

The Heritage of Naval Surgery

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Introduction

Surgeons in the modern Royal Australian Navy (RAN) share a rich history and heritage handed down to us, particularly from surgeons of the Royal Navy during the age of sail from the 16th to the late 19th century. Naval surgery became a separate branch of military surgery. It became standard practice to include surgeons as a standard part of a ship's scheme of complement. Areas of each ship were allocated for surgeons to operate using surgical instruments and supplies and assisted by medical sailors. The discipline of naval surgery evolved to include specific training for surgeons in the treatment of common illnesses encountered at sea - this being previously the responsibility of ships' captains. The first hospital ship, *Therapetia*, a trireme, accompanied the Athenian fleet in the 5th century BCE (1). Much later, in 1608, the Royal Navy (RN) provided its first hospital ship *Goodwill* for an expedition to Algeria (2). During the Crimean War 100,000 wounded British soldiers were repatriated by Royal Navy Hospital ships⁽³⁾.

Surgeons of the Royal Navy became indispensable members of fighting ships, facilitating the return to duty of wounded sailors and boosting shipboard morale by their caring humanitarian approach.

This paper follows the landmarks which produced this unique heritage. Four periods of naval or military surgery will be described: 1) ancient Egyptian surgery between 1700 and 3000 BCE; 2) 16th century developments in wound care; 3) the 19th century care of convicts during their transportation to Australia from England; and 4) examples of executive skill, courage and innovation displayed by 20th century naval surgeons in war and in support of peace-time civilian crises.

The History of Military Trauma Surgery

The frozen remains of a Neolithic hunter were found by two walkers in the Otztal mountains on the border between Austria and Italy in September 1991. This discovery revealed the earliest evidence of rudimentary wound care occurring at least 3,300 years BCE. 'Otzi the Ice Man', as he came to be known, died of a massive haemothorax 5,300 years ago following penetrating chest trauma: an arrow had pierced his left thorax and lacerated his left subclavian artery. (5,6) The remains of primitive wound dressings applied to Otzi demonstrate that

even in prehistoric times conflicts inevitably required medical support. Only 300 years later, in 3000 BCE Egyptian court physicians began to record their surgical treatments – mostly of the ruling class. The earliest naval surgery developed *pari passu* with the trauma incurred in the earliest naval warfare (1)

The Edwin Smith Papyri-a textbook of ancient Egyptian surgery

Edwin Smith was a British archaeologist who discovered ancient medical tracts, written in ancient Egyptian Hieratic script around 1700 BCE. They represent our oldest known surgical treatise. The case descriptions and treatment recommendations recorded in them were based on clinical experiences accumulated by earlier court physicians up to 1,000 years prior; that is from approximately 3,000 years BCE. (7, 8)

The ancient surgeons responsible for compiling these cases used what clinical information was available to them to diagnose, determine prognoses and advise on treatments, much as contemporary clinicians do today. However, unlike current practice, there was no diagnostic support. The competence of ancient surgeons depended on their use of innate intelligence, knowledge and clinical acumen. What few surgical instruments they possessed needed to be applied with skill and courage. The Edwin Smith papyri systematically describe injuries starting at the head and proceeding downwards through body regions like a modern anatomy textbook. The treatments are remarkably rational and there is little recourse to magic. The cases discussed in the Papyri are classified into three clinical prognoses: favourable, uncertain and unfavourable, much as modern triage does.

An unfavourable clinical verdict was delivered in ancient Egyptian words meaning 'an ailment not to be treated'. Nevertheless such patients still received humane care scientific interest and the best possible attempts to alleviate suffering in under-resourced and austere circumstances, often in war. One example of an unfavourable outcome was chest injury with pneumothorax. Surgeons of the time understood that attempts at treatment were futile and inhumane. Far more treatable trauma patients occurred on the battlefield and these received higher priority.

Due to the tenacity, skill and innovation of subsequent generations of military surgeons chest injuries with pneumothorax are now effectively and safely treated by surgeons.

Ambroise Paré.

Surgery has advanced over the centuries because of the humanity and skill of military surgeons working under the most inhumane and austere conditions; the conditions typical of surgery during war or civilian crisis. Ambroise Paré (1510 – 1590) was such a surgeon who spent much of his surgical life working under these conditions. He advanced the surgical care of war wounds by replacing hot iron cautery for the control of bleeding using ligatures instead.

Physicians of Paré's time mistakenly attributed the terrible septic outcomes from war wounds and operations to the effects of a poison in gunpowder. Reasoning that this could be neutralised by heat, they prescribed cautery of wounds with

boiling elder oil. The standard of care was to pour boiling oil over open amputation wounds after surgery. To heal the stump, the edges were left open to heal slowly by secondary intention. This was intended to improve the survivability of the soldier (or sailor) from the injury. However the extra trauma induced by cautery caused horrible pain and further diminished the already compromised physiologic reserves of the unfortunate victim.

During the Siege of Turin in 1537 Paré's supply of elder oil ran out. Driven by his desire to provide optimum treatment to those under his care he confiscated supplies from the palace kitchen and concocted a substitute made of egg yolks, oil of roses, and turpentine. This was applied cold to the amputation wound because there was no fuel. When he anxiously reviewed his soldier patients the next morning Paré found the conventionally treated patients in pain and unwell and mostly delirious while those not cauterised were comfortable, clear headed and relatively free of pain. (9, 10)

Paré proved that relief of pain was important and overturned conventional wisdom using his own powers of observation and innovation. He described his findings clearly, recognising their significance and arguing that his innovative practise produced better patient care. Paré's new treatments were finally accepted by the majority of his contemporaries.

Surgery in the British Navy

Naval surgeons participated in the growth of naval power which proved crucial to the development of the British Empire. The practice of naval surgery had its origins in the era of the Tudor navy of King Henry VIII when gunpowder and cannon were introduced. Sea travel and sea warfare, already cursed by diseases related to the cramped conditions on sailing ships, poor nutrition at sea and exposure to diseases in foreign lands, now produced horrendous wounds resulting from explosions and missiles. While fire had always been a threat to sailing ships, the advent of explosive munitions brought searing blasts, sudden fierce fires and overwhelming exposure to noxious gases not previously experienced. Prior to the advent of firearms, naval battles consisted of ramming, fire ships, archery and close quarter combat between crews whose ships would be deliberately entangled to facilitate boarding and counter boarding. Fighting was hand-to-hand, between sailors armed with weapons that bludgeoned, stabbed and slashed one victim at a time. If they impeded the ability of the combatants to get at each other, the dead and injured were thrown overboard.

Naval battles under sail in the era of explosives were often carried on at very close quarters with ships locked together, cannons and muskets blasting away at point blank range. The pattern, the number and the rate of accrual of injuries escalated rapidly. (11) Surgeons in such battles described large numbers of severely injured men that quickly swamped the limited space and resources that could be allocated to their care in a sailing warship

Naval surgeons in convict ships to the Australian colonies.

The vessels engaged in transporting convicts to the Australian penal colonies were overcrowded, poorly equipped merchant

ships. Though comprised of chartered merchant vessels, the First Fleet was sponsored by the British government with the commissioners of the Royal Navy responsible for supervising the vessels' refits and victualling in preparation for the voyage to Port Jackson. Few of those responsible understood the magnitude of the journey. A naval surgeon was posted to each ship. (12) These were men steeped in the traditions of the navy and most importantly they understood the ethics of naval service. These naval surgeons had to care for crews, convicts, fee-paying passengers and marine detachments alike. They also resisted the unbridled cruelty and inhumanity of masters who had learnt the craft of transporting humans as cargo in the slave trade, mainly between Africa and America. Ships' surgeons also exposed the callous greed of the ship owners who repeatedly sent unseaworthy, under-victualled ships on the long voyage to Australia without any concern for the health or safety of the convicts and crews.

These naval surgeons had acquired vast experience in treating injuries during war and in managing the health of crews on protracted voyages and in foreign climates. They were uniquely qualified for the roles that befell them during the era of convict transportation.

The surgeons of the First Fleet lost few convicts to disease or trauma. Transported convicts had spent months in fetid prison hulks while awaiting transportation to Australia. Some of those transported on the first fleet were fitter on arrival at Botany Bay than when they left England. Sadly, subsequent fleets did not fare so well, principally because the naval surgeons were removed from them. Responsibility for fit-out, victualling and allocation of ship surgeons in subsequent fleets sent to Sydney Cove became the responsibility of private contractors. Though these contractors were required to work to Navy standards, abuses were common. Consequently death rates on the voyages rose disastrously once the contractors were free to appoint and to control their own surgeons.

The Second Fleet, which was managed purely by private contract, was a disaster. Almost 300 of 1000 convicts transported died during the journey from disease, sadistic floggings, general neglect, and the withholding of rations and clothing. Those who survived were sold at inflated prices in markets at Sydney Cove. Another 150 died after landing. Much to the disappointment of Governor Arthur Phillip, the majority of survivors of this fleet were so ill and weakened that they were unable to contribute to the food production and economy of the already starving colony – they simply added to the colony's burden. In response the Navy commissioners reassumed responsibility for medical care on convict transport ships and placed a naval surgeon on each vessel. They reported to the Navy, rather than to ship owners and their merchant seaman captains. Inevitably conflicts arose between naval surgeons and masters of convict ships. (13) The re-introduction of naval surgeons into the British convict ship system saw the transportee death rate plummet. The embarked naval surgeons were given the special title of Surgeon Superintendent to enhance their status beyond their stated rank. This made it possible (but not easy) for them to balance the commercial interests of ship owners and merchant captains, and the interests of the British Government and naval commissioners. The role of a naval Surgeon Superintendent on a convict transport ship required firmness along with tact and

diplomacy to moderate the cruelty and avarice that confronted them at sea. They did this while exercising clinical skill and experience, tempered by naval discipline, to deliver medical care at sea and to meet the expectations of the naval commissioners at home and Governor Arthur Phillip. The first four ships to make the trip to Botany Bay with naval surgeons again supervising the care of convicts and crew managed to deliver almost 700 convicts, as well as marine detachments and other passengers, with only fourteen deaths incurred and most of the landed convicts fit for work to support the colony. This was a remarkable outcome given the convicts were often in parlous health after being held for long periods in rotting, unsanitary prison hulks before being transferred to the care and protective supervision of naval surgeons in the convict transport ships.

One of these Surgeon Superintendents was Thomas Reid. An Irish born graduate of the Royal College of Surgeons, Reid made two voyages on convict ships to the New South Wales colony at Sydney Cove in 1817 and to Van Diemen's Land in 1820. At that time Royal Navy surgeons were still obliged to allocate part of their small salary to the purchase of a navy-approved kit of surgical instruments before boarding ship. This practice was unlike the army, whose surgeons had their instruments provided for them by the officers and men of the regiment to which they were assigned. (14) Only from 1805 had the Royal Navy finally taken over the expense of providing ship's medicines, previously also a responsibility of the surgeon, to be met out of his salary. Reid, using courage, common sense and his Navy-approved instruments was so successful in getting his convict and marine detachment charges to Australia in good health that Elizabeth Fry, a renowned agitator for prison reform at the time, cited him as a model for government policy on the care of convicts at sea and a role model for other surgeons.

Unfortunately for later transportees war broke out between Britain and France under Napoleon. The Royal Navy, now desperately short of surgeons for its warships could no longer release them for the Botany Bay convict ships. The death rate on convict transport ships soared again. Fortunately there was help waiting at the colony. William Redfern (1774-1833) had trained as a naval surgeon but became embroiled in the mutiny by British sailors at Nore. Though his role was confined to urging the sailors to "be more united amongst yourselves" Redfern was sentenced to hang but his sentence was later commuted to transportation to the Australian penal colony at Sydney Cove. There was a desperate shortage of trained doctors in the colony so Redfern was soon busy doing what he was trained for, attending to the sick whether free colonist, emancipist or convict. Even though he was a convict on a ticket of leave, Redfern was unrelenting in his advocacy for all aspects of health care in the colony: lobbying against excessive punishments (especially the lash), urging improvements in diet and sanitation, agitating for better housing for convicts. Though as a rash young man Redfern had plunged from proud naval surgeon to convicted and transported felon he never lost sight of, or ceased to live by, his naval surgery heritage. He deserved the honour of having the Sydney suburb of Redfern named after him. (15, 16)

The role of a Navy surgeon

Naval surgeons are, as are all members of a warship's complement, responsible to the vessel's commander. However, the special role served by surgeons as carers for all members

of a crew, as intellectual companions for ship captains and as sea-going scientists, has permitted special relationships between surgeons and their commanders. The special roles and relationships moulded around surgeons at sea brought unique responsibilities but permitted freedoms that could be enjoyed by the average member of a war ship's crew. This remains the case today.

The twentieth century, though an era of revolutionary technical advances in ship design, sea keeping qualities and war fighting abilities, still required courage and innovation in the provision of surgical care at sea, on the surface and below, at peace and at war. During WWII the USN Surgeon General, VADM Ross T. McIntyre was responsible for an enormous expansion in Navy health care capacity. This was in preparation for the expected massive casualties from naval warfare and amphibious landings needed to reverse the advances made by the Japanese. He leased hotels and converted them to hospitals, took over army hospitals at General Patton's tank training facilities, lobbied for funds and facilities to improve medical care on war ships and to commission hospital ships and fast-tracked the entry and training of USN surgeons and medical corpsmen. McIntyre's strategic vision, organisational courage and executive skill were crucial to the campaign. McIntyre did not tire after the Pacific conflict ended, spending the rest of his working life caring for and representing those left handicapped by war wounds. (17, 18)

The Pacific war, with its seaborne aerial combat, amphibious operations and fierce Japanese Kamikaze pilots, was a particularly bloody affair for Allied naval surgeons. LCDR Sam R Sherman was flight surgeon on the USS *Franklin* when it was severely damaged by Japanese bombing on March 19, 1945. A Japanese fighter managed to penetrate the defensive screen around the *Franklin* and scored a direct hit, setting off a chain of explosions that blew Sherman into the air, concussed and bruised him and blew off his glasses. (19) In a moment a series of explosions caused hundreds of casualties. Sherman was faced with carnage frequently described by his forebears in the age of sail. Most of Sherman's medical corpsmen had been killed, blown overboard or injured. Of the other three doctors on board the *Franklin* one had been killed by the explosions. The other two, trapped by fire in the wardroom, were not rescued for many hours. Sherman managed to collect a group of musicians to help him and, though injured himself and surrounded by fire and chaos, began the business of triage and saving lives. Having spent months preparing himself and his equipment for this moment, exercising for disaster and making his corpsmen exercise again and again, he put preparation into practice. While the *Franklin's* damage control crews went about the deadly serious business of saving the ship, Sherman staunched haemorrhage, treated burns and carried out amputations and other emergency operations. His example deserves our attention, the more –so because of the modesty with which he contributed his memories to oral histories collected after WW2.

Sherman's vivid story illustrates the resourcefulness and courage a naval surgeon must deploy to cope with mass casualties on a damaged ship in the middle of a modern era battle.

The story of HMAS Hobart and her response to a peace-time crisis on Macquarie Island, in the sub-Antarctic zone

During early January 1979, HMAS *Hobart* was berthed in Sydney for maintenance. Many of her crew were on Christmas leave and much of her machinery was at least part dismantled for servicing. While in this state, *Hobart* was tasked to respond to a civilian crisis on Macquarie Island where a biologist had fallen down a cliff, suffering severe spinal and limb injuries. Though the victim had been retrieved from the site of the accident to the Macquarie Island base, a helicopter rescue was required to move him to a ship-borne medical facility and on to the nearest major hospital, 1450 kms in Tasmania. (20)

Hobart, a Perth Class Guided Missile Destroyer, was not equipped to carry a helicopter: an improvised landing pad was required. *Hobart's* captain and a hastily assembled crew brought her to partial sea readiness. They sailed her out of Sydney on one boiler, through heavy weather with wind exceeding 30 knots and swells over 5 meters and sailed the 2160kms to Macquarie Island. On the way they converted her quarter deck to a temporary helicopter landing pad. At the island they rendezvoused with the Antarctic mission support ship, *Thala Dan*. The *Thala Dan's* navy-trained helicopter pilot, having retrieved the patient from the island, landed on *Hobart's* improvised quarter deck platform in heavy weather. With the patient now under the care of her medical team, *Hobart* headed to Tasmania, again at speed in heavy weather, even though many of the crew were sea-sick under the violent conditions. After undergoing emergency surgery in the Royal Hobart Hospital the patient was transferred to Melbourne but sadly, in spite of courageous efforts by all concerned, he eventually succumbed to his injuries. This operation illustrates what modern seaborne surgical capability can require. The essential ingredients include personal and team enthusiasm, commitment beyond the normal call of duty by all ranks and disciplines, individual and organisational inventiveness, innovation, adaptability, executive skill and a willingness to work far away from the usual supports of land-based medical practice. Our challenge is to utilise complex modern resources to overcome age old problems that have always beset seafarers: bad weather, geography, distance, isolation and all too frequently, inadequate resources.

Concluding Remarks.

Surgeons in today's navy must be prepared for deployments in training, international exercises, peace time power projection and in any of the dimensions of human conflict and disaster. Deployments, as was the case for the Royal Navy surgeons tasked to the convict fleets, may not always be in war or even to sea. War service for a naval surgeon today may be on land in Afghanistan or in a cramped ship, policing off-shore exclusion zones in the Middle East. A modern naval surgeon may be deployed to support the force protecting international trade from peace-time piracy or to rescue and provide emergency care to asylum seekers on overcrowded and often unseaworthy fishing vessels. They may be required to work in full battle dress in the tiny medical facility on a frigate operating in the constant heat and humidity of a Middle Eastern war zone or in the still cramped, hot and noisy but better equipped facilities on amphibious landing ships. These conditions will improve as design and technology become more sophisticated. HMAS *Manoora* and *Kanimbla* (Landing Platform Amphibious or LPA's) with their Primary Casualty Receiving Facilities (PCRF,

now MR2E) have been valuable assets for the RAN since 1994. The acquisition of HMS Largs Bay (now HMAS Choules) to replace these decommissioned LPA's will see more spacious and better equipped medical facilities than were provided on the LPA's. Medical care afloat will move to even higher levels of capacity and technological sophistication with the arrival of the two Canberra class vessels during the next decade. However, the factors that characterise naval surgical service will remain. Personal and operating facilities will always be cramped. Privacy at sea will always be limited. Ships, powering through seas, embarking and landing helicopters or landing craft, participating in manoeuvres or combat are noisy. The sea will always be unpredictable. We will be expected to innovate to deal with shortages as casualties consume available resources or our supply lines are stretched. In peace-time operations or in war we will be expected to show leadership as we exercise executive skills to cope with imbalances between demands and resources, to model new scenarios, propose new strategies to enhance our performance, and to incorporate the most modern technologies and techniques into our sea-going armamentarium. Our defence force medical services, including those of the RAN, are expected to be ambassadors for Australia and the Service, to be major permissive factors in the increasing power projection role expected of Australia and to be keys to the ability of Australia and her navy to respond to threats and to humanitarian crises at home and overseas.

The qualities required are not unique to naval surgeons but are to be found in abundance among them. As military surgeons we take pride in the special nature and circumstances of our work. Fortunately, the navy is not usually at war. Naval surgeons must always have the skill and the will to look after the whole force, in peace as well as in war and if necessary, without the immediate support of other doctors. Life at sea produces a wide range of injuries and morbidities, many of which may be outside the usual patterns individual surgeon may deal with in their civilian life. (21) Advice can usually be sought but isolation and the other commitments a tasked ship may face require the navy surgeon to manage wherever their skills and knowledge are called on and to maintain the training and commitment to do so.

The special challenge of naval surgery is to uphold the traditions of humane service employing courageous innovation and executive skill, at sea and on land.

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Seaman Medic Adrian Argall onboard HMAS NEWCASTLE, applies an oxygen mask onto a 'Casualty' during a medical training exercise