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Understanding Contributing Factors to Child Drownings in Public Pools in Australia: a Review of National Coronial Records

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Cover Page Footnote

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Abstract

This study examined the incidence and circumstances associated with child drowning in public pools in Australia; and identified the frequency and nature of coroners' recommendations. Retrospective case-series analysis of child (aged 0-10 years) unintentional drowning deaths in public pools were conducted based on Coronial data. A total of 12 child drownings were identified. A lack of supervision was recognized as the key contributing factor in 92% of cases, with the caregiver responsible for multiple children (83%); older children supervising younger children (17%); and a busy pool environment (25%) consistently linked with in-adequate supervision. To address drownings in public pools it is essential that coroner recommendations reach 1) aquatic centres so they can improve their practices; and 2) aquatic stakeholders so that strategies can be developed. Strategies that highlight techniques to assist caregivers responsible for multiple children and how best to provide supervision in a busy pool environment should be a focus.

Keywords: Fatal/non-fatal drowning, lifeguarding, lifesaving, parent child aquatics, supervision

Background

For children and young people, drowning is among the leading causes of death worldwide, with males at greater risk than females and children under the age of five years disproportionately at risk (World Health Organization, 2014). In Australia, 30 children (the majority male) aged between 0-14 years drowned between 1st July 2013 and 30 June 2014 (Royal Life Saving Society Australia [RLSSA], 2014). Although a large portion of drownings in this age group occurred at unpatrolled locations including backyard swimming pools and lakes, dams, and/or lagoons, drowning deaths also occurred in swimming locations that were patrolled by a lifeguard (RLSSA, 2014). In Australia over the past decade, 80 people drowned at public swimming pools and of these drownings, 25% were under the age of five years (Scarr, Chellew, & Franklin, 2007). This pattern is consistent with other developed countries such as the United States where, although the majority of drowning deaths in middle childhood (ages 5 through to 11 years) occurred in unpatrolled settings, about a dozen deaths were recorded annually at lifeguarded swimming locations (Schwebel, Simpson, & Lindsay, 2007).

The role of a lifeguard has changed immensely over the past 15 years. The early lifeguard was seen as a lifesaver, a person who had been taught the skills of how to react to an emergency and rescue people who were drowning (Lanagan-Leitzel, 2012). The contemporary role now requires a multitude of skills, including the primary function of drowning prevention, but the lifeguard must also be prepared to rescue and provide immediate emergency care should an incident occur (RLSSA, 2007). Accordingly, lifeguards need to master a variety of skills to provide constant surveillance of their designated zone of coverage. These skills include scanning, recognition of people in difficulty, communication, and public relations and education (RLSSA, 2007). It has been noted, however, that lifeguard effectiveness decreases in the presence of other lifeguards, during busy conditions, and late in the day (Harrell, 2001; 2006). It is unclear whether the roles, responsibilities and effectiveness of a lifeguard are clear and interpreted correctly by caregivers/parents of young children.

Studies in public pools have identified that the frequency of child risk-taking is alarmingly high, with some caregivers unlikely to intervene when children were engaged in high risk activities (Schwebel et al., 2007). A recent study comparing supervision in pools and playgrounds found that a significantly greater number of children were unsupervised in pools than in playground settings (Petrass & Blitvich, 2012). The reason for this pattern is unclear,

especially because risk of child drowning remains a serious threat even in public swimming areas that are patrolled. Similar patterns are evident in other patrolled aquatic settings such as beaches where in one study, 24% of children were not considered to be adequately supervised in the water as parents lay on the beach sunbathing, talked to others, or were using their mobile phone (Moran, 2010). It has been noted that lifeguards are not supposed to act as babysitters (Scarr et al., 2007). Whilst there are several injury prevention approaches that contribute to the prevention of pediatric drowning including Engineering, Education and Enforcement (the three Es of injury prevention), adult supervision is one of the most effective means to prevent unintentional child injury in many domains such as the home (Morrongiello, Ondejko, & Littlejohn, 2004), playgrounds (Schwebel, 2006), and pedestrian settings (Wills et al., 1997).

To prevent drowning deaths in patrolled aquatic settings, specifically public pools, where typically a lifeguard is present, a much greater understanding of the nature and circumstances associated with these incidents is required. Therefore, this study aimed to 1) investigate the incidence and circumstances associated with child (aged 0-10 years) drowning in public pool settings in Australia; 2) identify the frequency of coroners' recommendations and 3) scrutinize the type of recommendations in line with the three Es (Engineering; Enforcement; and Education) of injury prevention.

Method

To identify child drowning deaths in Australian public pools with a lifeguard present, all cases included on the National Coronial Information System (NCIS) database from all nine jurisdictions within Australia were searched. This system provides information from source material such as coronial findings, toxicology reports, autopsy reports, and police report of death. Although it is acknowledged that the consistency and quality of these documents may vary both within and between jurisdictions, this system provides detailed information, particularly coronial findings and police narratives which make it possible to determine common risk factors for child drowning in public pools.

When searching the NCIS database, the injury mechanism "Threat to Breathing, Drowning/Near Drowning" was selected to narrow down cases to drowning, and then the database was interrogated using the coroners screen search function, which allowed keyword searching of NCIS text documents (i.e. coronial findings and police records). This keyword search was conducted using the terms "public swimming pool" or "public pool" or "wave pool" or "recreational pool" or "toddler pool" or "council swimming pool" and "drown" or "near drowning" or "immersion." The drowning terms were subsequently combined with "aquatic facility" or "aquatic complex." Words derived from applicable terms (e.g., drown, drowned, drowning) were also incorporated. As this search was very specific and identified a limited number of cases, "swimming pool" and "pool" were searched and then used in conjunction with "drown" or "drowning" or "near drowning" to increase the likelihood of obtaining all relevant cases.

All potentially relevant case documents were obtained and reviewed for appropriateness against the following criteria: the incident occurred in a public pool between July 2000 and June 2012 and the case was closed before 30 June 2012; the injury mechanism was drowning; and the intent at case completion was "unintentional." Cases were also restricted to include children aged 0-10 years in order to remain consistent with the Australian publication, *Guidelines for Safe Pool Operation* (RLSSA, 2001) which state that children under 10 years of age must be actively supervised by a person 16 years or older.

Analysis

To understand the circumstances associated with cases that met the inclusion criteria, a structured content analysis of text documents was conducted. Data analysis methods were descriptive, establishing common themes across cases. Preventative comments or formal recommendations were extracted and reviewed independently of the actual drowning cases. Recommendations were examined in relation to the "Three Es" of injury prevention: Engineering of the environment including design of pools or modification to the aquatic setting; Enforcement of pool and/or supervision legislation and policies; and Education. Recommendations were subsequently compared with the Australian Water Safety Strategy (Australian Water Safety Council, 2012) to examine the consistency of recommendations with nationally-identified drowning prevention objectives.

Ethics

Ethics approval for the research project was obtained from the Human Research Ethics Committee (ethics approval B12-116) and the Victorian Department of Justice (ethics approval CF/12/22765).

Results

Overall, 12 public pool drowning deaths of children aged 0 to 10 years were identified (Table 1). The mean age for these fatalities was 5.2 ± SD 2.14 years, (range 2 to 8 years) and the majority of victims were male (67%). With the exception of two drowning deaths, incidents occurred in spring (33%) or summer (50%) and the drowning incidents commonly occurred when the child was at the facility with family. The other incidents (17%) occurred on school excursions.

Table 1 - Details associated with the drowning incidents, classified according to child age.

Case Number	State	Age Group	Gender	Pool context	Circumstances
3	VIC	0-2 years	Female	Incident occurred in learn to swim pool (depth range 40-60cm). The setting also contained a 25 m pool and a toddler pool.	• Supervisor responsible for two children; • Children left unattended as supervisor went to bathrooms; assumed other patrons would watch them.
8	ACT	0-2 years	Male	Incident occurred in leisure pool. The setting also contained a 50m pool, 25m pool; and a spa.	• Supervisor responsible for four children; • Supervisor following closely a child, whom she believed to be her own, but then noticed their child was rescued. • Lifeguard indicated that there were people everywhere so it was difficult to see what was going on and to watch everybody; • Seven qualified lifeguards on duty.
1	VIC	3-4 years	Male	Incident occurred in deep end of main	• Supervisor responsible for seven children;

				pool. The setting contained a main pool, wading pool and spa.	• Other patrons noted that supervisor appeared asleep at different times while children played in pool.
4	QLD	3-4 years	Male	Incident occurred in main pool (depth range 1.2m at shallow end to 1.5m deep end). The setting also contained learn to swim pool and a toddler pool.	• Sibling and friend (aged 14 & 15 years) responsible for supervision of three children; • Supervisors assisted one child getting changed in bathrooms, and assumed other two would be ok; • Pool operating in low patronage mode.
9	NT	3-4 years	Male	Incident occurred in main pool. The setting also contained a man-made lake.	• Supervisor responsible for three children; attended setting with four other adult friends and seven other children; • Even though children were young, adults sat in shaded area outside of main pool; • All lifeguards who had noticed the children were concerned about a lack of supervision; • At least five qualified lifeguards on duty; two at main pool.
2	QLD	5-6 years	Male	Incident occurred in deep section of main pool. The setting contained a main pool (1.87m deep), wading pool (calf deep) and spa.	• Sibling and friend (aged 14 & 16 years) responsible for supervision of two children; • Child left unattended as one supervisor left and the other went to get changed.
10	WA	5-6 years	Male	Incident occurred in leisure pool. No other details of the setting provided.	• Supervisor responsible for one child; • Supervisor found it difficult to see due to busy pool environment and glare on the water.
12	QLD	5-6 years	Male	Incident occurred in deep end of main pool. The setting also contained a wading pool.	• Two supervisors responsible for five children; • Supervisors both left pool area for different reasons and did not notice child was absent from group for 17 minutes.

5	QLD	5-6 years	Female	Incident occurred in main pool (depth range 1.2m at shallow end to 1.5m deep end). The setting also contained learn to swim pool and a toddler pool.	• Supervisor responsible for one child; • Supervisor getting changed in cubicle; noticed child moved and could not see them, but was not concerned (as was a short amount of time); child retuned to pool.
6	QLD	5-6 years	Male	Incident occurred in main pool (50m). The setting also contained a 25m pool; a leisure pool and a wading pool.	• Supervisor responsible for two children; • Supervisor was speaking to one child and when she returned attention to pool, other child not able to be seen.
11	NSW	7-8 years	Female	Incident occurred in 50m pool. The setting also contained a wading pool and learn to swim pool.	• School excursion, 19 teachers responsible for ~200 students; • Children placed in two groups (swimmers and non-swimmers) according to answer on permission note. No assessment verification and thus false or misleading information presented which resulted in child being placed in swimmers group. • Three qualified lifeguards on duty.
7	WA	9-10 years	Male	Incident occurred in diving pool (3.8m deep). The setting also contained a wave pool, a 25m and 50m pool; and a hydrotherapy pool.	• School excursion, two teachers and four additional supervisors responsible for 54 students; • Supervisors experienced difficulty in adequately supervising all students in various pools; • Five qualified lifeguards on duty; reported being away from diving pool for 1 minute.

A lack of supervision was identified during the coronial investigation as the key contributing factor in almost all (92%) of these child drownings, although explicit identification of this risk factor varied. A lack of parental supervision was only unequivocally identified as a contributing factor in one quarter of cases (25%). For example, two textual statements included "lifeguards reported that they had noticed the children on the day and were concerned about a lack of parental supervision;" or "caregiver unjustifiably assumed that someone else would supervise children." Content analysis of the text documents identified that supervision was a contributing factor in a further 67% of cases. For example, text reported "child absence from family gathering was not noticed for some time - 17 minutes," and "patron in the pool

noticed the child in deep water, unconscious." Supervision is multifaceted and other factors that were consistently associated with the notion of supervision and drowning incidents in public pools included the caregiver being responsible for multiple children (83%); the caregiver leaving the younger children under the supervision of older children (17%); and a busy pool environment (25%) with overcrowding such that lifeguards reported that people were everywhere, making it difficult to keep an eye on everybody and what was going on (Table 1).

Despite each of the identified cases of drowning deaths having coroners' findings attached, less than half (41.67%) included coroner's recommendations. The number of recommendations associated with each case varied (range = 1–8, median = 3, IQR = 6), and with the exception of one engineering intervention (the Australian Standards for the railing on a disability ramp in a public pool should be amended to require vertical bars to prevent a person slipping under the rail into deep water), they all related to enforcement and education aspects of the "Three E's" of injury prevention (Table 2). Analysis of the enforcement and education recommendations indicated that recommendations were not documented relative to child age, despite the considerable differences in suitable supervision at an aquatic environment for a child aged 0-2 years compared to a child age 9-10 years. Recommendations were typically aligned with focus areas in the Australian Water Safety Strategy and linked to the Guidelines for Safe Pool Operation.

Table 2 - Enforcement and education recommendations identified in coroner drowning reports

ENFORCEMENT	• That all primary school students participating in unstructured swimming activities or fun days, after being assessed as to whether they are deemed to be swimmers or non-swimmers, be required to wear an appropriate coloured wrist band thereby identifying students who are either swimmers or non-swimmers. • Public pools be audited by RLSSA and implement any recommendations • Minimum safety standards at public pools should be made enforceable, and the RLSSA guidelines would appear to be a good starting point. This should include: o Requirement to regularly make a head count of people in the water and also note the proportion of small children or other people who might be considered not to be likely to be strong swimmers. o Consideration to implementing the policy that the ratio of lifeguards to primary school students, during unstructured swimming activities be 1 lifeguard:50 students o Providing sufficient lifeguards to ensure that all areas of water and people therein can be supervised easily without obstruction from any object. o Mandatory, appropriate signage at strategic locations within an aquatic facility, for example, entrance, change rooms and immediate vicinity of toddlers/teaching pool. o Enforcing that all lifeguards carry a resuscitation pocket mask which incorporates an oxygen nipple; the older style mask where a hose is stuck under the mask to facilitate oxygen delivery, is dated technology
EDUCATION	• Signage relating to parental or adult supervisor responsibility must be well signposted in large lettering. • Signage in relation to pool behaviour should be prominent and should be in an area where it is able to be visualised. • Depth indicators should be displayed in areas where depth is changing with signage such as depth increases to …. Parents keep children at arm's length. • At the commencement of summer period, a public awareness/educational campaign to be delivered stressing the need for parental/carer supervision at public pools. • Educational pamphlets should be made available at the pool entry – even if all safety arrangements are in place it is important for a parent accompanying a child who cannot swim to know that the result of momentarily losing sight of the child could be fatal. • The Education Department review its approach to professional development with a view to ensuring that teachers who will be expected to plan and conduct school excursions, particularly aquatic excursions, have received training on the practical application of relevant procedures and guidelines. • The guidelines, whether enforceable or not, should be regularly reviewed and in this regard it is essential that a central database be established to collate statistics of all significant safety related incidents. • Risk assessments should be conducted, especially when large numbers at a facility.

Discussion

Consistent with previous studies on child drowning (Brenner, 2002; Callaghan et al., 2010; Petrass, Blitvich, & Finch, 2011), our findings indicate that a lapse in, or lack of, supervision is a key contributing factor to child drowning deaths in public pools with a lack of supervision

a contributor in almost all (92%) cases. While coroners reported a lack of supervision as a key contributor in the circumstances associated with the drowning, our analysis identified that few recommendations related to supervision.

The role of coroners' recommendations in improving public health and safety is relatively unexplored (Bugeja & Ranson, 2005). As the training and qualifications of coroners is primarily legal, not public health, coroners may not fully appreciate the potential value of recommendations that can enhance current public health and safety awareness strategies, or recommendations that can inform the development of injury prevention countermeasures (Halstead, 1995). Based on analysis of the narrative documents investigated in this study it is apparent that a lack of supervision is a key factor in child drowning in lifeguarded aquatic locations. Whilst one of the coroner recommendations identified the need for a public awareness/educational campaign to be delivered stressing the importance of parental/carer supervision at public pools, analysis of the circumstances associated with the drowning deaths provides further insight into the complex nature of supervision. Factors such as the caregiver being responsible for multiple children; the caregiver leaving younger children under the supervision of older children; and how best to provide supervision in a busy pool environment all contribute to complexity.

These factors suggested that further work is required. First, to ensure that coroner recommendations are reaching aquatic centres so that they can improve their practices; second, for recommendations to reach aquatic stakeholders so that strategies to assist caregivers in supervision can be modified and/or developed and imbedded within public awareness strategies that focus on supervision to prevent drowning and other unintentional injuries; and third, to alert caregivers of the need for vigilant supervision.

The Australian Water Safety Council has indicated that drowning prevention programs need to be evidence-based, targeted at supervisors of young children, and evaluated to ensure effectiveness (Australian Water Safety Council, 2012). To date, no published peer-reviewed studies are available that evaluate the effectiveness of aquatic education campaigns that address supervision. Review of grey literature, however, demonstrated that the Royal Life Saving Society New South Wales (NSW) recently published an evaluation of the Keep Watch @ Public Pools program (Royal Life Saving Society - New South Wales, 2013) with findings that provide insights into possible reasons why supervision continues to be identified by coroners as a key factor in child drowning in these settings. First, a variety of responses was received regarding how facility respondents defined "good supervision" of children, and only 4% considered that being prepared to enter the water was an aspect of good supervision. The level of supervision provided by a caregiver is likely to be influenced by the aquatic environment in which the child is located, the child's swimming/survival skills, and the level of physical and cognitive development. When facility employees do not yet have a consistent and accurate understanding of what "good supervision" entails in public pools, it is impossible for a consistent message to be conveyed to caregivers who are responsible for supervising their children. This failure suggests that further collaboration is required between the aquatic industry and researchers to provide guidelines pertaining to good supervision of children, accounting for factors such as swimming ability.

Second, while it has been noted previously that the role of lifeguards does not include acting as babysitters (Scarr et al., 2007), the Keep Watch @ Public Pools evaluation indicated that 15% of lifeguard respondents were 'sometimes' or 'never' comfortable in approaching caregivers and less than half (49%) of respondents reported that they were 'always'

comfortable to discuss supervision of children (Royal Life Saving Society - New South Wales, 2013). This is concerning and provides further insight into why poor supervision practices continue to be identified by coroners as the key contributor associated with drowning deaths in public pools. Key components of a lifeguard's role include public relations and education. These aspects of the role provide an avenue to increase awareness of the personal supervision responsibility each patron assumes for drowning prevention at a facility (RLSSA, 2007). To effect a decrease in the number of child drownings associated with a lack of supervision, further investigation is required to ascertain why facility employees are not comfortable approaching caregivers to discuss their supervision practices. Research is also required to determine what caregivers believe their supervision responsibilities are when they attend a lifeguarded aquatic facility.

Based on previously reported statistics (Scarr et al., 2007), it was estimated that at least 20 public pool child drowning deaths would be identified in the NCIS database for the period included in this study. Because only 12 fatal drownings were identified, this demonstrated that while the term 'public pool' would be expected to be used in police and coroners' records, this perhaps was not the case. Because of this outcome, it is recommended that researchers using the NCIS for aquatic information implement broader search strategies and terms to obtain a reliable dataset to assess contributors to aquatic drowning deaths.

Limitations

Although the number of child drowning deaths at public pools in Australia is small, the strength of this study was that it was able to examine incidents over an extended period of 11 years. Despite this, like all studies, our study had methodological limitations that require acknowledgement. First, this study only considered closed cases and while time to case closure varies for unintentional drowning, for the time period considered in this study, 97% of cases were closed. Based on the consistency of contributing factors identified, the effect of excluding open cases is likely to be minor. Second, focusing on drowning deaths may underestimate the value of lifeguards, because children who survived drowning events due to the quick actions of a lifeguard or other patrons are not considered in this study. Obtaining accurate information on the number of non-fatal major and minor drowning incidents that occur at aquatic facilities could be difficult.

Conclusion

Deaths from drowning at lifeguarded swimming locations are uncommon, but they do occur, and young children are especially vulnerable. To prevent such drowning deaths, an understanding of the nature and circumstances associated with these incidents is critical. Information and recommendations generated from coronial investigations provided a sound starting point. The narrative text analysis in this study indicated that a lack of supervision is the key contributor in child drowning deaths in public swimming locations, although few coroner recommendations aligned with this factor. Whilst public awareness campaigns that focus on caregiver supervision have been developed, further evaluation of these programs is required, and the inclusion of strategies for caregivers responsible for supervising multiple children and for supervising during busy conditions should be considered. Further collaboration is required also between the aquatic industry and researchers to provide general guidelines pertaining to good supervision of children and to determine what caregivers and lifeguards believe their responsibilities to be in lifeguarded swimming locations.

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