Lifeguard vigilance and dr

A research project, conducted by Quality Leisure Management on behalf of Impulse Leisure, sought to evaluate the use of drowning detection systems

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This paper recounts the project undertaken on behalf of Impulse Leisure, whereby we examined the practicality of using drowning detection systems (DDS) to improve pool safety, while rationalising (i.e. reducing) the number of lifeguards at specific times on specific sessions.

The project was commissioned by Impulse Leisure, and we have worked closely with them on the development and implementation of the findings. I must stress, right at the outset, that the project has been undertaken independent of any financial support from suppliers, such as Poseidon, or other organisations who may have an interest. We know that the main barrier to installing DDS is cost and not the reputation of the product itself. Further, we are strong supporters of the National Pool Lifeguard Qualification as a robust mechanism for providing the industry with competent lifeguards, and the IQL Approved Training Centre Scheme has also had real benefits in driving up standards of ongoing training.

So, the fundamental objective of the project was to determine if it is feasible to fund the installation of DDS by using fewer lifeguards and, at the same time, reduce the risk of drowning.

Another motivation for the project is our experience at QLM in dealing with a number of accident investigations and, indeed, many near-misses. For example, one of our clients had three near-drownings, all requiring resuscitation, in one month across two different pools. These were all teenage children who were first identified as being at the bottom of the pool by other swimmers. On each occasion, the investigation congratulated the lifeguards on their performance and identified that they were doing their job as per their training and, more importantly, as per the normal operating procedure that complied with the requirements of the HSE publication *Managing Health and Safety in Swimming Pools*.

Currently the requirements for the number of lifeguards for both programmed and unprogrammed swimming sessions are determined in the guidance given in *Managing Health and Safety in Swimming Pools*. These minimum numbers provide the baseline against which organisations should provide the appropriate number of lifeguards. For example, a 33-metre pool with one swimmer in an unprogrammed swimming session requires two

Blackshots Leisure Centre

owning detection systems

lifeguards. However, if this is a programmed swimming session (e.g. lane swimming), then only one lifeguard would be required. The basic principles of supervision are based on the simple 10:20 scanning regime, i.e. that the lifeguard will scan their area within 10 seconds and then be able to get to a casualty or person in difficulty within a further 20 seconds. This would mean that a rescue would be performed, in theory, within 30 seconds, adding on any time of course to remove the casualty from the water. It should be further noted at this time that the current industry position is that the RLSS and ISRM do not advocate elimination of lifeguards, even if DDS are used. However, published research by ISRM some years ago on the Poseidon system clearly identified that there was an opportunity to adjust the balance between lifeguards and technology. It is our opinion that this opportunity has, up until now, not been taken by the industry.

Feasibility study process

So, what was involved in this project with Impulse Leisure? Firstly, we conducted desk research. This was extensive and reviewed the available research in the USA, France and the UK. Research in the UK had been conducted on the Poseidon system by ISRM. Excellent research was also obtained on lifeguard vigilance from the University of Paris. Jeff Ellis Associates in the USA had conducted an extensive survey on lifeguard vigilance at more than 600 pools. In addition various relevant articles, particularly from the USA, were obtained.

Over the past few years, QLM has conducted many mystery visits using leisure professionals who are trained mystery customers. From these mystery visits, we identified more than 100 pools where the vigilance of lifeguarding was commented upon by our team. While this research is clearly being interpreted here based on the judgement of the individual mystery visitor, our team are all trained and experienced leisure managers. The QLM research of 100 pools was found to be very useful in providing a review of lifeguard vigilance in the UK.

We then conducted a four-week pool usage analysis at Blackshots and Belhus Park pools for Impulse. This involved looking at the number of lifeguards and bathers in the pool during every half-hour the pool was open. The type of session was also identified and this research enabled us to determine the potential benefit from the introduction of DDS and any possible reduction in lifeguard numbers at the two pools being examined. We obviously had to conduct a detailed independent analysis of the Poseidon system and its reliability and suitability for the pools concerned. At this point Poseidon provided us with full cooperation and information. Additionally, we visited two pools with the Poseidon system installed. A full analysis of accidents and incidents at the pools over the preceding two years was conducted to identify any trends and examine any rescues, near-misses and public order issues. We were then able to determine if the objective of increasing safety with fewer lifeguards was achievable.

Having identified how the programme at each pool could accommodate a rationalisation of lifeguard numbers, the next stage was to conduct a detailed financial appraisal on implications and payback. Impulse Leisure then received a detailed report with the research contained therein and clear recommendations. Once the report was accepted, a detailed risk assessment, taking into account the implemented findings, was conducted by us. This, in essence, provides significant reassurance to Impulse Leisure; i.e. they have a risk assessment conducted by ourselves that clearly identifies how the pool will operate with the implementation of DDS with fewer lifeguards at certain times than that recommended in *Managing Safety in Swimming Pools*.

At the latter stages of the project we communicated with the Health and Safety Executive, outlining our findings and our intended actions. Their response, which was extremely positive in our opinion, provided reassurance to Impulse.

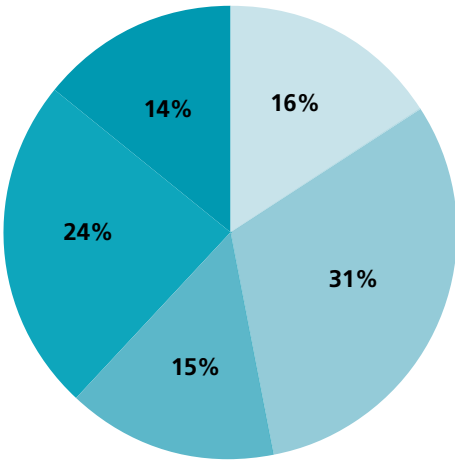

Fig.1 Jeff Ellis & Associates Lifeguard Vigilance Survey: Detection time of mannikin underwater

Research findings

The Jeff Ellis and Associates research in the US involved dropping a full-size mannequin into a pool, and timing the speed of response by the lifeguard. The results are shown in Figure 1.

The exercise was repeated with 682 tests during the summers of 2001 and 2002. The 10:20 scanning regime worked on only 14 per cent of occasions. With the average detection time of 69 seconds, this is powerful information and, in our view, reinforces the belief that two-thirds of drowning swimmers are first reported to the lifeguard by the users of the pool. Only 30 per cent of bathers in trouble are spotted within 30 seconds, with two-thirds of the mannequins being spotted in more than a minute. Clearly the opportunity to reproduce this test in UK pools is fairly problematic, as a lifeguard should be able to spot four people walking in with a mannequin in between them in an indoor public pool in the UK – we would hope!

Moving on now to the QLM analysis of 108 pool visits, where lifeguard vigilance standards were examined; the results are shown in Figure 2. When analysing the general level of supervision and lifeguard vigilance we graded the standards as follows:

LIFEGUARD VIGILANCE STANDARDS

Vigilance Standards	No. of occasions	% of occasions
Good	35	32%
Average	30	28%
Unsatisfactory	33	31%
Poor	10	9%
No. of pool visits:	108	

Fig.2

- Good – lifeguards are vigilant, in correct positions, adopting a professional stance and scanning in accordance with 10:20 principles;
- Average – lifeguards appear vigilant, although their position on the pool does not allow them to react to incidents within 20 seconds;
- Unsatisfactory – lifeguards are not vigilant, are talking or are distracted; and
- Poor – the standard of lifeguarding is such that the lifeguard's reaction time to an accident or incident is likely to be significantly reduced, e.g. there is excessive talking between lifeguards or with members of the public, and lifeguards are spending long periods not watching the pool.

Therefore, while we assume that 'average' is acceptable, it was only barely acceptable to the mystery visitor. Good standards of lifeguarding were only attained in 35 per cent of the cases. Unsatisfactory standards, where lifeguards were not vigilant, talking or distracted occurred nearly one third of the time, with a further 10 per cent of incidents where lifeguard vigilance was of significant concern. Cross tabulation of lack of vigilance and talking on poolside showed a positive correlation.

The lifeguard vigilance study at the University of Paris showed that, fundamentally, it is not a behavioural issue. While some lifeguards will be distracted and will not perform their duties as per their training (particularly where talking is concerned), the factors that reduce the effectiveness of lifeguarding vigilance are predominantly environmental and physiological. One of the overriding findings from the vigilance studies is that the optimum supervision time is no longer than 30 minutes for a lifeguard. Clearly this could have a significant impact on staffing costs and rotas if the maximum time on poolside was reduced to 30 minutes from the current 90 minutes.

The research considers how levels of activation of the human being are affected. 'Activation' describes the excitability of the central nervous system. Activation states are measured in a continuum ranging from deep sleep to states of strong alertness. There is an optimum vigilance level that is linked to an optimum activation level. It is vital to stress that activation levels under or over the optimum level reduces the quality of vigilance. For example, over-alertness in the short term caused, for example, by caffeine can well reduce the level of vigilance. Other factors that inhibit obtaining the ideal activation level are noise and other distractions; the human biological clock, for example, makes a difference, with some people being better and more alert in the morning than others. It is identified that heat levels of more than 30°C, i.e. those commonly found in swimming pools, can lead to a 45 per cent reduction in vigilance levels. Of course, issues such as lack of sleep will also reduce the activation level.

Other issues that can affect levels of vigilance will include motivation, the monotony of the job (linking to demotivation of the employee), levels of frustration, and other worries and stress caused domestically or through the work situation.

'On balance we are of the opinion that the positives far outweigh the negatives. As good as human beings are, the research shows that using technology will increase their effectiveness'

Tom Griffiths, who frequently comments on lifeguarding safety in the USA and has written extensively on the subject, produced this telling comment in one of his articles: 'As a normal human being, many lifeguards have not been able to maintain vigilance.'

Therefore, what we are asking lifeguards to do is something extraordinary. No wonder we fail to maintain optimum levels of lifeguard vigilance.

The Poseidon DDS

We now move on to the Poseidon system and an examination on suitability and reliability if it is to be used in conjunction with the reduction of lifeguards at swimming pools. We are now aware of two other DDS on the market, one had already been discounted and had not been installed in the UK and the other has been launched post-completion of this project.

The positives of the Poseidon System, from our research, show that it is a smart and reliable system. The limitations are known and can be identified prior to installation. The technology is proven and has, on four occasions, been used to alert staff to a real-time potential drowning incident. To our knowledge, there have been no cases where the system has failed and a bather has drowned in a Poseidon pool. It has more than 100 installations worldwide thanks, in some countries, to government grants.

The latest revision of *Managing Health and Safety Swimming Pools* (paragraph 179) identified the requirement for organisations to consider the use of DDS in the lifeguarding arrangements for the pool. Further, the Management of Health and Safety Work Regulations 1999 in its additional guidance stated that organisations should actively consider the role of technology. This is particularly important, as firstly the leisure industry has failed to consider this additional guidance on legal obligations and, secondly, it is sound practice in health and safety management that hard control measures, i.e. fences and guards, are preferable to soft control measures, i.e. trained personnel. Clearly, this is a case where the DDS is a hard control measure.

Another key part of the research involved examining the mechanics of drowning and whether the DDS would be effective in the overwhelming majority of cases. Again, our findings were positive.

On the other hand, the Poseidon system is not suitable for every pool and the key area of glare that can blind a camera must be identified and managed in advance. The system has the potential to overcome the glare problem at pools for lifeguards, but if the cameras are themselves blinded then the installation is useless. The positioning of the cameras is crucial, so blind spots must be identified in advance. Where these are significant, the installation may not be suitable.

The detection rate in wave pools is poor because of the wave action, and where a pool is heavily crowded, the system potentially reduces the effectiveness of identifying a body, simply because a moving person may be standing over a body in shallow water. However, for deep water pools, the underwater camera is used. Finally, we must identify that Poseidon has no preventative role at all and itself cannot perform the rescue. Therefore, there can be no suggestion that the pool is left without lifeguards, where it should have lifeguards based on industry guidance. On balance, we are of the opinion that the positives far outweigh the negatives. As good as human beings are, the research shows that using technology will increase their effectiveness.

Blackshots Leisure Centre

Belhus Park Pool and Blackshots Leisure Centre were the focus of the research. Blackshots has a 33.5 x 12.8m pool. Since the research commenced and was completed, an adjustable

ORIGINAL LIFEGUARD-TO-BATHER RATIOS

0-100 bathers = 2 lifeguards
101-120 bathers = 3 lifeguards
121-143 bather = 4 lifeguards
Inflatable = 5 lifeguards including deep end cover
Lane swim = 1 lifeguard up to 15 bathers
Aerobics and club swim = 1 lifeguard

Fig.3

PROPOSED LIFEGUARD TO BATHER RATIOS

0-50 bathers = 1 lifeguard
51- 120 bathers = 2 lifeguards
121-160 bathers = 3 lifeguards
Inflatable =unchanged as cameras mainly overhead

Fig.4

floor has been fitted. However, the Poseidon system copes with this, so it is not in itself a factor that affects the research. The pool has a minimum of two lifeguards for unprogrammed swimming. It was identified at an early stage that the splash and teaching pools would be excluded, due to their lifeguarding arrangements and perceived level of risk. However, the management of the pool may use the research at a later date to install the detection system.

The lifeguard-to-bather ratios prior to the installation of Poseidon are shown in Figure 3. These are standard arrangements although in our opinion it can be argued that the threshold for the third lifeguard could be slightly lower.

The lifeguard supervision ratios were amended as in Figure 4, based on the research and from our experience and observations at the pool. As with all lifeguarding numbers, the nature of the user group may affect the ratios.

Financial issues

The total cost in Year One includes the installation costs and originally identified purchase costs. Blackshots identified a realistic reduction of two lifeguards per annum. Lifeguard pay rates were based on an hourly rate, plus the overhead costs including leave, recruitment and sickness costs. Included is the platinum level warranty and servicing, which includes complete cover. At Blackshots Leisure Centre a 3.5 year pay-back was identified. At Belhus Park, due to the size of pool, lifeguard numbers and programme, the pay-back time was around 10 years.

Conclusions

This has been a brief snapshot of our research. We firmly believe that using technology at Blackshots Leisure Centre enables a sensible reduction of lifeguard numbers, and most importantly, the centre will have a higher standard of safety. I referred earlier to correspondence with the Health and Safety Executive. In its correspondence, it made supportive and objective comments that essentially said that it is a matter for risk assessment and due process by pool operators to ensure the right balance between swimming pool safety using technology and lifeguards, and that the principles of the 10:20 scanning system for the lifeguards was still crucial.

Impulse Leisure has been a pioneer in challenging the accepted wisdom of how we operate pools. It is in this way that we improve standards in the long term. I firmly believe, having assisted many pool operators in setting and maintaining standards and having conducted numerous accident investigations, that in certain circumstances it is feasible to adjust the numbers of lifeguards through use of DDS and improve standards of pool safety.

Next steps

At the time of writing, Impulse is installing the DDS. In conjunction with Impulse we hope that more pool operators will seriously consider the applicability of this research to their own pool. ●

● *The ISRM would like to make it clear that it had no involvement in this research project and, as such, cannot comment on its findings.*