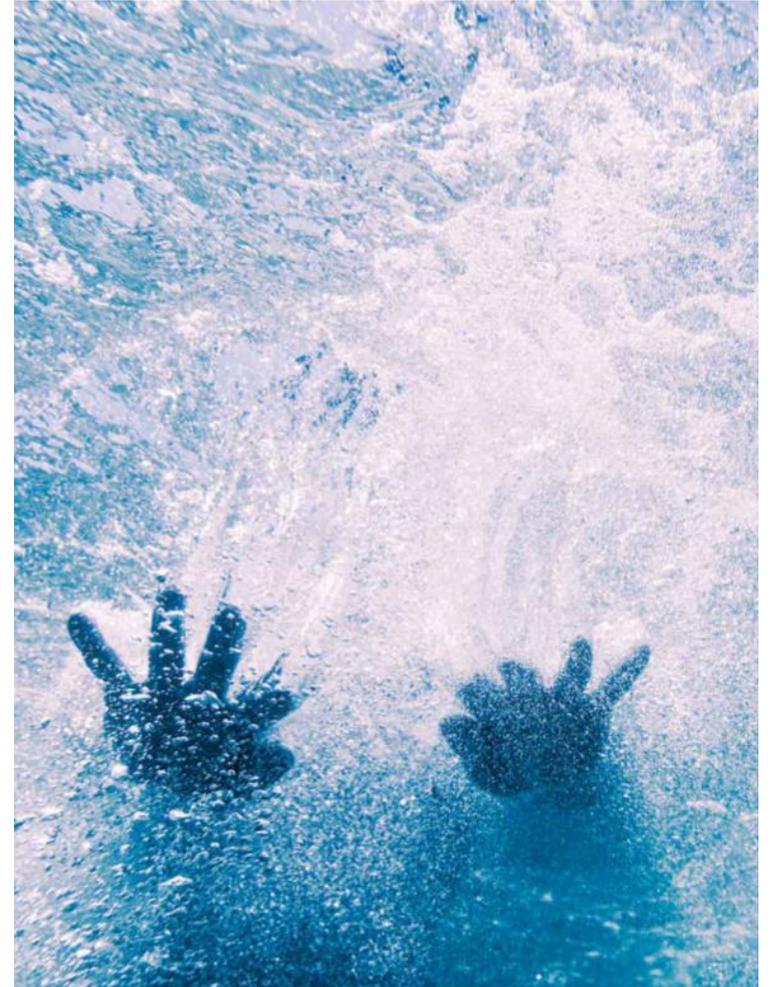


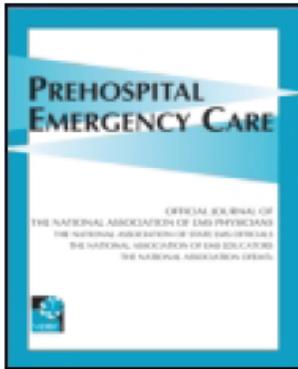
Drowning and Child CPR – What’s happening?

Dr Gene Ong
Children’s Emergency
KK Women’s and Children’s Hospital



Paediatric Trauma-Related Cardiac Arrest

- Survival from paediatric cardiac arrest due to trauma has been reported to be 0.0%-8.8%.
 - Kjellemo H et al. Pediatric Cardiac Arrest Due to Trauma. Prehosp Emerg Care. 2016 Mar 1:1-7.
- Yet scattered cases of good outcomes



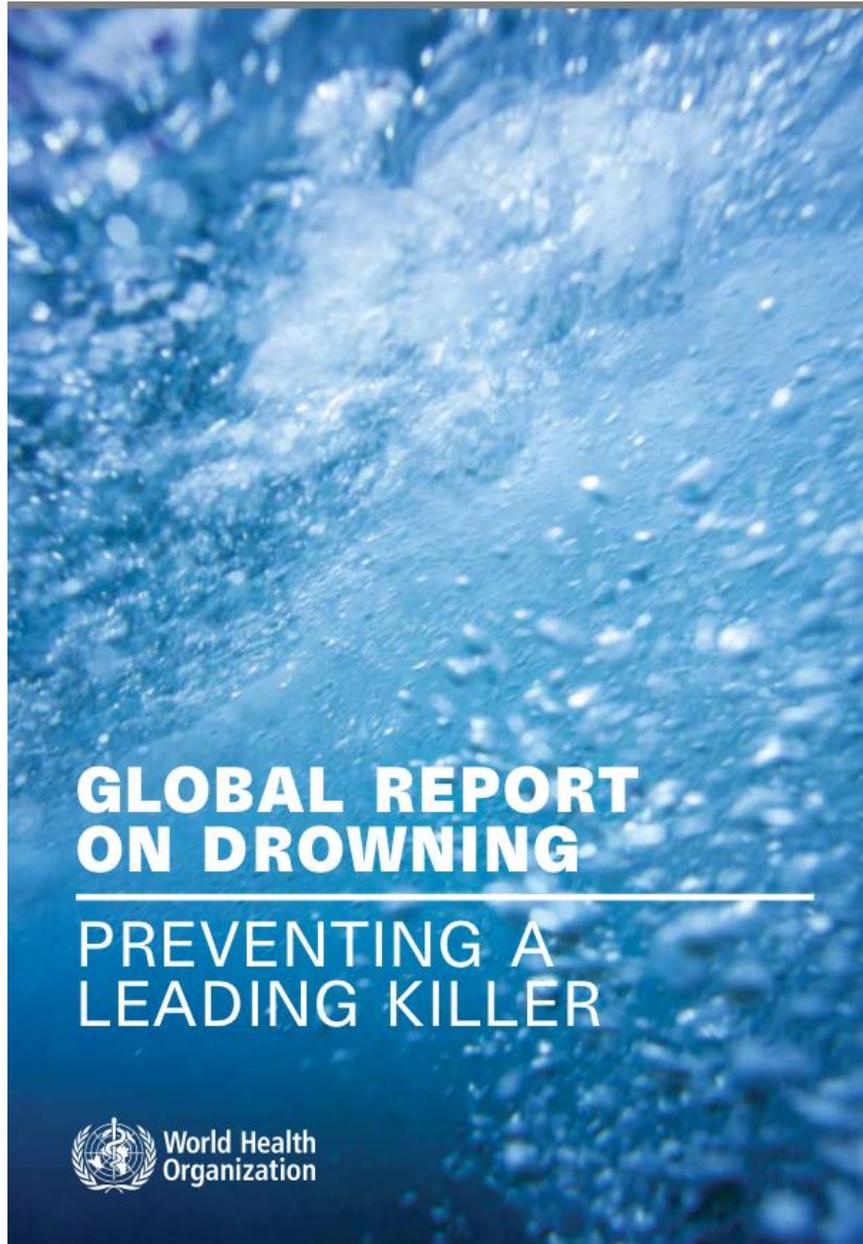
Epidemiology of Out-of Hospital Pediatric Cardiac Arrest due to Trauma

Valerie J. De Maio MD, MSc, Martin H. Osmond MD, Ian G. Stiell MD, MSc, Vinay Nadkarni MS, MD, Robert Berg MD & Jose G. Cabanas MD for the CanAm Pediatric Study Group

- N = 123
- 19.5% experienced ROSC in the field and 5.7% survived to discharge.
- Survivors had 3X the rate of bystander cardiopulmonary resuscitation (CPR) than non-survivors (42.9% vs. 15.2%).
- The overall survival rate for OHCA in children after trauma was low, but some trauma mechanisms are associated with better survival rates than others : especially **drowning** and penetrating trauma

TREATMENT CONCLUSIONS BASED ON EVIDENCE

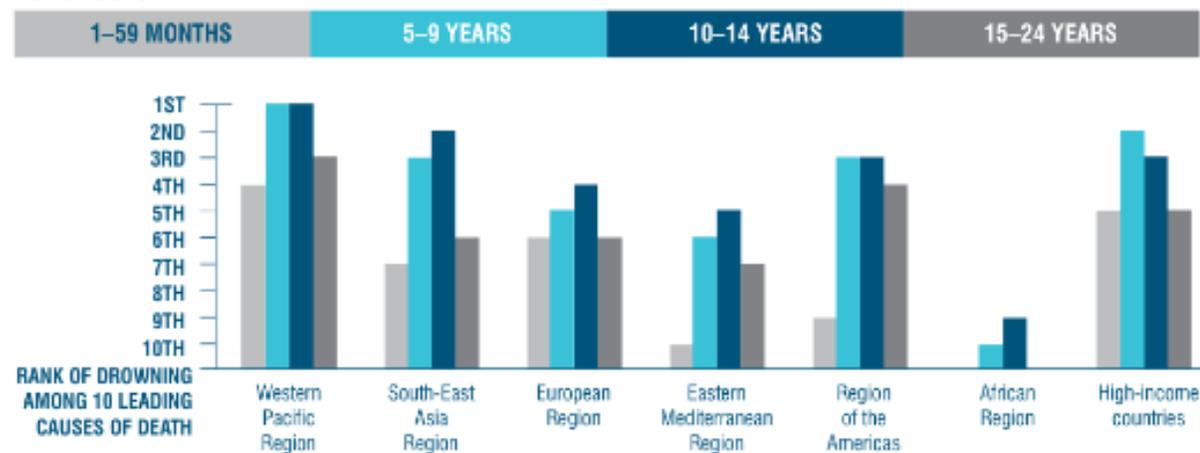
- Early resuscitative efforts in out-of-hospital paediatric trauma-related cardiac arrest (Pre-hospital):
 - Likelihood of rapidly reversible cause of traumatic arrest or witnessed or early arrest
 - Mechanism
 - lightning strike or **drowning (with significant hypothermia)**



There needs to be much more national and international attention focused on drowning, given the limited data available on its true scale and the heavy toll it takes on families, communities and economies.

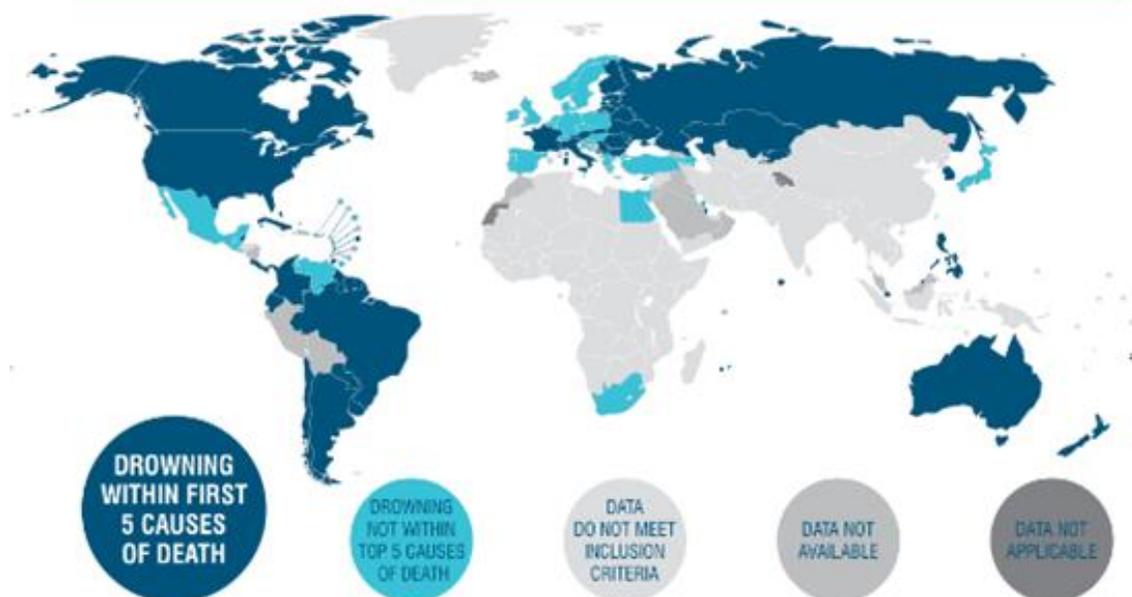
RANK OF DROWNING AMONG 10 LEADING CAUSES OF DEATH BY REGION AND AGE GROUP

AGE GROUPS



Note: Data for all high-income countries appears as 'High-income countries'. All WHO regions provided show ranking for only the low- and middle-income countries within those regions.

DROWNING AS A LEADING CAUSE OF DEATH AMONG 1-14 YEAR OLDS, SELECTED COUNTRIES



Analysis of mortality data submitted to WHO shows **drowning is one of the top five causes of death for people aged 1-14 years for 48 of the 85 countries** where data meet inclusion criteria (see Figure 3).⁷

⁷ Mortality data for countries were considered if they met the following criteria: estimated coverage of national deaths of 70% or more; ill-defined causes of death less than 20%; 10 or more deaths in the 1-14 year old age group; and data available from 2007 or later.



Private pools a high-risk area as drowning cases among children go up

By LOUISA TANG



TODAY file photo

Published 10 MARCH, 2016

Boy's drowning a 'tragic misadventure'

✔ This article is more than 12 months old



Police officers retrieving the body of Muhammad

Girl, 6, dies after swimming mishap in public pool



The girl was found unconscious and floating on the water during a swimming lesson at Kallang Basin complex on Dec 20, 2017. PHOTO: SHIN MIN DAILY NEWS



🕒 PUBLISHED JAN 11, 2018, 5:08 PM SGT

Boy nearly drowns at Bukit Batok Swimming Complex



In the video uploaded by Facebook user Wong Chee Wai, Sport Singapore lifeguards are seen attending to the boy, who is lying by the edge of the pool. PHOTO: SCREENGRAB FROM FACEBOOK/WONG CHEE WAI



🕒 PUBLISHED JUL 6, 2018, 9:28 PM SGT

SINGAPORE

More children in near-drowning mishaps: KKH study

Between 2011 and 2015, there were 17 to 27 cases each year of submersion incidents involving children, a sharp rise from the previous five-year period which saw five to 12 cases each year.

By Holly Matthews and Monica Kotwani, 938LIVE

Posted 10 Mar 2016 11:44 Updated 10 Mar 2016 23:13

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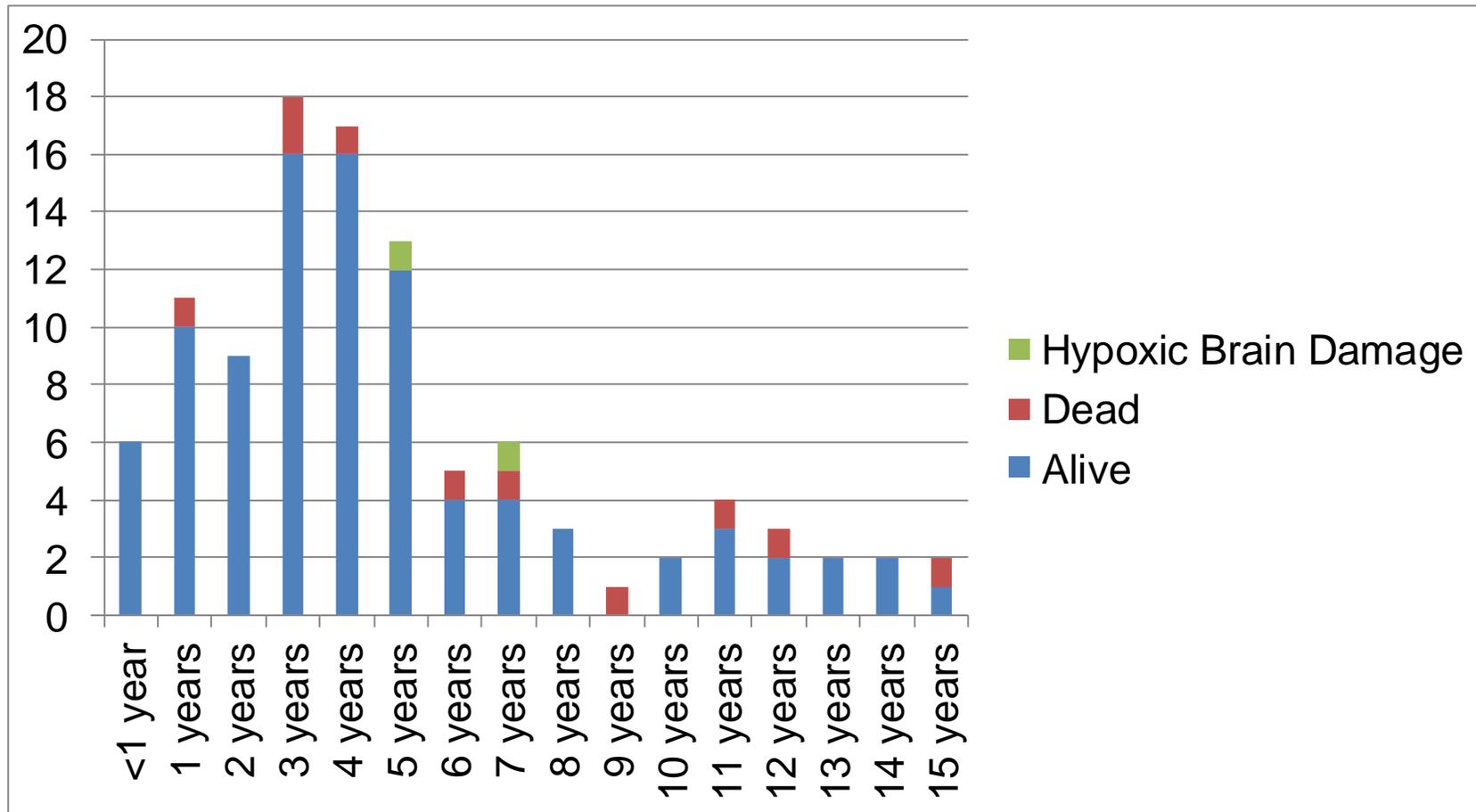
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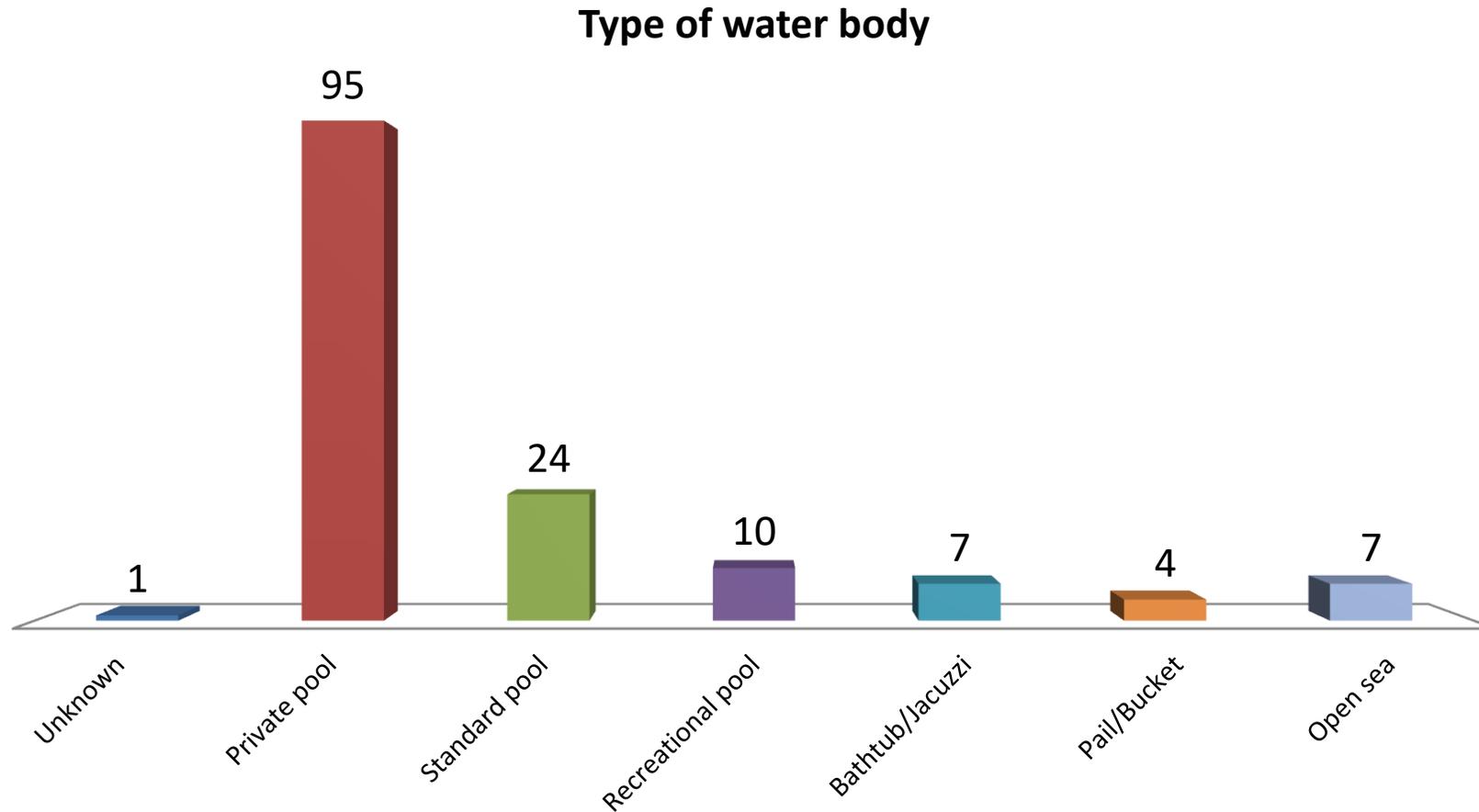
SINGAPORE: The number of children involved in near-drowning or drowning incidents in Singapore has risen drastically over the last five years, according to figures released by the KK Women's and Children's Hospital (KKH) on Thursday (Mar 10).

- 1-2 paediatric drownings per year seen in KKH in that period

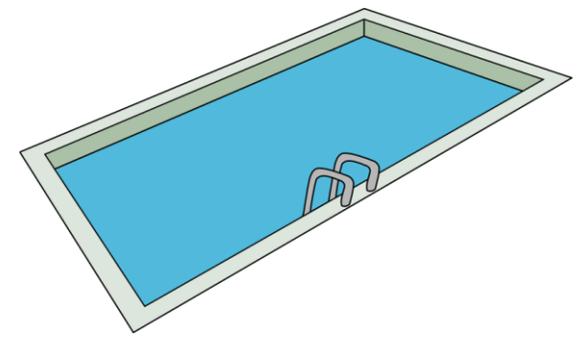
Morbidity and Mortality for Submersion Injuries (2011 to 2015, KK Registry)



Drowning Location (Jan 2012 to June 2016 – KK Registry)



Some Facts on Submersion Injuries



- In most countries including Singapore, drowning ranks amongst the top three causes of death by unintentional injury
- Severe brain damage usually occurs within a few minutes of complete submersion when the brain is deprived of oxygen
- Drowning is silent
- Drowning can happen in as little as 5cm of water

Summary of findings from KKH submersion injury surveillance

- Upward trend of submersion incidents involving children where 1 in 10 cases led to drowning death
- Pre-school age children are most vulnerable to submersion incidents; older children are still vulnerable
- Highest occurrence of submersion incidents involving children in condominium pools; 50% of drowning deaths occurred during pool parties
- Based on our data, if a child sustains a submersion injury during a pool party, the child is eight times more likely to die from drowning
- 40% of the submersion incidents occurred from Friday to Sunday, between 4pm and 8pm

Factors Influencing Submersion Injuries

- Lack of close supervision (anywhere)
- Lack of swimming ability
- Lack of barriers
- Medical disorders
- **Lack of immediate cardiopulmonary resuscitation (CPR)**

WHA



WHA



CPR for paediatric submersion injuries

- **The greatest morbidity and mortality associated with non-fatal drowning is due to hypoxia, specifically cerebral hypoxia.**
 - Need to correct this as the greatest priority in the resuscitation process.
- **Ventilation** is essential and should begin as soon as possible.
- The reported incidence of cervical spine injury in drowning victims is very low (0.009%).
 - Routine neck immobilisation not recommended (Class III, LOE B)
 - Do not delay in opening airway manoeuvres
 - Unless witnessed diving accident

CPR for paediatric submersion injuries

- Heimlich maneuver or abdominal thrust are not recommended and should be avoided. (Class III, LOE C)
- If vomiting occurs, turn to the side and remove vomitus.
- Apply AED if available as arrhythmias can be a complication.





Pediatric



**INJURY
PREVENTION**

**COM
FIRS**



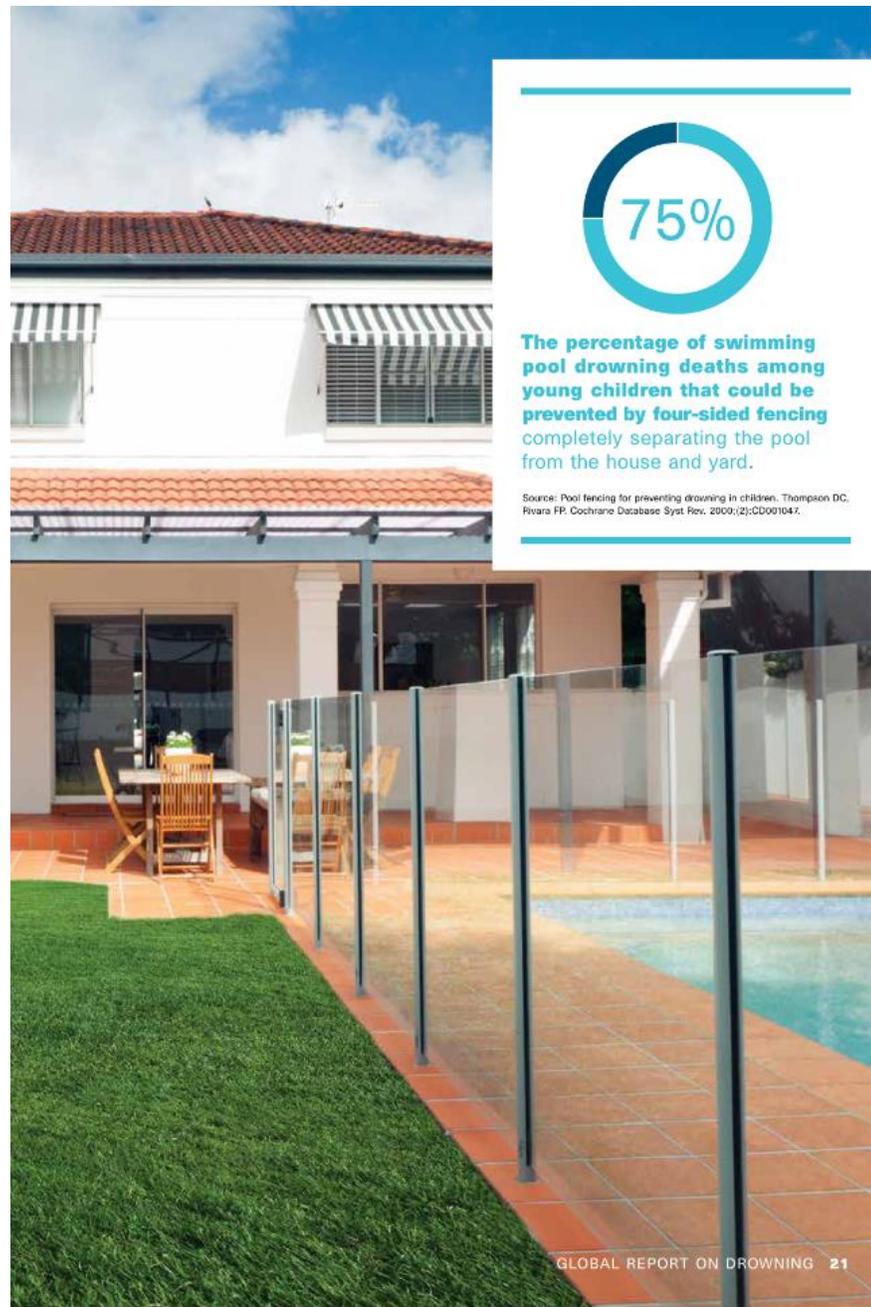
ACCESS

Trauma Care



**Paediatric
Integrated Post-
Trauma
Resuscitation Care**

DECREASING EVIDENCE – BASED EFFECTIVENESS FOR PAEDIATRIC TRAUMATIC ARREST



The percentage of swimming pool drowning deaths among young children that could be prevented by four-sided fencing completely separating the pool from the house and yard.

Source: Pool fencing for preventing drowning in children. Thompson DC, Rivara FP. Cochrane Database Syst Rev. 2009;(2):CD001047.

TEN ACTIONS TO PREVENT DROWNING

The 10 actions outlined in this section are based on available evidence and are deemed to be effective, feasible and scalable. Complementary measures such as drawing on best-practice models, using social media and communication to raise public awareness, and adapting interventions to suit local contexts (for example, making barriers from locally sourced materials) are important in ensuring these strategies are effectively implemented.

In addition, in resource-poor settings where educational levels are low, it is important to understand how people perceive drowning before introducing interventions, including what local people see as the cause of drowning and appropriate ways to treat and prevent it. Findings should guide how actions are implemented.

Our 10 actions fall into three categories:

COMMUNITY-BASED ACTION



1

Install barriers controlling access to water



2

Provide safe places (for example, a crèche) away from water for pre-school children, with capable child care



3

Teach school-age children basic swimming, water safety and safe rescue skills



4

Train bystanders in safe rescue and resuscitation



5

Strengthen public awareness and highlight the vulnerability of children

Just in time training



FRIENDS OF WRIGHTSVILLE BEACH OCEAN RESCUE PRESENT

CPR & DROWNING RESUSCITATION CERTIFICATION

AT THE CAROLINA CUP

\$60, LIMITED TO 30 PADDLERS

FRIDAY, APRIL 21: 1-5PM



GET CERTIFIED

Acknowledgement

- Dr Arif Tyebally
- Ms Jasmine Feng
- WHO report on submersion injury 2014

Disclaimer

- No Animals or Children Were Harmed in the Preparation of This Lecture





Thank you for your attention!

My apologies for traumatising you all with this talk

SingHealth Academic Healthcare Cluster



Singapore General Hospital



KK Women's and Children's Hospital



Sengkang Health



National Cancer Centre Singapore



National Dental Centre Singapore



National Heart Centre Singapore



National Neuroscience Institute



Singapore National Eye Centre



Polyclinics SingHealth



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