

4 Acott C, Sutherland A and Williamson J, Anonymous reporting of diving incidents: a pilot study. *SPUMS J* 1989; 19; (1) 15-19.

\* This book was translated into English in 1943. A 1984 reprint is available from the Undersea and Hyperbaric Medical Society, 9650 Rockville Pike, Bethesda, Maryland 20814, USA, for \$ US 50.00 including postage.

For Further information about the Divedata Databank project write to

Dr D.G.Walker,  
P.O.Box 120,  
Narrabeen,  
New South Wales 2101,  
Australia.

#### AUSTRALIAN DIVING DEATH RATES COMPARISONS WITH USA AND JAPAN

Robert Monaghan

Is the diving death rate in Australia really ten times higher than in the US? A recent PADI Australia publication titled "Diving Accident Management In Australia" suggests that the answer is yes. My models, republished in the "SPUMS Journal"<sup>1</sup>, suggests otherwise.

Table one shows PADI Australia's reported statistics<sup>2</sup>. By comparison, my article calculated 16.7 diving deaths per 100,000 divers was a minimal estimate for the death rate among US divers. If the NUADC estimate is correct, then the diving death rate reported by PADI Australia is really ten times that of the US! If my models are correct, then the Australian diving death rate is roughly comparable to the US figures.

We should start by converting the PADI Australia reported death rate, which is expressed as 2.4 deaths per 10,000 PADI Australia certifications, into a directly comparable death rate per 100,000 divers. Clearly, there are more certifications than there are divers, since one diver can hold several PADI certifications. I have held over 30 leadership level PADI ratings and certifications myself! "Skin Diver" magazine reported that out of circa 250,000 PADI certifications, some 50,000+ or 20% were issued at advanced diver and leadership levels. This statistic implies that 100,000 PADI certifications represents 80% entry level divers and 20% upper level diver ratings. In other words, we expect 100,000 PADI Australia certifications to represent 80,000 divers who also hold 20,000 upper level diver certifications. A death rate of 24 deaths per 100,000 PADI Australia

#### TABLE ONE

##### DIVING DEATH RATES

###### USA

PADI Australia uses an NUADC estimate of 2.6-2.8 diving deaths per 100,000 "active" divers.

###### AUSTRALIA

PADI Australia reports 2.4 deaths per 10,000 PADI Australia certifications, which equals a rate of 24 deaths per 100,000 PADI Australia certifications.

###### JAPAN

PADI Australia reports 20 diving deaths per 100,000 "active" Japanese divers.

Source: PADI Australia's *Diving Accident Management in Australia* pp. 53, 76, 99.

certifications therefore represents 24 deaths per 80,000 divers. This rate is mathematically equivalent to 30 Australian diving deaths per 100,000 divers based on PADI Australia's figures.

I believe this figure can be applied to the overall Australian situation simply because PADI Australia dominates 65% of the Australian diving instruction market<sup>3</sup>. Further, we can calculate the number of deaths among PADI Australia certified divers. We know the rate (2.4 deaths per 10,000 PADI Australia certifications) and the number of certifications (33,000 certifications annually)<sup>3</sup>. We can easily calculate that roughly 8 diving deaths occurred among PADI Australia certified divers. As expected, this represents the major fraction of the reported Australian diving deaths.

Does it make sense that PADI Australia should have a tenfold greater rate of diving deaths than the US? I believe this conclusion is absurd. After all, we use similar or identical equipment and techniques. The same PADI program dominates both markets, representing at least 72% in the US<sup>4</sup> and 65% in Australia. Finally, the same instructor training and store programs, using the same materials and philosophies, are employed in both countries. Why then should there be such a huge difference in diving death rates between Australia and the US?

My models suggest that it is not that Australian death rates are too high, but rather that the claimed US death rates are much too low. Naturally, this has raised a storm of controversy in the US, particularly amongst those who prefer to remain complacent about diving safety based on the low claimed death rates. My calculations suggest there is no room for complacency and instead I make a call for action on improving diving safety now.

My article found that the National Underwater Accident Data Center (NUADC) figures utilized an excessive number of "active" divers. I argued that there were fewer

divers, making fewer dives, but at more risk than the NUADC rosy safety statistics would suggest. Since the publication of that analysis, "Underwater USA" has quoted new NUADC figures which greatly reduce their "active" diver population estimates, e.g. by over a million divers. Even PADI's own US diver estimates are substantially less than the NUADC figures. A recent Diagnostic Research Inc. (DRI) survey commissioned by the Diving Equipment Manufacturer's Association (DEMA) reported only 2 million US divers. My model estimates were for experienced divers only. What if one adds in resort course divers (400,000+ per NUADC) and student divers (500,000+) to my updated model estimates for experienced divers? You get a figure which is close to the survey results for all divers reported by DRI/DEMA. I would therefore argue that the inflated "active" diver population figures of NUADC should be rejected. Similarly, we have to abandon all those rosy US diving safety statistics based on NUADC figures.

Is the death rate among Japanese divers really lower than the death rate among Australian divers? I think not. The Japanese diving deaths are reported by an official government agency. However, PADI Australia has estimated an "active" diver population among Japanese divers by using a process similar to that employed by NUSADC. The result has been similar, namely, an inflation in the number of "active" Japanese divers. This leads to a substantial underestimate of the true Japanese diving death rate, just as happened with the NUADC figures. As further evidence, I point to the precipitous drop in Japanese diving death rates from over 50 to just 20 per 100,000 divers in just a few years. I doubt such a large drop could occur so rapidly among so many divers. Using a more reasonable dropout rate estimate, my models suggest the true Japanese diving death rate is substantially above that calculated for Australia here.

I must admit I was very glad to see these Australian diving statistics because of the support they lend to my models and estimates. My models estimated a minimum US diving death rate of 16.7 diving deaths per 100,000 divers. But I believe the true rate is considerably higher than this minimum figure. I further feel that the US and Australian diving death rates are roughly comparable, although I believe that both the Australian and especially the Japanese diving death rate are still higher than the US figures based on my models.

If PADI US wishes to continue to claim such a low death rate among US divers, then they need to explain the tenfold higher death rates among PADI Australia certified divers, and do something about it! PADI Japan, which dominates the Japanese market and is the world's fifth largest training agency, also has some work ahead of it. I presume both entities would prefer to abandon the low US death rates and accept my models and conclusions as reported here. I think it is past time that the US diving industry accepted the conclusion that diving is not as safe as the NUADC figures would suggest. My models and estimates suggest that diving is not getting any safer, either. I believe there is plenty of room for improvement in how we teach diving and in how we dive. That's my primary message here.

I am understandably envious of my Australian colleagues, with your co-ordinated chamber and rescue operations and your independent diving statistics collection efforts, particularly Project Stickybeak. I am hopeful that the US diving community will see fit to follow your example. I have called for an independent US entity to collect not just diving mortality data but also diving injury data as well. My viewpoint is that such an entity will need to be financially independent of interested parties in the diving industry, including diving equipment manufacturers, trade associations, and diver training agencies. I agree with your ideas that such a morbidity and mortality database will enable us to improve diving safety. Using it, we can determine where and how we can make effective safety improvements in diver training and diving operations. Thanks to your efforts, Australia enjoys what is undoubtedly the world's best program in this regard. Your efforts provide compelling proof that such a program is both possible and very worthwhile. Keep up the good work!

## REFERENCES

- 1 Monaghan R., The risks of sport diving: just how many divers are there ? *SPUMS J.* 1988; 18 (2): 53-60.
- 2 Diving Accident Management in Australia. North Ryde: PADI, 1988. 76.
- 3 Diving Accident Management in Australia. North Ryde: PADI, 1988. 77.

*Robert Monaghan's address is P.O.Box 2182, Southern Methodist University, Dallas, Texas 75275, USA.*

## THE EQUIVOCAL BEND, SHOULD WE TREAT WITH HYPERBARIC OXYGEN?

David Smart

## SUMMARY

Three case histories of divers presenting to the Royal Hobart Hospital (RHH) with minor symptoms and signs after diving have been retrospectively examined to assess the effect that treatment with hyperbaric oxygen (HBO) had on their condition. Hyperbaric oxygen produced complete amelioration of almost all symptoms in each of the three cases. The problems in interpreting the data relating to