immediate advice, the first-aid teams are equipped with radios with their own frequency.

Figure 11
Shoulder injury sustained during the 'flags' event



A high percentage of injuries occur in the surfboat events, especially in the younger crews and female boat crews (Figure 9). Many crews now wear helmets: several years back a 17-year-old died after a surfboat collision, when he was thrown out of the boat, suffered a head injury and unfortunately drowned. Injuries in the surfboat arena are much higher with heavy surf conditions, with some spectacular 'wipe-outs' seen.

The main injuries in all areas are sprains and strains, mainly amongst the competitors, but also amongst the many officials, often occurring when they need to rush over loose sand to check finish positions, when their muscles are not warmed up. Minor fractures are common, particularly in the rough surf, but they are rarely serious, with the worst having been a compound fractured femur a few years ago.

Dislocations are also common, with a high percentage being dislocated shoulders in the 'flags' arena (Figure 11). In this event, competitors jump up from the prone position, facing away from the finish line, run up the beach jostling for position before they all dive to retrieve 'flags' – 30 cm lengths of rubber hose – pushed vertically into the sand, in order to remain in the competition. Competitors landing awkwardly, especially with another competitor falling on them, are common victims of fractures and dislocations.

In 2002, 42 competitors and 11 spectators required sutures and even officials are not immune from cuts from broken glass, or lacerations from tripping over tent pegs. Head injuries occur but fortunately they are not usually serious, with simple concussion or cuts needing suturing. Needless to say in such a large gathering where there are many older officials and spectators, even Masters competitors, there will be heart problems and a fair smattering of most medical conditions over the six days. Injuries occur in approximately 5.5% of officials, and although many spectators are treated, because there are so many of them, the percentage is actually quite small. Even with 7,000 competitors the percentage treated is small.

Conclusion

The work of Australian surf lifesavers has been eloquently expressed:

When I think of all the good things about this country, when I think of what it is about being Australian that makes me feel proud, one of the things that come to mind is our surf lifesaver...

Young Australians who patrol for absolutely nothing other than a sense of pride and the knowledge that they are out there saving lives, keeping our beaches safe for you and me and most importantly for our kids.

Mike Gibson, *Sydney Daily Telegraph*, April 1996.

References

- 1 Fenner PJ, Harrison SL, Williamson JA, Williamson BD. Success of surf lifesaving resuscitations in Queensland 1973-1992. *Med J Aust.* 1995; 163: 580-3.
- 2 Manolios N, Mackie I. Drowning and near-drowning on Australian beaches patrolled by life-savers: a 10-year study, 1973-1983. *Med J Aust.* 1988; 148: 165-7, 170-1.
- 3 Fenner PJ, Leahy S. Successful defibrillation on a beach by volunteer surf lifesavers. *Med J Aust.* 1998; 168: 169.
- 4 Fenner PJ, Leahy S. Analysis of rescue and resuscitation cases in surf life saving 1990-98. *Resuscitation.* 1999; 40: 119.
- 5 Leahy SJ, Fenner PJ, Harrison SL, Tebb NW. Coastal drownings in Australia 1997/98. *Resuscitation.* 1999; 40: 121.
- 6 Fenner PJ. Patterns of drowning in Australia, 1992-1997. *Med J Aust.* 2000; 172: 349.
- 7 Fenner P, Leahy S, Buhk A, Dawes P. Prevention of drowning: visual scanning and attention span in Lifeguards. *J Occupational Health and Safety - Aust NZ.* 1999; 15: 61-6.
- 8 Short A D. Beach hazards and safety. In: Short A D, editor. *Beach and shoreface morphodynamics.* Chichester: John Wiley and Sons; 1999. p. 293-304.
- 9 Pia F. *On drowning.* New York: Water Safety Films Inc.; 1979.

This paper is based on a presentation given at the SPUMS ASM in Noumea 2004.

Surf Life Saving Australia and Harvie Allison gave kind permission to reproduce their photographs.

Peter J Fenner AM, MD(London), MB, BS, DRCOG, FRCGP, FACTM, is an Associate Professor, James Cook University School of Medicine, Townsville, and a General Practitioner, North Mackay, Queensland.

He is an advisor in marine envenomation to the World Health Organisation and International Life Saving, and was a guest speaker at the SPUMS ASM 2004.

Address for correspondence:

PO Box 3080, North Mackay,
Queensland 4740,
Australia.

Phone: +61-(0)7-4957-7800

Fax: +61-(0)7-4937-7824

E-mail: <pjf@occupationalhealthmackay.com.au>