

ROYAL CANADIAN NAVY
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The Physician Assistant Onboard Canadian Submarines – with a Brief History and Overview of our Canadian Submarines.

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ABSTRACT

We will learn how the profession of Physician Assistant on Canadian Forces Submarines came to be. I will cite some historical facts and how all of this evolved into the modern Submarine Physician Assistant of today.

The main highlights of this paper are under the headings of – History of Canadian Submarines; History Of Submarine Medical Technicians; The Process Of Becoming A Physician Assistant; Submariner. It will outline the required submarine and medical courses, the roles and responsibilities of the Physician Assistant. It will also touch on medical support, life on board and some of the common medical problems which may arise.

It is my belief that an individual needs to have all these facts in order to make an educated decision on whether or not he or she should follow this demanding and arduous career path or if they should take another worthwhile direction.

INTRODUCTION

This paper will introduce you to Physician Assistant (PA) on Canadian Submarines.

It is my goal to give the reader a realistic view of all that it takes to become a Submarine PA in the Canadian Armed Forces. Future PAs will be able to read this paper and have a better understanding of Submarine PAs prior to making a commitment for themselves, their family and to the Canadian Armed Forces.

By the time you read the conclusion of this paper you will be familiar with all the milestones an individual has to reach to be successful as a certified PA on Canadian Submarines.

History of Canadian Submarines

CC1 and CC2

Canadian Submarines have been in service since 1914. The first two Submarines, originally named "*IQUIQUE*" and "*ANTOFAGASTA*", were built in Seattle for the Chilean government. However, the deal with the Chileans fell through, and on the eve of the First World War, these Submarines were purchased by the Premier of British Columbia, Sir Richard McBride. The Dominion government ratified the purchase and on 6 August 1914 the two submarines were commissioned *CC1* and *CC2*, the names chosen because of their resemblance to the British "C" class of their Submarines. After three years of cruising and training on the west coast they were ordered to Europe, and on 21 June 1917 set sail for Halifax with their mother ship *HMCS SHEARWATER*. They were the first warships ever to transit the Panama Canal under the White Ensign. Unfit for a transatlantic crossing, they remained at Halifax until sold for scrap in 1920.^{1,2}

CH14 and CH15

These Submarines were 2 of the 10 submarines of this "H" class built in Quincy, Massachusetts. *H14* and *H15* were on their way to Britain when hostilities ended for World War 1 and were rerouted to Bermuda. They were presented to the RCN in February 1919 and commissioned at Halifax that June as *CH14* and *CH15*. Scarcely used, they were paid off on 30 June 1922 and sold for scrap five years later.^{1,2}

U-190 and U-889 (Captured U-Boats)

On the 12 and 13th of May, 1945, *U-190* and *U-889* formally surrendered at sea to ships of the RCN, war having ended days earlier. Both were of the large IX C Type, built in Bremen in 1942 (*U-190*) and 1944 (*U-889*). They were almost immediately commissioned into

the RCN (Royal Canadian Navy) for testing and evaluations. Following which on 12 January 1946, *U-889* was turned over to the USN (United States Navy). She was expended in torpedo tests off New England the following year. *U-190* was paid off on 24 July 1947 and **on October 21** was sunk by Canadian Naval Aircraft near the position of her last victim, *HMCS ESQUIMALT*, in April of 1945.^{1,2}

HMCS GRILSE

The *GRILSE* (SS-71) was the former United States Navy Submarine *USS BURRFISH* (SSR 312). She was loaned to Canada for five years and returned at that time. The *GRILSE* was commissioned into the RCN at Groton, Connecticut, 11 May 1961. The Submarine was originally commissioned on 13 September 1943 and conducted 6 War Patrols during World War II. After American and Canadian service she was sunk off San Clemente as a target **on 19**

November 1969.^{1,2}

HMCS RAINBOW

The *RAINBOW* was the former United States Navy Submarine *USS ARGONAUT* (SS475), originally commissioned on the 15 January 1945. The *ARGONAUT* only conducted 1 war patrol during World War II. On 2 December 1968, at Norfolk, Virginia she was transferred to the Canadian Navy and became *HMCS RAINBOW* (SS-75). She remained on the West Coast of Canada and conducted numerous exercises. On the 31 December, 1975 she was decommissioned and returned to the United States.^{1,2}

O-BOATS

These Submarines all were built at H.M. Dockyard Chatham England. The *OJIBWA* the first commissioned 23 September 1965, the *ONONDAGA* in the middle commissioned 22 June 1967 and the newest arrival the *OKANAGAN* commissioned on 22 June 1968. After yeoman service of 35 years the last of these, *HMCS ONONDAGA* decommissioned in July 2000.

- *HMCS OJIBWA* (SS-72), Commissioned 23 Sep 1965
- *HMCS ONONDAGA* (SS-73), Commissioned 22 Jun 1967
- *HMCS OKANAGAN* (SS-74), Commissioned 22 Jun 1968
- These 3 state-of-the-art (when built) Oberon-Class submarines were built in Chatham, UK
- The Oberon-class was highly successful, used by the British, Canadian, Australian, Chilean, and Brazilian navies
- Were true workhorses of the Canadian Navy, conducting countless patrols
- All underwent extensive upgrade between 1982 and 1986
- Between 1998 and 2000 all were slowly decommissioned after more than 30 years of service
- Canada purchased 2 other Oberons from UK, *HMS OLYMPUS* as an alongside trainer and *HMS OSIRUS* for spare parts.^{1,2}

VICTORIA (UPHOLDER) CLASS

The Canadian Maritime Force has purchased four Victoria (formerly Upholder) class diesel-electric submarines from the UK Royal Navy – *HMCS VICTORIA* (876), *HMCS WINDSOR* (877), *HMCS CORNER BROOK* (878) and *HMCS CHICOUTIMI* (879). The Victoria Class replace the decommissioned Oberon Class, the last of which was retired in July 2000. The first of class, *HMCS VICTORIA*, was commissioned in Halifax in December 2000 and the second, *WINDSOR*, in June 2003. *CORNER BROOK* was delivered in March 2003. Currently today we have two Victoria class submarines in service, *HMCS VICTORIA* serving on the West Coast and *HMCS WINDSOR* serving on the East Coast.^{1,2}

History Of Submarine Medical Technicians



The Physician Assistant (PA) profession evolved in the United States during the mid-1960s, in response to a shortage and uneven geographical distribution of doctors working in primary care. Mid-level clinicians have been employed by the Canadian Forces (CF) for over 50 years and in 1984 the first class of "Physician Assistants" graduated from the Canadian Forces Medical Services School at Borden, Ontario.

In this paper I will examine the evolution of the life as a Medical Technician (Med Tech), the courses they are required to successfully complete and the progression steps it takes them to reach the level that is required to be a Physician Assistant onboard Canadian Submarines.

Canadian Submarines did not always carry a Medic / PA, they adopted the British way of doing things which was "build the vessel then fit the men". This meant if you did not carry a medic then there was room for one more mechanic or other hard sea trade-related member. The United States Navy however always carried a medic, some of whom served with marked distinction during the war. In the British and Canadian Submarines, the Chief of the boat (Coxswain) was given a crash course in some emergency procedures, but as the dives of the Submarine got longer and hyperbaric medicine came into its own, the requirement arose for a trained Medic with a specialty in underwater medicine.

With the commissioning of *HMCS GRILSE*, the first Canadian Submarine Medical Technicians went to the US Submarine base at Groton Connecticut across the river from New London where they went through a six month long course on everything from dental work to a course called "The conservative Management for the Surgical Problem" which served them well later in their career on surface ships and other independent duties. It is interesting to note that Canadians who were fortunate enough to be chosen for this course were always in the top 5% of the class which credits the medical trade group three and four courses (now called the Physician Assistant course) for the proper preparation of the Med Techs at sea on independent duty. It is also worth noting that first two or three chosen for this training were ENT (ear nose and throat) specialty. The navy figured out that these specialty trades were being wasted at sea – e.g. Lab techs, OR techs, X-ray, etc. – so they opened the training to LSMA3 (Leading Seaman Medical Assistant Trade Group 3), and all medical specialty trades were shore-bound.

Back then the Submarines carried Medical Assistants at the junior rank level, however the LSMA3 ratings were trained equivalent to a PA in the US, whereas today the juniors are called Med Techs and are not trained equivalent to a PA until much later in their career. With the arrival of the Oberon class of Submarines, the call for Submarine Med Techs was increased and it became mandatory to carry a Medic in Canadian Submarines. As the Military evolved so did the prerequisites to become a PA on Submarines. In 1984 the first class of "Physician Assistants" graduated from the Canadian Forces Medical Services School at Borden, Ontario. From then to present day Canadian submarines are required to carry a certified PA onboard as part of the regular crew. However to become a PA today it requires a lot more time in the service and a higher rank level than before. So getting PAs qualified and ready for submarine service is much harder today but very rewarding in the end.³

The Process Of Becoming A Physician Assistant

To become a Physician Assistant there are many years of training and a certain process that one must follow. Upon completing Basic Training in St. Jean Quebec, a member then proceeds to the Canadian Forces Medical School to take the first step on their career path to becoming a PA. The first medical course is a 6 month course called QL3 (Qualification Level 3)⁴. This course is a combination of classroom studies and working in the field as a Med Tech. During the QL3 course one will learn the basis of anatomy and physiology, how to assess

patients, how to treat patients, administer medications, initiate pre-hospital treatment for trauma and medical emergencies, conduct medical operations in a field environment, perform medical administration and supply tasks, perform airway management, prepare minor surgery supplies and equipment, and perform laboratory procedures. Each one of these items is broken down even further into sections of book learning and hands-on training. The first medical course of their career is very important as it sets the foundation for their career as a Med Tech and in the future becoming a Physician Assistant. After completing their first medical course each Med Tech is then given a posting to a base in Canada, where they will begin applying the knowledge and skill set that they have just learned.

There are many different positions that a Med Tech can start their career at after successfully completing the QL3 level – in the field as a combat medic, in a hospital setting working on a ward, or in a clinic seeing patients on a walk-in basis. Also each Med Tech must take a course called PCP (Primary Care Paramedic) this course trains them to be a paramedic and gives them their license in whichever province they have completed their training. A Med Tech will then spend 2-3 years depending on their progression as a military member working on their skills and preparing themselves for the next journey toward becoming a Physician Assistant. The journey takes them back to the medical school in Borden, Ontario for their next medical course called QL5.⁵ This course is another long 6 month course which involves more in-depth medical information and skills –

- Provide non-emergent care
- Provide advanced emergent care
- Provide clinical care
- Manage medications
- Perform health and safety inspections
- Manage chemical, biological and radiological casualties
- Carry out medical administration procedures
- Provide medical support during operations

Once a Med Tech has completed this course and has advanced to the next rank level (Corporal) usually at the 4 year mark of their career, they can begin to do independent duty within their scope of practice. As a QL5 they are able to go to sea on ships, under the supervision of a Physician Assistant. The PA will help train the Med Tech and prepare them for their next course required. The next phase of a Med Tech's life is very long – about 4-6 years until they get their next career course. During this time they will be deployed in many units across Canada and also deployed on ships or on land with the Army or Navy supporting their troops overseas. The Med Tech is constantly challenged with new tasks on a daily basis. Once a year they receive an annual evaluation which is submitted to Ottawa where a merit board is convened and its members decide who is number one at their rank level. Most Med Techs will be promoted in their career around year 8-10 if they have had a flawless record and good performance reviews. Once they have been promoted to the rank of Master Corporal they start to take on more of a supervisory role and help with mentoring the new Med Techs that are coming up through the ranks. Once selected by the merit board in Ottawa a Med Tech will once again return to the Canadian Forces medical School in Borden Ontario to take yet another step on their career path to becoming a PA. This next course is called QL6A6 which is only 3 weeks long and the main focus is on –

- Leadership
- Medical administration
- Learning to do medicals
- Conduct a Patient Assessment
- Initiate a Treatment Plan for Common Conditions
- Set up a Field Medical Facility

Once they return to their home units they will be given more of a leadership role and

will work toward their next rank level. A medic usually remains at the Master Corporal level for another 5 years until they are ready to be promoted to the subsequent rank of Sergeant. Once they have been at this level for at least one or two years they will then be selected to attend the Physician Assistant course in Borden, Ontario. The PA course is broken down into 3 phases:^{7,8}

Phase 1: Students enrolled in the PA Program are required to complete a course curriculum of 47 weeks of didactic course work at the Canadian Forces Health Services Training Center, located at CFB Borden, Ontario.

Phase 2: 47 weeks of supervised clinical competency rotations within a wide variety of selected civilian medical facilities throughout Canada.

Phase 3: 4 days of OSCE (objectively structured clinical examination) type exams.

After completion, all PAs write the CAPA (Canadian association of Physician Assistants) certification exam. PAs are required to pass this exam in order to be able to work on an independent duty position, whether it is in a clinic, field setting, deployed overseas, on ships and or submarines. All students granted admission to the PA program are drawn from existing Medical Technicians in good standing within the Canadian Forces Medical Branch and are selected by merit by a military selection board. After completing the PA program they are posted to various locations in Canada to fill positions wherever needed. All PAs are required to complete their ACLS (advanced cardiac life support) and ATLS (advanced trauma life support) courses. As well there are many other courses they can take depending on what position they fill. Up until now you have read what it takes for a Canadian Forces Medical Technician (Medic) to become a PA.

Submariner PA – The Process



We will now shift our focus to the evolution of the Physician Assistant onboard Canadian submarines. PAs have been providing safe and effective health care in the Canadian Forces and in the United States since the 1960s. The existence of mid-level providers in Canada can be traced back to sick berth attendants in the Canadian Navy and on submarines close to 100 years ago they used the cook or coxswain as the first aider on board. Through the years, they have been called 6B medical assistants. However, in 1986 the name changed to physician assistant as a result of the re-alignment of the profession to better reflect its rapid growth in the United States.^{7,8}

Victoria-Class submarines are now required to have a certified Physician's Assistant (PA) on board who is also a fully trained submariner. The submarine qualification process requires trainees to complete the Basic Submarine Qualification Course⁹ which is 3 months long, conducted at CFNOS Submarine Training Division in Halifax, Nova Scotia. During the course, qualified instructors teach the trainees all aspects of the submarine broken down into many different categories and systems inside and out of the submarine. Trainees then join their respective submarine to complete a period of consolidation. They are given an OJT (on the job training) package on completion of the BSQ to work through which requires over 200 different signatures from qualified submariners in all trades. After they have spent numerous hours to months learning every system on board while alongside and at sea, they must prepare for, and complete the four departmental consolidation walkthroughs – Combat Systems Engineering, Electrical, Marine Systems Engineering, and the Coxswain – to the satisfaction of the walkthrough OPI on each department and system that falls under it. When this is completed, they must then successfully challenge a Basic Submarine Qualification Board (AILS). All the departmental OPI's and the Executive Officer of the boat get together in a room with the candidate and for about 1-2 hours they will drill the trainee with questions on everything they have learned. If successful the trainee will be awarded their submarine qualification. The

Commanding Officer will pin their Dolphins (a Submarine warfare insignia worn by enlisted men and officers of the Royal Canadian Navy to indicate that they are qualified in Submarines) on their uniform. OJT is a very large part of the on board training regime. In addition to the BSQ program and OJT package, most trainees will arrive with trade or position related OJT packages for the courses they received at CFNOS Submarine Division. Some examples of OJT and courses that the PA is required to complete are:^{9,10}

- Senior Harbor Watch Keeper
- Petty Officer of the Watch (POOW) (surfaced)
- Helmsman (submerged)
- Command Display Console (CDC) (submerged)
- Fire Control Console (FCC) (submerged)
- Wet Pressurized Escape Training (WPET)

SCC (ship control consol) / MCC (machinery control consol) Watchkeeping

When the Submarine is alongside in homeport the PA enters the monthly duty watch rotation. They are given another package called the DWS (Duty Watch Supervisor Package) which they must complete and then pass another board. Once the PA has been qualified they become the Senior Harbor Watch Keeper and are responsible for the safety / security of the crew and the Submarine.¹⁰

Control Room Watchkeeper Surface; (4 week course taught at CFNOS Halifax)

When the submarine is transiting on the surface the PA enters the POOW rotation. As the POOW he's responsible for managing the "Control Room" personnel and dealing with any emergencies. He's also responsible for Navigating the Submarine – keeping the chart up to date for course, speed and position. The POOW answers to the Officer of the Watch (OOW) on the Bridge.^{10,11}

Control Room Watchkeeper Dived; (4 week course taught at CFNOS Halifax)

When the Submarine is submerged the PA is part of the CDC/FCC Operator rotation and the Helmsman's rotation. As the Helmsman he's responsible to keep the ordered Depth and Course. He's also responsible to operate the "One Man Console" (OMC) for Propulsion, Planes control and Auto-Pilot control. The FCC (Fire Control Console) Operator is responsible to collect data from all sensors, conduct Target analysis and transform data into a target / firing solution which includes Bearing, Range, Course, Speed and Bearing Rate. As a CDC (Command display Console) Operator he's required to co-ordinate and control the flow of information to the Action Information Organization through data from all sensors (i.e. Sonar, Radar, and Periscopes) prioritize and display this information for command on CDC.^{10,12}

WPET

All submariners must undergo wet pressurized escape training (WPET) in the Canadian Submarine Escape Trainer (CSET) located at the Institute Marine du Quebec (IMQ) in Rimouski, QC. This course teaches and/or maintains the skill of the submariner how to properly escape from a sub in the event of an emergency. WPET is conducted during the Basic Submariner Qualification (BSQ) Course, and every two years thereafter for operational submariners. Also there are 3 medical courses that a PA requires to have to aid him better in understanding operational and hyperbaric medicine.⁹

As well there are certain medical courses one should have while serving on submarines. This said, time constraints and/or operational commitment may make it very difficult to acquire these "nice to have" courses.

Diving Medicine Basic (DMB)

The Diving Medicine Basic Course prepares Medical Officers and Physician Assistants to provide clinical support to diving operations. This two week course is offered at the School of Operational Medicine in Toronto. During this course you will learn everything from being able to assess fitness to dive; provide clinical medicine support to divers and submariners including annual medicals; and provide emergency medical care to hypo/hyperbaric casualties (excluding recompression chamber treatment).^{13,16}

Diving Medicine Advanced (DMA)

The Diving Medicine Advanced Course prepares Medical Officers and Physician Assistants to provide advanced medical support to diving operations. This three week course is offered at the School of Operational Medicine in Toronto. During this course you will learn to provide operational medical advice on the employment of CF divers; treat hyperbaric /hypobaric related injuries; and assist in the administrative processes following a diving-related accident.^{14,16}

Submarine Medicine (SbMed)

The Submarine Medicine Course prepares Medical Officers and Physician Assistants to provide medical support to Submarine operations. This three week course is offered in Halifax Nova Scotia. Graduates of this course will be able to assess the medical fitness of submariners; ensure a safe environment for submariners (occupational health); provide support to the escape and rescue of submariners; and investigate the medical aspects of a submarine incident/accident.^{15,16}

Roles and Responsibilities of the PA

When the PA is posted to a Submarine they belong to the executive department. In this section there is the Commanding Officer, Executive Officer, Coxswain, PA, 2 cooks and 1 Steward. Whether at sea or alongside the PA has many responsibilities. They become the divisional chief for the cooks and steward; maintain a sickbay office ashore as well as onboard. If the sub is not at sea then the PA works in his sickbay office to maintain medicals and support of the crew. The Physician Assistant is responsible to the Commanding Officer for advising of the precautions necessary for the prevention of illness and dental fitness in the submarine; ensuring that crewmembers Periodic Health Examinations and immunization profiles are up to date; providing emergency medical and dental care while at sea; briefing the CO daily while at sea and weekly when alongside on Submarine company's general health condition; providing health advice for atmospheric air quality matters onboard the Submarine while at sea and alongside; ordering, performing monthly inventory and monitoring the expiry dates of narcotics and controlled drugs held in the CO's cabin safe; providing recommendations and advice concerning the evacuation while at sea of sick or injured crewmembers; maintaining and ensuring the security of all medical documents.



The PA is responsible to the Executive Officer for the organization, administration, good order and cleanliness of the sickbay; acting as advisor on hygiene and sanitation matters with CPR (Cardiopulmonary Resuscitation). There also is a team made up of 4 members of the crew called the CCT (Casualty Clearing Team). This team is comprised of 1 steward, 2 cooks, and another suitable member chosen by the PA – usually a sonar op on the opposite watch rotation of the PA. This provides 2 teams of 2 to help with casualties and there will always be someone awake on different watches to be the first on scene to start treatment until the PA can arrive. The team is trained as AMFR (Advanced Medical First Responder)¹⁷ which is a 10 day course teaching them more advanced skills similar to civilian fire fighters. This helps the PA a lot especially if there is a mass casualty scene – the CCT can manage casualties to a certain level until the PA can get there.

The CCT in the event of casualty will arrive on scene with the necessary equipment and start their primary and secondary survey and be ready to hand over to the PA when he arrives on scene. It is very beneficial to have this trained team on board as they can take care of small lumps and bumps, cuts etc. while the PA is getting his required rest off watch. If the casualty is critical or needs some type of major medical intervention then the PA will be wakened to help out, otherwise the team writes it up and reports to the PA at a later time so he can follow up with the casualty. The PA also trains his team on a regular basis by running casualty exercises at sea to keep his team on their toes and also to see how the crew comes together to assist. Every year the CCT and the PA attend a three day CCT training taught by other PAs to foster team spirit. All crew members on board also are trained on where all the medical equipment is located and how to use it. In general this works out well because if the CCT and the PA are busy with casualties we can send a crew member to get extra medical gear for us.

There is specialized equipment on board as well that is used for extraction of casualty either from a tight space or to transfer them to another area or in the event we need to medically evacuate the casualty to a higher medical facility either by boat transfer or by helicopter lift. The PA has the final say when it comes to evacuating a casualty, they will inform the command that the casualty needs better treatment and the whole submarine comes together as a team to make this happen from arranging transfer, to rigging of ropes and stretchers to get the casualty out of and off the Submarine. Unlike the larger submarines in different countries, Canadian subs do not have a sickbay to work on casualties so we do our treatments wherever we can find space. Usually this is done in the junior rates' eating mess. Their tables become the PAs exam bed or if the casualty can not be moved to the mess then the Commanding Officer's cabin doubles as another spot, using his bunk as a treatment area. All in all casualties on board Submarines are well looked after and are in very good hands. Some of the medical issues that the PA and his CCT have to deal with are discussed next.^{10,18,19}

Life on board

Life aboard a submarine is quite different compared with life on a surface ship – there is no regular variation between day and night. There are no set days off while at sea, therefore, life is repetitive and without progression. Time is completely governed by the watch rotation which is: 8 hours in the control room, 4 hours off (not sleeping) used for meetings and general work, 4 hours back in the control room followed by 8 hours off for sleep/meals and personal time. Because of the watch rotation meal hours are very hard on the system since one is either coming off watch, having a quick meal and going to bed, or waking up, eating and sitting on watch for 8 hours. The meal hours onboard a Submarine are as follows: 03:30 breakfast, 11:30 lunch, 15:00 mid-afternoon snack, 19:00 supper, 23:30 mid-night snack. So as you can see each of the meals offset the on-coming and off-going watch rotations.

Submarines are built compactly and living spaces are dictated by and are secondary to military requirements. There are 48 crew members onboard Victoria Class submarines with 3 toilets and 2 showers available for all members to share. However showers are limited to available water on board. Cooks and stewards are entitled to a shower every day as food handlers, the PA every second day, the crew every 3-4 days. In general crewmembers will take "bird baths" at the sink or use baby wipes on a daily basis to maintain hygiene. Stowage space for personal gear is markedly limited and it becomes difficult to deal with the amount of clothing one can store onboard as there are no laundry facilities available. Reading, card playing and watching TV are the only entertainment, personal Wi-Fi (i.e. cell phones/internet) is not available, so Facebook/ Twitter/messaging etc is non-existent while at sea. As well this makes it extremely difficult for the PA to communicate with medical authorities ashore should the need arise. This can leave the PA on his own to make some difficult, possible life-changing medical decisions on behalf of his crew. There is no personal communication to family and friends until once again coming alongside. If you are fortunate you will have lots of communications from your loved ones waiting for you. Once the Submarine is underway only the authorized crew members are allowed topside (outside of the submarine).^{10,19}

Common Medical Conditions encountered

Headaches amongst submariners are common, especially during prolonged submerged operations, because of the slight increase of pressure within the boat, and because of the ventilation and depletion of oxygen and the increase of carbon dioxide content of the air. Headaches are also related to the close confinement, noise of the engines, smell of diesel, battery gases, increasing nervous tension, fatigue, and perhaps inadequate lighting. Drinking of strong coffee is also a factor which must not be ignored, for both affect the crew's stomachs and nerves, especially if they indulge in them at night on an empty stomach. The incidence of disease in submarine personnel reflects the disease incidence in a population of healthy young adults, as influenced by the environment in which they reside. Prolonged residence in specialized craft such as submarines, where there is no sunlight and limited fresh air, where there is close association in sleeping and working spaces – when enhanced by the presence of heat and humidity – presents ideal conditions for the spread of disease. The diseases typical to submarines have been attributed to colds, constipation/diarrhea, skin diseases and various physical complaints of neurogenic (giving rise to or arising from the nerves or the nervous system)²⁰ or psychogenic (physical symptoms caused by a psychological or emotional state)²⁰ origin. While it is true that these diseases are encountered in the majority, they must not be considered as the only conditions existent. Due to the confined space, crew is more prone to experience MSK (musculoskeletal) type injuries and superficial lacerations to head and extremities often requiring sutures.^{18,19}

DISCUSSION

In this paper we have reviewed and discussed the history of Canadian Submarines –the way it was and the way it is now for a Medical Technician to become a Physician Assistant and to further become a PA on Submarines, including all of the roles, responsibilities and courses that come with the position. As you can see things have changed from the 1960's to present day, not only with the evolution of the military, but also with the Medical Branch – from the time required at each rank, to the qualifications required to progress to the next level in order to shoot for the ultimate goal of being selected for the PA course and then becoming a Submariner. Becoming a PA on Submarines is no easy task and requires a lot of dedication and effort to complete each phase of the training as it is completely out of trade for the Physician Assistant.

CONCLUSION

In conclusion we have learned that there are many different facets to becoming a Submarine Physician Assistant. There are on one side the extensive medical courses that are needed and on the other side the arduous Submarine qualifications one needs to accomplish. This is quite a precarious balancing act to be able to fuse, in essence, two very different sides of a coin or even two separate careers. In both instances one has to invest an extraordinary amount of time. With current information coming from so many different sources, this isn't easily realized by possible future Submarine PAs. I hope that this paper will make this decision process a little easier and clearer for future candidates. Completing the Submariner Qualification, especially as a PA (we are a rare breed) is very rewarding and it is an honour to ~~proudly wear the Dolphins~~.

DBF! (Diesel Boats Forever!)

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