

Examination of a pilot intervention programme to change parent supervision behaviour at Australian public swimming pools

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Abstract

Issue addressed: Drowning is one of the leading causes of unintentional death in children worldwide. There is limited evidence about the effectiveness of programmes targeting child drowning prevention at public swimming pools. We examined the effectiveness of a public education programme (Keep Watch @ Public Pools) for improving child supervision levels by parents at public swimming pools.

Methods: The programme was evaluated via an observational study of parent supervision behaviour with children aged 0-14 years. Measures included domains of attention, proximity and preparedness. A rating scale from 0 = least effective to 4 = most effective was used, based upon the supervision domains. Seven public swimming pools in Melbourne, Victoria, Australia were randomised to either intervention or control pool. The intervention occurred over 6 weeks, and observations were taken over a one-week period both pre- and post-intervention. Observations of a total of 10 186 children and 6930 parents/carers were recorded and analysed.

Results: A significant improvement in attention, proximity and preparedness was observed in parents of children aged 6-10 years at intervention pools. However, similar results were not observed in parents of children aged 0-5 years and 11-14 years.

Conclusions: Supervision behaviour of parents can be modified, and the implications of these results for the community through to practice and policy are discussed.

So what? Targeted public education programmes provide an effective way of improving parental supervision of children at public swimming pools. Such education programmes should be widely implemented throughout public swimming pools, as one part of a comprehensive approach to drowning prevention.

KEYWORDS

aquatic risk management, children, commercial aquatic facility, drowning, lifeguard

1 | INTRODUCTION

Public swimming pools provide multiple benefits to health and social well-being.¹ Ensuring the safety of patrons is paramount, and the aquatic industry takes a proactive stance to ensure the safety of patrons when visiting their facilities.² While the majority of injuries in public swimming pools are minor,³ deaths still occur. A recent study of fatal and non-fatal drowning in Victoria found that public

swimming pools accounted for the highest proportion of drowning in those aged 5-19 years (40%).⁴ It also accounted for 19% of drowning in those aged 0-4 years.⁴

A wide range of strategies have been implemented to prevent drowning deaths in children.^{5,6} However, there has been little evidence of the effectiveness of any strategy, other than in home swimming pools, where fencing has been enacted and legislation implemented to ensure compliance.⁵⁻⁹ Lack of parent or carer

supervision has been identified as a key factor in child drowning in public swimming pools;¹⁰ therefore, strategies to address this issue are required.^{3,11-13} Supervision is a complex activity, using multiple sensory domains of touch, hearing and sight for it to work at its peak efficiency.¹⁴ Parent supervision has been explored in greater detail to understand how it works and how it should be defined.¹⁵ The three domains that are most used to understand supervision are as follows: Attention—listening, watching, interacting with the person in their care; Proximity—how close is the carer to the person in their care; Continuity—how often are they actively supervising (ie, can see, hear and be able to react).¹⁴

Professional lifeguards at public swimming pools play an important role in the supervision of children to prevent drowning.¹⁶ While the main role of lifeguards is to prevent drowning, they also attend to first aid incidents, manage patron safety, and provide customer service, cleaning and maintenance.³ With such diverse roles and a responsibility for multiple patrons (a maximum 1:100 ratio²), there is a need for appropriate one-on-one parental supervision to increase and ensure child safety. There have been no previous studies reported that have evaluated the effectiveness of community education programmes to address supervision in public swimming pools. Therefore, this study aimed to determine the effectiveness of a public education programme, Keep Watch @ Public Pools, for improving child supervision levels by parents at public swimming pools in Victoria, Australia.

2 | METHODS

2.1 | Study setting and participants

There are over 300 sites where public swimming pools are located in Victoria, Australia. Typically part of a larger leisure centre, facilities operating year round may include an indoor and/or outdoor pool (usually 25 metres[m] or 50 m), a shallower toddler/wading pool, diving pool, spa and sauna and a gymnasium. Smaller seasonal pools may simply include a 25 m pool and a toddler or wading pool. Layouts and design vary across facilities with pools of varying depths as well as additional features such as wave pools and water play areas. This study was conducted at seven public swimming pools in metropolitan Melbourne, Victoria. Pools were randomised to either control (four pools) or intervention (three pools) groups. Random allocation assignment was completed using a random number generator in Microsoft Excel. While the pools were not matched directly each group included a pool within 5 kilometres (km), 15 km and greater than 15 km of the CBD. In addition, each group included pools from the inner east, west and south east of Melbourne. Each pool operated year round and had a 25 m or 50 m indoor pool, along with a toddler or learn to swim/leisure pool. The three intervention (experimental) pools were offered the education programme at no cost.

All children were considered to be participants in the study. A child was defined as a person aged less than 14 years. For analysis, the age groups were broken down into three groups, 0-5 years, 6-10 years and 11-14 years as per the Guidelines for Safe Pool

Operation (GSPO)² and the Keep Watch @ Public Pools programme. If it was difficult to determine which age group a child should be assigned to then the lower age group was used, for example if the child was thought to be aged 4-6 years then they would have been coded into the 0-5 years age group. Observations of a total of 10 186 children and 6 930 parents were recorded and analysed.

2.2 | The programme

Keep Watch @ Public Pools is a programme of the Royal Life Saving Society Australia (RLSSA) targeted at eliminating drowning deaths and reducing the number of aquatic-related injuries at public swimming pools. The programme was developed using a health promotion planning and evaluation cycle (ie, identification of the health problem via: consultation, data collection, presentation of findings and determining priorities and analysis of the health problem via: literature review, description of target group, exploration of the problem, analysis of the factors' contribution to the problem and reassessing {this study} and strengthening the resources), and this paper represents the impact and immediate outcome assessment.^{17,18} The programme was informed by the transtheoretical model (TTM) of behaviour change¹⁹ as recommended for use in drowning prevention studies.²⁰ The original TTM posits that individuals move through the following stages of change: precontemplation (unaware of the problem), contemplation (aware of the problem and desired behaviour change), preparation (intend to act), action (practice the desired behaviour) and maintenance (work to sustain the behaviour change).²⁰ Specifically, Keep Watch @ Public Pools programme was designed to move parents from precontemplation or contemplation to action. It was assumed that most parents would be in the precontemplation or contemplation stages as they were either uninformed or underinformed about the consequences of their behaviour, particularly in the public swimming pool setting. Multiple strategies were used to expose parents to the information, gain their attention and interest (via signage at key points at the public swimming pool, ie, entryway, toilets, etc.; information cards and fact sheets with the "rules" of keeping your child safe at the pool; training for pool lifeguards to communicate the importance of supervision; and information on the Keep Watch website), create an understanding of what was expected, change the attitude of the patrons and pool staff around supervision, and change behaviour.

The programme audience is parents of children with the aim of promoting the importance of appropriate levels of supervision within aquatic facilities. There are specific policies included in the programme, based on the GSPO²:

1. Children are not allowed entry into the public swimming pool unless under the supervision of a person 16 years or older.
2. Parents and guardians should actively supervise their children at all times. As such, they should be dressed ready for action, including unexpected entry into the water.
3. For 0-5 year olds and non-swimmers, a parent or guardian is in the water at all times (within arms' reach of the child). It is best if

the parent or guardian is engaging with the child, that is, playing with them, talking to them.

4. For 6-10 year olds, constant supervision is required, be prepared to get wet and enter the water with this age group.
5. For 11-14 year olds, a parent or guardian must regularly check on their child by physically going to the point where they are in or around the water.

The public swimming pool was provided with signs, brochures and information cards that the lifeguards can use to educate patrons, stickers and other promotional material as well as a training session from RLSSA to staff. The training session included information about child drowning, the programme and how it works, and how they could use the programme to help with supervision issues.

2.3 | Observational study

Evaluation of the programme occurred via direct and video observation of parents with children aged 0-14 years of age. The observational study was used to assess behaviours around specific areas of public pools where young children typically recreate. The level of supervision (based on a formula developed by the authors using the framework of Saluja et al¹⁴) of children was assessed pre- and post-intervention. The intervention (Keep Watch @ Public Pools programme) was implemented over a 6-week period through autumn and winter, including a two-week school holiday period to maximise exposure to the messaging. Pre- and post-observations were conducted within the school terms to limit any potential behavioural differences that may be observed during the holiday period.

Observations occurred at each of the seven pools over a one-week period both pre- and post-intervention. Between one and a half and two hours (average 101 minutes) of video footage were collected from each facility pre- and post-intervention (ie, half-hour blocks of video footage over four sessions, where one session was in the morning and one in the afternoon on a weekday and a weekend day). Data collection occurred by videotaping the relevant areas of the pool, which was then reviewed by trained researchers. An observational data sheet was also used to collect data during the sessions.

2.4 | Analysis of video footage

Six randomly selected three-minute sections of the video material from each observation period (ie, weekday morning, weekday afternoon, weekend morning and weekend afternoon for both pre- and post-intervention) were selected. The random selection was made by breaking down the footage into one-minute intervals and using a random number generation to select the starting point for the three-minute sections.

The first randomly selected video section was then examined and assigned supervision ratings; this was repeated for the second and third randomly selected timeslots. However, if at the start of a random three-minute time period selected nothing was happening in the area then the next random time period was used. If activity in

the pool ceased, the timer was stopped, and the video advanced to when activity recommenced to achieve three minutes of footage.

2.5 | Observer data collection

An observation data sheet was created to record the date, and time video recording was undertaken, as well as current signage in the swimming pool, comments about supervision made by staff on duty at the time, and any other comments that may have been relevant to study. Two observers were trained in person and provided with a detailed protocol. Training emphasised the need to ensure all the potential age groups of children recreating in, on or around the pool were filmed, that is panning the video camera across areas parents may be supervising. Each observer consulted with the designated staff member on duty and asked them to identify the main play areas used by the children, for example, toddler pool and leisure pool. These pool areas were recorded on the data sheet and the same areas filmed on each visit. Unobtrusive vantage points from which to film the children and their parents were selected in each area. The observer panned slowly from left to right across each of the nominated areas in turn, ensuring areas where parents may be seated were included. The zoom facility on the camera was used to film more distant parts of the area. To ensure full coverage of all areas of the pool, the observer moved to a different section of the pool every 15 minutes. Only recreational activities were included in the observations. Learn to swim lessons were excluded from the analysis due to different requirements around parental supervision. To ensure rater reliability, a sample of observations was selected and coded in a group setting, discussing how and why they coded and adjustments made to the underlying information to be coded. Intra- and inter-rater reliability studies were conducted to examine the reliability of data recorded by the same rater over multiple trials and by multiple raters, respectively. This included the dual coding of a random sample of the selected observation and the rater having to come back and recode a random selection of observations 2 weeks post-initial coding. No statistical analysis was undertaken of this process as there was little difference overall in the coding.

2.6 | Measures of supervision

Saluja et al¹⁴ defined three active elements of supervision as attention, proximity and continuity. These elements were redefined for the current study, replacing "continuity" with "preparedness," due to the need for a parent to act if something went wrong and an inability on occasion to follow a parent of a child if they went out of visual range on the video, such that they could not be tracked and assigned a rating (refer to Limitations). Preparedness included a parent's ability to respond to their child's need for assistance in the water if required, their location in relation to the child and elements of the original "continuity".

Each element used in the study is outlined in Table 1. Attention was defined as the amount of interaction a parent had with a child at a given point in time. Proximity was defined as the distance the

TABLE 1 Description of rating for the elements of supervision^a

Rating	Attention	Proximity	Preparedness
4	Engaged—Playing with, talking to, interacting with child (should be close by but not necessarily touching)	Touching (needs to be touching for the whole period) Within arms' reach (needs to be within arms' reach at all times, this may include touching but shouldn't move away)	In water
3	A lot—at least talking and watching, not necessarily touching (may be at a distance but still visual, verbal and auditory)	Nearby (close but not within arms' reach, may be within arms' reach at some stage but not all the time)	Out of water but in swimming attire (may have towel wrapped around)
2	Some—regular visual contact and talking to, within earshot	Distant (would need to take more than two-three steps to reach child)	Out of water but in swimming attire that is covered.
1	A little—occasional glance not talking, unable to hear (talking to others/noise levels)	Intermittent supervision (present for some of the time and absent for some of the time)	Out of water - fully clothed
0	None—no interaction (not in area or reading book, talking to other patrons or staff) Unknown (Parents not in camera view at all but may be present)	Absent (not present at all or drop off and pick up only) Unknown (Parents not in camera view at all but may be present)	Absent Unknown (Parents not in camera view at all but may be present)

^aRating scale: "4" =most effective through to "0" = least effective.

parent was from the child. Preparedness was defined as a parent's ability to respond to their child's need for assistance in the water. Each of these elements was rated on a scale from "4 = most effective" to "0 = least effective." If the researcher was unsure of the specific supervision rating, then the lower option was used (e.g., for proximity—a person standing next to a child but uncertain whether any physical contact occurred would assume the lower category, ie, "within arms' reach"). Each three-minute period was broken into one-minute segments, and supervision assessment was based on the average behaviour for that minute.

2.7 | Child/parent ratio

For each one-minute period, the total number of children to the total number of adults in field of view was calculated. This ratio was averaged across the three minutes, and then an average for both pre- and post-intervention pools was determined.

2.8 | Data analysis

A rating of four was considered optimal, while a rating of zero was considered to be the least effective level of supervision. Averages were taken for each type of supervision category, that is, overall attention, proximity and preparedness, based on the six randomly selected, three-minute time slots. A parent-to-child ratio was calculated based on the number of parents and children present. The supervision averages were then entered into SPSS,²¹ and ANOVA calculation was undertaken on the comparison of the means for the pre- and post-intervention supervision levels ($P < .05$ was considered to be significant).

2.9 | Ethics

Ethical approval for the study was obtained from the Royal Life Saving Society Australia Ethics Committee (Reference no. RLS07R01).

3 | RESULTS

Observations of a total of 10 186 children and 6930 parents/carers were recorded and analysed (Table 2). Results for the average supervision levels of the four control pools and three intervention pools are detailed in Table 3. Supervision of children in the 0-5 year age group was highest in all control and intervention, pre- and post-intervention groups and across all domains of supervision. For children in the 6-10 year and 11-14 year age groups, supervision scores in all pre- and post-intervention and control groups decreased with increasing age.

Following the 6-week intervention period, a significant improvement in supervision scores was observed in the 6-10 year age intervention group (Table 3). This increase in supervision was observed across each domain of attention, proximity and preparedness. The intervention group showed improvements in the attention and proximity scores of 1.1 ($P < .01$) on a scale of 0-4. In addition, the intervention group showed lower but still significant improvement in the preparedness score of 0.5 ($P < .01$). No change in supervision scores was observed in the 0-5 year or 11-14 year age groups.

The average child-to-parent ratio improved across all age groups post-intervention (ie, there were less children per adult) in both control and intervention pools (Table 3).

4 | DISCUSSION

This pilot study of a public education programme (Keep Watch @ Public Pools) designed to improve the parental supervision of children at public swimming pools demonstrated a significant change in supervision of children aged 6-10 years. The supervisory behaviours improved across all key elements assessed (attention, proximity and preparedness). This demonstrates that supervision in public swimming pools can be improved through a targeted public education programme.

TABLE 2 Number of child and parent observations analysed for each control and intervention pool, pre- and post-intervention

Pool	Control pre-test		Control post-test		Intervention pre-test		Intervention post-test	
	Child	Parent	Child	Parent	Child	Parent	Child	Parent
1	390	291	509	416	365	207	531	415
2	1257	686	971	654	376	209	513	378
3	898	528	880	630	952	579	1121	782
4	602	420	803	735				
Total	3147	1925	3163	2435	1693	995	2165	1575

TABLE 3 Average supervision levels by age groups for the control and intervention pools, pre- and post-intervention

	Control			Intervention			Significance
	Pre- (CI)	Post- (CI)	Change	Pre- (CI)	Post- (CI)	Change	
Attention							
0-5 Yrs	2.6 (2.3-2.8)	2.6 (3.0-3.0)	0.1	2.3 (2.0-2.6)	2.2 (1.8-2.6)	-0.1	$F = 1.6 P = .15$
6-10 Yrs	1.0 (0.8-1.2)	1.3 (1.6-1.6)	0.3	0.3 (0.1-0.5)	1.5 (1.1-1.8)	1.1	$F = 10.4 P < .01$
11-14 Yrs	0.3 (0.0-0.5)	0.2 (0.3-0.3)	-0.1	0.2 (-0.1 to 0.5)	0.0	-0.2	$F = 1.3 P = .27$
Total	1.8 (1.5-2.0)	2.2 (2.7-2.7)	0.5	1.9 (1.5-2.3)	2.2 (1.8-2.6)	0.3	$F = 1.7 P = .18$
Proximity							
0-5 Yrs	2.2 (1.9-2.5)	2.4 (2.8-2.8)	0.2	2.1 (1.7-2.5)	2.1 (1.7-2.5)	0.0	$F = 0.7 P = .58$
6-10 Yrs	1.3 (1.0-1.6)	1.3 (1.7-1.7)	0.0	0.5 (0.2-0.7)	1.6 (1.1-2.0)	1.1	$F = 6.2 P < .01$
11-14 Yrs	0.2 (0.0-0.4)	0.3 (0.5-0.5)	0.1	0.1 (0.0-0.1)	0.1 (0.0-0.3)	0.1	$F = 0.8 P = .48$
Total	1.9 (1.6-2.2)	2.2 (2.6-2.6)	0.3	2.1 (1.6-2.5)	2.2 (1.8-2.6)	0.1	$F = 0.6 P = .64$
Preparedness							
0-5 Yrs	2.8 (2.5-3.1)	2.8 (3.1-3.1)	0.0	2.6 (2.2-3.0)	2.3 (1.9-2.8)	-0.2	$F = 1.1 P = .3$
6-10 Yrs	1.1 (0.9-1.4)	1.4 (1.8-1.8)	0.3	0.5 (0.2-0.9)	1.0 (0.7-1.3)	0.5	$F = 4.9 P < .01$
11-14 Yrs	0.2 (0.0-0.4)	0.3 (0.6-0.6)	0.1	0.2 (-0.1 to 0.5)	0.7 (-0.6 to 2.0)	0.5	$F = 0.5 P = .68$
Total	1.9 (1.6-2.2)	2.3 (2.8-2.8)	0.4	2.1 (1.7-2.6)	2.1 (1.7-2.5)	0.0	$F = 0.8 P = .48$
Average parent-child ratio	1.7 (1.5-1.9)	1.4 (1.6-1.6)	-0.3	1.6 (1.3-1.9)	1.4 (1.3-1.6)	-0.2	$F = 1.9 P = .13$

CI = 95% Confidence Interval. Bold indicates significance level $P < .05$.

This study was aimed at moving people to action within the TTM. Changes were not observed in parental supervision of children aged 0-5 years or 11-14 years. This is not to say that parents may have moved from any of the other preceding stages to a higher stage such as contemplation to preparation. Lack of observed change is partly due to overall supervision being more effective the younger the child, in all control and intervention, pre- and post-intervention groups (thus more at the stage of maintenance in the model). It may be the case that parents of children in the 6-10 year age group were more receptive to the messages (visual resources etc.) provided and that the target of the messaging may need to be revised to reach wider age groups. It could also be suggested that as the parents of children aged 0-5 years had higher levels of attention, proximity and preparedness pre-intervention; it is less likely that significant changes in these domains would be observed. It is not unexpected that parents of younger children in this age group have higher levels of supervision, as one would expect parents of younger children to be more cautious and aware of their safety, particularly if their child had not undertaken water familiarisation classes.²² Perceived risk

may influence engagement and readiness to change. As outlined in the Health Belief Model (HBM), this is a key component to provide cues to action.¹⁷ The HBM is another behavioural model that has been used in drowning and other unintentional injury prevention research, including parental supervision and injury prevention behaviours, and communication research.^{23,24} According to this model, the key constructs that predict health behaviour are as follows: risk susceptibility, risk severity, benefits of action, barriers to action, self-efficacy and cues to action.¹⁷

Supervision by parents of children aged 11-14 years was absent pre-intervention and did not improve during the intervention. Parents of older children may not perceive a need to supervise children at this level in aquatic environments. For example, older children may be seen as not requiring supervision where there are other supervision strategies available (eg, lifeguards). The perception of risk of parents with children aged 11-14 years may be reduced particularly if the child has attended swimming lessons; however, swimming skills of the child may not be appropriate for the environment depending on pool depth, style and other features.²⁵ Previous

experience with swimming and water safety education and parental attitudes, awareness and risk perception were not assessed as part of this study and therefore require further exploration.

While supervision has been shown to be lacking in many cases where children drown,^{11,12,26,27} there have been no previous studies that have directly examined improving supervision behaviours of parents, in a public pool setting. This has partially been due to the lack of appropriate definitions²⁸ as well as the complex nature of supervision¹⁴ and challenges with in situ observation. The current study provides a direct measure of supervision in public swimming pools.

A general observation regarding implementation of the programme was that programmes such as this rely on management being proactive in promoting and ensuring the integration of the supervision policies into the operation of the pool. Thus, the level of input of management is an important consideration in future programmes. For example, are related policies in place, (such as, what to do with an unsupervised child), does the staff induction include information about the programme, are staff supported in reinforcing the supervision messages to parents.

Not only is parental supervision a complex activity, it is also often undertaken in competition with other demands. It is often lack of supervision, which is identified as the first layer of protection that is missing or broken and contributes to a child drowning.¹¹ Supervision is not a static process and changes are based on circumstance, location, activity and age of the child. A study by Boles et al²⁹ demonstrated that even simple activities such as talking on the phone, using a computer or watching television affect supervision.²⁹

If supervision is affected by everyday activities, then it is postulated that it must be possible to improve supervision using prompts, reminders and safer systems. As a more robust understanding of supervision and its elements have appeared,²⁸ this has enabled provision of better information about how people can improve supervision of children.

4.1 | Limitations

While this programme was successful in improving the supervision behaviour of parents of children 6-10 years of age, it did not show a statistical improvement in supervision by parents for the other age groups. Additional reasons for lack of change in parental supervision in children aged 0-5 years and 11-14 years are outlined below.

Due to resource limitations, the programme could only be delivered in a small number of public swimming pools and as such small changes were unlikely to be statistically significant. In addition, the programme ran for a short duration and had a limited sample of children aged 11-14 years.

The collection of supervision behaviours by parents in a real-world, multiperson setting is complex and may be affected by, the position of the camera, location of the people being filmed, movement of people within the study area, available light, identification of parents, number of people present and the presence of the observer. In addition, examination and coding of supervision footage are time consuming. The most effective method for this study was to use

randomly selected three-minute sections. However, the fluid nature of supervision is such that it may change between each segment. The parent-to-child ratio was difficult to measure accurately as often the parent moved out of shot. While this information was recorded in situ, it may have been possible for a parent to be absent for a short period of time without the researcher noticing.

To reduce the probability of the control pools being contaminated, there was no external promotion of the programme. This may have had a negative impact on the intervention pools due to a lack of reinforcement of the key messages. It is also unclear how effective any one resource, or combination of resources, may have been in reaching parents of children in the targeted age groups. Furthermore, the number and demographic characteristics of parents exposed to the key messages were not able to be assessed, thus any influence of these variables on behaviour change was unable to be determined.

Variation in the type of pool including the design, size, depth and geographic location may also influence supervision. For example, the design of some toddler pools may affect the proximity with which a parent can physically stay within arms' reach of their child, particularly in busy periods. This study was conducted at indoor pools in metropolitan Melbourne, there may be differences in supervision levels in regional and/or outdoor pools. There may also be seasonal variation in supervision levels and parent openness to messaging, with water safety being front of mind during warmer months of the year. Finally, the lack of statistical analysis of inter-rater reliability may be considered a limitation.

4.2 | Future directions

Longitudinal studies are required to determine whether observed changes in parent behaviour are maintained or could be improved. Such studies could also be used to determine any effect on injury and drowning incidence at public swimming pools.

Programmes such as this are dependent upon industry- and community-wide support. Due to the nature of the study and concern for contamination at control pools, the programme was ineligible for promotion across industry and more widely throughout the community. Mixed methods research should be undertaken to explore the effectiveness of wider community promotion of such programmes.

5 | CONCLUSION

The pilot evaluation of the Keep Watch @ Public Pools programme demonstrated the ability to improve the supervision behaviour of parents with children aged 6-10 years. Supervision of children when in, on or around water is an important prevention strategy. The importance of parents working in concert with lifeguards for the protection of children when recreating in public swimming pools should be emphasised. Those education programmes shown to be effective at improving parental supervision at public swimming pools should be implemented.

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CONFLICT OF INTERESTS

The authors declare that there are no conflicts of interest in connection with this article.

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