

# The world as it is

## Future synergism in diving accident management: the Singapore model

Chong Si Jack, Liang Weihao, Kim Soo Joang and Kang Wee Lee

### Key words

Hyperbaric facilities, diving accidents, hyperbaric oxygen therapy, treatment, research, general interest

### Abstract

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With the rise in popularity of recreational diving in recent years comes increasing numbers and risk of diving-related injuries and demand for professional medical treatment of such injuries. Concurrently, hyperbaric oxygen therapy (HBOT) has become more readily available for the treatment of various medical conditions. In Singapore, diving and hyperbaric medicine was largely a military medicine specialty confined to the Singapore Armed Forces for many years. The new Hyperbaric and Diving Medicine Centre set up in Singapore General Hospital (SGH) offers an excellent opportunity for collaboration between the Singapore Navy Medical Service (NMS) and SGH. This combines the expertise in the field of diving and hyperbaric medicine that NMS provides, with the resources and specialized services available at SGH. This collaboration was formalized by the recent signing of a Memorandum of Understanding between the two organisations. The partnership will allow both organisations to build on each other's strengths and enhance the development of research and training capabilities. This collaboration will also be an important step towards formal recognition and accreditation of diving and hyperbaric medicine as a medical subspecialty in the foreseeable future, thus helping its development in Singapore. This synergistic approach in diving accident management will also promote Singapore as a leader in the field of diving and hyperbaric medicine in the region.

### Introduction

The popularity of recreational diving has increased in recent years in the Asian region. With the rise of this sport inevitably comes increasing numbers and risk of diving-related injuries and demand for professional medical treatment of such injuries. Concurrently, HBOT is increasingly being accepted for certain medical conditions and there has been an expansion of hyperbaric services in other countries in this region.<sup>1</sup> The new Hyperbaric and Diving Medicine Centre (HDMC) set up in Singapore General Hospital (SGH) offers a unique opportunity for collaboration between the Singapore Navy Medical Service (NMS) and SGH. This combines the expertise in the field of underwater medicine that NMS provides, with the resources and specialized services readily available at SGH.

### Aim

The collaboration between the NMS and SGH seeks to achieve the following synergism in diving accident management:

- to streamline and optimise available resources through cooperation rather than competition between the different services, and allow ample resources to be diverted to research;
- to house a wide range of facilities and clinical services together with the hyperbaric chambers at a single location, thereby increasing convenience and reducing need for unnecessary transfers, especially of ill, unstable patients;
- to increase our patient pool and widen our reach through the promotion of our services to local and regional patients;
- to work towards formal recognition and accreditation of diving and hyperbaric medicine as a medical subspecialty in the future;
- to establish Singapore as a subject-matter expert in the fields of diving and hyperbaric medicine in the region, with world-class facilities, services, training and research.

### Navy Medical Service (NMS)

In the 1970s, the practice and knowledge of hyperbaric treatment in Singapore was in its infancy. HBOT was predominantly used in the treatment of decompression illness (DCI) in fishermen divers,<sup>2</sup> and infrequently as adjunct treatment for cases of gas gangrene, burns and diabetic ulcers. The highlight in the 1980s for hyperbaric medicine and its specialists in the Republic of Singapore Navy (RSN) was when the nation was building its first subway/train network, the Mass Rapid Transit (MRT).<sup>3</sup> The

project involved extensive underground tunnelling with men working in compressed air environments. The expertise of the NMS in compressed-air works was called upon, and for the four years of the MRT project, diving medicine specialists supervised the construction sites and successfully treated all cases of DCI.

NMS physicians continued to gain exposure in the years after the MRT project and saw an increasing number of DCI cases amongst recreational divers.<sup>4</sup> Clinical hyperbaric medicine cases were also an increasing trend, with non-healing diabetic wounds constituting the majority of the cases. Since then, NMS's expertise in diving and hyperbaric medicine has grown and is now a vital part of the support it provides to the RSN. NMS has also established itself as a subject-matter expert in Singapore and the region through the provision of specialist consultation and treatment services.

To ensure currency and competency, medical officers and senior specialists are regularly enrolled in overseas courses and seminars for training and knowledge-sharing, and the expertise and knowledge they bring upon their return is incorporated into the service.

### Singapore General Hospital

In Singapore, military diving contributed to the vast majority of all diving activities in the past. As such, the fields of diving and hyperbaric medicine have largely remained a military medicine specialty and its practice confined to the military until the establishment of the first civilian hyperbaric chambers in 2002. With the advent of diving as a popular leisure sport and an increasing number of applications of HBOT, SGH commissioned the Hyperbaric and Diving Medicine Centre (HDMC) in partnership with Hyperbaric Health (Figures 1 and 2) in 2008, offering HBOT for a variety of conditions including decompression illness, gas embolism, gas gangrene, non-healing wounds and compromised skin flaps and grafts, amongst other indications. This is the first publicly funded multi-place, hyperbaric medical facility to

be set up in a tertiary government hospital in Singapore.

The benefit of having the HDMC within the premises of SGH itself is the ready availability of a wide spectrum of clinical services and facilities that SGH can provide to the diving patients. These include ward facilities to provide monitoring and nursing care, an intensive care unit for the severely ill, and operating theatres, as well as specialists in various fields providing round-the-clock, expert medical advice. The presence of a state-of-the-art chamber within the premises of the hospital is invaluable to the treatment of ill patients who may otherwise be too sick to be transferred to a hyperbaric facility at a different location.

### Collaboration between NMS and SGH in diving accident management

The relationship between the NMS and SGH was formalized by the signing in October 2008 of a Memorandum of Understanding in areas of clinical practice, research and training. Since then, the two organisations have collaborated, whereby accredited military personnel will manage both military and civilian casualties at the HDMC in SGH. NMS personnel currently provide 24/7 recompression therapy care for all diving casualties. This ensures clinical competency and facilitates management of complex decompression illness cases that may be associated with other injuries, due to the close proximity and support of the full range of clinical services in SGH.

### Collaboration in research

One of the potential benefits of the collaboration between NMS and SGH will be to allow more to be channelled towards research and development. An example of research collaboration between the two organisations is a joint, prospective study to evaluate the effects of hyperbaric oxygen therapy on acute thermal burns. Recruitment of study participants began in early 2009.

**Figure 1**  
**The Hyperbaric and Diving Medical Centre,**  
**Singapore General Hospital**



**Figure 2**  
**Medical staff at SGH HDMC monitoring a patient**  
**during hyperbaric treatment.**



## Conclusion

In a small country like Singapore, collaboration between different services in providing professional and holistic hyperbaric treatment will serve to benefit all parties involved with better resource utilisation and achieving synergy in diving casualty management, which will benefit our patients. This will likely be our approach to the future development and evolution of the field of diving and hyperbaric medicine in Singapore.

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*LTC Chong Si Jack, MBBS, MRCS(Edin/Ireland), MMED(Surg), is Head, Medical Doctrines and Training Branch in the Republic of Singapore Navy. He is an advanced trainee in the Department of Plastic, Reconstructive and Aesthetic Surgery at Singapore General Hospital.*

*CPT Liang Weihao, MBBS, DFD(CAW), is Medical Officer at the Medical Doctrines and Training Branch in the Singapore Navy.*

*Kim Soo Joang, MBBS, M.Adv.Med.(Otago), is the Principal Resident Physician of the Hyperbaric and Diving Medicine Centre, Singapore.*

*COL Kang Wee Lee, MBBS, MRCS(Edin), MMED(ORL), FAMS(ORL), is Chief Naval Medical Officer in the Republic of Singapore Navy. He is a consultant otolaryngeal surgeon in the Department of Otolaryngology in Singapore General Hospital.*

### **Address for correspondence:**

*Chong Si Jack  
Navy Medical Service  
Republic of Singapore Navy  
126, Tanah Merah Coast Road  
Singapore 498822*

**Phone:** +65-6544-4949

**Fax:** +65-6544-4955

**E-mail:** <chong\_si\_jack@hotmail.com>

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