Ship’s Barber–Surgeon:
The Evolution of Naval & Maritime Medical Instruments from the 16th to the 19th Century

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Cover: Constitution Escapes the British Squadron, Anton Otto Fischer, (US Naval Historical Center, Washington Navy yard, Washington DC)
Acknowledgments

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# Table of Contents

Acknowledgments .................................................................................................................. 6

A. Preface .............................................................................................................................. 10
i. Aims and Objectives ........................................................................................................... 11
ii. Proposition ........................................................................................................................ 11
iii. Methodology .................................................................................................................... 12
iv. Format ............................................................................................................................... 13
v. Materials and Artefacts ...................................................................................................... 13
vi. Publications ....................................................................................................................... 15
vii. Image & Copyrights ......................................................................................................... 16
viii. Historical Literature References .................................................................................. 16
xi. Contributing Museums .................................................................................................... 17
x. Categories .......................................................................................................................... 18
xi. Instruments & Implements ............................................................................................... 18
xiv. Labelling .......................................................................................................................... 20
xv. Analysis ............................................................................................................................. 20

Chapter I – The Age of Exploration and the History of Select Ship Wrecks ......................... 22

1.0 The Age of Exploration by Sail ....................................................................................... 22
1.1 Naval Warfare .................................................................................................................. 24
1.2 Routine Risks .................................................................................................................... 25
1.3 Carracks, Mast & Guns ..................................................................................................... 26
1.3.1 The Mary Rose ............................................................................................................ 27
1.4 Age of an Empire ............................................................................................................. 28
1.4.1 HMS Swift .................................................................................................................... 31
1.4.2 HMS Pandora .............................................................................................................. 31
1.4.3 The St. George ............................................................................................................. 33
1.4.4 The Kronan .................................................................................................................. 35
1.5 East Indiamen 17th – 18th century .................................................................................. 37
1.5.1 The Batavia .................................................................................................................. 39
1.6 Piracy & Privateering in the 17th – 19th Century ............................................................... 41
1.6.1 The Queen Anne’s Revenge ......................................................................................... 44
1.7 Birth of the US Navy ........................................................................................................ 47
1.7.1 USS Scorpion ................................................................................................................. 50

Chapter 2 – The History of the Barber–Surgeon ..................................................................... 54

2.1 The Barber-Surgeon Company & Colonial Agencies ......................................................... 60
2.2 Regulations ...................................................................................................................... 62
2.3 The Orlop Deck, Sick Bay & Surgeon’s Cabin .........................................................62
2.4 Barber–Surgeons and his Mates .............................................................................66
2.5 Ranks and Titles of Barber-Surgeons ....................................................................67
2.6 The Seafarers & Their Health ................................................................................70
2.7 At-Sea Punishments ...............................................................................................72
2.8 Logs and Journals ..................................................................................................73
2.8 Number of Surgeons ..............................................................................................75

Chapter 3 – Surgical Instruments ............................................................................78
3.1 Medical Chest ..........................................................................................................78
3.2 Saws and Blades ......................................................................................................82
3.3 Trephining ................................................................................................................90
3.4 Syringes ....................................................................................................................93
3.5 Probes .......................................................................................................................94
3.6 Trocar Spikes and Catheters ....................................................................................96

Chapter 4 - Apothecary Instruments .......................................................................97
4.1 Mortars and Pestles ...............................................................................................97
4.2 Spatula .....................................................................................................................98
4.3 Spoon .......................................................................................................................98
4.4 Weight ......................................................................................................................98
4.5 Needle .....................................................................................................................99
4.6 Chaffing Dish .........................................................................................................100
4.7 Mallet ....................................................................................................................101
4.8 Prosthesis & Artificial Limbs .................................................................................102
4.9 Bandages and Sponges .........................................................................................103
4.10 Feeding Bottles .....................................................................................................104
4.11 Scissors ................................................................................................................105

Chapter 5 – Apothecary Containers .......................................................................107
5.1 Earthenware ..........................................................................................................107
5.2 Metal ......................................................................................................................110
5.3 Wood ......................................................................................................................111
5.4 Glass ......................................................................................................................112

Chapter 6 – Hygiene Instruments ...........................................................................114
6.1 Shaving Instruments .............................................................................................114
6.2 Combs ...................................................................................................................115
6.3 Manicure Set .........................................................................................................118
6.4 Ear scoops .............................................................................................................119
6.5 Whetstone .............................................................................................................119
6.6 Toilets & Underway Sanitary Health ................................................................. 120
6.7 Latrines & Seats of Ease .................................................................................. 121
Chapter 7 – Conclusion .......................................................................................... 124
Appendices ............................................................................................................. 127
Appendix A - References ....................................................................................... 128
Appendix B - Museums ........................................................................................... 135
Appendix C – Articles of Wars of 1790 ................................................................. 137
Appendix D – Collection of Artefacts: Instruments, Implements, tools & Objects ...... 139
Content of Figures
Figure 1. Oil painting of the sinking of the Mary Rose. (National Geographic) .................................................................22
Figure 2. Water Color Painting recording of a gun carriage with an iron gun salvaged by John and Charles Deane. (Wikimedia Commons 2009) .........................................................................................................................29
Figure 3. Image of the dockyard. (Kronan Museum 1980-2016) ............................................................................................32
Figure 4. Print of Batavia. (Moif 2010) ........................................................................................................................................39
Figure 5. Image of Edward Teach. (Groce 2011:15) ....................................................................................................................41
Figure 6. French merchantmen Mercury similar to the QAR. (Smithsonian Museum 1991) .......................................................44
Figure 7. Sunboat USS Scorpion. (US Navy Historical Center) ................................................................................................50
Figure 8. Cross-section of the orlop deck / cable tier inside the ship Vasa. (Katarina 2014) .........................................................54
Figure 9. Flogging as a punishment. (Groce 2011:50) ..................................................................................................................72
Figure 10. Content of a pocket instrument kit 1731. (Goat Specialist 2010) ................................................................................79
Figure 11. Chart from the "Surgeon's Mate". (John Woodall 1617) ............................................................................................80
Figure 12. Amputation and use of a tourniquet. (Wooster 2012:8) .............................................................................................82
Figure 13. Example of a one stage circular cut. (Wooster 2012:19) .........................................................................................83
Figure 14. Woodall saw. (Kirkup 2005:112) ............................................................................................................................84
Figure 15. Petit screw tourniquet 1780-1805. (Wikimedia Commons 2014) .............................................................................86
Figure 16. Example of a ligature. (Wikimedia Commons 2014) ...............................................................................................87
Figure 17. 17th century naval surgeon trephining kit. (Gross 1999) ........................................................................................90
Figure 18. Removal of a toe. Image from 1704. (Ellermmeier 2016) .........................................................................................101
Figure 19. Cairo toe housed at the Egyptian Museum in Cairo. (Gannon 2012) .......................................................................103
Figure 20. Example of a Westerwald stoneware ceramic. (Martimer Wheeler House) ............................................................107
Figure 21. Metal bowls in a barbershop by Josh Amman. (Wikimedia Commons 2014) .........................................................110
Figure 22. Human Flea found on the Mary Rose. (Mary Rose Trust 2005) ..............................................................................116
Figure 23. Seat of ease arrangement HMS Victory. (NRG’s Model Ship World) .................................................................123
Figure 24. Seat of ease from the VASA. (Wikipedia 2007) ........................................................................................................123
Figure 25. Depiction of sire Williams treating Lord Admiral Nelson’s gunshot wound aboard the HMS Victory. BBC Film Trafalgar Battle Surgery. (BBC Channel 4 Television) ................................................124

Contents of Table
Table 1. Wrecks Analyzed .....................................................................................................................................................18
Table 2. Warship Specification ..............................................................................................................................................30
Table 3. Benefits and Disadvantages of ships ..................................................................................................................43
Table 4. Pirate’s ships and classes .....................................................................................................................................45
Table 5. Barney’s fleet as of June 1814 .............................................................................................................................51
Table 6. Renner’s sq. footage of surgeons compartment ..................................................................................................66
Table 7. Barber Surgeon’s Pay ............................................................................................................................................69
Table 8. Casualties from 1810 in the Royal Navy ................................................................................................................71
Table 9. Number of Guns 18th-19th century French ........................................................................................................75
Table 10. Size of vessel 16th - 17th century Dutch .............................................................................................................76
Table 11. Size of vessel 18th - 19th century American .........................................................................................................76
Table 12. Weights and the varieties .....................................................................................................................................99
Table 13. Scissor’s blade percentage ..................................................................................................................................106
Table 14. Scissor’s blade length .............................................................................................................................................106
A. Preface

i. Aims and Objectives

There are two reasons why the author decided to pen the evolution of nautical medical instruments. In 2014, the American media channel Discovery Channel released a documentary on ancient medical techniques and possible new applications in the modern era. The author became so intrigued by the whole idea of ancient medicine that back in 2015 he investigated the subject. After extensive investigation it was clear that surgical implements, shipboard medicine and hygiene related to them onboard Age of Exploration ships was a poorly studied area of expertise.

The secondary reason is that during my research on a subject for the thesis, the author could not find single comprehensible publications on the topic of the evolution of medical instruments. Numerous books were published but they were either from a historical context or it was a publication on the recovery of medical instruments from a single ship.

The study of medicinal instruments at sea has not been fixated by maritime archaeologist in the past. Life at sea was said to be that of desolations, melancholies and maladies. Likewise, the material culture is relatively a new discipline. Medicine was known as insignificant for most of the 19th and 20th century as surgical instruments did not have any “historical value” or “financial value”. As Montgomery emphasized in his thesis paper; cannons and bayonets are more prone to be researched than combs and toothbrushes (Montgomery 2009:13). Such is true with nautical studies where the structure and construction of ships is more prominent than the study of a medical chest or the surgical implements inside it.

It would not be at least until 1960, where George Bass amongst other archaeologist, would acknowledged the importance of using “true” material culture and not biases. This recognition would be vital during the excavation of the Marie Rose and other wrecks as it would prove to be a real treasure trove for researchers.

ii. Proposition

In this paper we will find, identify and discuss the evolution of medical instruments, devices, pottage and tools used by ship barber-surgeons which were retrieved from nine different naval and merchant wrecks from the Age of Exploration; create parallels of the artefacts to see if any evolutionary progression occurred during the four centuries; determine if there are any dissimilarities between the medical implements between her Warships versus those of the merchant and pirate’s ships; determine if the evolution of the medical instruments progressed due to new innovation, technological advancement and scientific discoveries or rather evolved due to new threats to the crew during long voyages and finally to observe if the medical instruments diffused to different parts of the world due to trade or due to geo-political conflict.
iii. Methodology

The research strategy utilized in this thesis was to locate wrecks, or data related to active investigations into underwater archeological sites with potential finds of medical instruments; localize the specific artefacts to be analyzed; examined whether the shipwreck was that of a vessel that belonged to a Warships or to a merchant vessel or a pirate/privateer ship; analyze the vessel’s type and determines if they acquire medical instruments or were issued them as part of the logistical loadout pre-voyage; associate the medical instruments, devices, pottage and tools to each other and see if any parallels could be drawn; and determine if the materials of diverse origins were marketed and traded.

Please note that the author did not participate in any of the excavation and preservation of the medical artefacts used in this paper. All approaches and procedures were solely done by the museums and its faculties. That said, the methodology in this thesis will comprise of two parts.

The main part of this paper was to assemble and make a database on artifacts that are and assumed to be part of the ship’s surgeon medical implements. This crucial part ensued by means of locating shipwrecks which presumed to have surgical instruments. The means by which the primary wrecks were found was by means of publications accessible at the public library and also by the means of vocalizing with staff members from the University of Southern Denmark.

By finding the shipwrecks of interest, the rest of the objectives were effortlessly ensued. Those objectives are as follows:

• Probing for ships where medical artefacts were excavated from.
• Finding museums and laboratories which hold the collection and assembly of medical objects.
• Least but not last, seeking publications related to the medical artefacts.
• Categorizing Materials
• Labelling Materials
• Analyzing Materials

Search for Wrecks. The search for medical instruments resulted in a compilation of a list of nine noteworthy wrecks. The majority of the ships are of British origin (Marie Rose, HMS Swift, HMS St. George and the HMS Pandora), one of American origin (USS Scorpion) one Dutch (Batavia) one Swedish (Kronan) and the last was of French origin but was converted into a pirate ship (Queen Anne’s Revenge). This research paper concentrated on the study of surgical instruments excavated from three classes of ship: Warships, Pirate ships and merchant vessels. It’s important to note that the merchant ships consisted mostly of ships employed by the Dutch East India Companies.

Case Studies. Other named vessels are noted in this paper for case study rather than archaeological finds. The ships used as case studies comprised of Vasa, HMS Ardent, Swiftsure, HMS Revenge, HMS Domingo, Brunswick, Topaze, Hannibal and the HMS Theseus. Table 1 shows the list of ships that has medical materials for analytical study. In the quest for wrecks, two sources were used; publications besides the university’s faculties.
Search for Publications. Publications from the University’s library were rummaged through for the search of ships. What publications couldn’t be found on the shelves were surfed throughout the library’s electronic database. For extra assistance, the libraries’ staff members were benefited from. Throughout the rummaging, four main publications were identified. That by the Marie Rose Trust and that by the Marine Odyssey while two master theses were identified on the electronic data base. For extra information on those publications, please see under publication in preface or under References. The publications were skimmed through thoroughly to ensure that the subject was relevant to the medical artefacts and of its functions.

University Faculty Advice.

Three members from the University of Southern Denmark were sourced getting supplementary information apropos shipwrecks containing surgical artefacts – Jens Auer, Thijs Maarleveld and Chris Underwood. Few ships of interest came up in the search. Jens had a recent catalogue on the Pandora while Thijs had a vintage catalogue on the Batavia. Both catalogues had a chapter dedicated on the medical finds. All the while, Chris Underwood published a book on the provisions and hygiene of the sick from the HMS Swift.

iv. Format

This report is composed of eight chapters starting with the preface and finishing with the seventh chapter which would conclude the paper. Chapter 1 and chapter 2 covers the historical background of the wrecks, exploration and colonization. The authors will observe how politics played a major role abroad which would require the incorporation of the surgeons aboard. The preface is where the writer goes into the introduction and of the approaches used to write this report. The preface is followed by the first chapter and by the second chapter which discusses on the ship’s surgeons and their integration into maritime practices. In the second chapter, the reader will look into the appearance of medical practice at sea, medical innovation and its players, the deck in which the medicinal skills were practiced, the ship surgeon’s and its mates in addition to logs and journals.

The next chapters - Chapter 3 to 6 - will deal with medicinal artefacts recovered from the wrecks. Chapter 3 contains the surgical instrument, Chapter 4 and Chapter 5 will comprise of apothecary instruments and containers used to hold remedies and herbs; Chapter 6 will contain the hygiene instruments recovered from the barber surgeon medicinal chest or cabin. Chapter 7 will summarize and conclude this paper.

v. Materials and Artefacts

It is in the author’s belief that the study of surgical implements from the Age of Exploration is an area of growth for future marine archaeologists and researchers but is woefully understudied at present. The study of medicinal instruments can inform the reader about the social status and general roles of the barber – surgeons; inform us of the medicinal procedures likely applied in austere underway conditions; determine the base of knowledge obtainable during a set historical period; inform one on the evolution of tools, pottage, implements, and methodologies in the maritime realm.

Many of the artefacts that were recovered from the shipwrecks of interest can be found under Appendix D including surgical instruments, apothecary instruments, apothecary containers, and hygiene
instruments. Many of the images of the recovered artefacts can be found in the Appendix while the images in the main text are examples and replicas.

One might wonder if any metamorphoses coincide between surgical tools used on land and surgical tools used shipboard in the age of sail. It could be argued that there is no difference as surgical tools are just metal instruments whether used at sea or on land. Clearly, virtually all instruments, medicines and pottage purchased by ship’s surgeon were manufactured on land. The science was such that they were brought likely by both land-based surgeons and naval surgeons from the same provisioners. That is to say that the instruments were generally equivalent no matter where they were used. The difference is how, where and under what conditions those implements were used and practiced with in the hands of the surgeon. What differs also from the maritime context and that of land-based doctors are maladies and diseases that have been reported by surgeons at sea. Also injuries varied greatly as the environments in which surgeons practiced their art were inherently more dangerous. Whilst ships carried a surgeon who had to be master of general practice they also had to master trauma medicine, preventative medicine, pharmacology, surgery and mortuary affairs as well as botany, anthropology and psychology. On the other hand, for doctors on land, these roles were practiced by individuals who were masters of only one trade.

As the barber surgeon had to buy his own medical instruments, the artefacts analyzed in this paper will be comprised of personal belongings or possessions that belonged to the barber surgeon in addition to the surgeon’s officially issued instruments such as the ship’s medicine chest, furniture of the sick berth and cockpit and instruments jury-rigged by the ship’s company. Note that in the Royal Navy, the medicine chest was a personal belonging until 1805 whereas the medicines themselves were provided by the Navy.

All of the artefacts; type and quality can be reflected in the economic and social status of the surgeon. For instance, the chest of the 19th century St. George could be well compared with the chest used by the ship–surgeon of the 16th century Marie Rose. The St. George’s surgeon had a simple coarsely constructed chest pointing to a surgeon with a restricted income and brought from a lower end market. Whereas the chest of the Mary Rose was a fine box constructed using dovetails pointing to a well-paid and a higher status surgeon.

It is sometimes difficult to interpret, catalogue and classify artefacts recovered from ships or even determining if any of the artefacts were actually part of the surgical or medicinal purpose. Artefacts sometimes are similar to other items but with an opposite function. An instance could be that of bowls. Were bowls retrieved from a ship employed to serve food or employed for medicinal purposes such as bleeding? Because of such, all of the artefacts used in this paper were all retrieved from a medical chest or from surgeon’s cabin in the orlop deck or adjacent to other medical instruments.

Unlike apothecary containers and instruments composed mostly of wood, ceramics, marble, glass and few metallic materials such as brass, pewter, copper-alloy and bronze, surgical instruments rarely survive the underwater environment because of the composition of the materials being composed of ferrous materials. As seen with our ships of interest, few intact surgical instruments could be used in our analysis as the archaeological evidence for similar implements subsists only by the presence of wooden or bone handles. One could speculate of the functions of those artifacts onboard a ship due to its morphology. Because some of the medical artefacts couldn’t be documented due to their ferrous state as to what their function and utilization were, analysis of some replicas and contemporary drawings were necessary.
Some would notice that some ships had surgical and apothecary instruments salvaged while other ships only had apothecary instruments but no surgical instruments. A likely theory can be made. The primary theory is that some of the sunken vessels like the USS Scorpion were sank deliberately while others like the Pandora, Marie Rose and Batavia where all wrecked either accidentally, due to maritime conflict or due to bad weather. In the case for a ship that was floundered on purpose: prior the sinking, the ship surgeon likely salvaged his personal belongings such as his surgical tools all the while the apothecary objects such as containers, mortars and dishes were left onboard as it was part of the ship’s gear. For those ships that floundered because of conflict or weather; the ship-surgeon was not as lucky. In a survival scenario where there is short line between life and death, surviving the initial intact was more important than the retrieval of personal processions.

Many ship’s museums could be used in this paper. But because despite the structure of the ship being still in one piece, some if not all materials have been taken either to be reused on other vessels or used for financial gain. For example the USS Niagara (still sails and used as a sailing school), HMS Victory which was brought to port where she was emptied and rebuild as a museum and the USS Constitution. All of those ships are still in ports and structurally intact. But the same cannot be stressed for the material culture which was dispersed around to be reused or sold.

**vi. Publications**

The publications consulted for this thesis paper could be categorized in three parts; books, catalogues, and thesis papers. Due to recent discoveries, some artefacts and its wrecks have no catalogue or books published as of yet.

**Books.** In 2005, the Marie Rose Trust published a comprehensive study on the medical culture related to surgery and medicine onboard the Mary Rose. The Marie Rose Trust published details on the wreck including reports on the surveys, recording and the recovery of artefacts. The publication also included images of the artefacts and a plan showing the original area where the artefacts were found and recovered. Both images and information’s were used from the book to be used in this paper. A second comprehensive publication was written by Chris Woodman on the hygiene and medical apparatuses excavated from the HMS Swift that was excavated from the Argentinian bottom. Those publications unlike the others needed to be translated as it was published in Spanish. Images and some information’s were used from that book to be used in this paper. A third publication used in this paper is by M.D. John Kirkup and titled “The Evolution of Surgical Instruments: an Illustrated History from Ancient Times to the Twentieth Century”. This historical book on the land-based surgical tools will be used for its evolutionary medical instruments which progressed from the beginning of times. The last book was published by the Marine Odyssey on the apothecary bottles from the SS Republic and the SS Tennessee. Like the publication by the Marie Rose Trust, that publication includes a report on the survey, recording and recovery on the artefacts. It also includes images of the recovered objects.

**Catalogues.** The publications utilized were catalogues that went briefly into what was excavated. Not all of the catalogues had the comprehensive documentation as those of the books. Nevertheless, they still helped.
Thesis. One master thesis was written in 2009 by a former student of the University of Southern Denmark. That research paper was done by Paul Montgomery in which he investigated the hygiene and medicinal instruments excavated from the HMS George.

vii. Image & Copyrights
Because historical sources are vague in the descriptions and approaches taken by surgeons and the use of instruments, images are sometimes a greater value than literature. Because of such, some images will be used in this paper as they encompass evidence of surgical instruments being used.

Also, for the author and reader to be on the same page, all the images of the artefacts that were recovered from the ship wrecks and that have been used in the Appendixes were not properties of this author.

The images of artefacts from the Mary Rose are properties of the Mary Rose Trust publication 2005.

The images of artefacts from the Kronan are properties of the Journal of the Nordic Archaeological Science.

The images of artefacts from the Batavia are properties of the Western Australian Museum 2016.

The images of artefacts from the Pandora are properties of the Bulletin of the Australian Institute for the Maritime Archaeology 1995.

The images of artefacts from the Queen Anne’s Revenge are properties of the North Carolina Department of Natural and Cultural Resources.

The images of artefacts from the HMS Swift are properties of Chris Underwood.

The images of artefacts from the HMS St. George are properties of Paul Montgomery.

The images of artifacts from the USS Scorpion are properties of the US Naval Institute.

viii. Historical Literature References
The comparative studies of the medical instruments from the 16th to the 19th century onboard naval and merchant vessels will draw on data obtained from archaeological records as well as both archival and historical sources. Historical documents and ancient texts are sometimes of the most valuable sources. Some historian’s assert that the medical practice has been well acknowledged and that written records of the medical practices are both accessible and inclusive. However, it is imperative to reason that even if historical sources are extensive, they are often in reality incomprehensive and the specifics are absent which could be essential to draw an acceptable conclusion about past medical practice. Most importantly, historical sources lack the necessary details of apparatuses used during the medical practices onboard ships. What implements a ship surgeon would have in his chest doesn’t necessary enlightens researchers on how they were utilized. Also, the historical and archival sources don’t entail the evolution of those medical instruments or the diffusion of the implements.

Nevertheless, there are few notable historical sources that could be beneficial for the readers in terms of instruments used but also histories of injuries that one might be faced with. Nevertheless, a comprehensive list of injuries at sea was noted mostly in logs and daily books by the surgeons from the seventeenth to the eighteenth century. The list of injuries could be broken down into minor wounds, penetrating and missile wounds, head injuries, closed fractures, dislocations, open fracture, limb
amputation, burns and scalds, fevers and plague, scurvy and other food related illness, lung disease, venereal disease, worms and parasites, punishment, dentistry and anesthesia. The analysis of surgical instruments would become fairly easy in the nineteenth century as many manufacturers would yield catalogues on a variety of their surgical instruments with accurate particulars of their composition.

One of those most notable sources is the “Oeuvres” that was published in 1575 by Ambroise Paré. Oeuvres is actually not a single book but rather a collection of 26 works compiled in this large volume. The collection is full of successful experiments and shrewd observation.

Another historical publication is the “Imperatoris medici, de humani corporis fabrica libri septem” that was printed by Andrea Vesalius in 1555. This publication is renowned for its anatomical illustration of the human body which will be the foundation of modern anatomy. The publications are composed of seven sections which deals from the structure and functions of the body system.

The “Generall Historie of Plantes” published by John Gerard in 1597 is another beneficiary historical publication. Unlike the other ones, this book is essentially a translation from a book by Rembert Dodoen in which Gerard added few extras including a list of plants discovered by explorers in the New World.

Another publication was that of “Medicina statica: Being the Aphorisms of Sanctorius” in 1737 by Santorio Santorio. In his book, Santorio penned down the transition in the Hippocratic and Galenic theories and the questioning of their medicinal practices.

“The Whole Art to of Chirurgerie” by Pete Lowe in 1597 is a good publication on amputation and the use of tourniquets and bandages above the line of incision.

Another three historical publication that could be consulted is “The Surgeon’s Mate” by John Woodall (1617), “A briefe and necessary treatise” and “Proved Practice for Young Surgeons” by William Clowes and “The Most excellent workes of Chirurgery” by John de Vigo. The three periodicals were inscribed with remedies, surgical practices and instruments needed for each of the medical practices of the time. Those books were likely consulted by the barber-surgeon’s mate as part of their theoretical homework’s and requirements.

Obviously, those are only a handful of historical publications used in this paper. Numerous other publications can be consulted.

**xi. Contributing Museums**

A dozen museums were contacted by means of email by the author to get informed on wrecks but exclusively to see if any of them had any medical artefacts that were previously excavated. The museums of interests that were contacted can be found in Appendix I. Most if not all the museums were helpful, even if some didn’t have the materials required for this research.
x. Categories

Unlike the modern days where one might categorize the tools into two categories; that of surgical and hygiene (toilet) instruments, defining the instruments in this paper has been more problematic because few instruments could function both ways and that toilet instruments could easily been used to mitigate the risk of infection for instance. Mitigating the risk of getting sick by means of toilet instruments meant that the crew member also mitigated seeing the surgeon all together. Despite that most modern instruments are similar to those of the ancient times; the author decided that the medical instruments would be allocated in four groups as defined below. Each group will be outlined within the specific medical procedures and roles. In all, a total of 148 artefacts from the four classes would be analyzed by different means.

xi. Instruments & Implements

The first category is that of surgical instruments. Such surgical instruments would be those to deal with large open wounds, bleeding, removal of foreign bodies, suturing, head injuries, closed and open fractures, dislocation, limb amputation, and burns and scalds. The surgical instruments comprised of 60 instruments.

- 4 Medical chest
- 13 amputation handles
- 3 tourniquets
- 18 trephining tools
- 9 syringes
The secondary category will be that of apothecary instruments. Apothecary instruments also known as (pharmaceutical) are utensils used to prepare drugs and medicines to deal with maladies and diseases one might get while at sea. The apothecary tools are all objects required in the practice of drugs making and those to heal small wounds. The apothecary instruments comprises of 27 instruments.

- 5 mortar (including one pestle)
- 5 spatulas
- 1 spoon
- 1 weight system
- 2 needles
- 1 chaffing dish
- 1 mallet
- 3 artificial limbs
- 4 bandage rolls
- 1 feeding bottle
- And 3 scissors

The third category is that of apothecary containers. Apothecary containers are those artefacts whose main function was to contain liquids, herbs, plants or gels from leaking and from the environment. The containers were categorized in three parts; earthenware’s, wood, metal and glass. A total of 34 containers were recovered.

- 16 earthenware
- 5 metal
- 6 wood
- 7 glass vessels

The last category consists of hygiene instruments. The hygiene instruments are also common in nowadays as toiletries and comprises of ear probes, razors, combs and tooth brushes. Hygiene instruments consist of two functions. One is to mitigate maladies and diseases from growing or reproducing whilst the secondary function is more related to anesthetics. A total of 27 hygiene instruments were recovered.

- 3 razors
- 3 brushes
- 13 combs
- 3 manicure sets
- 1 earscoops
- 2 whetstone
- 3 toilet related artefacts
xiv. Labelling

The artefacts used in this research paper will have identical numbers as found and used by the museums in which they are displayed while artefacts that were taken from catalogues and not labelled would be given an identification number. As seen in the paper, both the name of the ships and the identification numbers would be used throughout this paper.

xv. Analysis

Because of timing, travelling restrictions and funding limitation, none of the medical instruments were subjected to chemical analysis by the author.

Stages of Disintegration

From the time a ship sinks to the time the wreck have been discovered, there are usually some stages in which the wreck will disintegrate.

Stage 1. After sinking, the hull, which can either be damaged or intact, sank to the bottom of the sea floor. Which side of the ship that the wreck rest upon depends on the ships and how they sank. The Mary Rose for instance when she sank, sank on her starboard side, the same side that the Pandora ship sank. Over time, the side that the ship rest upon on the ocean floor got buried and the accumulation of silt continued to accumulate around and within the hull.

Stage 2. The exposed part that was not under the sediment over time would collapse due to the disintegration because of the local underwater currents, wave motion and marine borers and wood worms.

Stage 3. As the upper decks and structure disintegrated and collapses, the objects from the upper level would tumble down and rest on the sea bed adjacent the wreck. The objects were either then buried or swept a distance from the wreck or just got trapped under the hull where the rest of the structure would have collapsed.

Stage 4. The objects and hull get disturbed by nettings from a fishermen’s boat or by divers.

Stage 5. With modern activities, the sediment used to cover the hull moves with the currents and water motion. Explosives have been recorded to be used on some of the wrecks like that of the St. George. The use of explosives damages and helps with the disintegration even more.

Just as on land, the underwater sites can be changed and altered by means of transformation processes. There are usually two kinds of transformation process, C-transform (Cultural Transform) and N-transform (Natural Transform).

C-transform changes the sites by means of fishing, dredging, manufacture waste dumped in the ocean, diving and recycling. When the HMS Pandora got stuck on the reef, the seamen were tasked with dumping heavy objects such as cannons overboard. After the HMS St. George sank, a salvage team recovered few of the cannons. Most of the times, the archaeological site is altered because of fisherman and divers. The nets used for fishing would get either entangled or trap some of the objects that were dislodged due to the geological process. Divers either from salvage teams or recreational divers once they locate a wreck and having a financial gain, they would take any objects that can be lifted and that has a value in terms of financial values. Also, the site can be transformed by means of manufacture waste or just by waste in generals. Modern objects get thrown overboard all the time. Those objects if heavy enough without distributing water will sink and can get mixed with older objects that came from the wrecks.
N-transformation alters a site by geological and biological processes. Most objects would be intact inside of the structure unless the objects that were on the open deck tumbled down or if the objects were purposefully were thrown overboard to aid a ship float again. Any objects that settled at the bottom of the sea floor next to the wreck, with underwater currents and wave motion, the objects could have been relocated somewhere else. Biological process occurs by animal disturbance, plant growth and by marine borers such as the sea urchins which bores through wood and wood worms that eat decayed wood. Once the wood of a structure have been disintegrated, the structure would collapse and any objects trapped within the structure would tumble down and settle next to the wreck where another C or N transformation would take place.
Chapter I – The Age of Exploration and the History of Select Ship Wrecks

Figure 1. Oil painting of the sinking of the Mary Rose. (National Geographic)

1.0 The Age of Exploration by Sail

The trans-Atlantic exploration has a long historical basis that goes back to the year 312 CE. Emperor Constantine of the Holy Roman Empire had just defeated his rival Maxentius at the battle of Milvian Bridge and became the sole emperor of the west. The following year, Constantine challenged and defeated Lucinius who has assumed power in 313 CE at the ground battle of Chrysopolis. Constantine knew that Rome had everything needed to be a capital but he understood that the city of Rome was declining economically. He wanted something new. Constantine chose a capitol for a New Rome would be built over the old Greek city of Byzantium. The location had numerous advantages. It was closer to the geographic center of the empire, it had favorable water approaches that could be easily defended and provided an excellent harbor. Its name would become Constantinople. Constantinople served for 12 centuries as a central trade center where Europeans could exchange goods with materials coming from the East.

However the city went into decline and never recovered from the Fourth Crusade (1202 – 1204 AD) leaving Constantinople vulnerable to the Ottoman Turks. On April 5th 1453 the Turks laid siege to the city (Hickman 2015). On May 29th 1453, Constantinople fell to the Ottoman Turks. After centuries of use the land route between Europe and Asia was effectively cut.
Europeans who wanted to venture east to Asia had to circumvent the Ottoman Empire and seek other routes by sea around Africa (northern part of Africa being controlled by the Portuguese).

These were lengthy and treacherous voyages, but this journey’s starting the Age of Exploration.

The testimonies by Ferdinand Magellan, Sir Francis Drake, Jacque Cartier, James Cook and Vasco da Gama have shown that the greatest threat to any seafarers at sea is not that of piracy or naval conflicts but due to diseases, sickness, malnourishment, and poisoning. In the course of three years while circumnavigating the earth from 1519 to 1522, Ferdinand Magellan left with five ships and 265 men. Unlike other ships of the period he brought with him a surgeon and three surgeon-mates. Despite all precautions, medical preparedness and redundancy, only one ship, his flagship “Victoria” returned with 18 men. 247 souls on four vessels including that of Magellan himself would succumb to starvation and diseases (Bruijn 2009:53). Magellan was not the only adventurer to lose his life to medical peril at sea. Renowned English privateer Sir Francis Drake expired of dysentery after losing the battle of San Juan in modern day Puerto Rico 1596.

Jacque Cartier, explorer of the St Lawrence River and who named Canada, enroute to Newfoundland had to stay onboard ships on the St Lawrence River. Of the 110 crew members onboard, only three of the crew remained healthy while 25 others died (Goethe, Watson, Jones 1984:14). In 1498 after rounding the Cape of Good Hope and journeying across the Indian Ocean, Portuguese merchant Vasco da Gama would establish a trade route between India and Europe. To do so he would return with only 55 men out of a crew of 170, a 68% loss. Over one hundred perished from scurvy alone. The cases of Magellan, Drake, Cartier and Gama are only a small fraction of the numerous other sailors who would lose their lives journeying outside of their lands and the boundaries of medical science as it existed in their day. In this rough seafaring life there was usually only one man trained in the arts of medicine. What would become known as the ship’s doctor of today was called the Barber-Surgeon in yesteryear.

But how did they perform the mission of maintaining a ship’s health? What tools, techniques and practices were available and routine? Our quest for the barber-surgeon medical instruments brings us back in time to the Age of Exploration from 1450 to the 1750’s. Those dates are vital to this paper because as with the testimony of Magellan, Drake, Cartier and De Gama, seafarers would venture beyond the known boundaries of maps. Their charters and commissions would be crucial actors in major conflict for control of the oceans. Taking perilous and lengthier journeys at sea meant that the role of barber-surgeons would have to be formally integrated with the crew. For their own survival the ship’s medicine and hygiene would play a great role in the success or failure of the mission. The reasons why men would undertake such perilous journeys generally falls into three categories; ‘Gold, God and Glory’; the never ending quest for Gold under the providence of God and to return in Glory were the broad aims for virtually all exploration, expansion and conquest for centuries (Gale 2008).

The principle motivation for exploration was economic. The incessant quest for riches and treasures, in particular Gold drove nations and monarchies to dedicate vast resources to seafaring. The Europeans hoped that by undertaking exploratory voyages, they could fill their coffers with wealth of plundered precious metals (gold and silver), spices, slavery, raw goods and other resources. They sought to expand and dominate maritime trade especially to the East Indies (Lavery 2013:63). As merchants became influential, they anticipated that their royal governments would seek faster more economical sea connections to Asia. This was the cause for the first voyages to the “New World”. In 1492 Christopher Columbus, an Italian explorer in the court of Isabel I of Castile was funded to do just that. Columbus, during his first voyage brought back an enticing sampler of the new world: a small amount of gold, native birds, and tropical plants never seen before to show the riches of the country he just “discovered”. The courts of Europe saw these riches as potential for unbelievable wealth. They
speculated that funding more voyages across the Atlantic would result in successful exploitation of resources and people that would enrich them beyond imagination.

The second motivation for maritime exploration was religious colonization and evangelism in the name of God. Many in Europe believed that it was their duty to convert and spread Christianity to other societies. After his first trip to the Americas, Columbus wrote:

“I gave them many beautiful and pleasing things, which I had brought with me, for no return whatever, in order to win their affection, and that they might become Christians and inclined to love our King and Queen and Princes and all the people of Spain; and that they might be eager to search for and gather and give to us what they abound in and we greatly need.”

There was also an assumption that in Asia there may be other Christian kingdoms present. Those assumed united “kingdoms” were expected to be allies and assist the European Christians spread religious influence which would assist in control of the oceans (Gale 2008).

The third cause was Glory. There was a fascination and interest about the world outside of Europe. First was the trade and stories from the Crusades, soon followed by the tales of Marco Polo and the economic expansion that fueled the Renaissance. With this expansion was the potential for conquest, personal admiration and national prestige.

By the late 15th century, the Spanish and Portuguese monarchs were the principle supporters of overseas expeditions. The secret of their achievements included moving from two masted ships to three masted ships; improvements and consolidation of Mediterranean and northern European stile boat-building; advancements in navigation devices including the astrolabe, the sextant and the magnetic compass; advantageous port locations (Gale 2008). Furthermore, it was their personal determination that inspired many seafarers to venture beyond the known boundaries of the oceans.

One man gambled that by journeying West across the Atlantic Ocean would directly convey the European merchants to India. In 1492, Christopher Columbus took two caravels – the *Pinta* and *Nina* - and one carrack – the *Santa Maria* west to what he thought was a direct route to India. Although those ships were second hand and not destined for exploration, they were innovative for their time. Their voyage would have a profound impact on world history. (Lavery 2013:63). Though it could be credibly argued that they were not the first Europeans to reach America, they were the first to record their feats and establish known trade routes.

The thirty three day voyage of Columbus to the New World would set off chains of events that would pave the way for European exploration and shipboard surgeons and their instruments. Within 30 years after the so called “discovery” of the new world, European seafarers would leave their foot print around the world. Europeans sailors would leave an impression to India, around the Cape of Good Hope and circumnavigate the world. Such proceedings are significant for our study of medical practice at sea in the later periods.

1.1 Naval Warfare

With the riches of Asia and the Americas available for exploitation, the quest for maritime supremacy lead to at-sea warfare between European nations and piracy by smaller states. The routes to Asia and the Americas presented the challenge - to establish naval supremacy other navies would have to be destroyed and merchants could be seized as prizes. Whosoever controlled the oceans would essentially have control over the direction of global trade. The 16th century would see an era where naval warfare would be transformed. Spain and Portugal were the leaders in establishing overseas empires, but they were closely shadowed by the French and their cross channel rivals the English. Perilous voyages where
trading vessels and merchant ships packed with plundered precious metals and wealth of goods came not without any risk. The risk of licensed piracy such as that of the famous English privateer Sir Francis Drake, on commission from Queen Elizabeth I were real threats for merchant vessels. Especially when there was no true ocean going naval squadrons to patrol at the time. When navies arose conflicts for global supremacy lead to massive battles amongst trade state rivals such as the attempted invasion of England by Spain in 1588. Sea battles were quick and usually at the whim of the winds. On occasion, battles went on for extended periods such as the engagement with the Spanish Armada of 1588 which persisted for a week (Brockliss, Cardwell, and Moss 2005: 5).

1.2 Routine Risks

Life in the navy and on merchant ships was dangerous and seamen kept the ship’s barber-surgeon and their mate’s lives hectic. Broken limbs, torn ligaments, rope lash amputations, open sores, strains, and sexual transmitted disease were all part of the trade at sea throughout the age of sails. Calamities were common, retribution severe and sexual conduct frequently lax (Brockliss, Cardwell, Moss 2005: 5). The stretch at sea was the chief cause for outbreaks of dysentery, typhus, scurvy, malaria and yellow fever. The two succeeding centuries did not fare better as the navies were constantly hit by epidemics.

Up to the nineteenth century diseases would be responsible for the death of more sailors than any other cause. A journey to Asia and Americas could take anywhere between 23 days to 23 weeks or longer. As the journeys lengthen, so did outbreak of deficiency diseases including scurvy and beriberi. Deficiency diseases occur only after an uninterrupted voyage lasting longer than three to four months. It has been suggested by historians that the death toll from scurvy alone, a simple lack of Vitamin C in the diet, since Columbus’s first journey to the mid-19th century was as high as two million (Tyndall 2012). William Clowes, one of the numerous surgeons at sea described a patient suffering from scurvy (Tyndall 2012):

“Their gums were rotten even to the very roots of their teeth, and their cheeks hard and swollen, the teeth were loose neere ready to fallout…their breath a filthy savour. The legs were feeble and so weak, that they were not scarce able to carrie their bodies. Moreover they were full of aches and paines, with many bluish and reddish staines or spots, some broad and some small like flea-biting.”

Perhaps the single greatest enhancement in the lives of sailors, apart from the longitudinal calculating chronometer, was the introduction of barber-surgeons and medical treatment to ships. A specialist was necessary to treat the sick and the wounded and maintain good health. As ships altered sizes and in complexity, in the need for ships involved in lengthy voyages and for the protection of assets correspondingly increased. So did the need for barber-surgeons amplified. The inherent menaces linked with life in the navy and merchant ships were regarded in terms of monetary costs rather than human life. Inadequate diet resulting in disorder and malnourishment, crowded vessels created idyllic breeding grounds for outbreak of diseases and accidental injuries were all risk factors as the excursion lengthen. A sick sailor was a useless sailor, each sick onboard was a liability which required the attentions of others. It was in the admiralties and merchant captain’s best interest to heal and treat all sick and wounded as quickly as possible returning them to their duty.
1.3 Carracks, Mast & Guns

In Europe, the 15th century saw a boom in revolutionary ship design. The northern European (Scandinavian) and Mediterranean oversaw a merging tradition which formed new generation of multi-masted vessels. The four most common designs were the carrack, caravel, galley, cocca and the cog. As is, the cog would transform into the carrack which was an influential design in which the ship’s scheme would remain unchanged. It would be repurposed both to function as a warships and as a merchant vessel. Over time, the cog was slowly transformed into carracks which were strong enough to take the weight of an artillery piece. Cogs were similar to the Kollerup, Skagen, Kolding and to the Bremen cog which originally would have been larger with fighting castles situated at the bow and stern of the ships.

The archaeological evidence for the early carracks is almost nonexistent but the remains of the English warship Grace Dieu from 1418 illustrates that the carrack types of ships were gradually emerging into large warships and pictorial evidence suggests that wrought-iron guns were carried (Konstam 2002:90). The best archaeological evidence of a fully functional and armed carrack is that of the Mary Rose. In the early 15th century, small guns (the size of a swivel gun commonly found on 16th to 19th century warships) were carried on only a few warships and used more as an auxiliary weapon to back up the ship’s archers and crossbowmen whom were perched on the bow and stern castles. The archers provided the main fire power at sea (Konstam 2002:90). In the 15th century, the Mary Rose was categorized as a fighting carrack.

The Mary Rose would illustrate that naval power would become a vital element in the European conflict and that naval artillery could be decisive in sea battles. As ships, both naval and merchant became capable of crossing vastness of the oceans, the sails and riggings would also require more hands. Adding cannons into ships also required gun crews, usually 40 to 60 men each and more boarding parties were required when the sailors arrived into the New World (Goethe, Watson, Jones 1984:4).

As a carrack, the Mary Rose was a four-masted warship with several gun decks and two high castles, one at the bow and one at the stern. Counting soldiers, mariners and gunners, she would have carried 415 men including the ship’s surgeon, 185 soldiers, 200 mariners and 30 gunners (Mary Rose Trust 2005:11). She was in service under Henry VIII for 34 years and deployed in three wars. In 1545, the Marie Rose alongside 80 English warships was part of the English Fleet that was hastily put to sea to encounter the French that appeared off Solent with 128 ships. The English warships withdrew to Portsmouth harbor where in the sheltered waters the ships would be most effective. The Marie Rose was struck by a squall and the winds heeled her over and she sank (Gardiner 2005:16). How the Marie Rose sank is debatable but there are four most likely theories that could have been factors in aiding with the sinking. One factor was that whilst she was turning to fire her opposite-side cannons, a gust of wind made the ship unstable and the lower open gun ports allowed tons of water to pour in and capsize the vessel. Another theory was that the Mary Rose was overloaded with guns and soldiers which were all positioned on top deck and in the fore and aft castles causing her to capsize. Another theory was that there was language barrier between the crew. Many of the crew were not originally from England but as many as 25% were from Europe, as well as Wales, Scotland and Ireland, each of which have varying dialects of English. For all we know, all of the above factors could have contributed to the Mary Rose sinking. Of the 415 crew onboard, fewer than 40 survived.

While the Mary Rose was being built, Admiral Sir Edward Howard directed an expedition of eighteen ships and 5,000 men which led to the seizure of 12 Breton ships during four day’s incursion tour of Brittany In 1513, after the Mary Rose was completed, she was ordered to a mission against the French flotilla near Brest where Admiral Howard made a daring attack on the French fleet of galleys and lost his life. In August 1513, the Mary Rose was part of a fleet conveying troops to Newcastle where the
English engaged the Scotts and in the summer of 1513, the Mary Rose would engage in skirmishes against the French. In 1522, the English would engage the French once more in which the Mary Rose aided with by shepherding the English troops over to France. From 1522 to 1535, the Mary Rose was kept in reserve where she would be repaired, refitted and caulked. What is known due to archaeological evidence is that extra bracings were fitted on the interior of the ship, extra gun ports were reported to be cut and an additional gun deck was added to the fore and aft castles. During the time of the Mary Rose, naval tactics preferred short range fire power and boarding enemies’ ships to take her as a prize. The Mary Rose was noted to having anti-personal netting on top of her top deck to prevent boarding parties entry. That net may have also been a contributing factor in the death of most of the Mary Rose crew.

The 16th century’s weapons modernization would see a number of breech loading and muzzle loading guns which would be further valued on ships as the crew would be fighting from protected spaces. Then again, the guns of the era, especially breech loading guns, failed and burst more often which caused more flash and powder burn injuries to the crew than hits from their enemies.

In the 16th century while the Portuguese and the Spanish were conquering the world, in England, ship designs and naval guns were about to transform naval combat. English ships, with the Marie Rose as a good example, were placing cannons in the hull of the ship as well as mounting bow guns, stern chasers (cannon) rows allowing for full broadsides (Lavery 2013:63). In 1588, the Spanish Armada sailed to invade England. The Spanish ships were thought to be the best in the world. They were the largest and the best armed and their soldiers that the ships conveyed were experienced combat veterans (Konstam 2002:88). The English had a smaller flotilla but unknown to the Spanish they were far more advanced in the use of guns at sea. Like the French 43 years before, the Spanish armada was battered and held at bay by the English flotilla’s superior gunnery. The victory was due to the four decades of training, experiment and failure against the French. The two other factors that aided with the defeat of the Spanish Armada were bad weather and incompetence from the officers.

1.3.1 The Mary Rose

Salvage operations to raise the Mary Rose was tried on numerous occasions including but each time, they failed. Over a period of time, the ship embedded herself in the soft sediments of the sea floor where for a century; she would lie on her starboard side at a 60 degree angle. Her exposed side over time was open to the current and marine organisms until the 17th and 18th century when the entire site was covered with a layer of hard grey clay which aided with the preservation from further erosion.

The Mary Rose was discovered in 1836 by pioneer divers John and Charles Deane who recovered several guns including a bronze demi cannon gun, timbers and other objects. Most of the artefacts recovered from the Mary Rose in the 1830’s and 1840’s were sold to collectors and the ship’s mast was chopped and converted into book covers, snuff boxes and other everyday objects. During the time, the site was reported to have been destroyed when the divers used cast iron explosives bombs to expose a large area of the hold. The Deanes recovered the base of the main mast but over time the Mary Rose was lost again after 1843 until its rediscovery in 1968.

In 1968, Alexander McKee in cooperation with the South Sea branch of the British sub-aqua club surveyed the area using sonars and discovered a peculiar shape underneath the seabed. Between 1968 and 1971, a team of volunteered divers surveyed the area furthermore and using dredgers, water jets and airlifts, the team begun to excavate the site. On May 5th 1971, three of the port frames were discovered by diver Percy Ackland altering the apex.
From 1971 to 1978, limited excavations outside of the ship were recurring to find the extension of the preservation of the ship. In 1978, a trench across the wreck at the bow was made attesting that two decks survived in situ and it was decided that the whole ship in its entirety was going to be excavated. In 1979, the Mary Rose Trust was established with H.R.H. Prince Charles as president. Over 500 volunteers including full time staffs were employed with the excavation. In 1979, the salvaged ship Sleipner was moored on site and the project became a professional one with archaeologist, staffs, administrators, fundraisers and conservators all working on site. The site was dividing using grids of bright yellow pipe which aided the divers find their exact position and using trowels and airlifts, the artefacts were meticulously surfaced where they were surveyed and recorded. In 1982, using the floating crane Tog Mor, the Mary Rose was surfaced and placed on the deck of a barge that was readied to be towed ashore. A purpose built lifting frame was made with attached wires passing through steel bolts that passed through major structural beams of the ship.

Once the ship was onshore, it was enfolded in protective foam and polythene and was constantly kept wet. The Mary Rose was housed behind the HMS Swift where a hall was built around her.

1.4 Age of an Empire

In the mid-17th century to the 18th century, the Dutch, French and British were competing for domination for global supremacy superseding that of the earliest dominance of Spain and Portugal by establishing colonies and trading post around the globe. Part of that expansion of the oversea empires was the development of a large-scale trade of slaves in what will become as the “Triangular Trade”.

During that time, the British clashed with the Dutch, Spanish and French for global supremacy at sea while the Swedes clashed with the Danish and Dutch. Those early modern period will see a transformation from the carrack of the 15th – 16th century to the galleon which would become the ship-of-the-line or man-o’-war and the machine of dominance of the oceans by the European powers. Warships begin to lug extensive armament of heavy bronze guns as testimonies by the Mary Rose but it would not be until the mid-17th century before calculated risks and ship designs permitted naval artillery to recognize its full capabilities. The British would be the first to recognize the full potentials of artillery. The design of the warships required the armament of cannons to be placed alongside the hull. In order to engage an enemy ship, that ship would have to present her side to the enemy to be able to fire a broadside (Konstam 2002:148).

Unlike the previous century, the 17th century naval tactics changed dramatically. The strategies shifted from close quarter fighting and boarding to immobilizing and even sinking the enemies’ ships by means of superior distance fire power that has a longer range. That is not to say that
boarding an enemy ship did not occur. On the contraire, many accounts of 17th, 18th and even 19th century emphasize on boarding an enemy ship and take her as a prize. By the 1630’s, warships were designed from the keel upward to use cannons and artillery as the main armament (Konstam 2002:88). Until the early 19th century, there would be little to no change in the designs of the warships or in their armaments. The British would overcome the deficiency in the ship designs through skills and better gunnery. In 1805, the French 74-gun Intrepide and the Spanish Man-of-War 140-gun Santísima Trinidad went to action stations of the southern coast of Spain. The French and Spanish ships were a fragment of a larger Franco-Spanish fleet comprising of 41 ships (18 French and 15 Spanish Ships of the Line) under command of Admiral Pierre de Villeneuve. Their prey was the English first rate Ship-of-the-Line HMS Victory the flagship of Admiral Horatio Nelson. Nelson’s fleet was comprised of 33 ships, 27 of them being ships of the line. Both sides would clash on the 21st October 1805 at the Battle of Trafalgar where those ships of the line would be part of a climaxing engagement for an entire era of naval warfare. In the 113 years of naval battles fought between the rivalry Britain and France, the two oceanic powers would industrialize fleets of two diverse classes, ships of the line and frigates.

The victory at Trafalgar by Admiral Nelson in 1805 is such a testimony of the British naval superiority of the oceans but also that of the transformation of naval ships. Approximately 19,000 seamen were aboard the British ships at Trafalgar of which 9% or over 1,700 were casualties.

The Ship of the Line as the name foretells were designed to fight as part of a fleet in a single line firing their guns in broadsides. The idea of having a warship one behind another was suggested to come from commanders from the Dutch Wars and would become the principle fighting style of the French, Swedes and Spanish who would abide by the doctrines of upholding the line of battle which greatly mitigated the risks of disaster. The British at the battle of Trafalgar had other tactics in mind. They believed that the only way to defeat a superior force was by altering the doctrine of fighting in line. The 74-gun Intrepide is the perfect testimony of an ideal comprise between gun power and mobility. A larger version is the three decker with 98 to 120 guns which made the ship of the line clumsier and slower but could pour fire on the decks of smaller ships. By the end of the 19th century Napoleonic era, ships of the line were expected to carry at least 74 guns.
It was always suggested that the French and Spanish had superior warships than the British. When the British in 1740 seized the Spanish ship of the line *Princessa* and in 1747 the ship of the line *Invincible*, the British officers were astonished at the superior design compared to their contemporary warships. Those two ships would be the backbone for the British Navy until the Napoleonic wars. What the British lacked in superior ships gained in crew experience. At the end of the Seven Years Wars from 1754 to 1763, the British Royal Navy would be seen for a long time as the finest in the world until its defeat during both the American revolutionary war and the war of 1812, though they were not defeats at sea.

In contrast to the man-o’-war were the single deck frigates that would grow into popularity during the 17th century. Being small and fast, the frigate was a multi-purposed vessel which could carry out reconnaissance, escorting convoys of merchant ships, independent cruisers and raiding enemy shipping. Other ocean going vessels of the time were armed schooners which were commonly used as privateers by the colonist and in which would become part of the US Navy during the revolutionary war. Sloops and brigs were also two vessels used in the age of sail.

The British domination of the ocean would last for a century but not without risk. Despite frigates and ships of the line being the main warships used by most navies of the time, other ships which differed in size and alternation for mission specifics were also used. The great majority of the artefacts studied in this research paper came from some of those ships that her majesty used in the interest of its empire. Some of those ships analyzed in this paper were the HMS *Swift*, HMS *Pandora* and the HMS *St. George*.

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<tr>
<th>Name</th>
<th>Type</th>
<th>Weapons</th>
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<th>Crew</th>
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<tbody>
<tr>
<td>HMS Pandora</td>
<td>Porcupine class frigate</td>
<td>• 20 6lb cannons</td>
<td>513</td>
<td>134</td>
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<td>• 4 18lb carronades</td>
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<td>• 12 ½lb swivel guns</td>
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<td>HMS Swift</td>
<td>Sloop of war</td>
<td>• 14 6lb cannons</td>
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<td></td>
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<td>• 12 swivel guns</td>
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<td>HMS St George</td>
<td>2nd rate ship of the line</td>
<td>• 28 32lb guns</td>
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<td>• 30 18lb guns</td>
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<td>• 40 12lb guns</td>
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<tr>
<td>Kronan</td>
<td>1st rate ship of the line</td>
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<td>• 4 heavy 24lb guns</td>
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*Table 2. Warship Specification*
1.4.1 HMS Swift

The British sailor of the Age of Empire did not seem deterred by the idea of crossing large stretches of ocean in a relatively small boat. In March 1770, the HMS Swift, a 14-gun sloop of war commanded by Captain George Farmer and based at Port Egmont, West Falklands, was engaged in a coastal survey of Patagonia. Sloops, which were one masted vessels, were fast and agile ships with a shallow draft and were preferred by many navies and pirates (Croce 2011: 116). A violent gale materialized out of the South Atlantic and caught the small vessel on a lee shore. Captain Farmer ran for shelter in the estuary of the Deseado estuary in what is now known as the Santa Clara-Cruz Province of Argentina. The estuary was a natural sheltered harbor which previously has been visited by sailors and explorers since the 16th century. Unfortunately, Swift struck an uncharted rock that was hidden by high tide, was badly holed, and foundered. The crew managed to get ashore, except for the cook and two marines all of whom drowned. The crew was stranded on a desolate coast subsisting only by collecting wildlife and hunting. The officers knew that close-by was the Port of Egmond, located some 400 miles from Puerto Deseado. One officer and six sailors struck out in one of Swift’s cutters and made it to the port. There they directed Swift’s consort, another 14-gun sloop HMS Favorite, back to Patagonia and extracted the Swift’s remainder crew. The wreck of the Swift was lost for over a century until it was rediscovered by local divers in 1982. The ship lies at 30 feet of water and is currently roughly 2/3 preserved.

Under the direction of Dolores Elkin, an archaeological team consisting of the Argentinian National Institute of Anthropology did their first archaeological intervention in 1998 while the Mario Brozoski museum’s main role was to manage and conserve the artefacts (Elkin 20016). The first excavation occurred at the stern of the ship where the officers’ quarters were located.

1.4.2 HMS Pandora

While the HMS Swift was a sloop of war, the HMS Pandora was a bigger sixth rate 24-gun Porcupine class frigate of the Royal Navy that was laid down in 1778 and commissioned the following year. The Pandora was best known as the vessel sent to search for the HMS Bounty and for her mutineers.

The primary voyage of the Pandora was in the channel during the susceptible incursion by the mutual fleet of the French and that of the Spanish in 1779. She was deployed to the North America’s during the American Revolution and was part of a convoy between England and Quebec. During her stay near the shores of North America, the Pandora captured eleven vessels, which were mostly composed of merchant ships. At the end of the American Revolutionary war, the Pandora was placed as a reserve fleet by the admiralty for seven years until June 30th 1790 where she was brought back into service due to the Nootka Crisis. Although the HMS Pandora was brought back to service in 1790 she was dispatched to the South Pacific to recover the HMS Bounty that was taken by mutineers and to capture the 25 mutineers. She was commandeered by Captain Edward Edwards with a crew of 134 men. In November 7th, she left Portsmouth for Tahiti where most of the mutineers were situated. After gathering all of the mutineers from Tahiti including Peter Heywood, George Stewart, Joseph Coleman, Richard Skinner and Michael Byrne, she went underway back to England. Of the 25 Bounty mutineers, the crew of the Pandora managed to capture only 14. Several of the mutineers managed to construct a schooner and sailed off while others eluded capture. The captain of Pandora was told that due to the shortage of water, those that managed to elude capture would be back to the island. This was true as on the 9th April 1791, nine more of the mutineers where tracked down and brought onboard where they were kept inside the Pandora’s Box which was a prison cell that was constructed on the Pandora’s quarterdeck and to keep the prisoners separate from the rest of the HMS Pandora’s crew (Queensland Museum 2011:5).
With the mutineers captured, the HMS *Pandora* spent four months searching the South Pacific for the HMS Bounty. After having set a westerly course through the South West pacific, *Pandora* encountered the first islands and reefs on the 25th August 1791. Now on a southerly course, the *Pandora* stayed in open Coral Sea at night and by day, she ventured back to the reefs for three days until a large opening was sighted.

A yawl with Lt. Corner was sent to recon the entrance and late in the afternoon, Corner signaled from the yawl to the *Pandora* that a safe passage had been found. Before nightfall, the yawl was ordered back to the main ship. While waiting for the yawl to come alongside, the tidal currents which were strong that night drove the *Pandora* further into the entrance which was during the low tide and at 1920 PM, the *Pandora* struck a reef. After several hours aground, and with the assistance of the rising tide, the crew managed to lift the *Pandora* and at around midnight, the *Pandora* anchored on the other side of Pandora Reef. The hull was reported by the Carpenter to be damaged with eight feet of water in the hold. George Hamilton, the ship’s surgeon inscribed in his journal that the crew were professionally busy either at the pumps pumping water out, making repairs below deck, lightening the load by heaving the guns overboard (Queensland Museum 2011:6). Despite the professionalism onboard the *Pandora*, one of the pumps broke making the crew unable to keep ahead of the water flowing in. The one pump could not pump water out fast enough as more water was coming in. It was reported by Captain Edwards that 31 crew members perished alongside 4 of the mutineers.

After 18 full days at sea and three days at the cove, the crew of 89 alongside 10 of the mutineers that were held prisoners at the *Pandora* Box reached a small village in Southern Timor where they found fresh food and fresh water. After three days of following the Timor coast, they arrived at the Dutch East India Company at the settlement at Kupang. After five weeks of recuperation, the members made

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*Figure 3. Image of the dockyard. (Kronan Museum 1980-2016)***
their way on the VOC ship Rembang to Batavia (now Jakarta) where they arranged for passage back home to England (Queensland Museum 2011:10).

After 186 years at the bottom of the Pacific Ocean, in 1977, Steve Domm, John Heyer and Ben Cropp rediscovered the Pandora. In April 1979, the Commonwealth Department of Home Affairs and Environment commissioned an archaeological survey to confirm the wreck and assert its archaeological possibilities. The retrieval of the rudder fittings that has been sent to the WAMM Fremantle laboratory specified that the rudder fittings belonged to the property of the British government and archival documents affirmed that the rudder fittings were manufactured by William Forbes who was one the suppliers of the fittings to the yard in Deptford where the Pandora was built. After the initial survey, a photomosaic was made by photographer Patrick Baker and showed that the site would be the most intact 18th century site in Australian water. Under Section 7 of the Commonwealth Historic Shipwrecks Act of 1976, the radius of 500 meters from the site is protected. A permit is required for any individual who wants to dive and venture inside the exclusion zone of 500 meters. The zone is regularly patrolled by aerial surveillance crafts. Unlike the HMS Swift and Pandora, the HMS St. George was a 98-gun second rate ship of the line modelled after the HMS Duke that was laid down in August 1774 and launched in 1795. Like many numerous other ship-of-the-lines also known as “man-o’-war”, the ships were true battleships that could weight over thousands pounds and carry over a hundred cannons and were used only by three dominant powers; France, Spain and England. At her size, the St. George berthed 747 personals comprising of officers, crew, and marines and, let’s not forget, the surgeon and his mates. In the 26 years of her service, St. George partaken in numerous adventures including sailing to the West Indies, being part of the channel defense fleet, and seen a number of diverse combats of her period, with the two most prominent being the battle of Hyeres Islands in 1795 and the battle of Copenhagen in 1801. At the end of her year, she was stationed with the Baltic Fleet until the St. George was dispatched to the Baltic to serve in a convoy fleet until sailing to her fate in 1811 (Montgomery 2009:17).

1.4.3 The St. George

The St. George sank of the coast of Jutland in December. She was the flagship under Rear Admiral RC Reynolds and under Captain Daniel Oliver Guion and being part of a convoy made of 130 ships, she was sent to the Baltic for the protection of the merchant convoy trading there. By disregarding the orders of not sailing later than November 1st due to winter storms, the fleet endeavored to sail but were compelled back and didn’t leave until November 9th. While crossing the Baltic Sea, the fleet sidestepped bad weather and the St. George amongst other ships of the fleet suffered heavy damage. Of the 120 merchant ships, only 76 survived the storm while the rest suffered damage or were lost (Montgomery 2009:17). During the hardship of the winter storm, the St. George lost her rudder and had to be towed by the HMS Cressy to the port of Yinga. The fleet remained at port up to December, where the rest of the fleet including the St. George made attempt to cross the Swedish waters. With the HMS Defense, the St. George got separated from the rest of the fleet and on the 23rd of December on the same day, both ships run aground. The events surrounding the sinking is debatable, similarly to too many maritime disasters, it’s most likely that HMS George was the outcome of bad weather mixed with bad judgements. Of her 747 crew that she was conveying, only seven crew survived while the rest perished.

The first salvaged operations to recover the St. George were made in 1876 when the English authorities commissioned the Danish diving company Fjaltring Salvage Company to salvage the ship. During the salvaged operations, six cannons, gun powder barrels and two ship bells were surfaced. The salvage company was reassigned in 1904 to Harbor Salvage Company where the salvage was concentrated on
the recovery of the cannons for potential reuse or to be repurposed into scrap metal (Montgomery 2009:24). During this salvage, 48 cannons and a huge number of copper nails were surfaced. The last major salvage operations occurred from 1940 to 1941 where the operation was focused on surfacing copper nails and copper sheathing. Part of the salvage operation was the use of explosives making a hole in the hold of the ship. Several coins that formed into a mass, bundle of sabre sheaths and two bronze signal cannons were surfaced (Montgomery 2009:24). The last salvage happened in 1954 by Sigurd Damgaard who dived the wreck. All of the salvage since 1876 was based on financial benefits rather than the archaeological.

The first archaeological enquiry was made in 1970 with the rediscovery of the wreck by an amateur diving club and from 1970 to 1986; a number of diving operations were made. It was suggested that during the 16 years of the campaign, the level of silt and sand from the ship diminished speedily and more of the ship was exposed to the elements. Because the sand was rapidly being reduced and more of the ship became exposed, the structure of the ship including the top decks began to decay. During the time, the local regional attorney gave a number of local sports diving centers including Delfinen and West Dive consensus to monitor the site and to recover any artefacts that were in danger of being destroyed. Working closely with the local museums, the dive centers that the local regional attorney consented to monitor the site also carried out substantial operational works in measuring and making drawings of the site. As more of the ship became exposed, the more artefacts counting cannon balls, copper nails, and the ship’s anchor were recovered. While the Delfinen dive club monitored the site in 1980, they reported that the wreck protruded an estimated 4 meters from the seafloor and the dive club and the museum enhanced their recovery operations. The speed in which the wreck putrefied due to the dwindling of the sand prompted the museum to officially begin a primary archaeological operation which comprised of recording and the recovery of artefacts. In 1984 and 1985, enough funds were raised for a two-week survey of the site (Montgomery 2009:26). During the survey, it was noted that the lower gun deck was destroyed and that the orlop deck was opened to the elements. The excavations took part on the lower gun deck at the bow of the ship where artefacts belonging to the carpenter and quartermasters were recovered. After the excavation of the lower gun deck at the bow, the excavation moved to the orlop deck where the barber-surgeon’s cabin was discovered. A number of artefacts used in trephining and amputation were recovered from the site (Montgomery 2009:27). In 1997, a campaign was made to save the rest of the ship’s contents. An extensive excavation of the site was carried out in which a significant number of artefacts were recovered. The extensive amount of artefacts would in the future illustrate the life onboard an early 19th century ship.

The British, French and Spanish were not the only regional players that would have used man o’-wars. Sweden in the 1660’s was one of Europe’s great powers. It was triumphant over Denmark in both the Torstenson War (1643-1645) and the Dano-Swedish War (1657-1658). In 1645, the Treaties of Bromsebro (1654) and the treatise of Roskilde (1658) required Denmark to relinquish the islands of Gotland and Osel, all of its eastern territories on the Scandinavian Peninsula and parts of Norway. Despite the treatise, the ruthless king Charles X of Sweden endeavored to end Denmark for good in the third war (1658 – 1660). The renewed attack on Denmark threatened the interest of the shipping nations England and Netherland in which the Dutch interceded in 1658 by conveying a taskforce to dissuade the Swedes from attacking Denmark and in the same year of November, England also sent a flotilla but to assist the Swedes. Because of the hostile winter weather and a political turmoil back in England, the English excursion was lost and Charles plan to finish Denmark were thwarted. At the end of 1660, Charles X perished and the treaty of Copenhagen ended the conflict. At that time, England, the Dutch republic and Sweden had the anti-Trench triple alliance but in 1672, the correlation between France and Sweden improved enough that the two nations formed an alliance (Konstam 2002:152). The same year, the Dutch Republic was attacked by the French under King Louis XIV and in 1674,
Sweden was stressed to join the war by engaging the northern German alliance. In December 1674, the Swedish army under Carl Gustave Wrangel and comprising of 22000 men progressed to Brandenburg where in 1675, they suffered a minor tactical defeat at the battle of Fehrbellin and by September of the same year, Denmark, the Dutch Republic and the Holy Roman Empire were at war with Sweden and France.

1.4.4 The Kronan

Just as British and France used man-o'-wars, the Swedish did as well. Despite Sweden having a superior fleet consisting of 18 ships of the line and 21 frigates more than Denmark, the Swedish fleet were vintage and of inferior quality. The Swedish also lacked maintenance and its crews lacked the professionalism that the English of the time had. One example was the Swedish 1st rate ship of the line was that of the Kronan. It would be one of the largest three decker warship conveying an estimated 110-126 guns and had a crew of 850 men comprising of 500 sailors and 350 soldiers (Akesson 1997).

Unlike the Dutch who emphasized building ships with flat bottoms and a small draft commonly used on smaller ships that would stay in shallow waters. The English approach was to give the ships a rounded bottom and a greater draft. The English had centuries of experience in ship building. It was unusual for the Kronan to be over gunned when it was more or less a common practice of the era. Before the 1650’s the English shipwrights has not been building three deckers on a huge scale and by 1660’s, ships designs were still untried. Modern accounts illustrates that those three deckers used by both the English and French were rather unstable because they were too high, narrow and usually overloaded with cannons and other weapons. The Kronan is the perfect case study for a three decker build in this era. The Stora Kronan was in full swing to be erected in October 1665 by English shipwright Francis Sheldon on Skeppsholmen in Stockholm. When the ship was launched, the rear section of the keel broke off because the slipway was said to be too small. The admiralty demanded an answer in which Sheldon countered that the damage was straightforwardly repaired and that the factor was likely that the timber used for the keel was left too long to dry. The admiralty demanded an answer in which Sheldon countered that the damage was straightforwardly repaired and that the factor was likely that the timber used for the keel was left too long to dry. The admiralty demanded an answer in which Sheldon countered that the damage was straightforwardly repaired and that the factor was likely that the timber used for the keel was left too long to dry. The sculptures were finished in 1669 but the rigging, tackling and arming procured three additional years until 1672 and in December 1672, the Kronan sailed during King Charles XI succession to monarch.

The Kronan as the flagship alongside the Svartet, Applet, Nyckckeln and 28 large and medium ships and nearly the same number of smaller vessels where to support the troops transport to support the Swedish Pomerania. This expedition took place after the Swedish tactical defeat at the battle of Fehrbellin in June 1675. The flotilla under the command of Admiral of the Realm Gustaf Otto Stenbock set sail in October 1675 but went no farther than Stora Karlso. The weather at the time was reported to be cold and stormy and the ships could not be heated. Because the crew was ill-clothed, whole cluster of them became ill. After less than two weeks at sea, the supplies diminished and Kronan lost one of its anchor. Admiral Stenbock decided to turn back to the Dalaro anchorage north of Stockholm. In 1676, Charles replaced Stenbock with Lorentz Creutz, a prominent treasury official who knew nothing of commanding naval ships. In the winter of 1675 – 1676 under Commander Claes Uggla, the fleet with Kronan still the flagship dreadfully endeavored to relieve the Swedish ground forces. Because the weather was still utterly cold, the fleet was blockade by ice when it reached Dalaro on 23 January and three weeks later on the 14th February, the fleet was once more halted by the ice at sea. The attempt to relieve the Swedish land forces was another failure.

In May 4th 1676, the Swedish flotilla was ordered out but the fleet was hindered until 19th May because of adverse winds. On the 25 and 26 May, both the Swedish and the Danish-Dutch fleet engaged each other at the battle of Bornholm. Despite having an advantage in ships, men and guns, the Swedish
were unable to inflict any losses on the opponents force and lost a fire ship and two minor vessels. After the unsuccessful engagement, the Swedish fleet anchored at Trelleborg where King Charles gave new orders to recapture Gotland (Konstam 2002:152). The king ordered the Swedish fleet to avoid engaging the Danish-Dutch fleet until they reached the northern tip of Oland where they could engage in friendly waters. Nevertheless on 30th May when the Swedish flotilla left Trelleborg, the Danish-Dutch fleet intercepted the Swedish fleet in which a pursuit began. The two fleets sailed north and on the 1st June, the Swedish passed the northern tip of Oland. The Swedish fleet to no avail tried to get between the shore and the Danish-Dutch fleet. The Danish-Dutch fleet sailed faster than the opponents and slipped between the shore and the Swedish fleet (Konstam 2002:152).

Because of poor coordination and communication, the Swedish fleet endeavored to engage the Danish-Dutch fleet before they had sailed the northern tip of Oland which was the agreement before the battle. There is a reason was the English and French shipwright did not built many three deckers. As noted before, the three deckers were commonly recognized to be unsteady because they were too high and narrow and overloaded with cannons.

As with the sinking of the Mary Rose in 1545 and that of the Vasa in 1628, the Kronan being a three decker turned hard to port with too much sail. In the process she heeled so far over that she began to flood from her opened gun ports (Akesson 1997). She heeled so much that her masts were parallel to the water and soon afterward, her gunpowder store ignited and exploded ripping a large section of her starboard side forward of the mainmast. On the 1 June, 1676, the stern section rose and shortly broke apart and as suddenly as the accident occurred, the Kronan sank with her port side down. (Lorenzi 2011).

Between 1680 and 1686 and using a primitive dive bell, 60 of the bronze guns were salvaged from the ship. Between 1980 and 1987, another 32 bronze guns were salvaged (Akesson 1997). It was reported that the guns that were recovered comprised anything between 6 to 32 pounders and were caste between the year 1514 and 1661. The oldest gun that was recovered dates from 1514 and is by far the oldest muzzle loaded gun in Scandinavia (Akesson 1997). The Kronan was a wreck that first was discovered in the archives by Anders Franzen and was put on a search list and won’t be discovered until 1980 lying at a depth of 26 meters (Kronan Museum 1980-2016). The excavations commenced in 1981 and after 27 years of surveying, recording and excavating the Kronan, 80% of the ship was surveyed and over 30,000 artefacts comprising of a cast with 260 coins, a cross staff, case of tin bottles, and in 2001, an apothecary chest with 70 bottles and medicine cans were recovered which are now housed and on display at the Kalmar County Museum in Sweden (Akesson 1997). During the excavation, Kronan hull was recorded to have broken diagonally in two. Despite the structure forward to be missing and because of the lack of salinity, the remainder of the structure was well preserved and consisted of seven decks level; the poop deck, quarter deck, the three level gun decks, the orlop deck and the hold (Kronan Museum 1980-2016). The environment of the Baltic Sea with the absence of the Teredo navalis worms (wood worms) made the site extremely well preserved and made the archaeological excavations easier to operate in. It was said that the excavations of the Kronan will continue for more seasons to come.

During the excavation, an estimated 200 to 300 individuals were recovered from the ship. During the analysis of the crew, it was reported that a great majority of the crew suffered severe trauma including unhealed laceration on the skulls, vertebrae, ribs and other limbs. It was suggested by medical historian Katarina Villner that the injuries were caused by the sudden sinking of the ship in which both men, cannons and heavy equipment alike were thrown around. Of the 850 crew that was onboard the Kronan, only 40 men comprising of 2 trumpeters, 14 sailors and 22 soldiers survived.
This age of naval empire was also supplemented by a decline of piracy and buccaneers which were highly active in the 16th century and mitigated with a regular navy. Similarly, so did the missions of scientifically findings such as the voyage to the Pacific Islands of Australia, New Zealand and other Pacific Islands by the British Captain James Cook and by French Admiral Louis Antoine de Bougainville.

Despite having advancement of navigation, nautical charts, ship design and medical knowledge, crowded ships still foundered and the stretch at sea would remain the chief cause for outbreaks of epidemics, dysentery, typhus, scurvy, malaria and yellow fever. The duties of the sailors would be major factors in injuries. The way of life for the sailors would also linger the same.

1.5 East Indiamen 17th – 18th century

Because there were so many contest in the trade of spices that fierce battles between the English, Dutch and the Portuguese were uncommon. By means of the private Dutch East India Company, the Dutch prevailed and would rule those trades for over two centuries to come. The Dutch East India Company was started when a group of merchants from Amsterdam financed an expedition to the Indies back in 1595. When the merchants brought back 245 bags of pepper and 45 tons of nutmeg, they started to compete with each other by sending out several more expeditions to the Indies. In 1602, the Vereenigde Oost-Indische Companie (United East India Company, or VOC) also known as the (Dutch East India Company) was formed to put an end to the internal competition and to protect the state’s trade in the Indian Ocean (Gaastra & Bruijn 1993:178). The company would also play a vital role in the Dutch war of independence from Spain.

Because they were given enormous powers, the Dutch East India Company had their private armies, fleets and currencies which made them as authoritative and influential as those of normal nations and it would be the beginning of the Dutch colonial empire and were given the domination of the spice trade. The VOC was also approved the ability to institute colonies as seen below, construct forts, install infrastructures, legislate treaties with other nations and even engage in wars if need be.

In the sixteenth century, trade with Asia was mostly controlled by Portugal. With the help of the local rulers, the Dutch proved themselves superior to the Portuguese naval and military strength. Gradually, the Dutch took over the Spice Islands, and would establish their main base at Batavia (modern day Jakarta) on the Island of Java in 1619 to control the production and marketing of mace, nutmeg, pepper and cloves being traded from Indonesia (East Indies) with Europe (Lavery 2013:126). The VOC would also establish a colony in Brazil and a staging point at Cape Town in South Africa. To have control over the spices, the Dutch also relocated the nutmeg and clove trees and gave certain authorization to plant on certain Islands and they would build a network of hundreds of bases.

The massive armed East Indiamen originated from Netherlands and England but were soon built by other European Countries to contest in the Asian Trade. The ships were primary cargo ships but have been known to transport soldiers and civilian passengers to and from colonies (Lavery 2013:134) testimonial by the legendary VOC ship Batavia that foundered striking Morning Reef near the Beacon Islands in 1629 off the coast of Australia. While the officers, captain and passengers occupied the cabins on the quarterdeck, the sailors and crew employed by the company slept below decks. After its establishment, the Dutch East India Company would have at least two to three fleets sail each year from Holland to Asia and South Pacific (Rijks Museum). However, it became a common practice for the autumn directors to decide on how many VOC ships they wanted to send to Asia. The number of ships depended on many factors. One of these factors was the amount of products that had to be
transported from the Batavia and other Dutch factories to Europe. Because the bases, factories and trading routes in Asia had to be protected against potentials enemies, VOC ships were required to patrol the Asian waters. Least but not last, because VOC had numerous bases including in Brazil and at Cape Town where VOC had a staging post and because their territories over time extended, numerous personnel’s including soldiers were needed to be transported. It was uncommon for times to see an increase in the VOC ships for troop transports only (Gaastra & Bruijn 1993:178).

It generally took eight months to reach the East Indies (the same amount of time it took before the VOC ship Batavia wrecked) but as recorded by the VOC ship Gouden Leeuw, the journey could have taken 127 days (Lavery 2013:126). After a while, bigger VOC ships were constructed to carry more people and cargo. Along the route, the VOC ships would set up trading posts where they could resupply for the rest of the journey. It was uncommon for the VOC to use a variety of ships to journey to the East India. Other than the ship and return ship, the company had in its arsenal yachts, frigates, pinnace, fluyt, catbark, galliot and hookers. The VOC had two kinds of practices for the two centuries. It had ships which would sail to Asia and stay there for intra-Asian trade and to serve the VOC in the east and then, it had Return ships. A Return ship was a VOC ship that would journey to the East India and then return back to Holland loaded with cargo (Lavery 2013:126). The Batavia would have been a return ship if she did not founder. Most of the return ships used by VOC would have been large square stern ships very similar to a warship. The Indiamen of the time were lavished with ornate décor, had gun ports and carried guns that could easily be misguided for warships. To counteract the instability created by the cannon, VOC ships were designed according to the “tumblehome Principle” where the hull becomes narrower above the waterline making the ship more stable (Lavery 2013:134).

During the two centuries of existence, outward journey to the East Indies rarely ended in disasters. Of the 5000 outward journeys, only two to three percent of the voyages were not completed. This translates into that of all the ships journeying to the East Indie, the VOC would lose only 105 vessels to the weather and the sea while only 36 VOC ships were seized by hostile hands (Bruijn & Gaastra 1993:179). This does not factor the return journey back to Europe. It was common for most of the VOC ships to stay in Asia for the intra-Asian trade.

It was recorded that between the establishment of VOC in 1602 and 1610, an estimated 8,500 people sailed to the East and in the seventieth century, the number rose to 4,000 people for that year. In the eighteenth century, even more people would journey to the East Indies.

The flagship Batavia alongside a fleet of seven more ships of various size (Buren, Dordrecht, Galiassie, s’Gravenhage, Assendelft, Sardaam, and Kleine David) under the command of Francisco Pelsaert left Texel, Holland for her voyage to the East Indies (McConnell 1996). The cargo carried onboard the East India comprised of silver coins, jewels two antiquities belonging to the artist Ruben for sale to an Indian Mogul ruler and some sandstone blocks for a portico that was to be erected as a gatehouse in the city of Batavia. Because with the VOC ship Batavia, Galiassie and s’Gravenhage were all return ships, they were to procure spices, black tea, silk and other commodities back to the Dutch Republic. At 48 meters in length and 12 meters in breadth, she is a mere illustration of a 17th century Indiamen. The Batavia was commissioned by the Dutch East India Company on the 27th of October 1628. Despite the order not to stop by the VOC, Pelsaert accredited a visit to Sierra Leone where the ship would be marooned until the wind picked up and where they picked up another individual (Lavery 2013:130). During the wait, 11 seamen would die from scurvy. This illustrates that despite being close to land, illness and a deficiency in nutrition will still take its role. The fleet anchored at Cape of Good Hope on April 14 1629 and would not sail until April 22 1629.
It was said that during the maiden voyage in a storm, the Batavia got detached from the rest of the fleet. While Pelsaert was weakened by an ailment and in his cabin, it was suggested that Ariaen Jacobsz, who was also the skipper of the Batavia deliberately coxswained the ship off course away from the main fleet. On the fourth of June, the ship floundered (Dash 2002:139). Just as with other East Indiamen of the time, the crew conveyed by the Batavia consisted of 340 personnel including the crew, soldiers and civilians composed of men, women and youngsters (WAM 2016). It was said that few last minute dissertations were made by few individuals, a common practice of the time. As with any other VOC ships, the soldiers and crew had to berth below decks on top of one another while the passengers, officers and crew berthed and ate in the cabins situated in the quarterdeck. The lack of space as seen with other ships before and after meant that hygiene was of little to no importance for the Captain and for the VOC companies. The barber–surgeon on board had two tasks, besides cutting hair he also carried out blood-lettings and in dire need, he would also amputate limbs.

1.5.1 The Batavia

In June 1629, the Batavia foundered on Morning Reef off the coast of Western Australia. Following the wreck, 180 persons including 30 women and children were ferried off the ship and landed on Beacon Island while 70 men remained onboard including the under merchantmen Jeronimus Cornelisz (McConnell 1996). Some 40 of the men with Commander Pelsaert and Captain Jakobsz made camp on the Island. The survivors that made it had some of the ships provision including barrels of ships biscuits and some water. There was not enough fresh water for all of the 268 survivors. In an effort to find
provisions 48 crewmen and passengers including all of the senior officers and the ship’s master. Commander Pelsaert left the survivors on the two islands and went to search for water. When no water was found, the crew sailed for 33 days to the settlement of Batavia to obtain help (WAM 2016). The only officer of any rank amongst the crew on the Island was Frans Jansz who was also the surgeon. During the first few days, he would have ordered the survivors and presumably set a council to lead them (Dash 2002:143).

Fragments of Albarelli and Zalfpotten apothecary jars were recovered from among the remains of the large camp that was set up by the survivors. This suggests that Aris intentionally gathered many important medicines from the sinking ship and carried them with him to the island. Many other medical artifacts were recovered from the submerged wreck site of Batavia.

Governor General Coen send out Pelsaert seven days later in the ship Jacht Sardam to effect a rescue of the survivors, which took double the time for the ship’s boat to get to Batavia. After 63 days, the Batavia wreck was found. The story of what transpired was learned: In the days following the departure of Pelsaert for search of fresh water, the Batavia completely broke apart taking 40 men with her. The breakage occurred so rapidly that the men onboard were taken by surprise (Dash 2002:147). Those that survived including Jeronimus Cornelisz made it to either of the two islands.

With the Commander gone in search for help, Jeronimus Cornelisz decided to conspire with other officers and take the ship Batavia for piracy and for her cargo. For him to achieve his deeds, he had to eliminate anyone that was standing in his way. He first sent about 45 people comprising of men, women and cabin boys to Seals Island which he told them that they would find fresh water. There was no fresh water there and Cornelisz knew it. He sent them there because he did not expect them to come back alive (McConnell 1996). Under the command of Wiebbe Hayes, Cornelisz ordered a group of soldiers to explore the High Islands that were visible on the horizon. He took their weapons arms as they would not need them, Cornelisz just like the 45 people that he sent to the Seals Island, did not except the soldiers to make it back. He concluded that because Pelsaert and his crew went that direction and did not come back that sending the soldiers that way; they would meet the same fate as the commander (WAM 2016). Using collaborators, he sent numerous others back to the wreck for useless errands and many drowned when his accomplices would push them overboard. Having gotten ridden of most of the opposition, Cornelisz decided to murder the remaining persons. Starting with the sick and weak, Cornelisz murder most of the children and women. A few women were left alive as sexual partners.

The first group that he sent away wandered back to the beach. Cornelisz sent one of his henchmen to get rid of them. The soldiers that where sent on the High Lands made a smoke signal to inform the main group that they found water. They were not aware that Cornelisz started a mutiny on the Islands and that he, along with his accomplices, murdered over 100 woman and children. Seeing the smoke from the soldiers and knowing that they did not perish, Cornelisz sent an attack force to kill them only to find his men were defeated. Jeronimus Cornelisz took matters in his own hands. He went to the High Islands to lure the soldiers to a trap. After in a sharp engagement where only the mutineers had muskets Cornelisz with five of his accomplices were overpowered and captured (Lavery 2013:133).

Surprisingly the sail of Commander Pelsaer’s rescue ship, the Sardam, was seen in the middle of the battle. Upon landing Hayes reported to the commander of what happened and that he was holding Cornelisz as a prisoner. The rest of the mutineers attempted to take over the ship Sardam, they were all but captured and taken prisoner. After questioning, Cornelisz denied any wrongdoing and blamed the others for his actions; Pelsaert hunted down and captured the final mutineers (WAM 2016). After using torture to extract confession by all of the mutineers, their right hand was cut off. Cornelisz had both of his hands were cut before being put to death on the gallows. On the 2 October, 1629, two men were left behind on the High Island as a punishment while the lesser offenders were brought back to
the settlement of Batavia. During the whole period of trial for the mutineers, Pelsaert recovered the items that were stolen by the mutineers using divers from Gujarat.

On the 5th December 1629, the Sardam returned to Batavia with the remaining of the survivors and with the cargo from the Batavia ship. The lesser offenders were executed during the journey back home after being flogged, keelhauled and hung from the yard arm as punishment. (WAM 2016). All of the mutineers were executed.

Of the 316 people that embarked Batavia only 116 survived. 40 drowned and 110 were executed by Jacobsz and his crew. The precise number of those that died is unknown because from Holland, some individuals deserted while others died during the trip. It was also recorded that one individual was picked up from Sierra Leone and that an unknown number of infants were born during the journey.

The Batavia ship was discovered 300 years after it initially foundered on the Morning Reef. In 1963, an archaeological excavation was conducted on the Beacon Island were 17th century artefacts originally from the Dutch Republic were recovered in conjunction to human skeletons (WAM 2016). The artefacts of Dutch origin and the skeleton remains of Europeans supports the idea that this was the place were some of the murder by the mutineers took place. This discovery also led to the discovery of the wreck where the following year an underwater team composed of civilian and military divers conducted the first underwater excavation of the wreck. At the end of the expedition, the archaeologist also surveyed the Beacon and Long Island was they recovered more burials and more artefacts belonging to the survivor’s camp.

A serious excavation of the Batavia occurred in 1972 and would last for four seasons of fieldwork. In the time, the stern of the ship was completely excavated while the bow was left alone for future excavations. Alongside the western side of the wreck, twenty-one iron, five bronze and two composite cannons were located. At the start of the first season, three iron, all of the five bronze and the two composite cannons were recovered. At midpoint of the site were four anchors situated on the east side of the site while south of the anchors were a pile of the shaped building blocks. Those blocks could have been the sandstone blocks that was being transported to Batavia before the wreck for a portico that was to be erected as a gatehouse in the city.

1.6 Piracy & Privateering in the 17th – 19th Century

Piracy also regarded as “sea devils” and known by other names including; Bucaneer, Corsair and Privateer have been a common practice in the classical age in the Mediterranean and elsewhere where merchant vessels were present. After the discovery of the New World, Portugal and Spain both established colonies and would establish a monopoly on the trade with the colonies.

On June 7, 1494, two years after Columbus discovered the new world, the Papal Treaty of Tordesillas was signed by Ferdinand II of Aragon, Isabel I of Castile and John II of Portugal. A north-south line of demarcation of 370 leagues (a league is equivalent to three nautical miles) or 1110 nautical miles west of the Cape Verde Islands was recognized which would separate the New World territories between Spain and Portugal (Molina 2016). The Spanish were given the western half while the Portuguese were given the eastern half of the hemisphere. As political and religious turmoil arose, the volatility of the Continental Europe gradually spread to the Atlantic.
The great demand of crops including sugar and tobacco in Europe and over the Atlantic also required a need for manpower to work the fields in the Spanish Caribbean and Portuguese Brazil. Thus two new industries were born slavery and slave transport. With the Portuguese presence in West and North Africa, local Africans were hunted, captured and taken as slaves. Moving them would require large numbers of slave transport ships to convey them to the Americas. The colonies established in the New World also had to be governed and would require resources and goods from Europe. The merchants that did not want to abide by the Iberian laws started the practice of smuggling goods and slaves to the Americas which created even more political turmoil. As the 16th century passed, this political and religious turmoil would drag England and other nations into war across the Atlantic. The profits and empire’s success would eventually lead to piracy and privateering.

The 16th century would see an epoch of privateers. Privateers where not pirates because they were covertly supported by their government during peace time, but on the seas they were in every way pirates. A privateer was a private person or warship that has been granted authority to by their government by means of a letter of “Marque” to engage, destroy and plunder a ship or ships of their enemy (Groce 2011:35). A good case of a privateer was that of sea Captain Sir Francis Drake who engaged the Spanish in the 1570’s. Henry Morgan was also an English privateer famous for raiding Spanish settlements in the 1660’s. It was noted by Acosta that during the age of Atlantic expansion, nations including Britain, France and Holland maintained naval flotillas comprised entirely of privateers (Acosta 2005:17). On occasion pirates were patriotic. The movement and location of the Spanish Armada of 1588 was reported by a pirate who submitted himself to the British Navy to warn them of the Spanish. The English used a combined fleet of privateers, pirates and the Royal Navy warships to defeat the armada (Acosta 2005:19).

The seventeenth and eighteenth century were referred to the Golden Age of piracy. With the rise of merchant ships with valuable cargo crossing the Atlantic Ocean and wars between colonial powers including Britain, French, Dutch, Spanish, Portuguese and Danish and the destruction of local civilizations piracy was inevitable. The year 1720 alone would see an estimated 2,000 pirates menacing the Atlantic trading routes (Smithsonian Museum). The wars in Europe meant that the nations did not have the ships to completely patrol the Atlantic and the colonies in the Americas. In the same time, merchant and slave transport ships were roaming the Atlantic oceans with no protection. They were all easy prey for piracy.

Sometimes, pirates are not given the credit that they deserve. Pat Groce notes in her work that by comparison to the merchant or royal navy ships of the time, life for pirates was desirable. Each was considered a free man and shared in successful captures of prizes (Groce2011:44).

If an individual signed the pirates “Articles of agreement”, he would receive rights unlike a Royal Navy sailor. It was uncommon for seamen from both merchant vessels and Royal Navy ships to volunteer as pirates. African slaves for instance were better treated by pirates than they were onboard a merchant or royal navy vessel. Blacks in this period were actually seen as equals on pirate ships, but if every caught, they would have been equally treated as a white man found guilty of piracy (Acosta 2005:53).

In the 17th and the 18th century pirates continued to flourish. One of factors was the excess of unsettled islands that were havens for pirates to resupply and repair their ships including Tortuga, Port Royal, Madagascar, New Providence and Nassau. The islands had provisions of fresh drinking water and food which permitted the pirates to live on them without being detected. Port Royal which is situated on Jamaica’s southern coast was referred as the “Pirate Capital of the World” (Groce 2011:56).

The second factor was the Triangular Transatlantic Slave Trade (TTST) which is also referred in history because it usually followed the triangular route. Merchants would first journey from Europe to the
Western coast of Africa where slaves were brought in exchange for goods. Once the exchange was finished, the slaves were loaded into the ships. Then, the slave ships would leave Africa and sail across the Atlantic which is also referred to the Middle Passage to the Americas. A trip across the Middle Passage could take anything from six to eight weeks. If the slaves survived, they would be offloaded where they would be sold and put to work in the fields. The ships would return to Europe with cargoes including sugar, coffee, tobacco, rice and later cotton. La Concorde de Nantes was one of those ships that became a target to piracy in 1717. There were cases where the colonist in America would journey directly to Africa without following the triangular routes. The ships were perfect prime targets for pirates.

The last factor is similar to the first one is that the inlets of islands were the perfect means of escaping the British Royal Navy’s ships of the line and that of the Spanish Galleons.

The rule for piracy was simple. Never buy a ship when you can simply steal one. The ships that pirates used were not significantly different than those that the colonial empires used. However, based on many accounts, pirates preferred small and fast vessels. Some of those vessels were sloops, which were fast and agile and schooners which were shallow drafted, fast and capable of waiting in shallow coves. Both were commonly used by both the British Royal Navy and by the US Navy during the war of 1812. Other vessels included Brigantines which were small and could be outfitted with a sail and oars; Galleys which could also be fitted with a sail and oars and Frigates; which were smaller than ships-of-the-line but could carry heavy firepower comprising of 24 to 40 cannons. Groce noted that only a few pirates ever commanded frigates because they were mostly used by most navies whom pirates preferred to flee (Groce 2011:118). Capturing a Frigate was nearly impossible without great fortune. A noteworthy exception was the capture of the USS Philadelphia by Berber pirates when it ran aground in Tripoli harbor 1803. Of the few of frigates successfully seized by pirates included the Queen Anne's Revenge that was built as a frigate then converted into by the French as a slave ship. Having larger pirate ships had its advantages and disadvantages as seen in table 3.

<table>
<thead>
<tr>
<th>Benefits and Disadvantages of larger pirates ships</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advantages</td>
</tr>
<tr>
<td>Sea worthy</td>
</tr>
<tr>
<td>More Stable at high sea</td>
</tr>
<tr>
<td>Larger platform for more guns</td>
</tr>
<tr>
<td>Larger Crew</td>
</tr>
</tbody>
</table>

Table 3. Benefits and Disadvantages of ships.
1.6.1 The Queen Anne’s Revenge

The famed pirate Edward Teach (1680-1718) commonly known as “Blackbeard the Pirate” stalked and plundered merchant vessels from the West Indies and on and around the Eastern coast of the America’s. His ship was that of the Queen Anne’s Revenge.

Little is known about the Queen Anne’s Revenge in terms of archaeology as only a third was excavated. The analysis of the ship is of great interest for both historians and archaeologist to learn more of the life of piracy but also how the ship was converted from a warship into a slave ship into a pirate ship. Since then, over 250,000 artefacts have been surfaced including the surgical and medicinal artifacts.

The slave ship Concorde was owned by Rene Montaudin de Nantes situated at the mouth of the Loire. The Concorde was active during the center of the French slave trade. She would have sailed to the west coast of Africa where she would have exchanged her cargo for between 300 and 500 slaves. From there, she would sail to the Caribbean either to Guadeloupe, St Dominique or Martinique where the slaves would be sold and used to work the sugar cane fields. Emptied of her slaves, the La Concorde would take a new cargo comprising of sugar where she would journey back to France. Arriving there, the whole process would begin again.

Like all of the pirate’s ships, the vessels varied to each other as they did not originate from the same provenances. Once a merchant vessel was captured, the ship would be refurbished to function as a pirate ship. Pat Croce noted that pirates favored small and shallow drafted vessels as in the instance of sloops, schooners, galleys and brigantine over the heftier and larger vessels like the frigates and man-o’-wars. Table 4 illustrates that theory. Despite such preferences, sometimes any ship was better than...
nothing *Queen Anne’s Revenge* (QAR). Originally built as an English frigate, the QAR was a good representation of a vessel that was one step down from a man-o’-war but larger than other vessels. As with any slave ship captured by pirates, La Concord was later modified by the French to hold more cargo including slaves.

On March 24, 1717, *La Concorde*, a 200 ton, 16-gun slave ship left Nante. The Captain during the journey was Captain Pierre Dosset. On July 8–1717, *La Concorde* arrived at the port of Whydah, which is now present day Benin. There, the ship took 516 African slaves. It was reported that the Captain and officers each received twenty pounds of gold dust for personal use (NCDNCR 2015).

<table>
<thead>
<tr>
<th>Name of Ship</th>
<th>Pirate</th>
<th>Class</th>
<th>Tons</th>
<th>Guns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Queen Anne Revenge</td>
<td>Edward Teach</td>
<td>Frigate</td>
<td>200</td>
<td>40 guns</td>
</tr>
<tr>
<td>Adventure Galley</td>
<td>Captain Kid</td>
<td>Oared frigate</td>
<td>287</td>
<td>34 guns</td>
</tr>
<tr>
<td>Golden Hind</td>
<td>Sir Francis Drake</td>
<td>Galleon</td>
<td>100-150</td>
<td>22 guns</td>
</tr>
<tr>
<td>The Whydah</td>
<td>Black Sam Bellamy</td>
<td>Galley</td>
<td>300</td>
<td>18 guns</td>
</tr>
<tr>
<td>Roebuck</td>
<td>William Dampier</td>
<td>6th rate ship of line</td>
<td>292</td>
<td>20 gun</td>
</tr>
</tbody>
</table>

*Table 4. Pirate’s ships and classes*

The journey from the western coast of Africa to across the Middle Passage took eight weeks. *La Concorde* before its capture had a crew of seventy-five in which sixteen were reported to have died during the journey while thirty six others were ill from scurvy and from dysentery (NCDNCR 2015). When *La Concorde* was around 100 miles from Martinique, they encountered pirates on two sloops which fired only two volleys at *La Concorde* before her captain, Captain Dosset surrender (NCDNCR 2015). According to Lieutenant Ernaut who was on *La Concorde* during the whole journey, the pirates had two sloops, one with twelve cannons and marines by 120 men while the second sloop had eight cannons and thirty men.

It was reported that after the capture of *La Concorde*, the pirates brought her and all of the captives to the island of Bequia in the Grenadines. There, the French crew alongside the African slaves was put to shore while the pirates searched *La Concorde* for any valuables. A cabin boy by the name of Louis Arot informed the pirates of the gold dust that the officers received back at the port of Whydah. The pirates searched the officers and seized the gold (NCDNCR 2015). That cabin boy and three of his fellow crew would voluntarily join the pirates. The pilot, three surgeons, two carpenters, two sailors, the cook and another French crew were taken by force. Edward Teach decided that he and his crew would keep *La Concorde* and gave the French one of the sloops. That sloop was renamed “Mauvaise Rencontre” (Bad Encounter) (NCDNCR 2015). In two trips, the French crew succeeded in transporting the remaining African slaves from the Island of Bequia to Martinique.

In November 28, 1717, pirate Captain Benjamin Hornigold turned over *La Concorde* to Blackbeard where he renamed her “*Queen Anne’s Revenge*.” He would journey to the Caribbean seizing more ships there and adding to his fleet. By December, the *Queen Anne’s Revenge* sailed from
Grenadines north along the Lesser Antilles where they took the opportunity to loot ships near St. Vincent, St. Lucia, Nevis, and Antigua and where he arrived off the eastern coast of Puerto Rico before the pirates continued to Samana Bay in Hispaniola, present day Dominican Republic.

During the three first months of 1718, no records were recovered of Blackbeard’s whereabouts.

However in April 1718, Blackbeard was reported to be in the Bay of Honduras off the Turneffe Islands where he captured the sloop **Adventure** and where it was chronicled that Teach forced the sloop’s captain David Herriot to join the pirate’s crew. From there, the pirates alongside the new crew journeyed east once again where they captured a Spanish sloop, which they added to their flotilla, off the coast of Cuba. From Cuba, they sailed north passing through the Bahamas before journeying alongside the North American coast. In May 1718, Blackbeard and his crew arrived off Charleston, South Carolina with his fleet of four ships including the **Queen Anne’s Revenge**, the Spanish sloop and two more sloops that were captured previously (Tyndall 2012).

For nearly a week in May 1718, Blackbeard decided to blockade the port of Charleston. During the barricade, the pirates managed to detain and take hostage the crew and passengers of several ships that where captured attempting to either leave or enter the port. During the blockade, Blackbeard demanded from the Charleston governor to be given a chest of medicine, which was ultimately delivered and the captives released before the pirates sailed up the coast (Tyndall 2012). Why Blackbeard blockaded the port for a chest of medicine is highly debatable. But it can be suggested that many of Teach’s company were ill-stricken with syphilis; a sexually transmitted disease that would have been cured with mercury, one of the content that was likely in the medicine chest that was requested by Blackbeard. On the island of Tortuga, to calm things down, the governor imported over 1,600 prostitutes, which would explain the massive outbreak. During a chemical analysis on one of the syringes that was recovered from the ship, it was analyzed that the syringe originally contained mercury. (Groce 2011:74).

After leaving Charleston, the flotilla endeavored to enter the Old Topsail Inlet in North Carolina, presently referred as Beaufort Inlet. Throughout the challenge, the **Queen Anne’s Revenge** alongside the sloop **Adventure** grounded on the ocean bar and had to be abandoned (Cohen 2011). A letter penned by Captain Ellis Brand of the HMS **Lyme** to the Lord of Admiralty in July 12, 1718 chronicled the following:

> “On the 10th of June or thereabouts a large pirate Ship of forty Guns with three Sloops in her company came upon the coast of North Carolina ware they endeavored To go in to a harbor, called Topsail Inlet, the Ship Stuck upon the bar at the entrance of the harbor and is lost; as is one of the sloops.” – Ellis Brand

It was suggested by many historians that Edward Teach grounded the **Queen Anne’s Revenge** and the sloop **Adventure** intentionally to break up the pirate’s troops which was suggested to have grown to over 300 pirates and to keep more of the loot amongst himself and few others.

Despite having no contemporary illustrations of the **Queen Anne’s Revenge**, archaeologist believes that the closest example is that of the 1730 French merchant ship **Mercure** (see Fig. 6).

Blackbeard used the newly modified vessel to attack other merchant ships from the west coast of Africa all the way to the Caribbean. He captured prominent vessels originating from the Dutch Republic, Portugal and England. After seven months, the **Queen Anne’s Revenge** was aground in June 1718. There is still a debate amongst researchers to if the **Queen Anne’s Revenge** was run aground on purpose by Blackbeard. Teach after deserting much of the crew had run away with a smaller crew perhaps so he could he keep most of the treasure to himself.
The Queen Anne’s Revenge was discovered by Intersal Inc. of Florida’s operational director Mike Daniel in 1996. The site became the responsibility of North Carolina Department of Natural and Cultural Resources (NCDNC) and started to be explored, documented and artefacts recovered by archaeologist under the direction of underwater archaeology branch. In 2004 the wreck was listed on the National Register of Historic Places. What happened to Edward Teach after he escaped is unknown. It was chronicled that in 1718, the manhunt for Blackbeard and his crew was on. On November 21, 1718, the Virginia governor Alexander Spotswood tasked Lieutenant Robert Maynard in capturing Blackbeard at all cost. Two sloops would navigate their way through Ocracoke’s snaky channel all the while being observed by Blackbeard. The two sloops; one being the HMS Jane which was commanded by Robert Maynard and marines by a 35 man crew while the second sloop was the HMS Ranger and was under the command of midshipman Mr. Hyde and a crew of 25. Around twilight, the two sloops moored and coordinated an early attack.

They say in the modern age “Don’t drink and drive!” But in the pirate era “Don’t Drink and Sail” should have been the motto. As the British were preparing to attack Edward Teach and his company of pirates drank all night. The following morning, the two sloops entered the channel and not soon after, Blackbeard’s Adventure emptied her port’s broadside when the sloops where within range (Groce 2011:67). While Blackbeard’s crew hoisted the sails, Teach cut Adventure’s anchor loose and the ship turned starboard side where her broadside were aimed toward Maynard’s sloops. The chronicles do not detail of what happened next. One version notes that while exchanging small arms fire, the Adventure turned toward the Beach of Ocracoke Island heading for the narrow channel and grounded on a sandbar while another version claimed that the Jane and Ranger had run aground. Either way, the Adventure turned her broadside towards the two sloops and emptied her guns on them. When the Jane was close enough to the Adventure, Blackbeard’s company boarded her where hand to hand fighting ensued. While Teach was moving to attack Maynard, he was slashed across the throat by one of Maynard’s men (Groce 2011:67). Badly wounded, more of Maynard’s man attacked him killing Blackbeard in the process. The engagement ended when Blackbeard’s remaining crew surrendered. Despite ferocious fighting, Blackbeard lost his head. While Blackbeard’s body was thrown into the inlet, his head was displayed from Jane’s bowsprit where it was brought back to Virginia for a reward of £100 (NCDNCR 2015).

It was emphasized by archaeologist Linda Carnes-McNaughton that Blackbeard’s crew health was so important that after he made the Queen Anne’s Revenge his flagship, he released all of the French crew except for the three surgeons, the carpenter and the cook (Jarus 2015). She noted, however, that under the "The Seaman's Vade Mecum" of 1707; which contained the rules that the pirates were supposed to follow had a provision stating that surgeons could not leave their ship until its voyage was complete (Jarus 2015). Four of the French crewmen including the cabin boy volunteered to join the pirate crew (NCDNCR 2015). Why Blackbeard was so keen on keeping the surgeons is debatable but the likelihood of the proliferating syphilis amongst the crew is a cause. This is enhanced by his taking of captives in exchange for medicines from Charleston.

1.7 Birth of the US Navy

In 1768 when the sloop Liberty, owned by the Massachusetts importer John Hancock, was seized for violating many of the British-imposed customs laws. Its seizure led to protests that culminated in the Boston massacre, the shooting of 13 colonists by British soldiers, in 1770. The colonists were primed for revolt when even more draconian British rules were passed, including the Tea Act, where only British East India tea could be sold in the Americas at a 25% mark-up valued added (Ad Valorum) tax
equal to the modern day VAT. In Boston December 1773 a group of colonists disguised as Native Americans boarding three British merchant ships East India tea ships, splitting open the tea chest and discarding the contents into the sea in protest. It was called the “Boston Tea Party” (Lavery 2013:165).

The imposition of taxes and punitive laws drafted by the British Parliament were formalized in the “Intolerable Acts” of 1774. By summer of 1775, the colonists were in full revolt, a rebel army besieged the British army in Boston.

In October 13 1775, the second Continental Congress, meeting in Philadelphia and acting as a governing body for the rebel colonies ordered the formation of the Continental Navy. This would soon become the United States Navy. The Continental Navy was created to disrupt the transatlantic supply routes used by the British who needed hundreds of thousands of tons of supplies to support its army that was fighting their countrymen. The first fleet was built and was composed of seven ships: two brigs, two frigates and three schooners. Over the course of the revolution, the Continental Navy sent to sea over 50 armed vessels of various types effectively preying on British merchant ships.

Despite the fact that the first Continental Navy has no experience fighting at sea, they fostered commanders who fought triumphant direct battles over numerous larger British warships. The most exciting example is when Captain John Paul Jones in 1779 took the French merchantman Duc de Duras and converted her into a 42 gun fighting Frigate the Bon Homme Richard. She took on the British Frigate HMS Serapis a 44 gun Fifth rate ship at the Battle of Flamborough Head and captured her. Nearly 200 British vessels were taken as prizes which caused the British to divert its warships to protect the convoy and trade routes. The British had decades of experience fighting both the French and Spanish at sea, so American victories were a great surprise.

Outside of the Continental Navy were an independent fleet of privateers which were commissioned by the Continental Congress. A distinctive vessel made use by the American privateers was the schooner; a small, fast, two masted flexible flush-deck ship that could slip past the British man-o-war and stay hidden in inlets and shallow coves (Croce 2011:116). Since the schooner couldn’t take the British head on, it could outmaneuver them and strike in strategic places with their smooth bore cannons. After the American Revolutionary war, the Continental navy was disbanded. However, due to threats to the American shipping by Barbary pirates in the Mediterranean from the four North African sultanates, the Naval Act of 1794 was passed and a permanent standing navy was created. This standing navy was composed of six frigates; USS Chesapeake, USS President, USS United States, USS Congress, USS Constellation and the most famous of all “Old Ironsides”, the USS Constitution.

The war of 1812 two different naval powers would again clash between England and that of the United States. The US navy had in its arsenal just a few ships including the six frigates commissioned back in 1794, armed schooners and a flotilla of gunboats used on the Chesapeake Bay. The British had at their arsenal 11 ships of the line, 38 sloops of war, unknown number of schooners and 33 frigates (Dep of Navy 2012:5). The British Royal Navy could claim over five hundred active warships if required. At the outbreak of the war, the British Royal Navy had over 140,000 seamen and a combat experienced Royal Marine Corps of 31,000 men. The US Navy on the other hand was small with only 5,000 seamen and only 1,000 marines (PBS 2011). Nevertheless, the US Navy despite its small number had a number of veteran’s officers who saw action during the Quasi-War with France and who saw action fighting the Beys of Tripoli. Because most of the American citizens lived in coastal states, most of the populace was well acquainted with sailing.
Due to its relative small size, the US Navy would concentrate its efforts and resources on fortifying the Chesapeake Bay area in defense of the city of Norfolk, the large naval and merchant port. Chesapeake Bay was an ideal area for the British naval forces to harass the Americans by different means including to landing troops, destroying or capturing goods and hastily returning to sea when necessary. The British sent a squadron to Norfolk, under the command of Rear Admiral George Cockburn, where they endeavored to destroy or capture the frigate USS Constellation. While Norfolk was made safe other areas that opened to the Chesapeake Bay including Annapolis, Washington and Baltimore were all targets of opportunity for the British, one raid burned Washington DC and the White House.

The action on the Chesapeake Bay would not be the only engagement that the American navy would have with the British Naval forces. Two years before Barney’s fleet had to be destroyed, the USS Constitution under command of Isaac Hull managed to outrun a British squadron that lasted fifty-seven hours (see illustration on the cover of this report) but a month later, the Constitution engaged with the HMS Guerriere in the Atlantic. The Constitution at the time was a heavily constructed frigate with a thick hull composed of live dense oak and a capacity to carry forty-four guns which in 1812, Hull brought her up to at least fifty guns. Because of the heavy broadside weight, the Constitution withstood the bombardment from the HMS Guerriere and countered back with volley after volley of gun fire and won the battle (PBS 2011). It was a major victory for the Americans that would be followed by two more US frigate victories. In December of 1812, lightweight warships composed of gunboats and two frigates were built for the shores of Lake Erie. On September 10, 1813, US Navy Master Commander Oliver Hazzard Perry would engage the British Commander Robert Heriot Barclay with nine of the thirteen vessels that he had in his arsenal. Four of the vessels including the USS Niagara were held by Perry’s second in command Jesse Elliot. For Commander Perry, it was a messy and bloody endeavor. Perry’s USS Lawrence for instance would see a good 60% killed. Perry’s ships were lightly built with the hull two inch thick only. It was said that the hulls of the fleet were so thin that the vessels would not withstand the bombardment from the British and that in theory; even musket shots could penetrate the hulls from Perry’s ships (PBS 2011). In a row bow, Perry evacuated the Lawrence and headed for the Niagara. With him, Perry had a pennant that read “Don’t Give up the Ship”. Once onboard the Niagara, Perry double loaded the carronades and continued to bombard from broadside with the British. With a wind change, Perry sailed the ship directly into the British line and let loose the broadside on both the port and starboard sides hitting four of the British ships. Due to the confusion, the British ships HMS Queen Charlotte and the HMS Detroit collided and got entangled together. Commander Barclay struck colors and surrendered. What started as a likely defeat for the US Navy became a historic victory. Despite having inferior ships and fewer men than the British Royal Navy, the US Navy fought valiantly to gain major advantages against the better trained British Royal.

One thing is certain is that warships of the 19th century would see little change in the design or in the armaments used to fight from those ships of the 17th century.
1.7.1 USS Scorpion

Commodore Joshua Barney, a seasoned veteran of both the French and Continental Navy sent a suggestion to the government responsible for the defenses of the Chesapeake Bay. Barney offered to the government build or convert a flotilla of both armed sloop-rigged row-galleys and fire ships composed of fast sailing boats and turn them into floating gun batteries to defend the Bay against the British (Dep of Navy 2012:6). The proposal was authorized and Barney was appointed commander of the small fleet. On the 28th April 1814, Barney set to Baltimore with 12 barges and two gunboats (gunboat 137 and 138). One of those gunboats that would join Barney’s fleet was gunboat No.59. Before being ordered to the Chesapeake Bay, the gunboat was reconstructed at the Washington Navy Yard and in 1812, she was renamed “Scorpion”. On the 18th February 1813, the self-propelled floating artillery battery was ordered to join the Chesapeake Bay fleet still under the command of Barney. The type of ship that the Scorpion was is contentious because the records for the gunboat did not survive. Communications between Barney and Jones mentions the Scorpion as a cutter while the dispatches from the British sporadically mention her as a sloop (Dep of Navy 2012:8). Either way, the Scorpion would be a sloop-rigged that could be propelled either by oars or sail. Scorpion was ordered to serve the Potomac fleet based at the Potomac River in 1813 where she became the Barney’s flagship with Lieutenant George C. Read as the commander officer. It was emphasized that one of the flotilla’s gunboat was employed as a hospital with the likeliest candidate being the Scorpion. Scorpion had sufficient space and protection for the sick and wounded and due to its inadequate and restricted maneuverability was hardly at the front line in military engagement. After the Scorpion joined the flotilla, Barney’s fleet comprised of 19 boats.

Barney’s flotilla would not see action until June 1, 1814 where they encountered enemy vessels including the British schooner St-Lawrence, the frigate Dragon and a number of smaller vessels (Dep of Navy 2012:9). After sight of the American fleet, the British gave chase. Because of unfavorable conditions, the fleet made it to Patuxent and after making it to Cedar Point into the river, the American fleet opened fire on the British boats. The frigate Dragon due to tidal conditions could not pursue the...
flotilla. On the 10 June, the American fleet engaged the British for the second time at the bank of the lower Patuxent. On June 25, the fleet escaped the creek with the aid of a battery that was established at the mouth. Unfortunately both gunboats No 137 and No 138 had to be scuttled during the second engagement.

On August 19, the British squadron under Major General Ross landed at Benedict, Maryland to make an offensive against Washington DC, which at the time was ill protected. In need of veterans, Jones ordered Barney with the majority of his forces to defend Washington DC. Barney left with 400 fighters, and left behind the flotilla with Lt. Solomon Frazier with 120 men including the wounded and the sick. When the British approached the flotilla which was situated of Pig Point, Frazier was ordered to scuttle the fleet. Of the 17 ships, 16 including the Scorpion were destroyed. The one boat that did survive the initial destruction was later captured alongside the 13 merchant schooners by the British (Dep of Navy 2012:10).

The recovery of the USS Scorpion and of the other ships started quickly after the withdrawal of the British troops. Barney’s crew was ordered back to the site to recover any valuables comprising of guns, carriages, cambooses, anchors cables, shots and two loads of iron ballast. However, because the recovery was unorthodox, there were no reports from which of the vessels the materials came from. It was also noted that in September 1814, a resident man by the name of Joshua Weems corresponded with the government about the looting and presented to collect as much on the governments behalf and anticipated to be rewarded for his efforts (Dep of Navy 2012:25). The flotilla was mentioned back in the 19th and 20th century with some ships exposed to the air while others had dredging operations. The sites where covered in mid- twenty century by silt coming from the upstream.

<table>
<thead>
<tr>
<th>Type</th>
<th># of boats</th>
<th>Weapons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st class barge</td>
<td>3</td>
<td>• 24lb long gun</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 42lb carronade</td>
</tr>
<tr>
<td>1st class barge</td>
<td>4</td>
<td>• 18lb long gun</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 32lb carronade</td>
</tr>
<tr>
<td>2nd class barge</td>
<td>2</td>
<td>• 18lb light long gun</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 24lb carronade</td>
</tr>
<tr>
<td>2nd class barge</td>
<td>4</td>
<td>• 12lb long gun</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 24lb carronade</td>
</tr>
<tr>
<td>Look out boat</td>
<td>1</td>
<td>• 18lb gunnade</td>
</tr>
<tr>
<td>Vigilante Galley</td>
<td>1</td>
<td>• 18lb gunnade</td>
</tr>
<tr>
<td>self-propelled floating artillery</td>
<td>1</td>
<td>• 24lb long gun</td>
</tr>
<tr>
<td>battery (scorpion)</td>
<td></td>
<td>• 2 12lb carronade</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 18lb gunnade</td>
</tr>
<tr>
<td>Gunboats</td>
<td>2</td>
<td>• Guns removed to be used on land</td>
</tr>
</tbody>
</table>

*Table 5. Barney’s fleet as of June 1814*
The real archaeological excavations began in 1978 by the Nautical Archaeological Associates in conjunction with the Calvert marine Museum of Solomon’s, Maryland and was granted by the US Department of the Interior’s Heritage Conservation and Recreation Service. First the team surveyed the area using magnetometer. Returning the following June the team started to excavate recovering numerous well preserved artefacts. Based on the recovery of a surgeon kit, carpentry tools, military implements and a grog cup, the artefacts were classified into six categories: Surgical and dental, military hardware, carpentry tools, maritime artefacts, naval architectural features and domestic shipboard articles (Dep of Navy 2012:26). In November 1996, further surveys were done in the Hills Bridge Transect with the deployment of a magnetometer, side-scan sonar and ground penetrating radar. While the survey did not produce any great significant targets, only one target was constant enough of a shipwreck. In February 1999, another survey was conducted and the team got a GPR signature over the site of the Scorpion and in December 2009, the Calvert Soil Conservation District produced a report that included topographic and bathygraphic data of the Scorpion site and it was not until the 2010 season that the real archaeological excavation began on the USS Scorpion.
Figure 7 Artefacts Placement and Hull Cross Section from USS Scorpion wreck (US Navy Historical Center)
Chapter 2 – The History of the Barber–Surgeon

There are little archaeological records of surgical instruments during antiquity but surgical manuscripts were written in Latin and published for instance by Theodoric (1267) and by Guy de Chauliac (1363) and other historical sources such as *De Re Medica* by Paul of Egina is known.

Egina observed that ‘medical men’, as he calls them; were present eight centuries prior that of the *Marie Rose* (John 1917: 590). The manuscript inscribed that under the Byzantine Empire, seagoing physicians were already present on ships and that the practice of manning physicians by the seventh century was more common than previously believed. *De Re Medica* for instance reminds the seagoing physicians on the importance of referring to text books on the healing arts and to take them also as they will be far away at sea and indulged to give treatment when needed. Those physicians seemed to have fair knowledge in patient care. The manuscript states;

“…and obliged to give their immediate succor where ignorance and delay may mean death to their patient” (John 1917: 590).

As early as the eleventh century, barbers and their assistants were already proficient in unsophisticated surgery for the sick and wounded. Inscribed in *Document IX Prudence* by poet Francis of Barberino from the thirteenth century read that a commander of a warship could employ a physician if he so desired (John 1917:591). The poem titled “Dangers of the Sea and how part to avoid them” cautions the seafarers on embarking on-board a ship deprived of a priest or doctor (John 1917: 594).

For those artifacts that have been seen recovered, they are believed to be part of a specialist kit. Numerous medical artefacts have been found from pre-Tudor wrecks. One wreck was excavated in Pozzino, Italy. Salvaged from the ship was an apothecary chest consisting of 136 small cylindrical boxwood phials (Adrian 2011). Since the phials were still fitted with their wood cork bungs, the contents were still partially preserved and could be analyzed. The contents consisted of cinnamon, cumin and vanilla. Other artefacts also retrieved from the same wreck were a collyrium bar (eye salve), fragments of petit ivory and wood statue and a bronze bleeding cup (Jennie 2011). The wood statue was likely...
used for rituals or worshipping to aid in healing patients. The last object recovered was identified as a hooked iron instrument, probably that of a scalpel.

Another wreck that had surgical instruments is that of a Roman merchant vessel that sank of the coast of Syracuse, Sicily in AD 200. Salvaged was a surgical kit with an assembly that consisted of a wooden bandaging stick, and three copper alloy scalpel handles (Wolfgang 1996: 2243). Two of the scalpels had long, slender dissectors that would have been suitable for ophthalmic surgery while the third artefact was a corroded iron instrument. The instrument was likely used as a cataract needle or cautery.

An additional wreck with an assemblage of what likely consisted of a surgical kit was that of the wreck of Monthellet in France. The assembly consisted of five slender instruments. Three were needles while the two others were needle-syringes (Antiquity Publication 1997). It is believed that the kit was lost from a ferry or barge. Like the first wreck, this one consisted of a specialist kit of an eye surgeon.

As seen from the pre-Tudor wrecks, they each carried surgical instruments. The findings are indeed significant from an archaeological point of view but they cannot be used in our studies for four reasons. Foremost, despite having surgical instruments onboard, some theorize that perhaps they were infrequently used at sea. The ships of the time were open–decked. The weather and environment could have prevented any doctors from practicing their trade onboard, except in the fairest of weather. The ships were leaky and wet, the structure of the vessels would likely make the ships unsteady and the space was likely overcrowded getting to a sick near impossible.

The second reason is that all of the instruments retrieved from the wrecks were believed to come from specialist doctors, most likely eye surgeons. The unaesthetic condition of the ships and lack of sturdiness would have made eye operations improbable.

Thirdly, from the early 16th century all the ways to the modern period, the instruments, or the whole kits are sophisticated in terms of functionality were used for the expected injuries that one might find onboard a ship. For example, the medicine chest salvaged from the Marie Rose which had both surgical instruments and medicinal tools. None of the artefacts retrieved from those previously seen wrecks would have that function except for maybe the wreck in Pozzino which had vials with some of the contents still inside and a bleeding cup. But it’s more probable because with a bleeding cup one might find a blade, scalpel or razor of sorts.

The fourth reason is the one that I advocated in the prologue. The vessels in antiquity were never far away from land or from the sight of land. The exception was for direct cross Mediterranean voyages where the journey could last anywhere from eight to ten days (Goethe, Watson, Jones 1984:3). If there was an accident where one of the passengers is sick, the vessel would presumably drop the patient at a nearby port where the individual would be seen by a doctor.

During the Hellenistic period, it was chronicled that Rhodian warships carried doctors also known as “iatros”. The doctors were usually foreigners, possibly coming from Kos (The Free Library 1997). Kos, a Greek Island, is the home of Hippocrates. The Hellenistic period was one of great advancements in both sciences and medicine. Hippocrates was a Greek physician that lived in the Age of Pericles. He is regarded as the forefather of medicine and the “Father of Western Medicine”. He revolutionized medicine in ancient Greece by establishing the “Hippocratic School of Medicine” and establishing medicine in general as a profession. He is important because his teachings will be practiced until the 19th century. Hippocrates did not differentiate between physicians and surgeons; nevertheless; did give surgical trades a high profile.

Herophilus, Erasistratus and Glaukias were three amongst numerous other scientist of the time that made advances that we still practice today. Public dissection was first practiced in Greece by
Herophilus; (335-280 BC) was the first to practice public vivisections on Egyptian and Greek criminals (Anat 2010). The period sees the first understanding of the heart and how it pumps blood when Erasistratus (304-250 BC) explained that the human body was controlled by vacuums which pulled blood across the body (Pearce JMC 2013). He also analyzed parts of veins, nerves and artilleries that ran through the body. And Glaukias of Tara (195-155 BC) penned down on pharmacology and bandaging (Georgia & Paul 2002: 303).

The Romans were also known to have doctors based on their fleet. A good example is that of Axius, a specialist eye doctor who was based on the Channel Fleet, in Dover (The Free Library 1997). Merchant vessel just like their counterpart might also have carried a doctor depending on the size of the vessel. Despite the scientific advances, one common practice of the time and that will still be a common practice until the 19th century is based on the Hippocrates and Galen teaching of the theory of the four humors. The theory is that the body is made of four humors; black bile, yellow bile, phlegm and blood and that diseases, maladies and disabilities are based on the imbalance of one of those humors.

In the thirteenth century (1266), there were maritime laws regarding the disposal of medical care to the seaman. The “Rules of Oleron” as the laws were known were codes of maritime laws published by Eleanor of Guienne and adopted by the English monarchy under Richard I, Henry III and Edward III (Law Dictionary 2012). Article VII under the Law of Oleron instructed the Captain to drop the sick sailor at onto dry land. He is then to provide the sick with accommodation and candlelight where a woman would attend to him. The article also instructed the captain to buy food that is commonly found onboard a ship and when the ship is ready to depart, if the sick is recovered, he is to return to duty were he would be paid a full wage (Virtual Library 2010). The charges made for the treatment will be deducted from the full wage. Despite the fact that the sailor is not healed onboard the ship; this is the first instance where the captain had to care for the sick at a port until he is fully recovered.

In the modern times, we go to the dentist for teeth cleanup and checkup, to the barber shop for a haircut and to the physician for a regular checkup. This is the humdrum in the modern age. In the Tudor times, the practice would have been similar except for one thing. The appointments of the time would have all taken place at the barbershop.

The animated series “The Marvelous Misadventures of Flapjack” illustrates flawlessly the role of the barber-surgeon of the time. The barber shop in the series illustrates well the role that the barber played in the Tudor time. In the series, a recurring character known as Dr. Barber is embodied either as a barber or as a surgeon. In episode Shave and a Haircut …Two Friends; Captain Knuckles request Flapjack to read a map which he believes is a route to the Cammie Islands. However due to his long hair, Flapjack couldn’t read nor see anything. Knuckles brings Flapjack to the doctor where after taking a look at him, the doctor recommends Flapjack to get a haircut at the barbershop next door. Captain Knuckles and Flapjack goes next door only to find that the barber is the same person that they saw on the other side. As with the Dr. Barber from Flapjack, the archaeological recovery of the Mary Rose and the St. George illustrates the many duties of the barber-surgeon onboard a ship. In the Tudor time, European countries each had their own practice of surgery with France being ahead in surgery of all other nations until the eighteenth century.

Both ship surgeons and military surgeons of the sixteenth and seventeenth century wrote on surgery and practiced it in able fashion both onshore and afloat. Surgery, particularly in Northern Europe is credited to France due to Pierre Franco and Ambroise Pare (Rutkow 2001:6). Ambroise Pare would be known as the father of surgeons. Like most of the surgeons of the time, Pare started as an apprentice at the age of nineteen. He received most of his experience at Hotel Dieu as a dresser and moved from
an apprentice to a military surgeon in 1536 during the Italian campaigns of 1536 to 1545 (Bruijn 2009:31). Ambroise Pare gained most of his practical skills on the battlefield where he would experience with new innovative techniques. He would publish in 1545 “Method of Treating Wounds” and in 1564; he would publish “Great Treatise on Surgery”.

Thomas Gale (1507-1586) rejected the idea that gunshot wounds were poisoned or burned. Gale would also experiment with different potions and fidgeted with salves, ointments and plasters. He would also urge that when foreign bodies were so difficult to extract in which the process could eventually lead to death, the foreign bodies should be left alone. It is noted that during the battle with the Spanish armada of 1588, Gale would secure 72 surgeons in London alone for both the army and navy (USN Medical Bulletin 1921:578).

William Clowes went to Flanders where he operated on many wounded. He also served in the English fleet that defended Britain against the Spanish Armada. He wrote clearly and deliberated about many surgical cases. In one of his case for instance, Clowes documented how in the treatment of a gunshot wound to the abdomen, how he cauterized the stump after he ligated and cut the extruded omentum. Then, using waxed silk threads, he sutured the abdomen leaving a ligature for drainage (Foster, Jelliffe, 1907:490). Clowes credited Guillemeau and not Ambroise Pare for the introduction of ligature of vessels during amputation. Just as with Thomas Gale, he did not believe that gunshots were poisoned except from foul air. He went all the way to prove his theory by shootings an arrow from a musket and then many arrows from small cannon. When the feathers where not burned, he suggested that the heat could not have purified the projectiles. Clowes would also publish a book titled “Proved Practice for Young Surgeons”.

Peter Lowe (1550-1610) learned surgery in the Wars of the League. Lowe would publish “The Whole Art to of Chirurgerie” where he discussed the use of tourniquets and bandages above the line of incision to stop hemorrhaging and lessen the pain during an amputation and to either cauterize or ligature the blood vessels. He also noted that if infection exists to use cautery instead of ligature. In 1599, he would organize the faculty of Physicians and Surgeons of Glasgow and he would examine and license practitioner of both arts.

Richard Wiseman (1622-1676) in 1637 was an apprentice at the age of fourteen to the Barber-Surgeon Hall and at the age of 21, he was employed with the Royal Navy of Holland and would participate in the war with Spain. He would publish a collection of eight “Chirurgical Treatises”

John Woodall was a surgeon with the East Indian Company and was employed as a military surgeon for France. He would publish “The Surgeon’s Mate” which was known as the bible for both ships barber-surgeons and for the apprentices.

Andreas Vesalius (1514-1564) who would lay the foundation for the modern anatomy in his book De humani corporis fabrica libri septem.

Despite controversies with their publications, many of the French and English surgeons; both ship surgeons and land surgeons; would lay the foundation for modern surgery.

Two advancements would change the medicine from the dark ages to the modern era. Firearms including muskets, swivel guns and cannons would gradually replace the swords, battle axes, lances and bows and arrows and the widespread of venereal diseases; particularly syphilis; that would render both seafarers and soldiers ineffective and its treatment of mercury. Both France and England would have two kinds of surgeons; those referred as the ‘surgeons of the short gowns’ and the ‘surgeons of the long gowns’. The difference between those two types of surgeons was that the long gown surgeons were academic and university trained usually for instance from College of St- Côme or college of Hotel Dieu.
while the short gown surgeons were uneducated but gained practice by means of apprenticeship (Rutkow 2001:8). Although surgeons of the short gown did not have the equivalent status and were neither intellectually educated nor empirically schooled as those of the long gown surgeons, they were in the public eyes as the surgeons with greatest talents. While the English surgeons got their education by means of Latin publications, the French on the other hands due to Jean Canappe used publications translated from Latin to French (Rutkow 2001:8). This permitted the barber - surgeons who were not proficient or did not speak Latin to be able to acquire surgical teachings.

The barbers and surgeons in France as well in England originally had separate guilds; the associations of the Fellowship of Surgeons and the association of the Company of the barbers. In England in 1540 under Henry VIII, both guilds were merged into one and would become known as the Company of Barber-Surgeons (PBS 2001). In 1603 in Paris, France, with the authorization of the government, the name of guild of barbers was transformed into the guild of barber-surgeons (Rutkow 2001:9). The association was initially established to help standardize the trade of surgeons and other medical practitioner certified in the medical practices. Although the surgeons and barbers guilds were united as the Barber-Surgeon Company, the barbers could not be involved in surgery and the surgeons could not act as barbers (Family Search 2015). Teeth pulling and bloodletting were the two operations that could still be practiced by the barbers. London surgeons were constrained to the practice of surgery whilst on the rural area; surgeons were more open to practice together with apothecaries and physicians (Bruijn 2009:30). Elizabeth I’s Statute of Artificers and Apprentices of 1563 established that an apprentice must be below 21 years of age and must serve for seven years (Secara 2011). In 1745 under King George II, the Fellowship of Surgeons broke away from the Company of Barber Surgeons and in 1800, the guild will be re-established as the ‘College of Surgeons’ and as ‘The London College of Surgeons’ (Wear 2000:23).

The barber-surgeon in the Tudor times would have practiced surgery on the wounded from war, do bloodletting, shave, sell medicines, perform enemas, extract teeth and cut the hair (PBS 2001). Bloodletting in the time would have been the most common practice. A patient who was sick and complained of internal pain was usually bled. During the black plague of the 16th century, numerous university educated physicians and surgeons were wiped out leaving many of the barbers to practice surgery and operate on the wounded (Foster 1997). Despite that surgeons were present; barbers of the Tudor time would be involved in surgery. It was actually a common practice for the patient to see barbers rather than the surgeons.

Before 1215 AD where there were no surgeons in Europe, it was a common practice for the church to treat the wounded and do bloodletting. It would not be until 1215 under the Fourth Lateran Council where a papal decree would rule that the clergy could not practice surgery or be involved in bloodletting (Daily Catholic). Article 18 under the Fourth Lateran Council specified; “….nor may a subdeacon, deacon or priest practice the art of surgery, which involves cauterizing and making incisions…” (Daily Catholic). The principle was that because the barbers were familiar with using razors, it was best to let them get involved in surgery and bloodletting.

Having a surgeon on board a ship was not a common practice prior the mid-16th century. For instance, it’s believed that the care of the ill on Portuguese galleons and carracks was the responsibility of the captain and of the priest. Religious rituals were deemed far more important than medical treatment (Bruijn 2009:53). In such case, it was likely that the barber-surgeons aboard warships of the Tudor period were present only to treat the officers and persons of great importance (Gardiner 2005:11). Without concrete archaeological evidence, it’s hard to say accurately. Even medical instruments that where retrieved from well-known shipwrecks like that of the Marie Rose, are difficult to determine whether the ship’s surgeons were the ones to use them and if so, on whom were they allowed to practice.
Even if clerics could no longer be involved in surgery or bloodletting, under the Act of Parliament in 1511, bishops were still required to certify the barber-surgeons (Family Search 2015). This involvement was discontinued only after 1750. The number of surgeons during Henry’s reign most have been small and it would not be surprising if none of the ships had a surgeon. Additionally, because most English merchant ships hove close to home water or in the English Channel or Irish Sea which were patrolled by warships, many merchant vessels did not require a barber-surgeon. In case that an individual fell ill, they could be dropped ashore. Late in the Tudor period, because of lengthy journeys of trade, exploration skirmishes and plundering; the demand for surgeons at sea was high. The need for surgeons would become so high that the Barber Surgeon’s Company of London would start to press-gang army surgeons and barber-surgeons. As the skirmishes between the French and English intensified, so did the pay (The Mary Rose Trust 2005:171). The armada of 1588 would be the turning point in the establishment of barber-surgeons onboard naval ships. Despite that the company was land based, in 1606, the barber-surgeons serving on his/her majesties ships fell under the authority of the Barber-Surgeon Company. The company was given the task of examining the barber-surgeons employed on ships. But because of loopholes and pressured by the wars, many unqualified men would be granted service as barber-surgeons. After the restoration of the monarchy by King James I, the king tried to get all naval surgeons certified but as in 1606, numerous ambiguities would grant uncertified man to act as surgeons. In France in the year 1628, the barber-surgeons were also required to get examined before embarking onboard their ship. The statutes of the surgeon’s guild of Marseille were responsible of examining the French barber-surgeons prior embarkation (Goethe, Watson, Jones 1984:23). This changed in 1668 when the “Premier Chirurgien du Roi” (First Surgeon to the King) or one of the kings’ representatives was responsible in inspecting the ship’s surgeons (Goethe, Watson, Jones 1984:22). Just as with the English navy, barber-surgeons of the French navies often paid bribes for a diploma. Any barber-surgeons serving on the English ships such as the Mary Rose would have had a significant post. As guns started to show up on naval ships, Henry VIII acknowledged the importance of barber-surgeons on his ships. The king recognized that barber-surgeons on ships were similar with those of the barber-surgeons in the army (Mary Rose Trust 2005:172). However, it would not be until the Charter of 1629 under Charles I where barber-surgeons were to be provided on any sailing ships from British ports and that the barber-surgeons were to be inspected by the Barber Surgeons of London (Nixon 1944:511).

In America from the 1600–1750’s, little progress beyond common practice was made in medicine and surgery. Unlike Europe, there were only a few physicians and surgeons. The medical needs for the populace was still practiced by the clerics, governors, and self-educated physicians (Rutkow 2001:12). This would change in the eighteenth century where most of the Americans would procure their degree in medicine in Europe (Rutkow 2001:12). At the end of their studies, they would return to the colonies with new medical insights and practical approaches. Some of the American figures who left their accounts in writing during the revolutionary war were John Bard (1716-1799), John Jones (1729-1791), Samuel Bard (17421821), William Baynham (1749-1814) and John Warren (1753-1815). The first American surgical work was by John Jones who published “Plain Concise Practical Remarks on the Treatment of Wounds and Fractures” in 1775 (Rutkow 2001:12).

The 17th century would witness a turning point in the history of medicine. The years of speculations were over and would be taken over by scientific experimentation. Nevertheless, the teachings would still heavily emphasize ancient philosophies and views of Galen and Hippocrates. Surgery would not keep pace with the advancements in anatomy and physiology. While universities made progress in Paris, it was a different case back in London. Because England was politically unstable, the country
became isolated from the rest of Europe. The surgeons had to rely on the teaching seminars and conferences organized by various barber surgeons and English universities.

Medical Advancement in Europe and in America in the 19th century would be distorted and resemble that of a modern system. Each country would see individual pioneers with cities being used as centers for the development of medicine and science. The 19th century would witness the archaic views of medicine replaced by a scientific influenced modern version.

The United States Navy for a long time mirrored those of the Royal Navy in many of its activities and regulations. One of those traditional practices was to employ competent surgeons with a satisfactorily stocked medicine chest (Frayler 2004:10). However, unlike the US Navy ships, merchantmen lagged behind again, many required a medical chest on board but not a surgeon. The management of medicine onboard a US merchant vessel was the responsibility of the master (Frayler 2004:13).

Usher Parson who was a surgeon mate in the American Navy in the Great Lakes fleet based on Lake Erie. He mentioned many of parallels between the US Navy and the Royal Navy. One of those practices was to place the surgical instruments in warm water between patients. This practice did not sterilized the instruments by any means but he; just like so many ship surgeons employed in the Royal Navy thought that warm instruments would cause less pain (Bolla 2014). This did not mean that Parson did not use his own judgment. On the contrary, it was noted that he actually did not operate on the wounded right after the battle. He conducted trauma management by stabilizing the injured and operated on them only the next day (Bolla 2014). He did this to observe that the patient did not undergo surgery while in a state of shock or while dehydrated. Patients were exposed to as much fresh air and sunlight as possible during recovery which mitigated the risk of an outbreak of infection and disease.

2.1 The Barber-Surgeon Company & Colonial Agencies

The Barber-Surgeon Company of London in 1606 was responsible to inspect the barber - surgeon chest and tools, a practice that would last until the eighteenth century. For instance, Article I under the title “Surgeons” of the Articles of Wars of 1790 instructed all barber-surgeons working on any naval ships to get their medical chest and instruments inspected by the Physician in the Commissions of Sick and Wounded or to the Physicians of Greenwich Hospital in conjunction with the Governors of the Surgeons Company before they were allowed onboard their ship (Privy Council 1790:131). It was also inscribed in the same Articles of Wars that the chest after the inspection was to be locked and the seals of the Physician and of the Surgeons Company attached to it in such a manner as to avert it from being opened before it was brought onboard (Privy Council 1790:131). The captain of the ship was responsible to decline the chest if it did not have the seal. This tradition lasted until 1805 where the royal navy ceased to mention the regulation in which the chest was to be inspected. When was the practice ceased altogether is unknown.

As with her majesties’ ships in England, barber-surgeons serving on the French navies had their medicine chest inspected by the most senior surgeon and pharmacist of the port (Goethe, Watson, Jones 1984:24). It was suggested that the pharmacist who examined the chest was never the same pharmacist that delivered the contents.

John Woodall was the first surgeon-general to the British East India Company (BEIC) who was responsible of the supply of the medicine chest to the barber-surgeons employed by BEIC. The East India Company had many ships sailing around the world in the seventeenth century and saw a great demand in reforms and transformations for the health care provisions for ships. In 1626, the “Privy
Council” decided to pay the Barber-Surgeons Company fixed allowance to furnish medical chests for both the army and navy. The Barber-Surgeons Company requested the BEIC to oversee the provision of the barber-surgeons medicine chest.

Dutch East Indian Company (VOC) vessels had to get their medicine chest also examined. However, unlike her majesties ships where it’s Physician in the Commissions of Sick and Wounded or to the Physicians of Greenwich Hospital in conjunction with the Governors of the Surgeons Company who inspected the barber-surgeons chest and instruments, in VOC, the medicine chest was inspected by their guilds and employer. It will not be until the first Anglo-Dutch War (1652-1654) where the contents of the chest where to be inspected by the physicians employed by the Admiralties and not by the guilds (Bruijn 2009:59). What entails in the inspection of the barber surgical chest is ambiguous. Because barber-surgeons had to follow regulations apropos the instruments required to be brought, it was likely that the inspection was to see if the instruments brought by the barber-surgeons followed the regulations. The approach which the surgeons kept their medical chest or how they used their instruments was much to their own expertise and judgement once at sea.

The ship’s surgeons entering service on the HMS Pandora, Marie Rose, HMS Swift and St. George or the merchant ships as VOC Batavia and the Queen’s Anne’s Revenge were required to supply their own set of surgical instruments and medicines. The first article in the Articles of Wars of 1790 for example emphasized that any barber-surgeons who wanted to serve on her majesties ships had to acquire his own instruments and a medicine chest (Privy Council 1790:131). It was the same case for the barber-surgeons serving on Dutch East India Company ships. The VOC governing body called the Heeren (Gentlemen) XVII in 1630 specified that the barber-surgeons employed by the Company had to have his own surgical instruments and a chest to put them in (Bruijn 2009: 69). While the practicing surgeon was likely already possessed of those instruments, the new comer surgeons had to acquire them. They would start out likely lacking some of the contents. In few cases, missing instruments could always be constructed on commission including pasteboard, skeins of silk, mortar and pestle, syringes and nozzles, clyster pipes for bladder, pig’s bladder, sponges, leather skins, drinking mugs and oil bottles, pewter cups, funnels, kettles, suppository spoons, pans, spatula, hammers, needles, linen and the like.

It would not be until 1805 that the chest of medicines was to be provided to the barber-surgeons by the navy. Unlike the military, the Gentlemen XVII doctrines from 1630 stated that VOC had the chambers supply medicinal chest to the surgeons. The contents of the chest consisted of 130 different ingredients which will remain the same throughout its presence as the medical knowledge of its time was agreed upon. At the end of each voyage, the barber-surgeon had to inventory the medicinal supplies that were used during the voyage.

Because instruments of the period were expensive, it will not be until the time of Charles I that an allowance was granted to the surgeon to acquire instruments and medicines. Such grant which was equivalent to 62 euros at the time for a master surgeon was scarcely ample to acquire all of the instruments and medicines especially when the surgeon’s monthly pay was 5 euros and 5 additional euros for every 100 cases of venereal disease he treated while his mates made only 2 to 3 euros. The Dutch East India Company paid their first surgeons 32-50 Dutch guilders per month while the surgeon’s mate were paid 24-28 Dutch guilders and the third surgeon between 14 and 18 Dutch guilders (Bruijn 2009:60). That was a 60 day advance on their salary that the barber surgeons received. The ship’s surgeons were allowed a third month’s cash advance to pay for his instruments. However, there were surely cases of where the ship surgeons couldn’t afford any instruments and so had to borrow from the ship’s carpenter (USN Medical Bulletin 1921:596).
In most instances a ship’s surgeons were probably employed only as contracts and contingencies demanded and during national emergencies such as war or new ships were constructed. There wasn’t a ship surgeon who was employed in his role for life. Ships, particularly from the Royal navies of the time were only employed as required. During peace time, those ship’s crews were disbanded and the vessels laid up and taken out of commission. Ships surgeons usually went to practice somewhere else when the war was over (USN Medical Bulletin 1921:598). This meant that at the beginning of a fresh war, the Royal Navies would have a scarcity of men including ships surgeons.

2.2 Regulations

As with most navies, sets of regulations for surgeons and for the rest of the crew were formed outlining the duties and role. The first published regulation for the sick and wounded where in the Articles of War of 1731. The Dutch East India Company also had similar regulations for both the sailors and the barber-surgeons. Those regulations were inscribed in the General Instruction. The regulations of the Companies did not alter as much as those of the navies. The protocols in the navies were frequently modified and published. Few extracts of the regulations from 1739 can be found under Appendix B. Montgomery did list in his research paper the regulations from the Articles of Wars from 1801.

2.3 The Orlop Deck, Sick Bay & Surgeon’s Cabin

While many famed Army surgeons such as Baron Larrey and Ambroise Pare practiced surgical operations in an open battlefield; ship’s surgeons had less than an ideal environment to work in. Most if not all surgical operations occurred in the confined surroundings between decks. It usually occurred in the cockpit situated on the orlop deck before one reaches the master gunner’s cabin as shown in figure 7. However; Julie Gardiner believes that the barber-surgeon on the Mary Rose had his cabin on the main gun deck on the starboard side where all of his shaving and medical instruments were recovered (Mary Rose Trust 2005:3). The cabin on the Mary Rose was big enough for only the barber-surgeon and his chest suggesting that he probably had a secondary cabin to receive the sick and wounded. Also, this may indicate that in the Tudor period, the barber-surgeon probably had their own cabin on the main deck and not on the orlop deck. On the other hand, the barber-surgeon employed on the VOC ship Batavia in 1629 probably worked from a small dispensary that was also on the gun deck (Dash 2002:125).

Many of other ships (Marie Rose, Batavia, Queen Anne’s Revenge, HMS Swift, HMS George, HMS Pandora, Kronan, USS Scorpion and Jacksonville) would have an orlop deck but that does assure that the ship surgeon’s cabin was situated there.

How would the barber-surgeon perform suing a combat action? The first indication of trouble would be hearing the Marine drummer beat “Clear Decks for Action”; the surgeon, his mates and the ‘loblobby boys’, junior sailors assigned to assist the surgeon would clear the cockpit of unwanted furniture and set up one or more canvas-covered operating tables on the midshipmen’s trunk (Stanley 2003:100). It usually took two of the seamen’s chest to act as table for the wounded. In the Articles of Wars of 1790 were similar instructions for the barber-surgeons and his mates (Privy Council 1790:133). At the corner of the platform, the surgeon or one of his mates was to place two vessels. One vessel was to be filled with water; which was used to rinse hands in between each operation, to wet the dissecting blades or for any other services while the second vessel was used to throw the amputated limbs until they can be thrown overboard (USN Medical Bulletin 1921:581). If the ship in which they serve was ever engaged, Article IX of the Articles of Wars instructed them to;
'In an engagement he is to keep himself in the hold, where a platform is to be prepared for the reception of wounded men; and himself and his mates and his assistants are to be ready and have everything at hand for stopping their blood and dressing their wounds'.

This instruction can also be found in the Articles of wars of 1801 under Article VI. For a merchantman, the ship-surgeon and his mates were to proceed below deck to the cable tier. Due to the limited space inside the cabin and deck, the operating tables were makeshift ones and the dark rooms were lighted with candles in the largest lanterns (Stanley 2003:100).

While numerous injured were operated on in the cockpit, the rest of the wounded companions had to be laid on the surrounding decks waiting to be operated on. Many detailed accounts are available from ship’s surgeons who saw naval sea action. One such chronicle was penned by naval surgeon Robert Young at the Battle of Camperdown in 1797, a major engagement against the Dutch in the French revolutionary war. Young details the cases he treated when he was stationed onboard HMS Ardent. With no qualified mates to assist him, he had to treat ninety wounded seamen whom were laid one on top of another at the foot of the ladder over 15 hour engagement. The cockpit, cabins, wing berths and part of the cable tier was already congested (Stanley 2003:101).

As the sails and its rigging were enlarged, as more cannons were added, larger crews were required to man the ship (Goethe, Watson, Jones 1984:3). Because the rooms were small, there was little area if any to maneuver the injured. The cross-section of the Vasa (Figure 7) illustrates the perfect case of a relative scale between the ship and that of a person. It is also vital to remember that when the Vasa sink, only an estimated 30 of the 145 individuals onboard died. Not all hands were onboard when she sank because she was on her maiden voyage to pick up 300 more soldiers (Katarina 2014). One could visualize the congestion on the interior of the ship after it would have picked up more of her crew, soldiers and provisions from elsewhere had she completed her last journey.

Whereas the foremost controls for sailing a ship were situated on an exposed deck, the cockpit was located on the inside of the ship (Kehoe 2014:7). Prior the 20th century, the cockpit was a compartment that was small, gloomy and unventilated; was situated deep in the bowels on the orlop deck just around the waterline. This cockpit is where the secondary maneuvering controls for the ship could be found and used to steer the ship when the top side was perilous due to weather or naval combat (Kehoe 2014:7). It was said that the crew were so aware of the horrors that took place inside of the cockpit that men practically desired death over being treated there (USN Medical Bulletin 1921:596).

The usage of the cockpit by the barber-surgeon is only true onboard a man-o’-war or other naval warships which had a cockpit. Many of the merchant vessels did not require a cockpit as pointed by John Moyles because the vessel was likely to be small and because merchant ships did not usually engage other ships in combat (Kehoe 2014:7). On merchant vessels and on those smaller ships that did carry a barber-surgeon; a makeshift operating theater was used in the cable tier. Like the cockpit, the cable tier was also situated on the orlop deck. On smaller vessels that had one or no lower decks at all; the cable tier would be situated in the hold.

In the late eighteenth and in the beginning of the nineteenth century, the sick were still treated in their own sleeping places (House of Common 1903:139). Traditionally, the sick berth; commonly known as the ‘cocksit’ in the British navy; was nothing more than a sailcloth cubicle mounted between two gun ports accommodated above the waterline (Goethe, Watson, Jones 1984:5). The sick bay was situated anywhere were there was room and where sailors could be isolated from others, typically in the forecastle or on the forepart of the main deck. It was preferable if the sickbay was adjacent the galley’s fire. The theory of the time was that smoke killed germs (Brockliss, Cardwell, and Moss 2005:6).
As lessons of cleanliness and of fresh air were gradually cultured, the sick bay was moved on the upper gun deck of the forecastle of the ships. Because the forecastle was separated from the rest of the ship, it was the perfect location for the sick berth. Since the bow was away from the living quarters, an outbreak was less likely to happen. Also, the forecastles were open to the light and air from the outside.

The origin of the sick bay likely came from Captain Sir Henry William Baynton, commander of the HMS Leviathan. A highly experienced combat officer who fought from Trafalgar to the French revolutionary wars, Baynton conceived the idea of conveying the sick together and designating them a certain portion of the deck surrounding their hammocks with a screen (Common 1903:139). Subsequently, testimonies by surgeons started to pour in on the practicality and advantages of an established sick berth. In the early 19th century, Lord Earl St Vincent who was governor of minister in charge of the navy as the first lord of the Admiralty hereafter ordered all sick berths to be situated on the upper deck beneath the forecastle deck for maximum ventilation (Brockliss, Cardwell, Moss 2005:6).

This change came only after Admiral Vincent was intrigued by the sick bay set up by Captain Adam Markham on the HMS Centaur. The layout of the sick berth depended exclusively on the size of the ship and on those of the number of crew.

Many descriptions are found of the sick berth configuration. Some noted the approaches to the bay while other inscribed about the layout. One journal was from the surgeon aboard the ship HMS Swiftsure a 74-gun ship of the line. He noted in 1798 the bay was permitted to employ “three constant sentries as sick berth attendants” to clean, cook and wash for the sick (House of Common 1903:139). In 1840 another chronicle originated from the HMS Revenge a 74 gun third rate Ship of the line where it was remarked on the furnishing of the sick bay, the day-to-day routine assumed by the staff and about the sick mess funds (House of Common 1903:140). An excellent illustration of a sick berth is that from Captain’s J.B.Pechell’ log on the HMS San Domingo, a third rate, 74-gun ship of the line. The illustration (see Figure 5) displays the starboard wing measuring 24 square ft. x 23 square ft. Depending on the ship; the sick bay could be smaller or bigger.

Mary Anne’s Renner’s thesis compared the size of the cabins from an 18th century ships. She noted in her table that the size of the surgeon’s cabin varied on the ship (Renner 1987:13). On the VOC ship Batavia, the surgeon was allocated a tiny medical dispensary which was five feet square (Dash 2002:125). It’s believed that the door situated at the top right lead to the round house. Next to the door a locker was two jars of water. A table and / or bed is secure to the foremost gun port whereas below on the left are the bullheads and screens lying flat with the mates table and chest (Montgomery 2009:51).

Extract from the Articles of War published of 1801 offer a look into the furnishing of a sick berth. Article VIII of the Articles of Wars instructs the following (Montgomery 2009:37);

“Other duties specified: to prepare dressings before an action, to instruct the crew in the use of tourniquets; to keep the sick berth stove alight; to use ‘carpenters’ saws if his own instruments are insufficient.”

Stoves would have been fired to provide heat for the sick and for boiling water if need be. The majority of the furniture’s used at the time by the surgeons and his mates were transferrable and the decks and cabins left exposed to the environment were usually at the mercy of the sea.
Figure 9. Drawing of the surgeon’s cabin by Captain J.B. Pechell. National Maritime Museum, Greenwich, London
Renner’s sq. footage of surgeons compartment

<table>
<thead>
<tr>
<th>Ship</th>
<th>Year</th>
<th>Sq. Footage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dispatch</td>
<td>1783</td>
<td>24</td>
</tr>
<tr>
<td>Adventure</td>
<td>1772</td>
<td>42</td>
</tr>
<tr>
<td>Resolution</td>
<td>1771</td>
<td>39</td>
</tr>
<tr>
<td>Endeavour</td>
<td>1768</td>
<td>39</td>
</tr>
<tr>
<td>Bounty</td>
<td>1787</td>
<td>36</td>
</tr>
<tr>
<td>Chaleur</td>
<td>1768</td>
<td>14</td>
</tr>
<tr>
<td>HMS San Domingo</td>
<td>1814</td>
<td>24</td>
</tr>
<tr>
<td>VOC Batavia</td>
<td>1628</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 6. Renner’s sq. footage of surgeon’s compartment

### 2.4 Barber–Surgeons and his Mates

Although many ship surgeons were familiar with the horror scenes of naval casualties during their long careers, the principle responsibility of the surgeon was for the health and wellbeing of men. This is the role of the ship’s barber–surgeon and those of his mates. In Europe there were three branches of medical personnel; the physician, barber and the apothecaries. While the physicians were university trained, the barbers were apprentices trained by masters (Mary Rose Trust 2005: 172). The barber-surgeon employed onboard ships had to assume the role of all three branches. His knowledge and the understanding of his mates were superior to the jury rigged improvisations of the crew and officers. Early on barber-surgeons were considered inept and not very intellectual. One account from botanist Jacob Voegen van Engelen (1756–1796) travelling onboard one of the Dutch East India Company (Bruijn 2009:16) ships wrote the following about one of the Dutch ship’s surgeons that he met:

“In our country, where surgery is practiced on a contemptible level, and only upheld by a few worthy and experienced surgeons in the distinguished cities, our ship’s surgeons start their schooling with the shaving of beards to be followed by the smearing of plasters and the letting of blood; the patron gives his pupil a short tract on surgery; a good memory and the spilling of some mutilated Latin jargon serves to round off his education. A sorry examination then follows, some money is paid, and there is our Aesculapius who has been provided with a certificate which gives him the license to treat all our sailors throughout the entire world until they are cured or die.”

It is not possible to tell whether the surgeons were truly unskilled or just not worthy of the crew’s trust. The chronicle by Engelen for instance would suggest that the crew did not trust the barber-surgeon employed to care for them. Then again superstition, religion and home remedies were the principle medical treatments for centuries and convincing a crew to apply science was difficult. The same mistrust was probably the case for Aris Jansz who was employed on the VOC ship Batavia in 1628. The VOC’s governing body, the Gentlemen XVII was said to have many difficulties in acquiring competent medical men (Dash 2002:125). Mike Dash noted that was because the ship surgeons employed by VOC had moderately few prospects to profit in the east unlike the merchants that they were employed to serve; and that the risk were similar to that of the fellow crewmen. Finally, the standards for the barber-surgeons were often low (Dash 2002:125). This problem seems to be also consistent with army surgeons. John Woodall mentioned in his “Surgeon Mate” that the pay of the land surgeons was so bad that correspondingly the job appealed only to the incompetent men (USN Medical Bulletin 1921:603). The following is an extract from the Surgeon Mate:
“And for the surgeons in his service he allowed to the surgeon –major of the whole camp five shillings a day. Also his majesty allowed to each surgeon two shillings and sixpence a day, which is three pounds and fifteen shillings a month, and to each mate three pounds a month…and further his highness has referred to the ancient masters and governors of our society the pressing of all surgeons and surgeons mate or servants to surgeons and barbers.”

Despite the bad reputation, barber-surgeons were valuable individuals whom were still susceptible to the same maladies, accidents and death that befell the crew. Being enclosed in their dispensaries below deck and frequently exposed to the ill, the ship-surgeons were likely to have a higher mortality rate than those surgeons on land. Even if more than one surgeon was employed, there was no guarantee that either of them would make it to the end of the journey. The loss of a barber surgeon likely meant the difference of life and death for the crew, particularly for those that volunteered aboard pirate ships. If both surgeons perished and a crew member became sick or wounded, his chance of survival were slight as whoever provided succor wasn’t trained in the art of surgery or apothecaries. In case that surgery was required, the sailor that was pressed to act as a surgeon would have no notion of how to blood-let a patient or properly amputate a limb; which were the two most practiced operations at sea.

Likewise, that individual given assistance to a sick was likely unschooled and could not read the labels which usually in Latin (Vallar 2007). On a large merchant ship and on a ship-of-line, the death of one surgeon was not as vital to the crew because a surgeon mate or third mate were likely present and had an adequate education to take over the master surgeon. The barber - surgeons acquired their skills through an apprenticeship just as their mates and third mates. As Jo Castle puts it, the barber-surgeon would be licensed only after passing his examination and after being fully trained as an interne for seven to eight years (Mary Rose Trust 2005:171). Good ship-surgeons relied not only on their training but also on the knowledge they acquired by means of other barber-surgeons, by reading publications of others such as “The Surgeon’s Mate” by John Woodall, “De humani corporis fabrica libri septum” by Vesalius, “Oeuvres” by Ambroise Paré and the “Certaine Workes of Chirurgerie” by Thomas Gale. They would have also understood Latin and spoken other languages and would exchange and use cures that would heal the patient swiftly and effectively (Mary Rose Trust 2005: 172). Surgeons employed by VOC had to be certified at the Surgeons Company Hall.

2.5 Ranks and Titles of Barber-Surgeons

For a long time the barber-surgeons did not have any military rank. The ship’s surgeons aboard VOC ship where they were ranked equally to those of the officers. Depending on their educations, they could be called “Sinjeur” if university trained and “Meester” if they were surgeons (Goethe, Watson, Jones 1984:22). As early as 1793, on French ships; physicians were given equal rank to those of the officers while the youngest surgeons were ranked as junior physician. On Royal Navy ships, the first indication of a military rank for a barber-surgeon appeared in 1512 under Henry VIII, the same year that the term “surgeon” and “surgeon’s mate” were presented (Goethe, Wat on, Jones 1984:22). In 1828, the surgeon mate would be known as “assistant surgeon” in both the English and American Navies and a university education was required for that position. In the American navy, the ship’s surgeons were also equally the same rank as officers but the practice would begin only in 1828. In the first half of the eighteenth century, barber-surgeons employed by VOC had the right to his own cabin next to those of the officers while the apprentice and mates had to share a sleeping quarter in the gun room separated by a canvas wall. The education received by the mates depended on the knowledge of the institution that they studied from and the ability to pay. Many of the apprentice’s instructions were practical such as in assisting the master surgeon with bloodletting, the administration of clysters, the application of ointment and splints, suturing of wounds, removing of foreign objects from the body and acting as the ship’s barber. The mate also had to progress in his studies, weight and make up medicinal preparations,
clean and sharpen the instruments, and nurse the sick (Cline 2001). In addition to those practical lessons that were instructed by the master surgeon, the apprentice during rare occasions would have landed a hand in holding down a patient during amputation. Painkiller and anesthesia were not invented during the time. Dissimilar the practical applications, the apprentice’s theoretical instructions and knowledge came primarily from books that he would have had to read on his own time. One of those books that the apprentice likely read was “The Surgeon’s Mate” by John Woodall (Cline 2001). After the completion of the trainees’ seven years of study, his master would bring him to the hall where the apprentice would attest of his services and be scrutinized on the autonomy as well as that of surgery. Under Elizabeth I’s Statute of Artificers and Apprenticed in 1563 laid down regulations which stated that apprentices must enter under the age of twenty one, serve for seven years and be twenty four of age before being licensed (Bruijn 2009:30). In the case for the surgeon’s mate working onboard one of the VOC vessels, the apprentice could complete his apprenticeship at sea and become a full ship’s surgeon or if the apprentice wanted to become a full ship surgeon, he could either pay a fee to the freedom of the United Company of Barber-surgeons or pass the “Sea Exam”, which legalized him to deal with many a variety of shipboard injuries including setting fractures, dislocations, wounds from shots, concussions, burns, gangrene, scurvy and many more (Dash 2002:126). The surgeon mates functioned as apprentices learning from and aiding the master surgeon. An age of no pain killers and anesthesia and a lack of modernized equipment would be made up by the surgeon’s mate and his other assistants who would hold the patients down as the master surgeon operated on them. An entry to the profession as a master surgeon was not assured but could use the post to stem a form of education.

Only a few individuals on board our ships could be identified. Artefacts recovered from those ships indicate that the individuals could be identified not necessary by their names or nationalities but rather by the roles that they played on board for we have an assemblage of “personal medical artefacts”.

Other than the artifacts, few ship’s surgeons could be identified by names because of the muster list, chronicles of events and a list of pay roll. This is despite that many musters list were lost in the archives or that many of the archives did not survive.

Researchers also discern the identity of few surgeons because of initials engraved on some of the instruments.

The surgeons employed aboard the ships that could be identified by name are John Cleland, George Hamilton, surgeon mate Innes James, Thomas Hamilton, Jean Dubou, Marc Bourgneuf, Claude Deshayes and Nicholas Gautrain. We also have the identity of some surgeons that were present aboard the ships before they were employed somewhere and foundered. One name is that of master surgeon Robert Symson and his third mate Henry Yonge who were on the muster list of the Mary Rose back in 1513. (Gardiner 2005:11).

The muster list from the HMS St. George dating from the 1st of July to the 31st of August 1811 had the identity of John Cleland. The ship’s original master surgeon employed was on leave for some personal reasons and had to be replaced by surgeon Cleland. Not much is known of that surgeon except that alike many of the crew, he was of Irish origins (Montgomery 2009:84).

The four barber surgeons who were employed on La Concorde de Nantes before she was captured could be identified due to the French ship’s muster list. Two were master surgeons while the third one was employed as a third mate and the fourth individual was one of the two’s master surgeon’s aide. Amongst the list of the crew where Jean Dubou (Dubois), Marc Bourgneuf and Claude Deshayes. The barber-surgeon’s aide was identified as Nicholas Gaustrain (Jarus 2015). Jean Dubou was from St Etienne and before his capture, he was paid 50 livres. Marc Bourgneuf was from La Rochelle and was paid 30 livres. The third surgeon, Claude Deshayes was listed on the muster list as a gunsmith and was paid 22 livres.
while the aide Nicholas Gaustrain was on the muster list but not on the court record. He was paid 12 livres (Jarus 2015).

Muster list from the HMS Pandora had the identity for the employed barber-surgeon George Hamilton. Also from the same muster list and pay book was the identity of Hamilton’s surgeon mate. His name was Innes James. Both of the surgeons were also recorded in the pay book. From the records, surgeon Hamilton appeared in the warrant on the 10th of August 1790 and received his half pay and on the 13th August, he was recorded of received an advanced pay while on October 17 1792, Hamilton was recorded of received a neat wage. The following year in 1793, surgeon Hamilton published a voyage account in Berwick and in 1794; Hamilton was documented of being invalided of the Royal Navy for losing his arm while being employed on the HMS Lowestoft.

The identity of the original barber surgeon that was employed on the Mary Rose in 1545 when she sank is known only by his initials “W.E.” that were engraved on his surgical instruments.

The identity of the barber surgeon that was employed on the Batavia before she foundered is known because it was penned down in Captain Francisco Pelsaert personal journal. At the end of the mutiny that took place on the Abrolhos Islands in 1629, Captain Francisco Pelsaert recorded about the enquiry that he directed on the mutineers while awaiting on the recovery of the goods from the Batavia. In his chronicles, Pelsaert makes many references of the ship’s surgeon. Depending on who Pelsaert interrogated, the name of the surgeon varied from one name to the other. The names that were mentioned in the enquiry are the following; Aris Cornelisz, Aris Jansz, Frans Jansz, Meester Frans Jansz, and Meester Frans. When it was the time for the ship surgeon to be questioned, he referred himself as Aris. All of the following names were noted to belong to the same person. Of all the officers employed on the Batavia, Jansz was likely the most popular. He was responsible for the health of 320 people that were on the ship.

The events recorded by Pelsaert as told by Aris Jansz started back on the Island with the other survivors. Refusing to join Cornellisz alongside his company of mutineers, Cornellisz planned to lure Aris and other survivors out on the pretense of needing to hunt seals and birds to feed the camp. While foraging, the mutineers started to slay a number of people and endeavored to eradicate the barber surgeon. Aris succeeded in escaping in the dark water and hide from the mutineers. He was later found by another group of survivors and subsisted to report of what has happened to Pelsaert when the rescue ship arrived.

<table>
<thead>
<tr>
<th>Barber Surgeons</th>
<th>Advance and Full Pay</th>
<th>Surgeons Mate</th>
<th>Advance and Full Pay</th>
</tr>
</thead>
<tbody>
<tr>
<td>George Hamilton</td>
<td>• Ad. £29</td>
<td>Innes James</td>
<td>• Ad.£11.14</td>
</tr>
<tr>
<td></td>
<td>• Fl. £97.12</td>
<td></td>
<td>• Fl. £61.10</td>
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<td>Jean Dubou</td>
<td>• £50</td>
<td>Claude Deshayes</td>
<td>• £22</td>
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<tr>
<td>Marc Bourgneuf</td>
<td>• £30</td>
<td>Nicholas Gaustrain</td>
<td>• £12</td>
</tr>
</tbody>
</table>

Table 7. Barber Surgeon’s Pay

The number of surgeon employed with the royal navy until the 19th century is hard to find. It was recorded that in 1513, the English war fleet that was sent to combat the French had only four master surgeons and few surgeon mates. The Medical register of 1779 lists 300 certified surgeons while from 1870 – 1880, a total of 482 surgeons were recorded being employed by the royal navy.
It has been documented that from the two centuries that the Dutch East Company were active from the 17th to the 18th century, a recorded 12,000 ship surgeons were employed (Bruijn 2009:20).

The number of barber-surgeons employed by VOC and by the Royal Navy does not imply that all of the barber-surgeons that were employed where documented. Those numbers do not take account of the uncertified surgeons whom were pressed-ganged into the navy or sold into the VOC ships which were common practices. As for the Royal Navy, the number of surgeons employed would have to be higher than that.

In the seventeenth and eighteenth century; during the Golden Age of Piracy; barber-surgeons employed with the Royal Navy and East Indiamen likely traversed paths with pirates. As the pirates engage and capture the ships, the surgeon’s would be converted into pirate surgeons.

Unlike many other seamen who have to sign the “Article of Agreement”, the surgeons did not require to sign the article. The Article of Agreement was a drafted document outlining the division of plunder, intolerable behavior followed by its punishment and other regulations that many pirates had to swear by an oath and make its marks to abide by that oath (Vallar 2007). "The Sea-Man's Vade Mecum" of 1707; which contained the rules that the pirates were supposed to follow; had a provision stating that surgeons could not leave their ship until its voyage was complete or that the old practicing surgeon would be free to go only as a new surgeon was employed as a pirate surgeon (Jarus 2015). Because many pirate surgeons were originally surgeons employed on captured ships, many were educated and could read Latin.

2.6 The Seafarers & Their Health

Because the Royal navy would put their warships out of commission when there was no war meant that the crew were unemployed. It also suggest that at the beginning of war, due to the scarcity of manpower, the crew for a long time would be press-ganged by the admiralties into the navy as men were needed to sail the ships. Many that were pressed into service particularly by the Royal navies were commonly beggars, convicts, homeless and drunks from the closest harbor inns (Goethe, Watson, Jones 1984:6).

At the arrival of the crew onboard the ships, the captain and surgeon; if there was one; would examine every individuals that were pressed into service. In the eighteenth century, it would be a common practice for those press-ganged to be stripped and bathed (USN Medical Bulletin 1921:599). The clothes that they came in either got smoked and scrubbed or the recruits could acquire an outfit from the slop chest.

In the earliest period, volunteers serving on her majesties ships were also a common practice. Adolescents that ran away, voyagers, emigrants, ex-military officers and naturalists occasionally composed the ranks of officers and that of the crew (Goethe, Watson, Jones 1984:6). An instance is that of the Mary Rose that sank in 1545 which was noted of having a crew consisting of Normans, Irishmen, Bretons, Dutchmen, Italians, Greeks, Genoese and French (Mary Rose Trust 2005:12).

The Dutch East India Company on the other hand did not have recruitment problems. Not at least until the mid-seventeenth century, where some provinces started to see their population growth fester and even diminishing. Unlike the English admiralties which would press-gang anybody seen fit, the Dutch admiralties in the 1650’s had soul sellers. Those soul sellers would emerge in ports of the Republic offering board, lodging and work.
The Americans just like their English navy (The colonial medical officers for a long time would imitated the practices from the Royal Navy), would press-gang individuals if men power was needed.

In the process of being pressed-ganged or sold by the crimps, ship fever was introduced by pest-ridden clothes of the contaminated recruits. This is said to be genuine particularly by the soldiers employed by VOC. They were likely infested with flea and lice causing an outbreak. Because of the congestion onboard ships, diseases such as typhus, plague, dysentery and fever would break out amongst the crew, decimating everybody within days. Cramped quarters inside ships formed a natural breeding ground for epidemic infections.

The crew employed onboard ships especially on the Mary Rose and on the Kronan could range anywhere from the age of 12 to the age of 60. On the Kronan ship, the majority of the crew ranged from 20 to 35 years of age. The age would likely correspond with the average size town from which the individuals came from. Not all of the causes of death were the result of infected recruits. Scurvy would kill over two million sailors while yellow fever; as instance from voyages to Haiti and the East Indies; and malaria would put many other sailors out of action. The anecdote from the Brunswick which in 1801 lost 287 men due to yellow fever when she went out of the West Indies; the frigate Topaze which of its 255 crew, only 55 survived and the case of the Hannibal which lost 200 crew in less than six months illustrates a small fraction of the many more ships that would be decommissioned due to illness and diseases.

On the VOC ship Batavia, of the 320 people at the time, almost 1 in 10 would die from illness while many more would become ill and would require treatment (Dash 2002:126).

Table 8 below represents a general idea of death causes in the Royal navy. Disease will be accountable for more death in the navy than any other causes. Conditions would slowly turn around at the end of the 19th century.

While at sea, the lack of a universal language and the lengthier journeys at sea; particularly within the narrow confines of larger ships which carried a crew three times that of merchantmen, probably made the company psychologically inept. It was a norm for the crew to have shipboard duties to keep them busy; yet; similarly to land, few brawls would always break out and transgressors were constantly nearby. Retribution for the problem makers was necessary in order to enforce the laws. The retribution typically entailed punishments of some sorts.

<table>
<thead>
<tr>
<th>Casualties in the British Navy (1810)</th>
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<tbody>
<tr>
<td>Cause of Death</td>
</tr>
<tr>
<td>Disease</td>
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<tr>
<td>Killed in Action</td>
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<tr>
<td>Deceased by wounds</td>
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<tr>
<td>Wreckage</td>
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<tr>
<td>Individual Accident</td>
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<tr>
<td>Total</td>
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Table 8. Casualties from 1810 in the Royal Navy
2.7 At-Sea Punishments

The surgeons was usually present when the men were being punished making sure that the punishment was not in excess of what the individuals could endure. Nevertheless, some punishment would see the individual dead. Some sentences were purely uncomfortable while others could cause the open wounds to succumb to gangrene or sepsis due to infection and eventually death if not treated right away. The most common type of capital punishment employed onboard a ship was that of flogging. The individual would be tied standing belly up against the mast, bent over one of the big guns or prone atop the deck grating. The bare upper back was toward the quartermaster, who would lash him with a cat – o’nine-tails (Groce 2011:53). Boys under the age of eighteen were flogged on the bare buttocks. In the eighteenth century, the number of lashed could be in the hundreds but the number was reduced in the mid-nineteenth century too two to three dozen lashes. The whip split ends typically would leave foul swellings whereas the weighted tips composed of knots would leave awful bruises. The weighted tips would often tear the skin, opening the opened tissue to bacteria and infection. Injuries succumbed to lashing were commonly treated by bleeding and by smearing a salves on the wound (Mary Rose Trust 2005:181). The practice of flogging as a capital punishment in the United States navy was discontinued in 1850 while the Royal navy suspended flogging in 1881 (Farrell 2014).

Another type of punishment that was undoubtedly employed by officers from VOC was the amputation of the hands. An anecdote penned down by Francisco Pelsaert mentions of the mutineers right hand being cut off while Cornelisz, who was the mastermind of the mutineer got both of his hands cut. There is the question whether such means of punishment was commonly practiced by all of the VOC because it was in the articles or whether this was an exception only to the VOC Batavia. It must have been a common practice employed by all of VOC ships because Pelsaert did not seem to question the practice.

Another type of punishment that was a commonly employed amongst pirates and probably those on VOC ships was marooning. Groce mentioned that marooning was a practice that was reserved for cowardly conduct such as for abandoning the post on the ship during combat or conning fellow crewman of their appropriate shares (Groce 2011:56). He also mentioned that the transgressor were marooned with only minimal provisions comprising of a flask of rum, flintlock, gunpowder, and a one round shot for the flintlock. Pelsaert mentioned in his chronicles that he marooned two men on High Islands on the 2nd October 1629, a similar punishment employed by the pirates. He does not indicate if they were left with any provisions. No one heard from those two men again suggesting that they likely succumbed to exposure to the elements, dehydration or starvation.

The worst type of punishment employed in nautical history is that of keel hauling. It encompasses binding the convicted man’s hand and feet with some rope and throwing him overboard. The individual
would then be hauled under the ship’s keel either from one side of the ship to the other or the length of the ship. If the individual did not drown, his skin would have been shredded to pieces and the convict would succumb to infection. It was uncommon for the transgressor to be also decapitated by heel hauling. Oftentimes, only a shredded bloody rope is recovered and those that do make it to the surface are usually long gone (Groce 2011:56). The hull of the ship typically is a breeding ground for a variety of sea life including barnacles. Those barnacles have been known to turn the vessel into a cheese grater.

The practice of heel hauling has been employed by the Royal navy, pirates, merchantmen and testimonial to the chronicles of Pelsaert, heel hauling was employed by VOC. It was mentioned by Francisco Pelsaert that one of the punishment that he employed on the lesser transgressors was keel hauling and then dropped from the yard arm. The chance of the transgressor making it alive from heel hauling as previously noted is nonexistent.

When the sailors and soldiers applied to work onboard the admiralties ships, inadequate diet resulting in disorder and malnourishment, crowded vessels creating idyllic breeding grounds for outbreak of diseases and accidental injuries, and uncomfortable foul conditions were all part of the job. Sometimes, being employed to work aboard a vessel meant a death sentence to the company. On the occasion that a fellow crewman died, it was a tradition for the Italians, Spanish and French to keep the deceased inside the bilge of the ship until they could be buried on land (Goethe, Watson, Jones 1984:4). The practice to bury the deceased at sea was primary suggested to be employed on English ships. The intention for such an approach is unknown but it was noted that it may relate back in the thoughtfulness of hygiene (Goethe, Watson, Jones 1984:4). However, throwing a body at sea without the appropriate ceremony on the English side suggests that the first obligation for those employed in the Royal Navy was to fight the ship and win at all coast. Anything else came secondary.

2.8 Logs and Journals

In 1695, the ship’s surgeons were obliged to keep a journal. However, since no guidelines were given as to what was needed to be inscribed, diverse information’s and contents of the journals were found. Some only added the number of patients while others penned down the consumption of medicines. Few surgeons took the time to note the patient name, symptoms, diagnosis and its treatment. Over a period of five years; over fifty ships’ surgeon journals employed by VOC were recorded and can be consulted in the archives in The Hague.

The ship’s surgeon’s journals in the 18th century became fewer in numbers than that of the seventeenth century. From the year 1764 to 1786, less than fifteen full surgeon’s journals were recorded. The lack of logs in the eighteenth century from VOC suggest that after the five years obligation of keeping records from the year of 1695 to 1700, the regulation for the surgeons were not enforced. The barber surgeon’s probably used that freedom to ceased inscribing in the logs. Of those that did inscribe in their journals, the notes varied greatly from the pay and money to few medical operations. Another factor was that VOC was losing its monopoly in the East Indies and elsewhere.

The English admiralties were keen on keeping logs and journals penned down by the ship’s surgeons. From the year 1793 to 1880, an estimated 1000 journals were recorded (National Archives). All of the journals can be consulted at the National Archive. It is not surprising the huge number of journals available as the Articles of Wars of 1790 and that of 1801 each instructed the barber surgeon to keep a journal. An extract from the Articles of War published in 1790 instructed the barber-surgeon to;

“He is to keep a Day-Book of his Practice, noting therein the names of the men that came under his care; their hurts and distempers; the day they were taken ill, and the day of their recovery, removal, or death; together with his prescriptions and methods of treatment while under care.” (Privy Council 1790:133)
The articles of Wars of 1790 also suggested that the barber-surgeon should keep two journals or as they call it in the regulation, ‘day book’. The ship’s surgeon required to compose a journal for diseases while the second journal was to compose the chirurgical approaches (Privy Council 1790:134).

There is one famous medical record that was penned by master surgeon Thomas Eshelby. Although all journals are great in importance, the one by Eshelby on the HMS Theseus described Nelson’s operation on his right arm. Below is an extract of what was scribbled in the journal;

“Admiral Nelson...Compound fracture of the right arm by a musket ball passing through a little above the elbow; an artery divided; the arm was immediately amputated.” (Ellis 1996: 89) What was inscribed in the journal by the ship surgeon employed by the royal navy varied from surgeon to surgeon. The National Archive noted some of the few inscriptions by the barber - surgeon. In some cases, the surgeons penned down in their journals the everyday ship life including one surgeon who wrote the following (National Archive 2010);

“Drunkenness nowadays in the Navy kills more men than the sword” and that with most diseases and accidents “you may trace grog as the principle cause of it”.

Surgeon Hamilton onboard the HMS Pandora when she sank in the Great Reef Barrier wrote in his journal;

“The guns were ordered thrown overboard; and what hands could be spared from the pumps, were employed thrumbing a topsail to haul under her bottom to endeavor to father her...We baled between life and death...She now took a heel, and some of the guns they were endeavoring to throw over board run down to leeward, which crushed one man to death; about the same time, a spare topmast came down from the booms and killed another man...During this trying occasion the men behaved with the utmost intrepidity and obedience, not a man flinching from his post.” – George Hamilton

The above extracts are only a few of the numerous other journals. Some penned down accounts of conflicts, mutiny and martial court while others penned down superstitions and unique nautical customs all the while some recorded things relating to curiosity and discoveries. Surgeons were also known to write about experimental treatments such as the case of one surgeon who treated a patient having symptoms of pneumonia. The surgeon penned down how in three hours, he managed to blood let an estimated 3.5 pints of blood from his patient (National Archive 2010).

Other surgeons wrote about diseases. There are detailed descriptions of living conditions comprising of cleanliness, hygiene and disease. One surgeon onboard the Dido was even noted to record how the ship that he was employed on was responsible in spreading the measles epidemic to Fiji which would end up killing nearly a third of the populace (National Archive 2010). Another topic that would be commonly penned down in the journals was that of scurvy. Either way, while the treatment of disease was crude at most, the journals or their contents will contribute to the knowledge that we have available today.

It was also noted that John Woodall inscribed in his book “The Surgeon’s Mate” that the barber - surgeons’ mate should keep a journal. In his journal, the mate should pen down his experience during lengthy and dangerous voyages (Cline 2001).
2.8 Number of Surgeons

It was accepted that many factors determined the size of the medical staff at sea. The size of the vessel, number of cannons, and the size of the crew were some of the three major factors.

From the sixteenth to the seventeenth century, major naval powers like England, the Dutch Republic and France determined the number of her medical staff by the size of their vessels. There were of course few exceptions to that rule. The “Couronne” from 1637 for example had a crew of 666 and had six surgeons that were employed on her. Another example is that of a privateer that was taken captive. It was chronicled that in 1657, a privateer alongside her 646 man crew and six surgeons were taken captive (Goethe, Watson, and Jones 1984:21). For the large number of crew employed on both vessels, both the “Couronne” and the privateer had to be large ships; probably ships of the line. It makes sense that larger vessels would have many master surgeons, few mates and few third mates for the vessel was likely crowded with marines and crews.

At the end of the seventeenth century, each Royal Navy ship no matter her size had to employ a surgeon’s mate. This was recognized in case the master surgeon perished; the crew was left with someone who has training in medical care (Brockliss, Cardwell, and Moss 2005:7). On larger man-o’-war, master surgeons were also eligible to extra assistance. At the time of Nelson, under the Order in Council of 23rd January 1805, only fourth rates ship-of-lines and beyond were permitted additional mates (Brockliss, Cardwell, Moss 2005:7). It wasn’t unusual for a man-o’-war or a merchant ship alike to sail without a surgeon’s mate. Likewise, it was a common practice for smaller ships to sail without a master surgeon at all.

<table>
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<tr>
<th>Number of Guns 18th – 19th century French</th>
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<tbody>
<tr>
<td>Number of guns</td>
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<tr>
<td>115 guns</td>
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<td>110 guns</td>
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<td>80 guns</td>
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<td>74 guns</td>
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Table 9. Number of Guns 18th-19th century French
While the surgeons employed in the admiralties of the seventeenth century were based on the size of the vessels, the French East Indiamen (as of 1681) might be the only ones that employed a surgeon on a regular basis based on the number of crew. This is similar to today’s policy where the number of surgeons is determined by the number of crew. On the VOC ships, the number of surgeons employed depended solely on the size of the ship. For instance, a return ship similar to that of the VOC Batavia would require three surgeons comprising of a first surgeon also referred to as a master surgeon and two assistant who could be a combination of a second surgeon and a third surgeon (Bruijn 2009:62). A medium size VOC ship similar to a yacht or frigate would require two surgeons comprising of one first surgeon and one apprentice. However, similar to the Royal Navy practices of the time, there was no guarantee that the VOC ships employed the required amount of surgeons. When the VOC ship Batavia journeyed to the East Indies in 1628, she was recorded of having only one surgeon. Being a return ship, the Batavia was required of having one master surgeon and two assistances.

The number of surgeons depending on the size of the vessel was true until the 1770’s where regulations and policies changed. In America for example, the board of committee in 1779 had a marine committee that passed some regulations concerning the ship surgeon’s and his mates’ onboard ships. One must remember that America is still a new country and has a relatively young navy. Because of that, determining the number of surgeons was complex. Since the enactment of the Federal Legislation of 1790, the legislation required every American flag vessel over 150 tons with a crew of ten or more to carry a medicine chest. The American merchant ships that employed twenty sailors were not required to employ a surgeon. The master of the vessel; the captain; was responsible to take care of the sick and wounded (Frayer 2004:13).

The eighteenth and nineteenth century would see a dramatic transformation. The French, English and American admiralties determined the number of surgeons and mates employed according to the number of guns (Reiss 2005:138 & Crowdy 2005:15). This contrast the sixteenth and seventeenth century where the number of surgeon’s was contingent solely on the size of the ships.

One must wonder if the number of guns actually concise with the size of the vessel and that of the crew. A man-o’-war for instance; being bigger than a frigate and schooner would have hundreds of cannons and employed hundreds of crew while the frigate smaller in size would carry fewer than 40 cannons. So
in a way, it could be said that the size of the vessel and the number of guns are similar in a way. It’s noteworthy to distinguish from the Royal Navy and merchant ships from those ships employed by pirates. Although there is no regulation of how many pirate surgeons were employed, it’s uncommon for pirates to refurbish the vessels that they captured by adding gun ports and guns. Before La Concorde de Nantes was captured, she carried only 16 guns. After her capture, she was reported of having 40 cannons.
Chapter 3 – Surgical Instruments

3.1 Medical Chest

There were probably many types of chest employed on a ship. There was the main ship’s medicine chest; also the most vital instrument. After the surgeon and his mates, the medicine chest was renowned to be the most important onboard any ships. It was so important that in 1628, HMS Rainbow’s company had to desert the ship when it was acknowledged that the chest was emptied of its contents (Kehoe 2003). The ship’s armamentarium of the chest comprised of a variety of ointments, lotions and herbs, but also dressings and surgical instruments. The instruments found inside a chest were commonly composed of steel and iron; however gold, silver, lead and many more materials could be used. Those materials were commonly composed in conjunction with wooden handles (Kirkup 2005:2). Part of the armamentarium of each chest probably also contained a kind of instruction manual that was penned down by a trained physician on land. Because the barber-surgeons were not permitted to prescribe internal medicine, the surgeon could always refer to the manual for suggestions and advices. Most ships, large and small, likely contained one such chest. Then, the ship surgeon probably had another medicine chest were he would keep all of his medicines for easy access. The ship surgeon also carried a pocket instrument case alongside a plaster box.

The plaster box; which was also commonly referred as a “dressing box” or in the Dutch East India Company as a “lapdoos” and in the modern age as a “first aid kit”; would have contained an estimated 25 items (Cline 2001). The apprentice was responsible for the plaster box, which was kept apart from the main ship’s medicine chest. It is likely that the plaster box was some of the measures put in place to combat the theft of medicine from the big medicine chest. It would have been a common practice in the time for the barber-surgeons to sell the medicines just to replace the medicines with inferior qualities. The dressing box was also used as a first aid that could be carried by the surgeon from deck to decks of a ship in case of a mishap or if there was a mishap; the surgeon or one the assistant could go to the scene of the accident without having to go to the dispensary on the orlop deck. The following is an extract from naval surgeon John Moyle’s publication where he described the dressing box (USN Medical Bulletin 1921:580).

“And being on board see that your dressing box is furnished. That is to say a box with six or eight partitions in it and a place for plasters ready spread. In the partitions you put your pots and glasses of Balsams and oils for present use. Now this box as well as your pocket instruments must be carried every morning to the mast between decks; where our mortar is usually rung, that such as have any sore or ailments may hear in any part of the ship and come thither to be dress. But such as by reason of illness cannot come thither, you must go to them where they lie.” - John Moyle 1703

In the seventeenth century, William Clowes listed 85 items that was required to be stored inside the medicine chest while John Woodall in his publication “The Surgeon’s Mate” inscribed and deliberated a mere 270 items which also comprised of 54 surgical instruments. In Woodall’s list of items, he suggested that the chest required 75 items while the plaster box would have required 25 items (Cline 2001). While Woodall goes into particulars about the medicines of the chest, he does not disclose much about the medicine chest itself. He did however designate a chart with the recommended location of the each medicine. From the chart (fig. 10), the chest likely comprised of three compartments; upper, middle and lower part of the chest. The upper and lower section of the chest illustrated as having 170 structural compartments while the middle compartment likely accumulated around 100 items (Cline 2001).
Naval surgeon John Moyle suggested not putting the regular medicines all the way at the bottom of the surgeon’s tool chest; a practice common with surgeons employed on merchant ships to save money from having to buy a secondary chest (Kehoe 2003). Moyle articulated that placing medicines in the tool chest was troublesome because the surgeon would have to displace his surgical instruments before getting to the medicines.

The medicinal chest was of great importance that it is featured in many publications by John Woodall’s, William Clowes, John Moyle and from other records such as from the Sea-Man’s Vade Mecum of 1707 which has three articles particular on the medicine chest (Bruzelius 1996) and from recordings of events. One such chronicle was recorded in 1718 when Blackbeard blockaded the port of Charleston for a week and captured many ships and taken many other hostages for a medicine chest. A similar anecdote to Blackbeard was that of Edward Low who also held a ship captive and pressed her company in order to procure a medicine chest (Kehoe 2003).

Those stories of pirates holding ships and hostages captive for a medical chest are not surprising. Dissimilar to merchantmen and Royal navy; pirates company were at a hindrance when it came to medicinal chest. They couldn’t purchase a medicinal chest at a normal port because they were not received in normal ports and secondly, the pirates just as any other seamen would get injured due to the life at sea and engagements and the company could be put out of action due to diseases.
hostages for a ransom of a medical chest and taking the surgeons and their chest from the captured vessels were the best approaches for the pirates.

The Sea-Man’s Vade Mecum of 1707 has three articles particular on the sea chest (Bruzelius 1996). This is the extract;

3) “The Owners shall be obliged to provide the Surgeons Chest well stored with Drugs, Ointments, Medicaments, and other things necessary [sic] for treating Sick Persons during the Voyage; and the Surgeon shall provide the Instruments of his Profession.”

4) “The Chest shall be visited by the most Ancient Master Surgeon of the Place, and by the most Ancient Apothecary, provided it be not the same that furnished the Drugs.”

5) “The Surgeons shall be obliged to get their Chest visited, at least 3 Days before the Departure; and the Master Surgeon and Apothecary, to do it within four and twenty Hours after they are thereto required, on Pain of thirty Livres Fine, and the Damages of Demurage.”

It was uncommon for the barber surgeons not to abide by the recommended treatments. There are many known stories were the barber-surgeon alters with the medicine chest and that of the contents. John Woodall advocated that the ship surgeons should procure and stock what they see fit for the Enlightened journey (Woodall 1617:4).

“What alterations of operations he findeth in each medicine, and what medicines keepe their force longest, & what perish soonest. Also what variety the climate causeth, of the Doses as well of the laxative as opiate Medicines.” – John Woodall

Four wooden medical chests were recovered from three wrecks. One wooden chest was retrieved from the Marie Rose (80A1530), two wooden chests were retrieved from the St. George wreck (6000/966I and 6000/965) and the last wooden chest was retrieved from the HMS Swift (INA 521). Although not all of
the ships had a medicine chest recovered, it was more than likely that the barber-surgeon employed onboard would have a medicine chest with him. The surgeon employed on the Batavia for instance most likely had a medicine chest with a set of surgeon’s saws, a handful of razors and some bowls and a small apothecary chest that would have contained the jars that were also recovered from the ship.

80A1530. The medical chest from the Mary Rose is built by means of a dovetail structure. It is made of composite wood. Walnut wood for the chest, elm wood for the two handles and beech wood for the boards (Marie Rose Trust 2005:189). The chest contained over 60 objects related to medicine and surgery. The dovetail construction of the chest in the course of the 16th century is a norm of the continental production making the chest an expensive item and indicating that the barber surgeon serving on the Mary Rose was that of a high status.

6000/966I. The medical chests from the St. George were all recovered from the orlop deck. Box 6000/966I had an ornamented woodcut holding tray on the inside. A lock was built into the structure while a brass hook fitting on the outside kept the box secured. All the fittings were composed of brass and despite being submerged; the artefact was not affected by the water. The same cannot be said about the interior of the box which when found, it was secured by its concretion. Such concretion entails that the inside of the chest prior the sinking of the St. George was occupied by iron tools. Once the concretion occurs, it shelters the outside by bounding together around the object. After the preservation by the removal of the concretion and for the preservation of the wooden part, a wood cut impression of the tools was found with few wooden handles. The box was simple in form and had impressions cut into the tray that went at the bottom of the box to acquire the tools. Upon close analysis of the inside, it was determined that the impressions were those of a trephining kit. Parts of instruments were retrieved from that box and described under the part Trephination. Amongst all of the impression that had an object retrieved, only one impression had no remains. Due to no remains, it’s likely that the whole instrument was metal corroded with time. The impression was that of two marginally curved separated arms branching out and running down to a single piece. The shape is that of a “Y” shape or that of a slingshot handle and would point to a forceps involving the removal of bone sections.

6000/965. Box is composed of oak, is rectangular is shape and reinforced with six brass plate fittings. As in box 6000/966I, the interior has a concretion indicating that metal tools were present at the time. Whereas box 6000/966I had a tray affixed to the inside, box 6000/965 is composed of two parts; a built in tray and a removable tray. The built in tray is affixed to the bottom of the main box. The tray has ranges of shaped cuts in the wood likely to fit instruments. An area is blocked by a wooden wall from the rest of the tray. As no impressions are visible in that blocked space, it’s likely that the space contained something large.

6000/965AN. A removable tray which fits inside the main box (6000/965). Being composed of oak wood, it has no brass fitting. As with the other trays, it has cuts made of wood to contain instruments intended for. Contrasting the trephining box, there is a higher level of complexity in the composition of this box. The layout is compact and well made.

INA 521. Box is made of wood had a tray INA NR 001 on top which contained glass bottles. Inside the box INA 521 was a white substance believed to be calcite. Another box INA 315 was retrieved from the HMS Swift. Despite that the box was retrieved elsewhere from other medicinal materials, artefact INA 315 contained a glass ware with mercury chloride on its inside.
3.1 Saws and Blades

Amputation of the limbs was the chief operation in naval surgery from the fifteenth century to the nineteenth century. Because of the innovative gunpowder and cannons, the viewpoint was that amputation was the only mean to save a life.

Unlike today were limb injuries are considered straightforward, limb injuries from the 16th century to the 19th century had to be amputated to avert eventual death from infection or gangrene. The knowledge and understanding of the cause of infection and of flesh eating bacteria was not well understood in the time (Pigot 1995:24). Unlike modern amputation instruments which are full metal and are easier to sterilize, blades of the past were probably made of iron. The material of the blades does not alter the functionality or the form of the amputation instruments used today. The amputation blades look similar to those from the 18th century. It makes sense as like the rest of surgical instruments, very little changed.

There were three major reasons why the limbs had to be amputated. The first reason is that the surgeons could not do much with injuries to the joints. The second reason was that any flesh wounds to the limbs that were not properly treated would lead to infection complicating the treatment even more. The last reason is that there were no proper facilities where those with wounded limbs could be nursed.

Many surgeon like John Moyle who dealt with many wounded seamen probably understood that because many if not all ships of the time lacked the proper facility for adept nursing; wounded limbs had to be amputated and it had to be done swiftly. Wooden splinters by enemy projectiles would crush, tangle and bruise the flesh of the limb making infection particularly high and the many individuals requiring the removal of the limbs required the surgeon to be Swift with the amputation. Surgeon John Moyle penned down the following (USN Medical Bulletin 1921:581); “…and to be with the hand held fast to the end of the stump till the blood should stop; the which in heat of fight we cannot spare time to do, but must be as speedy in our operations as possible.” – John Moyle 1703
It was said that during the battle of Borodino in the Russian campaign of 1812, Napoleon’s chief surgeon Baron Larrey was criticized by many including by military surgeon Blackadder for being too fast in the amputation of limbs. He was noted of having performed over 200 amputations in a day (Welling, Burris & Rich 2010). At the battle of Toulouse of 1814, one in fifteen of the British troops would lose a limb by amputation. That was 98 troops out of the 1407 wounded (USN Medical Bulletin 1921:608).

It makes sense that surgeons had to be speedy in the practice of amputation. Especially onboard vessels where numerous sailors could be taken down at once in the heat of battle by an enemy canon ball or by splinters created by flying projectiles. Another good testament of amputation was that of the famed Horatio Nelson. In July 1797 Nelson led a failed assault on the Spanish island of Tenerife. In the process, Nelson was hit in the right arm by a musket ball shortly after stepping ashore. Bleeding heavily, he was rowed back to HMS Theseus where ship surgeon Thomas Eshelby had to amputate his injured limb. On the 25th July, the ship surgeon Thomas Eshelby wrote in his journal:

"Compound fracture of the right arm by a musket ball passing through a little above the elbow; an artery divided; the arm was immediately amputated."

Although the anecdote of Nelson’s amputation is fascinating, Eshelby had to similarly amputate limbs from six other crew after operating on Nelson. Using speed would have been essential for the survival of those six individuals. As Dionis observed (Kirkup 2005:11);

“It is much better for a man to live with three limbs than to die with four.” - Dionis

What kind of blades and saws used in the amputation is unknown but a bone saw or even a tendon saw were probably used. In case a pirate barber-surgeon died either in a natural or manmade conflict, amputation of limbs on pirate crews fell to the carpenter available onboard the vessel. This was so as the carpenter’s instruments were similar to those instruments utilized by the pirate-surgeons and legitimate surgeons elsewhere. Was this practice employed only onboard pirates vessels or it was employed by surgeon’s onboard Royal navy vessels and merchantmen alike? Article 8 under the article of war of 1801 would suggest that surgeons employed on the Royal navy ships could use the carpenters saw if he thinks that his own saw is insufficient (Montgomery 2009:37).

There is a story where in 1886; onboard a sailing vessel off the coast of Cape Horn; the second mate with no surgical instruments and no experience in any surgical operations achieved to successfully amputate a fellow’s crewmen’s limb (Kirkup 20055). With the assistance of the carpenter and his armamentarium comprising of a shoe knife, a saw and a sail needle, they both managed to effectively operate on the crewman.
Wooster mentioned that the surgeons in the sixteenth and seventeenth favored the “one stage circular cut”. Unlike the normal approach where the surgeon would just saw the limb off, on the one stage circular cut, the surgeon would approach the patient’s injured limb from the lateral side. From there, the surgeon would cut the limb starting from the proximal side and transfer to the proximal side of the limb (Wooster 2012:9). The author would not go into details on this type of approach but one could check the images of the procedure (fig. 12). It was also a common practice and routine in the sixteenth century before and after an amputation to clamp off of the major vessels including the arteries and the sewing of the skin flaps. The whole process that the barber-surgeon would take is still debatable but the approach probably was the following:

The patient would be put on the makeshift table

The first process was to cut the sailors clothes to expose the limb to be amputated

The second process was to apply a tourniquet

A stick or piece of leather was given to the sailor to chew on as anesthetics will not be existent until the mid-eighteenth century

Before the amputation started, one of the apprentices would hold down the limb

After a few passes with the knife, the limb was sawed off and thrown into a bucket

Depending on the surgeon, the stump was either cauterized with a hot iron or ligature was applied to cut the vessel and artery from bleeding

The tourniquet would then be slowly released

Depending on the surgeon, either the skin flap was sewed or a linen bandage was lashed over the stump

While that patient was laid to one side, the next unfortunate will take his place.

In the sixteenth to the eighteenth century, the whole process would have taken less than eight minutes and in the nineteenth century during the Napoleonic era, English and French surgeons could amputate a limb in seconds. A rapid and effective amputation was the best that the surgeons could do under the circumstances.

It was common for the surgeons employed by the Royal Navy and later by the colonial medical officers to heat their amputation knives (USN Medical Bulletin 1921:596). It was suggested that a hot blade was less painful than a cold one.

The instruments used in the amputation can be seen by examining and analyzing artefacts recovered from wrecks. None of the artefacts survived intact. Amputation instruments were made of two materials; wood and iron. The handles of the amputation saws for instances were made of a variety of

Figure 14. Woodall saw. (Kirkup 2005:112)

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The instruments used in the amputation can be seen by examining and analyzing artefacts recovered from wrecks. None of the artefacts survived intact. Amputation instruments were made of two materials; wood and iron. The handles of the amputation saws for instances were made of a variety of
wood while the blades of the instruments had to be made of iron. Because all of the artefacts were recovered from the seabed, only the handles survived. Also, it’s vital to understand that the handles used in this topic could be part of other instruments not related to amputation.

Five amputation handles were recovered from the *Mary Rose* (80A1566, 80A1919, 80A1920, 80A1588 and 80A1580) and thirteen handles were recovered from the *St. George* (6000/965Æ, 6000/965Y, 6000/965T, 6000/965X, 6000/965Z, 6000/965AC, 6000/965AF, and 6000/965AG).

80A1566. Handle is composed of ash wood and is cylindrical in shape. It has a rectangular tang hole. It is suggested to acquire heavy blade or bar. Either an amputation blade or a cautery iron.

80A1919. Handle composed of alder wood and also cylindrically turned with a tang hole shaped as a diamond. The Handle could have been used as a cautery iron.

80A1920. Handle is composed of spruce and cylindrically turned. It was likely used for a cautery iron or a hefty amputation blade.

80A1588. Handle is composed of boxwood. Probably used to acquire an everyday blade.

80A1580. Handle is a fragment of a fruit wooden handle with a square tang hole. There is evidence of a collar and a nail in the grip and probably used for small cautery iron or chisels.

The handles recovered from the *Mary Rose* would have been similar to those illustrated by Woodall as illustrated in figure 15. However, Woodall’s saw handle was heavy and decorated with acorns at the end of the handle. The blades from the *Mary Rose* and many other wrecks from the sixteenth to the eighteenth century probably had amputation saws composed of wrought iron. The blades from the saws of this period were commonly supplied with an extra blade because of the imperfection of the “shear steel” and the abrupt movement of the patient which would snap the instrument (Kirkup 2005:112).

6000/965Æ. Six artefacts were retrieved from the *St. George*. The thin size and the cheer number suggests that they likely were lancets used in cutting skin and tissue. It is advocated that similar to today’s disposable scalpels; those artefacts were prone to breaking and had to be frequently replaced by a new one. Similar to scalpels, lancets were also instruments that would have been found inside a surgical chest. Lancets unlike scalpels had a blade that is double sided and more common in bloodletting while the scalpels likely had a function in precision cutting. The blade of the lancets were protected either by ivory or tortoiseshell and contained in fish scale or silver casing.

6000/965Y. Handle composed of two worked pieces of wood. The wood worked into a handle is held together by three iron pins which passes through the wood and the metal shaft. The iron pins were inserted near the end of the handle, near the front of the handle and in the middle of the handle. This handle was suggested to be either part of a probe or part of an amputation knife.

6000/965T. Handle is composed of a light wood. The wood specie has not been confirmed so far but was suggested to be ash. The handle comprises of two worked pieces of wood that is held together by three corroded iron pins, one near the end, one near the front and one in the middle of the handle. Due to iron oxide, the wood was stained in a brownish/reddish color. The handle was recovered from tray 6000/965AN. Due to the impression of the tray from where the handle was recovered, the exact length could be determined. It was suggested that this handle is similar to handle 6000/965Y and might have been duplicates.

6000/965X. Remains of a blade sheath composed of a bone or horn. The shape of the sheath is symmetrical on either side and would have “mirrored” the blade that was inserted the sheath. The sheath was held by an iron pin that was inserted at one end and passed through the blade and the secondary sheath. The blade would have resembled a switch blade of sorts where the knife when folded
on the inside would have been unfolded and readied to be used. Because of a lack of block to hold and lock the blade in place, it was suggested that the instrument was used as a thumb lancet. The lancet was probably used by the barber-surgeon or one of his mates to make a small and shallow incision on the surface of the skin.

6000/965Z. Similarly to 6000/965X, the sheath is made out of a bone. The sheath is fixed together by an iron pin at one end. The sheath echoes the shape of the blade that would originally be folded inside the sheath. Only small concretions at the base of the blade are remnants of the blade. The sheath is stained by the iron oxide. The instrument was suggested to be that of a bleeding lancet.

6000.965AC. Handle was composed from a single piece of wood, likely ash. The handle has no fixings. The impression of the tray suggests that it was part of a pointed narrow tip blade.

6000/965AF. Handle is made from three pieces of wood that were bounded together. Two wood were ebony while the third was a light wood that was at the core and that has been mostly covered by the two other pieces of wood. The blade was suggested to be long and thin in shape making it a handle of an amputation knife.

6000/96AG. Like 6000/965AF, this handle was also made from three pieces of wood that were also bounded together. Like the other handle, this one is also made from two ebony wood which covers the core wood which is made of a light wood. This handle was also part of an amputation knife.

Figure 15. Petit screw tourniquet 1780-1805. (Wikimedia Commons 2014)
Preventing bleeding in the primeval times was employed by direct thumb pressure in conjunction with the index finger before employing the application of a porous material covered by a bandage and followed by boiling oil and pitch or by cauterization (Kirkup 2005:47).

Unlike today where the tourniquet would be used for other practices than amputations, tourniquets in the past were part of the amputation kit. Amputation was practiced as far back as the Neolithic age, but employing constrictive devices to slow and help with hemorrhaging is known only since the Roman times. Guillemeau observed during amputation the following extract (Kirkup 2005:47).

“The legge now being extirpated...we must as then stoppe, and restraygne [the bleeding], which we must doe throughe the imposition of the fingers on the mouthes, or apertions of the vayne, which we must either bind or els cauterize...” – Guillemeau

Articles of clothes; commonly the use of two bandages; were used either on top or bottom of an incision. The clothes were then passed two to three times around the limb to control venous bleeding (Klenerman 1962: 937). Tourniquets were non-existent until the practice of ligature by Ambroise Paré (Bennion 1979:179). It is said that Paré overruled cautery to seal wounds after amputation and instead used a silk thread to ligature. Ligature is a practice to tie off blood vessels to prevent bleeding.

This practice was not adopted willingly by other surgeons who still relied on cauterization because despite ligature being less painful, it was prone to complications, infection and even in death and cauterization may have been an easier and faster way to treat a crew at sea (Bennion 1979:179). A cauterization was a branding iron that was used to slough off the open wound where it was then coated with an ointment and covered with a dressing.

In the eighteenth century, ligature would be a common practice still used today. For instance, Eshelby penned down in his medical journal that he used silk ligature around the brachial artery during the operation of Nelson’s right arm (Khan, Saeed, and Brinsden 2009: 23). The usage of silk thread for ligature was a common practice of the time in Britain. However, waxed threads could as well be used.

The first ‘blood stoppers’ known was in 1674 when Morell used a simple cord with a wooden rod pushed beneath it and twisted to constrict it known as a ‘garotte’ to avert a soldier from hemorrhaging. In 1678, a naval surgeon used such garotte in a successful amputation. On the other hand, a hard lined pad was added over the vessel in concern. (Bennion 1979:179).

By the seventeenth century, Ambroise Paré was a French military surgeon whom encouraged surgeons; correspondingly to the garotte; in tying a strong fillet above the site of amputation and using a stick or two to twist the constricting bandage. Such practice would give birth to the word tourniquet which in French means “touner” (Klenerman 1962:937). Tourniquet is also sometimes referred to a Spanish windlass. In the eighteenth century (around 1718), Petit would introduce the screw tourniquet. He
would describe his latest development before the Academies Royal des Science in Paris of the screw tourniquet (Klenerman 1962: 937).

Unlike the vintage use of constricting bandage and fillet that once been the common practice amongst surgeons in the sixteenth and seventeenth century, the screw tourniquets was much safer and did not require the help of an assistance. The tourniquet could also be applied by an individual and freely controlled as it could effortlessly be unscrewed to release the amount of pressure. William Northcode described the petit tourniquet in 1770 as;

“The most convenient as the patient can easily manage it himself” (Pigott 1995:23).

Screw tourniquets were so common that they would be issued on most ships of her majesties. The perfect archaeological testament of such device is the petit tourniquet recovered from the HMS Pandora (MA102) and one from the HMS St. George (7546/153). During the excavation of the Queen Anne’s Revenge, two parts of a tourniquet was also recovered. Another screw tourniquet that would be a historical testimony on its importance but not analyzed in this paper is the one used on Horatio Nelson by ship surgeon Thomas Eshelby on the HMS Theseus. After being hit by a musket ball making a compound fracture, Nelson was rowed from the beach to the HMS Theseus where Surgeon Eshelby and his mate Louis Remonier operated on Nelson’s arm in the early morning hours (Ellis 1996: 89). The tourniquet used on Horatio Nelson is now preserved at Wellcome Museum of for the History of Medicine, Science Museum in London. It’s unclear when the tourniquet was used on Nelson’s arm but, from numerous historical testimonies on other patients, it was presumably used before the amputation since such was a common practice of the time. Adding a tourniquet before amputation mitigated the risk of the patient such as Nelson and other crewmen from hemorrhaging to death while the limb was being taken off. Although a single petit tourniquet was retrieved from each wreck, the list issued by the Royal Navy required no less than six petit tourniquets (Pigott 1995:23). Even if we have no tourniquets recovered from US Navy ships, the United States Navy in 1812 would also require the same amount of the screw tourniquets on its ships. That was also likely the number of tourniquets also required in the 18th century. The cheer number of tourniquets is reasonable when realizing that numerous seamen would have limb injuries due to naval battles.

The screw tourniquet consisted of a strap which passed around the limb and in which the screw portion was attached. Once the screw was constricted, the pressure would bear over the main vessel of the limb by a curved piece fixed to the screw compressing the limb between the leather straps (Klenerman 1962:937). Contrasting the tourniquets retrieved from the wrecks where no parts of the strap survived, all petit tourniquets plates have a strap - presumably made of stout linen or canvas- threaded through a set of bars (Campbell & Gesner 2000:92). A good example of how a tourniquet might look like with a strap is that of figure 14 from the science museum.

Those Tourniquets had a brass threaded screw with a curved winder and two rectangular plates with extending flanges. Both the upper and lower plates would have holes at the end. The original screw and winder were probably made out of wood. Metal screws and winders would be available only in the late 18th century and all metal tourniquets would be the standard surgical equipment in the military and civilian surgery until the 19th century.

One tourniquet was recovered from the HMS Pandora (MA102); one tourniquet was recovered from the St. George (7546/153) while two screws were recovered from the Queen Anne’s Revenge (QAR.001).

MA102. Tourniquet had a brass threaded screw with a curved winder and two rectangular plates with extending flanges. Both the upper and lower plates have holes at the end. Both the upper and lower plates have holes at the end which probably had a set of bars. No straps survived. While both of the
upper plates have a single hole, the lower plate of the tourniquet has two holes. The screw and winder is made of metal.

7546/153. Like tourniquet MA102, this one had a brass threaded screw with a curved winder and two rectangular plates with extending flanges. Both the upper and lower plates have holes at the end. While both of the upper plates have a single hole, the lower plate has only one (Campbell & Gesner 2000:92). The holes did not have any bars that would have held the straps. As with the Pandora, the screw and winder from the tourniquet was made of metal. No straps survived.

QAR.001. Two pairs of screws composed of brass were recovered. It’s suggested that the screws may have been used in a tourniquet. Presumably of a screw petit tourniquet.

Whilst the tourniquets from the Pandora and St. George are paralleled in most aspects, there are few metamorphoses. 7546/153 is a reproduction from the original petit tourniquet and still retains the makers brand “Evans”. Evans of London was known for the manufacturing of its tourniquets in the course of the 19th and 20th century. The tourniquet 7546/153 was presumably purchased from Evans of London. The secondary variance is that with 7546/153, a set of rectangular sponges likely made from sponge coral were retrieved. MA102 did not have any brand label nor were any sponges retrieved from its wreck. It makes sense in way that the tourniquet onboard the HMS Pandora was simple as the Pandora was one amongst numerous other wrecks patrolling and operating for the English admiralty in the 18th century. That is the same century that petit tourniquets made its way into European markets. The tourniquet used on those vessels were probably originals while the tourniquets from the 19th century where reproductions from the original. As new materials altered, it would replace older materials. New companies such as Evans of London would use the new technology and materials and would make its way in manufacturing tourniquets and adding its brand as seen with tourniquet 7546/153.

The sponges retrieved from the St. George wreck were alleged to function as soft pads under the tourniquet as to not damage the limb exerted by the pressure of the tourniquet. No sponges were retrieved from the Pandora. Where those sponges part of the tourniquets as tourniquets are part of the amputation kit or whether they had other functions is still contentious.

Onboard some naval ships in 1782, it was a practice for the ship’s surgeon to distribute rudimentary tourniquets made of stiff leather with a linen compress and a wooden cylinder to twist the tape for tightening to avert wounded seamen from bleeding to death while awaiting treatment (Stanley 2003:100 & Bennion 1979:179). The same was likely a practice in 1811 as three sets of silk tourniquet straps were salvaged from the HMS St. George. The straps composed of silk are fascinating as the tensile strength would make it conceivable to exert a lot of pressure to it without worrying about the texture breaking.
3.3 Trephining

From a modern perspective, the art of trephining is valiant and dangerous. Such was the case in the past where the enactment of such surgery had a high occurrence of mortality. Trephining is the secondary capital procedure after amputation from the Renaissance to the 19th century. Being the oldest operation performed by humans, it was commonly advocated and practiced for the treatment of head wounds comprising in the treatment of depressed fractures and penetrating head wounds (Gross 1999:265). Likewise, it was used for therapeutic treatment such as epilepsy and mental illness. By the end of the 18th century, the use of therapeutic trepanning declined and in the 19th century, trepanning was confined to the treatment of traumatic epilepsy only (Gross 1999:266).

Due to the high incidence of mortality particularly when the dura was breached, a considerable debate in the 19th century in medical literature was ensued on when and if to trephine (Dagi, 1997). So perilous was the practice that the primary prerequisite was alleged to be “that the wound surgeon himself must have fallen on his head” (Majno 1975:28). Otherwise as Sir Astley Cooper puts it; “If you were to trephine you ought to be trephined in turn” (Dagi 1997:302).

Historically five approaches for trephining were used. Rectangular intersecting cuts, scrapping of the skull with a flint, cutting a circular groove and lifting the disk of bone, use of a circular trephine and the least but not last method is to drill a circle of closely spaced holes and then chiseling or cutting the bone between the holes (Gross 1999:263). In earliest European trepanned skull from the Neolithic period, holes were made by scraping the bone away with sharp stones such as flint or obsidian. Later, primitive drilling instruments were used to drill small holes arranged in circles in which the bone of the circular hole was removed. It’s not until the late medieval period that the introduction of mechanical drilling and sawing instruments were introduced. In later periods, the trephining instruments varied depending on the provenances. For instance, English surgeons during Napoleonic era tended to use the hand-held T-bar type trephine rather than the brace and bit trephine favored by the Continental surgeons. The T-shaped bore likely was rotated manually to cut through the cranium.

Numerous artifacts would support such case. Onboard man-o’-wars, trephining was used on any sailors with major head trauma. The most common injury was likely falling from riggings where upon landing the individual would have a depression in the cranium. Typically, trephining drills have smooth wooden shafts with tips of hard materials to be able to cut into the bone tidily as possible. The shafts would...
vary in sizes and this is due to because diverse areas of the body would entail different sizes of holes required for the procedure.

The most common trephining instruments probably comprised of a handle trephine, cranial elevator and bone rasp, Hey’s cranial saw, ivory bone brush and a double ended spring forceps. A brush in a trephining kit probably had the purpose of cleaning the area around the hole once it was trepanned in addition to keeping bone particles from getting inside. The most common hair for the brushes of the period were those of horses. The instruments above would have represented the whole trephining set that a surgeon would have had in his possession.

A wooden box with a removable tray was retrieved from the HMS St. George (6000/9661). Recovered from that wooden box were numerous trephining instruments comprising of one bore (6000/9000A), four handles (6000/996E, 6000/996D, 6000/996J and 6000/996F), two shafts (6000/996A and 6000/996B), brush (6000/966G) and a lancet (6000/996H) (Montgomery 2009:89-95) while from the removable tray were six handles (6000/965V, 6000/965U, 6000/965AO, 6000/965S, 6000/965R and 6000/965Q), two shafts (6000/965P and 6000/9650), one brush handle (6000/965W), 6000/9000A. The bore was composed of a number of parts that were not well preserved. The bore had a handle composed of smooth dark cherry wood. In the center of the handle protrudes an oval shaped hole with a smaller square hole passing over the first one. Both ends, embossed, are decorated. The shape is said to be shaped letting the surgeon hold it with one hand while permitting his other hand to be placed on the location of the cut and steadying the patient’s skull. The handle was made to allow pressure to be exerted with one hand (Montgomery 2009:90). To place the handle into perspective, the handle bears a resemblance to that of a bottle opener.

6000/966E. Handle is composed of a smooth dark cherry wood. The handle is said to be made fit onto a shaft of brass or copper. Shafts 6000/996A and 6000/996B were presumably used in conjunction with 6000/996E.

6000/996D. Handle is made of a smooth dark wood. Probably cherry wood. The shape in addition to the wood impressions of the tray shows that they were both functioned by turning. Handle is oval in shape. The implement that went with the handle was probably made of copper which now is decayed. From the impression of the tray from which the handle was recovered, 6000/996D was likely a cranial elevator which functioned to remove depressed bone fragments from the hole.

6000/996J. Handle is made of a smooth dark wood. Probably cherry wood. The shape in addition to the wood impressions of the tray shows that they were both functioned by turning. As with 6000/996D, the handle is oval in shape which also probably was contingent with an implement also made of copper. The tool bit is now decayed. Handle was part of a file or bone rasp. The full implement was probably used to smooth sharp bones or to remove tissues.

6000/996F. Handle is oval shaped and made of oak wood. Because the handle was made of oak, it was also heavier. Being stored on its side inside the box, the tool impression is that of a thin blunt blade. The object likely was a palette knife used with the removal of bone fragments or at bests a probe (Montgomery 2009:95).

6000/996A. Well preserved shaft composed of copper-alloy. Shaft is marginally smaller in size then artifact 6000/996B. It is hallow at the lower half which probably at the time held a cutting implement that would have been secured by a locking mechanism. The simple shafts with no identification of moving parts suggest that both shafts were modest tension mechanism for when pressure was exerted, it kept the cutting tip in place (Montgomery 2009:91).
6000/996B. Also a well preserved shaft composed of copper-alloy. It is hallow at the lower half which probably at the time held a cutting implement that would have been secured by a locking mechanism. The simple shafts with no identification of moving parts suggest that both shafts were modest tension mechanism for when pressure was exerted, it kept the cutting tip in place (Montgomery 2009:91).

6000/996G. The brush is well preserved, had a wooden handle tapered to be held with the fingers and a secondary piece of wood with two rows amassed with six holes each holding 12 tuffs of hair. Amongst the six holes, traces of fine white hair were noticeable. Where the hair originates from is unknown. Each row had a pin that held the tusfs of hair in place, indicating that the hair likely was looped around the pins keeping the hair in place on the wooden block (Montgomery 2009:92).

6000/666H. While most other artefacts had a function related to trephining practices, this object not so much. 6000/666H is a bone cover dyed red and brown. The bone cover was likely held by two iron pins while a blade was probably folded inside. The bone cover was also a bone sheath and would be similar to some type of a modern switch blade. The pins that held the sheath together and the blade all corroded. All is left is a tiny fragment of the base. The red / brownish dye was noted to be caused by oxide concretions that formed in the box (Montgomery 2009:94). Despite 6000/666H being retrieved from within the box, its function was more likely to be of a lancet / scalpel involved bleeding and counter irritation.

6000/965V. Handle made from one piece of wood. The handle is octagonal shaped and stained from the iron oxide. In the middle of the handle is a squared opening where a brass shaft could fit into.

6000/965U. Handle made from cherry wood. In the center there is also a squares hole.

6000/965AO. Handle, which is long and thin and made from wood. One of the ends is roundish. On the end opposite end that is not rounded, a small hole is visible. The hole takes a third of the space of the handle and is where the shaft of the blade originally was inserted. The blade would have been held by two iron pins. What kind of instrument this was is unknown.

6000/965S. Handle made from cherry wood. The handle is bulbous in shape with a carved lip. A shaft would have been inserted where the carved lip is.

6000/965R. Handle made from cherry wood. The handle is bulbous in shape with a carved lip. A shaft would have been inserted where the carved lip is.

6000/965Q. Handle made of cherry wood. This handle is also bulbous in shape but without the carved lip and is less elongated then the two previews handles. It was suggested that this handle functioned in conjunction with a shaft belonging to a probe.

6000/965P. A molded copper alloy shaft. The base is bigger than the 6000/965P.

6000/965O. A molded copper alloy shaft. Similar in size and shape as that of 6000/965P.
3.4 Syringes

Syringes were used to treat a variety of ailments including in the irrigation of the urethral in the treatment of venereal diseases including gonorrhea and syphilis. Syringes were also used in the introduction of irrigation lotions into wounds to clear out foreign objects and to give enemas, one of the treatments for congested or excessively active bowels. One of the most common ailments onboard a ship of the time was constipation due to the typical diet comprising of mostly salted food.

Venereal diseases were very common starting from the age of exploration to the 18th century. Because of lengthy voyages at sea and as soon the ships laid anchor in a port or inlet, the crew usually consisting of mostly men would visit brothels. Needless to say, the crew had suffered from long months of deprivation and that is where many contracted diseases. We did a small case study for instances where the governor of the Island of Tortuga in the support of pirates; to keep the rate of infection down, he was said of having imported over 1,600 prostitutes (Groce 2011:74). The syringe that was recovered from the Queen Anne’s Revenge used to contain mercury, one of the common chemicals falsely believed to be a treatment for syphilis.

Contrasting the eighteenth century where the inoculation of fluids into the body tissue by syringe was used only on corpses in the embalming process, it’s only in the beginning of the nineteenth century where hypodermic syringes were made possible for the administration of drugs and it won’t be until 1853 where the first subcutaneous injection of morphia was given by Alexander Wood (Bennion 1979:169). The plungers in most syringes could be removed to introduce lotion or other liquids to be injected inside the body. The leather washer was to ensure a tight fit between the plunger and the body.

In the seventeenth century onto the nineteenth century, syringes were mostly composed of bone, silver, pewter and brass up.

Three syringes were salvaged from the Mary Rose (80A1741, 80A1560 and 81A5738) one syringe was recovered from the HMS Pandora (MA74), two were recovered from the Queen Anne’s Revenge (QAR1904.000 and QAR308.001) and three syringes were recovered from the St. George (7546/803, 6000/3278 and 6000/642).

80A1741. Syringe is composed of pewter and a bronze pipe and recovered from the barber - surgeon’s cabin. 80A1741 consisted of a barrel, plunger and pipe and a catch. The catch functioned to hold the washer and support for the plunger in place. This enabled the plunger to be removed from the barrel to be filled with ointments and lotions. 80A1741 had a washer which was made of leather and ensured a tight fit between the plunger and the barrel of the syringe.

80A1560. Syringe has a body and plunger composed of brass. It was also recovered from the barber-surgeon’s cabin. 80A1741 consisted of a barrel, plunger and pipe and a catch.

81A5738. Syringe is composed of copper-alloy and has a shorter pipe then the two others. As with the two other syringes from the Mary Rose, it also consisted of a barrel, plunger and pipe and a catch. 81A5738 also had a washer.

MA74. Syringe had a central cylinder made of ivory. It has a damaged plunger shaft at the base of the thread. The syringe has a wooden plunger which was inserted into the shaft. At either ends was a threaded disc. No needles were recovered but probably were rounded and likely made of an ivory component rather than a metallic one (Campbell & Gesner 2000:91). The syringe from the Pandora is well preserved.

QAR1904.000. A remain of two pump clysters were recovered. The clyster is composed of pewter and was noted for having a makers mark. The second pump clyster did not have any maker’s marks. Pump
clysters are different from syringes. Pump clysters would have been used to pump fluids into the rectum of a sick. Pumping fluids that way permitted the body to absorb the fluids rapidly.

QAR308.001. Syringe was composed of pewter. On the plunger loop, it was noted to have a Paris maker’s mark. QAR308.001 was noted of containing mercury during chemical analysis. This suggests that this syringe was a urethral syringe used to treat patients with syphilis.

7546/803. Syringe was made from pewter.
6000/3278. Syringe was made from pewter.
6000/642. Syringe was made from pewter.

3.5 Probes

The fifteenth century would see a new weapon that would require the need for a novel type of surgical instrument. The discovery of gunpowder would effectively see a new type of trauma. Compound fracture, wound contamination, gangrene and even death were the types of trauma that the ship surgeon on boat land and afloat had to deal with. Innovative instruments comprising of probes, bullet forceps and new medical philosophy would become part of the ship-surgeon medicinal chest.

Probes were instruments that were used in the search of foreign bodies such as splinters of wood from the ships, for gunshot projectiles including musket and pistol balls and grape shots or even a fragmented bone that lodged itself inside the wound. Probes were also used to investigate inside deep wounds. Any wounds with foreign bodies had to be explored and the pieces removed. Probes were smooth cylindrical metal instruments, usually made from iron, with a bulb at one end. In conjunction to the probes, a surgeon was likely to have probe scissors to explore inside deeper wounds and a bullet forceps which were used to grasp and remove balls, bones and other foreign materials.

Gunshot wounds to the chest and abdomen were regularly fatal. The shot either from muskets, pistols or even swivel guns likely penetrated the fat layer and entered the chest cavity or intestines. If the foreign object opened the belly and exposed the intestines; peritonitis; inflammation of the peritoneum; would trail followed by death. The extract comes from the “Miscellaneous Works of Tobias Smollett” and anecdotes the exchange between him and a surgeon (Smollett 1851:34).

"The gentleman…asked what method of cure I would follow in wounds of the intestines. I repeated the method of care as it is prescribed by the best chirurgical writers, which he heard to an end, and then said with a supercilious smile, "So you think with such treatment the patient might recover?" I told him I saw nothing to make me think otherwise. "That may be," resumed he; "I won’t answer for your foresight, but did you ever know a case of this kind succeed?" I acknowledged I did not, and was about to tell him I had never seen a wounded intestine; but he stopt me, by saying, with some precipitation, "Nor never will! I affirm that all wounds of the intestines, whether great or small, are mortal."

If the employed surgeon couldn’t see nor feel the foreign material inside the wound with his probe or probe scissors, then it would have been impossible for the surgeon to extract the foreign object. Wounds to the limbs could also be fatal because of infection. In the sixteenth century, there was a myth that balls fire from muskets and pistols were poisoned; a myth that Thomas Gale and many others would disprove. There was also a myth that suggested that the bullets were sanitized when they left the barrel. Bullets many times would pull strands of soiled clothes into the body making infection ever more real.

Many chronicles were documented about splinters and mortality from splinters. The case to threat splinter wounds would have been the same as those of the canon and gunshot wounds. The history of Nova Scotia illustrates the horror that an opponent’s gun projectiles could do onto a company (Blupete 2010).
During the battle, the air was thick with savage wood splinters sent flying by the impact of the cannon balls shot through the wooden bulwarks. Projectiles of every kind embedded themselves into human flesh; the slaughter was appalling. We have some details of the wounds suffered by the Shannon’s purser, George Aldham, grape shot in the lower part of the abdomen (lived one hour)... Private Dan Neil (Marine), splinter wound in the breast, several sabre wounds, bayonet wound in the belly -- the list of these men and their awful wounds goes on and on. Upwards to a 100 men on both sides who died on account of this twelve minute battle, all with the same sort of dreadful wounds.

Four probes were recovered from the Mary Rose (80A1579, 80A1563, 80A1917 and 80A1918) and six probes was recovered from the St. George (6000/965AL, 6000/965Y 6000/965AQ, 6000/965AP, 6000/965AI and 6000/965A). No probe scissors and no bullet forceps were recovered from any of our ships.

80A1579. Object is composed of boxwood and is a decoratively turned handle. The handle has five incised bands. It was suggested that it was made to fit a probe or specialist seton needle.

80A1563. Object is similar to handle 80A1579 in composition. Unlike the first handle, this one is lavishly turned. The end is more or less spherical and has a copper-alloy collar. As with the first handle, 80A1563 may be a handle or probably a dental instrument.

80A1917. Object is composed of wood. It is ornately turned into a small dome and is made to fit a probe, hooks or specialized needles.

80A1918. Object is composed of boxwood and is similar to handle 80A1918. It has some copper-alloy metal banding and possibly fitted with a probe.

6000/965AL. Object is likely to be a probe due to the blunt tip at the end. More precisely a bullet probe. The instrument is composed of lead. At one end there is a hole that passes through while the other end is blunt and seems to be part of the molding.

6000/965Y. Handle composed of two worked pieces of wood. The wood worked into a handle is held together by three iron pins which passes through the wood and the metal shaft. The iron pins were inserted near the end of the handle, near the front of the handle and in the middle of the handle. This handle was suggested to be either part of a probe or part of an amputation knife.

6000/965AQ. Handle was recovered from tray 6000/965AN. It is short and thin in shape and has a hole on top which would have held a shaft of sorts. Due to the way in which the shaft was affixed to the handle, it suggest that the instruments was not a cutting implement but a probe of sorts or an instrument to that would hold the skin and tissue open.

6000/965AP. Handle was recovered from tray 6000/965AN. It is short and thin in shape and has a hole on top which would have held a shaft of sorts. Due to the way in which the shaft was affixed to the handle, it suggest that the instruments was not a cutting implement but a probe of sorts or an instrument to that would hold the skin and tissue open.

6000/965AI. Handle made from cherry wood. It was bulbous shaped. While the function is unknown, it was probably part of a probe instrument.

6000/965A. Handle is similar to 6000/965AI handle. It is made from cherry wood. It was bulbous shaped. While the function is unknown, it was probably part of a probe instrument.
3.6 Trocar Spikes and Catheters

Trocar spikes also known as cannulas were used to release trapped fluids from inside the body. Trocars were also known to be devised to drain liver abscesses, gall bladders and maxillary antra and to perform tissue biopsies. Trocar spikes likely came in two sizes, one small and one large which permitted the surgeon to punch a hole inside the body cavity. The external piece could then be removed leaving only a hallow cylindrical tube inside of the body. This hollow tube would allow liquids and gasses to be released.

Trocar spikes with rudimentary iron tubes with openings were employed from the medieval times until the eighteenth century (Kirkup 2005:237). The tubes were used to deliver hot iron cautery’s safely into the mouth, rectum or other cavities in order to mitigate scorching the healthy contiguous tissue. The tubes could be composed of other materials as well including metal, glass and rubber. The end of the nineteenth century would see rubber tubes replacing the other materials.

Catheters like that of trocars are short tin hollow tubes likely made of silver and used to be inserted into the urinary tract to get into the bladder or inserted directly into the bladder to drain urine. Catheters could also be used to apply some solutions to alleviate strictures or ulcers. Genitourinary diseases were a common disease in the past. The Romans were known to use S-shaped catheters; which were mentioned to be more comfortable for lengthy retention (Kirkup 2006:232). The S-shape catheter would be transitioned into the J-shape until the eighteenth century where the S-shape catheter was reintroduced.

Catheters usually came in cases with sets of twelve different gauzes. The male catheters are usually 12 inches long with a curvature at the end that is also perforated. The catheter would have been inserted into the male urinary tract with the wire removed as to let the fluids to pass into the tube via opening at the tip and out of the body. This catheter is likely of a lower end of the cost scale as most refined tools are composed of silver and other precious metals. But catheters specifically used on women also exist. For woman, the catheter are usually shorter, wider and straight and have been mentioned to have been employed before the male catheters.

One catheter and two trocar covers were retrieved from the St. George (6000/965G, 6000/965AB and 6000/965AH).

6000/965G. Caterer was identified as a male retractable catheter easily recognized by its curved tip. It is composed of a metal wire that was covered in a woven material that is elastic. At the end of the tip, there is a vent to drain the fluids.

6000/965AB. Object is a copper cover which would have covered the exterior of the trocar spike.

6000/965AH. Object is also made from copper and is a cover which would have covered the exterior of the trocar spike.
Chapter 4 - Apothecary Instruments

4.1 Mortars and Pestles

Mortars and pestles were used by both cooks and apothecaries for crushing roots, dried herbs and earths. Up to the late eighteenth century, the mortars and pestles were made of bronze, copper-alloy, bell metal or various forms of stones and marbles as embodied by mortars retrieved from many wrecks. The mortars made from stones and earthenware’s were susceptible to corrosion and were prone in shading particles contaminating the contents (Pigott 1995:26). The difficulties were overcome in 1780 when Josiah Wedgwood formed his biscuit porcelain. Porcelain mortars were known to be acid-resistant and so smooth that it was said that no fragments could rub off (Pigott 1995:26). Because mortars are similar in both shapes and materials to those of bells, it would not be unforeseen if the mortars were originally manufactured by bells-maker or similar craftsmen.

The mortars were probably manufactured using molds in which the metal could be poured into. Once cooled, the final product would be a piece that is continuous and made of a single piece of metal. At the end, the manufacturers mark would be stamped onto the surface of the mortar.

One mortar was retrieved from the Mary Rose ((80A1672), two mortars were recovered from the Batavia (BAT 562 & BAT 457), one from the Queen Anne’s Revenge (QAR-001) and one was recovered from the Pandora (MA93). One pestle was also recovered from the Queen Anne’s Revenge. The pestle was not recovered with the mortar so it may or not belong with the mortar nor could it belong to the barber-surgeon. The other wrecks had no pestles recovered but probably would have one that would have matched the mortars.

80A1672. Mortar was composed of copper – alloy. It was recovered with other medical artefacts. On the body, three horizontal ribs are visible with four external handle. The handles are of two types. Two are roundish while the two others are square. One of the square has another ring through it suggesting that the mortar could be suspended over the chaffing dish (Castle & Kirkup 2005:202). On the outside on the body, two crosses with an incision incorporating the figure ‘4’ is visible.

BAT 457. Mortar made of bronze. Mortar had floral decorations with some inscriptions. The inscription reads “AMOR VINCIT OMNIA ANNO 1625”. The inscription is incised in Latin reading “Love conquers all things”. Mortars of similar composition and sizes were retrieved from another VOC ship, that of the Vergulde Draeck ship which supports the theory that mortars of that genre where common apothecary items onboard a Dutch East India Company ships.

BAT 562. Mortar composed of bronze. While BAT 457 was well preserved, the same can’t be said about this mortar. The mortar has been recovered fragmented into five pieces. Due to the incomplete state of the artifact, the full inscription does not survive. Letters ‘OMNIA...Z’ are what is left. Another fragment, fragment BAT 625 is believed to be a fragment that fitted like a zig jaw puzzle to the five pieces of BAT 562. Piece BAT 625 is poorly preserved. Upon closer analysis of the oxidized surface, scarcely inscriptions reading “AMOR...VIN we noticed. The inscriptions supplemented the words absent from the five other fragments making a match. The mouth diameter of that piece was also measured disclosing similarities to the measurement of BAT 562. The piece BAT 625 belonged to the five other pieces making the BAT 562.

*QAR – 001. Both the mortar and pestle were composed of cast brass but of different composition. The pestle was not recovered with the mortar but rather from another unit during another season work.
MA93. Unlike the mortars recovered from the Batavia, from the Queen Anne’s Revenge and from the Mary Rose, MA93 is made of marble. MA93 has four equidistant ears spaced around the rim and one of the ears having a pouring channel on the upper surface. Despite having the inner surface pockmarked and scratched suggesting that surgeon Hamilton or another surgeon used a pestle to crush some ingredients for an ointment, no pestles were retrieved (Campbell & Gesner 2000:92).

4.2 Spatula

Spatula’s composed of diverse materials, were utilized in the mixing of ingredients, ointments, glue, pill masses and etc. Four spatulas were recovered from the Marie Rose wreck (80A1557, 80A1587, 80A1915 and 80A1927) and one spatula was recovered from the Kronan wreck (Kro1).

80A1557. Spatula composed of pine wood. Similar to a lollipop.

80A1587. Spatula composed of pine wood. Similar to a lollipop.

80A1927. Spatula composed of pine wood. Similar to a lollipop.

80A1915. Unlike the three other spatulas, this one is made of beech wood. It is also broken but likewise would be similar to a lollipop.

Kro1. A small wooden spatula was also retrieved from the Kronan wreck. That spatula when retrieved was inside a bottle. This would suggest that the barber-surgeon was probably mixing something inside of the bottle suggesting that the ingredients were either liquid or waxy and gluey.

4.3 Spoon

Wooden spoons could be used either to feed the sick or to function as a measuring device for specific amounts. One spoon was recovered from the Marie Rose (80A1675).

80A1675. One spoon was recovered from the Marie Rose. That spoon is composed of alder wood and was noted to be carved to fit the right hand. A carved ‘U’ on the back of the spoon where the handle meets the bowl is visible. This spoon has been suggested to be used to feed the sick a specific amount as it was noted that wooden eating spoons were commonly carved circular bowls.

4.4 Weight

Weights have been used since the beginning of civilizations. Egyptians weights were usually composed of granite or other natural stones. As periods passes and new innovation such as metallurgy comes by, so does the instruments such as weighs which alter from its natural composition to lead and bronze. Natural stones were still used by the Romans while the Greek continued to use lead and bronze. The natural weights used by the romans were often polished serpentine. Different provinces of the medieval age were known to use different composition of their weights. For instance, in medieval Europe, brass and iron or even the combination of the two metals were used for the weights while the Islamic countries used glass weights. In the 18th century, the most common material for weighs was brass, pewter and iron. Just as with the materials in which the weights were composed of, weights also altered in shapes. Weights could usually be found with assortments of shapes. Spheres, hemisphere, squares, disks, cubes and least but not last, polygonal shapes. Another common shape that was thought to be of convenience
where shaped like cups. The convenience is that they can be nested inside each other like a Russian doll making transportation and stowing much simpler.

Unlike other wrecks, the *Queen Anne’s Revenge* is the only wreck to have weights recovered from it. Like many other artefacts of other wrecks, the question is as to why. The answer to that question can be actually obvious. Before 1805, barber-surgeons had to own their own instruments including apothecaries and drugs. It wasn’t until 1805 where that rule change. The QAR dates a century before that rule was changed and the navy started to give the apothecary instruments which belonged to the ship. Whether the weights were part of the ship’s furniture or that of the surgeon is unknown. What is also unknown is whether those weights were part of the materials that was seize from the French or whether it’s something acquired and brought onboard by a pirate. Talking about pirates, pirates surgeons did not have that ability as with the majesties ships where the surgeons were given some furniture’s without charge or where the surgeons could just walkthrough a store and acquire the instruments as per regulation. One would not see a pirate surgeon just walk to the store and ask to have a balance and weights.

Either way, weights depending on the country of origin might have different values than other countries. Since the QAR was a French merchant ship, the standard unit was known in French as “livre” or pound in English. The pound was equivalent to 489 gm and its subdivision were the marc, once, gros, denier and the grain. Below is a table with weights variety from other provenances.

<table>
<thead>
<tr>
<th>Provenance</th>
<th>Standard Units</th>
<th>Equivalent</th>
<th>Subdivision</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>Livre</td>
<td>Livre = 489 gm</td>
<td>marc, ounce, gros, denier, grain</td>
</tr>
<tr>
<td>Germany</td>
<td>Marc</td>
<td>2 marcs = 1 pound = 467 gm</td>
<td>loth, quint, pfennig</td>
</tr>
<tr>
<td>England</td>
<td>Troy</td>
<td>Troy (pound) = 12 ounces</td>
<td>penny, grain, drachm, scruples, ounces</td>
</tr>
</tbody>
</table>

Table 12: Weights and the varieties

QAR2590.000. Seven nesting cups have been excavated from the *Queen Anne’s Revenge*. They are all similar in shape but altered in sizes permitting them to be nested inside each other. This permitted the weight to be carried compactly. The weights from the QAR are composed of bronze, one of the common materials of the time. Despite having weights retrieved from the QAR, no one is certain as if the weighs functioned in the apothecary practice or if they had other functions. It’s vital to remember that the QAR was a pirate ship until it sank leaving materials scattered over the ocean floor. The weights could have functioned as a mean to distribute equal share of loot amongst the crew. If the weights were indeed used by the pirate barber-surgeon, its function would be that of dispensing and to measure a quantity of drugs or ointment to be given to a sick pirate. The weights were likely to be used with a portable balance, in which case was not recovered.

4.5 Needle

Needles were likely used in sewing linen bandages likewise suturing ends of the underlying materials. Such approach is a common practice since Roman times and would have been composed of either bones,
iron, steel or wood. Needles were likewise used to close wounds after the completion of an operation. The surgeons probably had numerous of those needles in their medicinal chest. Written in the sixth century BC, Ayuvedic Sanskrit text *Sushruta Samhita* listed some contents necessary for surgery. Including in the list were a variety types of needles including triangular, round-bodied and straight needles (Kirkup 2006: 179). John Woodall also advises in his publication the “Surgeon’s Mate” for surgeons to include at least three needles well-armed and pointed to the plaster box. The number of needles required to be carried is unknown. It was suggested that bone needles were not used for surgery but rather to hold bandages together (Kirkup 2006:176). Historian John Kirkup mentioned;

"Eyed ivory and bone needles…are unlikely candidates for wound closure, as significant bulk around the eye combined with a doubled-over thread would have precluded easy penetration of the skin; the resistance encountered would have been considerable and probably would have broken the eye."

Ambroise Paré explained how to properly use a needle and thread. This is what Paré inscribed;

"must have a smooth needle with a thread in it, having a three square point, that so it may the better enter the skin, with the head of it somewhat hollowed, that the thread may lie therein; for so the needle will the better goes through.” – Ambroise Paré

A waxed silk thread was probably the material used in conjunction the needles for stitching the wounds up. Silk threats were raw materials that were not widely produced in England. Silk thread for suturing is still used in the modern age in conjunction with nylon cordage. John Kirkup also emphasized that there were no needles manufactured specifically for surgery at the time. The surgeon had to acquire the needles that were made for sewing clothes, sails and leathers (Kirkup 2006:176). The needles were used in conjunction to a cannula. When in use, the tip of the cannula which usually has a small opening and a small window is held up against the lip of the wound while the surgeon would trust the needle through the tissue to that opening which draw it together with the thread. The main purpose of the cannula is to help to hold the opposite side of the wound steady while the needle was poked into the opposite side of the skin. John Woodall refers the cannula as a “stitching quill”. The cannula when not in use functioned as container for the needles.

One needle was recovered from the *Marie Rose* (80A1733) and one needle was recovered from the *Queen Anne’s Revenge* (QAR232.014). 80A1733. Needle is composed of boxwood.

QAR232.014. Needle composed of silver. It was suggested that it could have been used in surgery.

### 4.6 Chaffing Dish

One chaffing dish was recovered from the *Mary Rose* (80A1626). Chaffing dished were likely used onboard numerous naval and merchant vessels for both cooking and medical applications. The chaffing dish was likely used to warm the oils and to dissolve the certos (USN Medical Bulletin 1921:581).

80A1626. A cast copper-alloy chaffing dish was retrieved from the *Mary Rose*. The rim of the dish has eight crenellations and a succession of ventilation holes in the center of the body. The holes are arranged in eight groups and within each group are five holes arranged in an ‘x’ pattern. Two larger opposite holes divide the smaller holes across the central line. The dish is suggested to have been used as a charcoal brazier to heat a suspended pot. During an experiment with a replica, it was noted that this dish had to be used with a suspended pot above it. During the experiment, the pot had to be raised above the charcoal as placing a pot directly in the dish prohibited sufficient air from reaching the coals and smoldering them too slowly.
4.7 Mallet

With heavy ships gear onboard a vessel, it was uncommon for a crew to have his toe or finger squashed to pieces. It was unlikely that there was a treatment or any healing of it; so the barber-surgeon that is employed on the ship had to take it off. Sometimes, a tooth that hurt also had to be taken out.

A mallet in conjunction with a chisel; both multifunctional items onboard a ship; were probably the instruments that the ship surgeon used. Naval surgeon John Moyle gave many advices to sea surgeons on how to deal with many of the injuries and illness one mind find at sea.

In the case for the finger or toe that had to be taken off; Moyle advises the surgeon to place finger and toe on the side of a table, bench or any other surfaces, then take the chisel and place it on top of the finger or toe. Then with the stroke of the mallet onto the chisel, the finger and toe should come off (Moyle 1703:139). Moyle mentioned in his publication that the flesh does not have to be divided as the chisel divides both, the flesh and the bone. The surgeon or one of his mates then would treat this as an amputation and deal correspondingly by adding a small pellet of dry lint at the end of the bone. Then to add a mix of pulverized Galen; either dry or mist; before adding a compressed bandage on top (Moyle 1703:139). Woodall in his publication commented that the mallet was to be employed in amputation only and to be used only on the fingers and toes.

A similar method was probably used by the ship surgeon to remove a tooth or even employed in cranial surgery. Kirkup mentioned in his publication that mallet employed in surgical operations were not apparent before the late Roman period (Kirkup 2005:51). In the sixteenth century, Ambroise Pare penned down:

Moreover I have thought good here to give you the figures of chisels, scrapers, pincers, together with a leaden mallet, because such instruments are not only very necessary to take forth the scales of bones which are broken, but also to plain and smooth those which remains whole” – Ambroise Pare

Pare’s mallet was noted to have a short handle and a large head in which the mallet could be employed on a small area but still permit powerful blows.

One mallet was recovered from the Mary Rose (80A1743). However, the mallet could have been borrowed from the carpenter as it was a common practice in the time. It was mentioned for instance that in 1740, surgeon Gooch removed a bony corn using a borrowed carving gouge and a turner’s chisel in conjunction with a mallet (Kirkup 2005:5).

80A1743. Small imputations of the fingers and toes were done using mallets amongst other implements. One of those mallets was recovered from the Marie Rose. Such approaches were unlikely to be practiced for chief amputations of the limbs for it would chatter the bones thus further complicating the procedure. The mallet is compound with an elm head and an oak handle.
4.8 Prosthesis & Artificial Limbs

The Egyptians were noted to be the first to engineer prosthetic limbs with the testimony of the archaeological discovery of an artificial toe belonging to a female mummy. The artificial toe was composed of wood and leather. Volunteers without a big toe were chosen to do an experiment to see whether that prosthetic toe was used to walk around in sandals as it was commonly done in Egypt or whether it was used only in burials (Gannon 2012). The volunteers proved the efficiency of using the prosthetic limb with the sandals making walking easier. This prosthetic toe is now housed at the Egyptian Museum in Cairo.

In Italy, a prosthetic leg was unearthed in Capua in 1858. Unlike the prosthetic toe in Egypt, the leg was composed of bronze and iron surrounding a wooden core. The artificial leg was noted to be used by an amputee below the knee. There are two historical stories which talks about the use of a prosthetic leg. The first story was penned down in 424 BC by Herodotus. Herodotus wrote the account of a Persian peer who was about to be condemned for death but managed to escape by amputating his foot. By using a wooden filler, the escapee managed to walk to the next town situated 30 miles away (Norton 2007).

The secondary account was penned down by scholar Pliny the Elder about a Roman general during the second Punic war who required his right arm to be amputated. The general got himself made a prosthetic iron hand that was shaped in such way to be able to hold the general’s shield and permitting him to return to battle (Norton 2007).

In the early medieval days, little if none advancement were done on prosthetics. A hand hook or peg leg were the only common advances. It was noted that most of the artificial legs and arms were there to hide irregularities or to hide injuries sustained in a battle but not to be able to function as a real limb. Only a wealthy individual could meet the expense of to have a peg leg or hook knife.

From the early 1500’s, prosthetic limbs made a came back. Gotz von Berlichingen was noted for having a pair of prosthetic advanced iron hands that could be manipulated. Those artificial hands had releases and springs and were suspended by leather straps. In 1512, an Italian surgeon who travelled to Asia witnessed of a bilateral upper extremity amputee. What made that amputee unique was that he could use his artificial hand to do the chores of a real hand.

The 17th century to the 19th century would also see a revolution in artificial limbs. In 1696, the first non-locking below knee prosthetic limb was developed by Pieter Verduyn which would be the blueprint for modern devices. In 1800, the “Anglesey leg” which will be commonly referred to the “Selpho Leg” by the Americans was developed by James Pott. The artificial limb was composed of a wooden shank and socket, a steel knee joint and an articulated foot. The foot was controlled by catgut tendons from
the kneed to the ankle. In 1843, the Selpho leg was updated by Sir James Syme. He added anterior springs, made the exterior smooth and concealed the tendons. In 1863, the first artificial limbs with a suction cup, polycentric knee and a multi-articulated foot was invented by Dubois Parmlee (Norton 2007).

Three prosthetic limbs were recovered from the *St. George* (7546/952, 7546/1002, and 7546/483). Did other ships carried prosthetic limbs is unknown.

7546/952. Artificial limb still blank with no cups. If needed, the carpenter could work on this limb using measurements from the amputee.

7546/1002. Limb is composed from one section of wood. It is cylindrical in shape and has a wider top getting narrower at the base. The top was hallowed out into a smooth half-circle while the rim is thinned out and smoothed into the shape of a cup. As with all prosthetic limbs, the narrower part would be in contact with the ground while the top is where the amputee would insert their stump. It was suggested that the carpenter manufactured those.

7546/483. As with limb7546/1002, it is composed from one section of wood. It is also cylindrical in shape and has a wider top getting narrower at the base. The top was hallowed out into a smooth half-circle while the rim is thinned out and smoothed into the shape of a cup. As with all prosthetic limbs, the narrower part would be in contact with the ground while the top is where the amputee would insert their stump. It was suggested that the carpenter manufactured those.

The top where the amputee’s stump was inserted seems to be worn out suggesting that this prosthetic limb was probably in use by an individual onboard the *St. George*.

4.9 Bandages and Sponges

Bandage rolls and sponges were probably required to be part of the medicinal chest as they are mentioned in many publications. Sometimes because of poor economy, the regulations prohibited lint from being used and ship surgeons had to make do with sponges. However; because the supply of sponges was so limited that surgeons were said to have to reuse the sponges over and over again (USN Medical Bulletin 1921:596). It would be not surprising if the bandages had a similarity to the sponges were they were so limited that they were reused.

The ship surgeons employed by the East India Company were provided some quantities of old linen to be used as bandages. The barber-surgeons were careful not to take those provided bandages for granted and usually took some of their own (Bruijn 2009:68). The linen was rarely dried as they were probably soaked in a mixture of honey and wine.

Eight bandage rolls were recovered from the *Mary Rose* (80A1558, 80A1674, 80A1798 and A1892-96). As noted previously, bandages were probably part of the surgeon medicine chest. John Moyle mentions in his publication about partitions of the dressing box with ample space for plasters that are ready spread but he also mentions of a hanging drawer under the middle of the top partition where linens bandages saturated with ointment are kept (Kehoe 2003). Just as with the sixteenth century, it looks
like the barber-surgeons of the eighteenth century would have had similar pieces of kit than that of the marry rose.

80A1558, 80A1674, 80A1798 and A1892-96. Bandages were retrieved from the medicinal chest of the Mary Rose. The rolls, primarily thought to be of unguent, were later revealed upon closer analysis by Brendan Derham to be rolls of linen bandages saturated with assortments of oils and resins (Castle 2005:207). Being so, they are ready made plasters. While no bandage rolls where retrieved from other wrecks, it is not as they did not have any. On the other hand, bandages were likely used but disintegrated over time. It’s hard to tell what kind of bandages were used but due to historical sources, images shows the different types of bandages and how they were used.

4.10 Feeding Bottles

Feeding bottles were likely not to be a common item inside a barber surgeon’s medical chest in the earliest time. Hitherto, one was retrieved from the chest of the Marie Rose (80A1555).

80A1555. The bottle is similar to that of an infant feeding bottle in which a lid with a nipple can be placed over the body by pushing it firmly into place (Mary Rose Trust 2005:212). In contrast to the seventieth century whereas the feeding bottles was used in feeding infants, the one salvaged from the Marie Rose was used purely in nurturing the sick in addition to those with facial injuries. No similar bottles were salvaged from other wrecks which begs the question of whether other wrecks did indeed carried one and it did not survive in the course or the one on the Marie Rose was an exceptional case in which the bottle was brought specifically by the surgeon as he assumed it would be a convenient item for feeding the sick. Artificially feeding objects have been common for thousands of years. Numerous objects have been utilized in the aid with the feeding by means of spouted cups also known as “pap boats”, beakers, ceramic, and wooden or pewter spoons. Because infants have evolved to suck on nipples for nutrition’s by breast feeding, the above methods of using such objects have been continued until the production of the feeding bottle in the 16th century. Feeding bottles for feeding those who have facial injuries were non-existent in the past but could have been substituted by others objects like spoons or kettles. Numerous artefacts are retrieved from wrecks all the time but knowing the purposes those objects plays onboard and whether surgeon’s used those objects for feeding purposes is unknown as the archaeological evidence is not clear. However, it’s more likely that surgeons did have to deal with facial injuries in the past and that objects like spoons and beakers were used for such purpose. It is likely that ship surgeon from the Mary Rose adapted the idea of using an object whose sole purpose was to feed infants and altered it into the feeding of sailors whose injuries were facial or those who were too sick to feed themselves.

Feeding bottles were composed usually of two parts, the main container with an opening narrowed at one end and a teat. The main container of the bottles could be made of multitudes of materials including glass, terra-cotta, pewter or tin. The bottle 80A1555 was made of wood, likely of maple wood. Despite the manufacturing process of the main bottle being debated, Jo Castle theorize in the fourth chapter of ‘Before the Mast: Life and Death aboard the Marie Rose’ the theoretical approaches likely taken in the manufacturing of the bottle retrieved from the Mary Rose. It is said that a feeding bottle is an exclusive turned piece in Britain during the Tudor period making bottle 80A1555 even more important. Ensuing is the three theoretical approaches in manufacturing a feeding bottle as inscribed by Castle. All approaches below can be consulted in in the Mary Rose publications (Mary Rose Trust 2015:213).
1\textsuperscript{st} Theory - Whilst the container is left amid centers on a pole lathe and hallowed out leaving an upright ‘core’ to support the work on the center. Once the hallowing is finished, the core is retorted out leaving an exclusion scar which was likely cleaned up by the means of the turning tools.

2\textsuperscript{nd} Theory – Later centuries saw containers held on the lathe from on end only by a ‘chuck’ which removes the need in leaving a core given the turner ample room in hallowing the inside of small containers. This approach was used extensively in the late seventeen and eighteenth century to make dispensers for sugar and spices which were similar to that of the feeding bottle.

3\textsuperscript{rd} Theory – The most likely theory of manufacturing the bottle was to hallow the bottle by means of boring the bulk of the material whilst the drilled base was expended by hand using a hooked knife. With the knife inserted down the bored hole, the bottle could be rotated by hand against the blade or vice versa.

The secondary parts found within the feeding bottles are teats. The teats have a flow pierced tip which could be composed of numerous materials. The tip usually resembles the shape of a nipple which makes sense as infants have a natural habit of sucking on the nipples of their mothers. The tip usually was composed of the same material that the main container was composed of with a sponge or fabric of sorts placed on top of the tip to mitigate the child from injuring the gums during the feeding. The teat belonging to object 80A1555 was constructed using the same wood as the rest of the container, maple wood. No fabrics or sponges were retrieved; which likely broke down to pieces while underwater.

As with an infant, the ship surgeon likely had a recipe to feed to those in need. After the ingredients where prepared and added into the container, the surgeon or one of his mates would feed the sick by putting the teat into the mouth letting that sailor eat. Due to vacuum inside the container, the sick would likely have to suck into the bottle to assert ambient pressure on the inside and outside letting the ingredients to flow free. The surgeon of the HMS Goshawk inscribed in his journal;

‘He boils the tea for the sick mess in the ships copper’. He also pens that apparently the tea was not savored by the sick suggesting the supply of a tea pot with which he could ‘infuse the tea and utilize the tea-pot as a feeding cup’ (unknown 1903:139).

\textbf{4.11 Scissors}

Many historical sources illustrate scissors. Ambroise Pare for instance illustrates linear cutters; similar to pliers where the blades are oblique and likely used in the amputation of fingers. Both Woodall and Guillemeau illustrate comparable dismembering cutters as that of Pare and Garangeot illustrated both; straight and curved bladed scissors (Kirkup 2005:424). He also illustrates linear bone clippers.

The interpretation on Albucasis of al-Zahra in 1000 AD by Spink and Lewis attributes the use of scissors in surgical applications to the Arabic practitioners. It was noted that Albucasis identified at least three pair of scissors; some with sharp and blunt tipped blades and some where the blades are shaped in a “C” form (Kirkup 2005:422). The scissors can be straight, angled or curved. The angulation can involve either the handle or the blade.

Regardless of Spink and Lewis attributing the employment of scissors in surgical applications; the use of scissors have been mentioned in historical sources dating from the first century AD (Kirkup 2005:422). The Greek medical doctor and philosopher Aulus Cornelius Celsus cited the employment of scissors to cut hair and to expurgate prolapsed festering omentum after an abdominal injury while in the sixth century; the translation of Paulus by Adams mentions the employment of scissors for circumcision and for the expunge of penile growths.
It was noted that the length of the cutting section distal to the blade relates to the function of the scissor. From the manufacturer Down Bros and Mayer & Phelps Ltd; 104 dissimilar scissors that were reproduced in scale drawing with named function were analyzed (Kirkup 2005:425). The length of the blades ranged widely from 31.8 cm to 8.3 cm. It was said that by grouping the scissors according to specific operations, the length of the blade closely relates to the operations. It was also suggested that the curvature, angulation and the percentage of blade length all could relate to the function of the scissors as illustrated in table 12.

The scissors were also analyzed by means of the percentage of the total blade length ratio. Scissors with a higher percentage were employed in cutting long sections of tissue while blades with a lower percentage were employed to cut shorter sections of tissue. Scissors with asymmetrical blades were said to be employed in cutting sutures, bandages and plasters and were also noted of having one longer probe – pointed blade that would be used to cut the materials without injuring the adjacent tissue (Kirkup 2005:426).

Two pair of scissor was recovered from the US Scorpion (99-69-AE and SCORP-2011-53) and one pair was recovered from the Queen Anne’s Revenge (QAR3291.000). Paradoxically, both scissors from the USS Scorpion originated from Sheffield, England and were manufactured by Haugue & Nowill; which were likely the silver firm.

<table>
<thead>
<tr>
<th>Type</th>
<th>No.</th>
<th>Av. Length (cm)</th>
<th>Av. Blade length</th>
<th>Type</th>
<th>Blade percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominoperineal</td>
<td>2</td>
<td>31.1</td>
<td>29.4%</td>
<td>30% +</td>
<td>43.8</td>
</tr>
<tr>
<td>Embryotomy</td>
<td>2</td>
<td>29.9</td>
<td>27.3%</td>
<td>Rectal</td>
<td>36.0</td>
</tr>
<tr>
<td>Vagotomy</td>
<td>2</td>
<td>28.7</td>
<td>23.9%</td>
<td>Bladder</td>
<td>33.3</td>
</tr>
<tr>
<td>Sympathectomy</td>
<td>2</td>
<td>24.8</td>
<td>22.8%</td>
<td>Ovariotomy</td>
<td>33.1</td>
</tr>
<tr>
<td>Bladder</td>
<td>3</td>
<td>23.7</td>
<td>33.3%</td>
<td>Eye, enucleation</td>
<td>32.7</td>
</tr>
<tr>
<td>Uterine</td>
<td>5</td>
<td>21.0</td>
<td>24.0%</td>
<td>Minor operation</td>
<td>31.7</td>
</tr>
<tr>
<td>Ovariotomy</td>
<td>6</td>
<td>20.6</td>
<td>33.1%</td>
<td>Nasal</td>
<td>31.1</td>
</tr>
<tr>
<td>Bone</td>
<td>2</td>
<td>19.5</td>
<td>28.4%</td>
<td>Abdominoperineal</td>
<td>29.4</td>
</tr>
<tr>
<td>Tonsillar</td>
<td>7</td>
<td>19.2</td>
<td>23.2%</td>
<td>Bone</td>
<td>28.4</td>
</tr>
<tr>
<td>Rectal</td>
<td>3</td>
<td>18.4</td>
<td>36.0%</td>
<td>Embryotomy</td>
<td>27.3</td>
</tr>
<tr>
<td>Nasal</td>
<td>5</td>
<td>17.1</td>
<td>31.1%</td>
<td>Stitch</td>
<td>26.9</td>
</tr>
<tr>
<td>Bandage</td>
<td>5</td>
<td>17.0</td>
<td>43.8%</td>
<td>Plastic</td>
<td>25.8</td>
</tr>
<tr>
<td>Mastoid</td>
<td>3</td>
<td>16.4</td>
<td>25.1%</td>
<td>Mastoid</td>
<td>25.1</td>
</tr>
<tr>
<td>Cleft-palate</td>
<td>11</td>
<td>16.0</td>
<td>24.2%</td>
<td>20-25%</td>
<td></td>
</tr>
<tr>
<td>Minor operation</td>
<td>15</td>
<td>15.5</td>
<td>31.7%</td>
<td>Cleft palate</td>
<td>24.2</td>
</tr>
<tr>
<td>Plastic</td>
<td>6</td>
<td>14.1</td>
<td>25.8%</td>
<td>Uterine</td>
<td>24.0</td>
</tr>
<tr>
<td>Stitch</td>
<td>3</td>
<td>13.7</td>
<td>26.9%</td>
<td>Eye, general</td>
<td>23.6</td>
</tr>
<tr>
<td>Eye, enucleation</td>
<td>4</td>
<td>10.2</td>
<td>32.7%</td>
<td>Tonsillar</td>
<td>23.2</td>
</tr>
<tr>
<td>Eye, general</td>
<td>18</td>
<td>9.6</td>
<td>23.6%</td>
<td>Sympathectomy</td>
<td>22.8</td>
</tr>
</tbody>
</table>

Table 13. Scissor’s blade percentage

Table 14. Scissor’s blade length
Chapter 5 – Apothecary Containers

5.1 Earthenware

The stowage of allotted and prepared medicinal ingredients was vital for its preservation. The most common type of containers were earthenware’s. In his book *De Materia Medica 50-70 AD*, Pedanius Dioscorides inscribed instruction on the containers needed to keep the drugs (Dioscorides 2000). The following is what Dioscorides penned down:

“Preparation Preparations that contain moisture require substantial containers from materials such as silver, glass or horn. Even thick ceramic containers are acceptable, and even wood, especially boxwood. Brass receptacles are ideal for eye medicines, liquids, and preparations.” Compositions of such containers could be anything from earthenware’s, stone, ceramic and alabaster pots. The containers could also be glazed, usually with tin or lead glaze or unglazed and decorated and left simple. Any vessels that contained liquid or moist pastes had to be glazed. Dried contents could be kept in either one of the vessels. Wooden containers were also common from the twelfth century onward to the seventieth and were preferred in the Northern Europe, but contrasting such, the Southern Europe still had a fondness for ceramic containers. The vessels were sometimes decorated either with floral or geometrical patterns. Any earthenware containers that were used to contain contents for long-lasting storage had sometimes a symbol or the name of the contents applied on the outside.

When Spain was conquered by the armies of Islam, they carried with them their culture including glazed earthenware’s and the production facilities to produce those earthenware’s. One wreck, the *Batavia*, will see similar types of wares that would have contained drugs and medicine.

The material earthenware wasn’t solely used on containers. Plates, bowls, jugs, jars and anything in between could be and were probably made of earthenware. In this part, all earthenware’s would be looked at.

Nine pottery jugs were salvaged from the *Marie Rose* (80A1534, 80A1559, 80A1573, 80A1574, 80A1575, 80A1637 and 80A1662). From the *Mary Rose*, a standing costrel (80A1459) and a jug (80A1483) were also recovered. One pot was retrieved from the HMS *Pandora* (MA4016), two were recovered from the HMS *Swift* (I-28MB, and I-27MB) and four earthenware’s were recovered from the *Batavia* (BAT2326, BAT2331 and BAT2305).

80A1534, 80A1559, 80A1573, 80A1574, 80A1575, 80A1637 and 80A1662. Of nine pottery jugs recovered from the *Mary Rose*, seven are stoneware jugs from the Raeren pottery industry. All jars have archetypal heavily thumbed bases in addition to single strap handles apart from for jug 80A1575 which has two opposed strap handles (Castle 2005:190). All of the jars from the *Mary Rose* retained a cork bungs. Cork bungs would have been a new innovation as before in the 15th century, the contents were sealed inside the vessels such as those jars with wooden bungs. The problem likely
faced with the wooden bung is that unlike the cork bungs, it required some sorts of leather ‘O-ring’ to keep the vessel air tight. The cork bungs did not require such as it would have provided an airtight seal by itself.

80A1459. A single standing costrel has been retrieved from the *Mary Rose* wreck. The costrel is believed to be Iberian Red Micaceous ware vessel originating from Portugal. As with other jars, this costrel also had a cork bung and a preferring mark in the shape of a stylized ‘V’. The meaning of the symbol is unknown but as with other containers, might have denoted a kiln shipment or the nature of its content (*Mary Rose* Trust 2005:192).

80A1483. A small jug was retrieved from the *Mary Rose*. 80A1483 is tin-glazed and decorated with latticed medallion painted in yellow with white painted dots and fenced with a dark blue/grey foliage design. It was noted that this jug was probably manufactured in Antwerp, Netherlands and used to confine exquisite liquids that was used in small quantities.

Raeren industry was suggested to be an area comprising of several sites of pottery manufacture. When mentioning Raeren stoneware, it is used to encompass those places (Adler 2005:259). Two of the most common sites are that of Aachen situated in Germany and that of Raeren situated in Belgium. Both sites would become major cultural centers of Western Europe.

Archaeological evidence comprising of Raeren shards at the sites suggests that the manufacture of Raeren trades has a long custom going back to the twelfth century and the transition to real stoneware was suggested to have started in the fifteenth century but yet has to be proven. The mid-sixteenth century would be known as the Raeren golden age and the manufacture of salt-glaze pottery would be a common practice (Adler 2005:259).

The archaeological evidence from the *Mary Rose*, and other shipwrecks off the coast of Australia, and Southeast Asia, and in North American graves shows that the Raeren pottery were distributed throughout the world.

I-28 MB. The basin differs in terms of composition. The basin is composed of earthenware ceramic (terracotta) that is reddish brown in color and glazed with a green glaze. Those basins probably had multitudes of functions which could include taken care of one’s hygiene by using the basin as a washing dish for hands or to splash water on the face. No one is certain of how such basins were used onboard ships. One theory was that the basin could function with artefact INA-NR019 to function as a toilet. But the dimension of the basins do not fit with the dimensions of the toilet seat.

I-27 MB. Basins is composed of ceramic and in two colors comprising of a cobalt blue and gray; the two colors that could withstand the high firing temperature of the kiln. Also, the most common reliefs and motifs for the basin of its time were those of the lion, flowers or rosette and those of the two hands below the lips and above the bade of the basin. Because those artefacts were stolen from Brozoski Museum in 1990, little is known about those basins. All of the descriptions that are available come from the recordings taken back in 1980’s during the excavation where more than two pictures were taken while many other pictures were reproduced.

The images are sufficient enough to determine that the basin from the HMS *Swift* belonged to a type of a stoneware ceramic known from the Rhine River in Germany and commonly referred to (Rhenish blue and gray). Before the 17th century, hundreds of potters worked in the region known as Westerwald, Germany. The potters were mostly migrants from Siegburg and Raeren (Museum of London: Unknown). After the 17th century, the industry grew and remained strong until the 19th century.
The basin salvaged from the HMS Swift wreck were more than likely manufactured in Westerwald and exported to Britain. In the eighteenth century, the industry has been known in its exportation of its stoneware ceramics to Britain, Australasia, Africa and America.

A second basin was modest with no decorations. It was smooth and white in texture. Both the interior and exterior of the basin was glazed and it had a vertical fold in the lower end of the handle. This basin similarly to the rest of them likely originated from Westerwald, Germany.

MA4016. Pot recovered from the Pandora was composed of brown salt glazed stoneware. The pot, having a bulbous belly, flat base, narrow neck and thick pronounced lip was wheeled thrown. At the surface of the belly, an apothecary’s measure ‘3’ was tooled. The container despite being at the bottom of the ocean still retained its mercuric content (Campbell & Gesner 2000:94).

BAT2326 Albarello made of an earthenware and glazed both on the interior and exterior with a tin glaze. When recovered, the vessel was fragmented into 21 pieces. Albarello is decorated with a zigzagging floral pattern while both the base and neck are decorated with a succession of blue dots that encircles the circumference. Between those blue dots are three blue bands followed by an orange and yellow band. Motifs as in this case are very common with painted albarellos.

BAT2318 Albarello is slightly smaller than vessel BAT2326. The decorations of the vessel are also similar to the other vessel with three blue bands close to the base and neck followed by the blue dots that encircles the circumference like dash lines or dots. Just before going to the middle of the vessel, a yellow band is there in a way barricading the floral central motives followed by half-circles that encloses the floral motifs. In the small diamond shapes produces by those half circles are smaller yellowish diamond shapes with a yellow dot.

BAT2331 Vessel also fragmented has a glaze that is poorly preserved. The decorations are also poorly preserved with only a few bands being visible.

BAT2305 Vessel is fragmented with only the lower half preserved. Like vessel BAT2331, this vessel’s glaze is poorly preserved with few decorative traces visible. A large portion of the vessel has been stained suggesting that the vessel was adjacent to some iron compound when it sank.

The jars that were recovered from the VOC ship Batavia where albarelli. Italian potters in the sixteenth century influenced by Persian craftsmen began to produce ceramic jars for the purpose of storing apothecary ingredients. Those earthenware vessels where knowns as “el barani” by the Persians or as powder kegs.

With the diffusion of mixed culture, the Italians started to refer to those vessels as albarelly which were decorated in Majolica tradition of a white tin glaze background mixed with vibrant colors in geometric shape and sometimes flowers and other floral decorations were displayed. The practice of tin-glazing started in the twelfth or thirteenth century in Southern France in Avignon where it was commonly used on tiles (Cooper 2000:126). The practice of using tin-glaze was uncommon before the sixteenth century until the Italian artisans established artisanal centers in Lyons, Nimes and Montpellier. In the sixteenth century, in the north of Rouen, albarelly and flat dishes were beginning to be manufactured and in the seventieth century, Rouen would become a major production center (Cooper 2000:126).

When the Italian artisan moved and settled in Antwerp in the late sixteenth century, they brought the style of apothecary vessels with them. When the Spanish occupied Antwerp back in 1585, the artisans fled north taking with them the albarelly (Cooper 2000:126). This kind of vessel in the aftermath became a common apothecary vessel throughout the Dutch Republic and would be commonly used by ship-surgeons to contain medicines and herbs ointments.
5.2 Metal

Many containers and bowls were salvaged from numerous wrecks. One bowl (80A1618) and one pan (80A1629) were recovered from the Marie Rose. Two bowls were recovered from the Batavia (BAT516A & BAT 516B), and one bowl was recovered from the Kronan (KLM 14383 Kr). Each was likely associated with the barber-surgeon as they were retrieved either from the medicinal chest or within the barber surgeon’s cabin.

80A1618. Bowl was retrieved from the Mary Rose. This one is composed of a sheet of brass. As with other bowls from other wrecks, this one has a cutout section or concave section cut out of the rim and shaped to fit around a neck and under the chin of an individual being shaved. On one side of the bowl a small ring is protruding from the side. It is attached on the rim. That ring was probably used to suspend the bowl to a wall; however, the bowls were more likely stored inside the chest or dispensary. The ring is a small sheet of metal that can be folded. 80A1618 has a pair of plain wire rivets below the rim has sides that join the base with a steep curve creating a sort of basin. The bowl is also blackened on its outside suggesting that the bowl was likely used as a suspension pot comparable to a modern frying pan used for heating ointments, plasters and decoctions (Castle 2005:204).

80A1629. This object was probably used in conjunction with the chafing dish (80A1626). The object is similar to a basin with vertical sides that joins the base with a steep curve. Below the rim are two horizontal pairs of wire rivets and two more rivets that are opposite those two. The outside is blackened suggesting that the basin was probably used as a suspending pot or used as a frying pan to heat up plasters, ointments and decoctions.

BAT 516A. Bowl composed of brass and has a hanging ring, one on the opposite side of the typical cut while the other ring is located on the left hand side of the bowl (Green 1989: 96). The rings could be used to hang both bowls on the wall. BAT 516 has a cutout section similar to that of 80A1618. It is also believed that both bowls from the Batavia were about the same size and shape suggesting that they were designed to fit one inside the other.

BAT 516B. Bowl is also made of brass and also has a hanging ring, also opposing the side of the typical cutout section while the other ring is located on the left hand side of the bowl (Green 1989: 96). The rings could be used to hang both bowls on the wall. It is also believed that both bowls from the Batavia were about the same size and shape suggesting that they were designed to fit one inside the other.

Both artefacts from the Batavia were composed of brass whilst the ones from the Marie Rose were composed of both copper-alloy and wood. The bowl from Kronan was also composed of wood.

The two bowls (BAT 516A and BAT516B) were said to be the most common rented instruments associated with barbering tasks. Bruijn noted that in the VOC rentals, numerous shaving basins were borrowed from the company (Bruijn 2009:70).

All of the shaving bowls are similar to those illustrated in the barber shop by Josh Amman (fig. 21). The image illustrates the shaving bowls hanging on the back wall. Despite our bowls having a similar hanging ring as seen in the illustration, the ship surgeons more than likely placed the bowls inside his
chest due to the limited space that they had to work in. The hanging ring also suggests that it was both; land and afloat surgeons who bought the instruments from the place.

5.3 Wood

Wooden bowls and canisters were common onboard ships especially those composed of beech and poplar wood testimonial to the objects retrieved from the wrecks. The bowls could have easily been made of porcelain which was also common of the 17th century (Lindeke, Ohlson & Jahrehorn 2009:25). Wooden canisters as testimonial below seemed to be common objects in the Tudor time. Illustrations similar to the archaeological finds appear in sculptures and illustrations. The canisters were also noted to be common objects in the mainland Europe especially in Germany. It’s noteworthy that the canisters were a common item in Britain (Mary Rose Trust 2005:198). There are a few recorded instance of similar canisters in England but were smaller in dimensions and most if not all were composed of beech wood. This would suggest that the canisters used in this paper were probably manufactured in Germany.

Nineteen wooden canisters were recovered from the Mary Rose (80A1526, 80A1535, 80A1690, 80A1702, and 80A1630) while one was recovered from the Kronan (KLM 14383). Due to the cheer numbers of containers, the author will be consulting only five wooden canisters recovered from the Mary Rose of the nineteen canisters for analysis. Also, it’s important to note that most of the wooden canisters has either a single or paired bands around the circumference. The bands were either incised or burned in. Also, some of those canisters have traces of black paint. The black painted was suggested to be painted on the side to indicate the content of the canister. It was noted that the canisters functioned to hold syrup, juleps, safts, and dry ingredients (Mary Rose Trust 2005: 197). It was used a contents label. None of this information were penned down below because at this point, it is unknown which canister was painted or which one had a band around the circumference.

80A1526. Container is composed of poplar wood and was retrieved from the cabin. The container was manufactured using roundwood. The canister had a lid that was broken. The canister has a

80A1535. Container is also composed of poplar wood but the manufacturing process was different. Instead of a roundwood, the canister was made using 1/4 cleft. An intact lid was recovered with the canister.

80A1690. Canister is composed of ash wood that was manufactured using ¼ cleft. A broken lid was recovered with it.

80A1702. Canister is also made of ash wood and is also produced using ¼ cleft. A full lid was recovered with it.

80A1630. Canister is made of poplar wood and manufactured using ¼ cleft. A lid was recovered.

KLM 14383 Kr. Bowl is made of beech wood and was recovered from the orlop deck. The bowl has a hallow half-sphere. Despite being well preserved, a dent on the edge with a minor crack running down towards its bottom is noticeable. The bowl was identified in 2004 as a scatula deauratoria and was suggested to be used on the making of gilded pills. That theory stands true as traces of gold at the bottom have been analyzed. The use of precious metals in the medicinal practice goes back in history. Pliny noted the first used from around 60 AD and the Arabs already used gold in its apothecaries as illustrated by its apothecary art. Gold was introduced in the apothecary recipes in either solid form or as in dissolved salts. In the 16th and 17th century, gold was used in its powder or shaving forms to treat
against syphilis, scrofula, and tuberculosis of the limp of the glands. In a way, it is not unforeseen seeing gold residue in the wooden bowl.

Inside a chest were bundles of golden leaves which was suggested to have a number of functions inside a man-o’-war.

5.4 Glass

The discovery of glass blowing took place around 300 BC. Two places of all, Egypt and Sidon are two glass manufacturers regions that will thrive and will be shadowed by the Romans who will manufacture the most widespread shape ware, the green glass flask. After the fall of the Roman Empire, glass containers declined. It will not be until the 13th century in Venice where guilt’s of glassblowers would be established and by the 16th century, the Germans would establish centers in Bohemia and Silesia. The use of glass wares to confine medicine will be in used until this day and clearly illustrated by the five wrecks which all had some forms of wares composed of glass retrieved from either the chest or adjacent the chest.

In later periods, a special type of bottle would be in the market. Those vessels were sometimes referred to “case bottles”. These bottles were known as case bottles because the shape permitted to be fitted inside the medicinal chests. There is no definitive way of knowing if the contents of the case bottles were wet or dry ones unless they have residue left which could be analyzed. Moyle advices ship surgeons in his publication to use square double glass jars and bottles (Kehoe 2003). He noted that those bottles will fit the partition better than the others and that they will also preserve the medicines better than the others.

Nevertheless, the author believes that by studying the cork-stoppers used on the vessels, it could be determined of the type of content stored inside.

Both intact bottles MA132 and MA49 both had cork bungs presumably cylindrical in shape as the one recovered with the MA49 all the while the two fragmented bottles is believed to have a parchment lid that would be in held on top of the bottle with a string. Since the cork stoppers are made out of the cork tree, it light enough yet keeps the contents inside dry as said about MA132 that had residue of clove oil. The parchment lid on the other hand likely contained dry ingredients as lid is not only paper but also held by a string. The shape of the mouth also plays a role in the determination of the type of contents. MA49 and MA132 has a short neck with wide lips. Wares MA91 and MA107 had a rudimentary neck and curved lips.

The 19th century sees an interesting transformation of two types of glass bottles that are characterized by their eight sided rectangular cross-section with widely beveled corners and the tapered cylindrical bottles that would become a common medicine bottle as advertised by the Illinois Glass Company. The perfect testimony of such wares are those from the Jacksonville “blue china” wreck. The bottles from that era are typical amongst many patented medicine bottles.

Vast amounts of bottles and phials have been recovered from numerous wrecks including three glass vials recovered from the Mary Rose (80A1540, 80A1565 and 80A1631, four vials from the Pandora (MA49, MA91, MA107, & MA132).

80A1540. Green glass vials embellished of a slightly protruding spirals running from the base to the lip. No contents survived. This vial was recovered from the chest. This vial was likely an expensive item and probably stored corrosive liquids such as mercury globules, scented waters or oils used in shaving.
80A1565. Green glass vials embellished of a slightly protruding spirals running from the base to the lip. Vial retained its cork. No contents survived. This vial was also recovered from the chest.

80A1631. Green glass vials embellished of a slightly protruding spirals running from the base to the lip. Retained its cork bung. No contents survived. This glass vial was recovered adjacent the chest. This vial was noted to be smaller and squatter

The origin of those three glasses from the Mary Rose are unknown. However, during the time, glass vessels were manufactured in large quantities in the Surrey and Sussex Weald. Similar glasses were retrieved Britain and France (Mary Rose Trust 2005:193). One was retrieved from a glass making site in Yorkshire where the site was operational until the 16th century and the other one was retrieved from France.

What the bottles from the Mary Rose contained is unknown. A century before the wreck of the Mary Rose, physicians used special glass containers for displaying urine for analyses. The containers retrieved from the Mary Rose were both luxurious and delicate vessels for the use onboard ships. Distinct from the 15th century, those bottles were also too small to be used as urine containers. It’s more feasible that the barber surgeon contained liquids that were either instable or corrosive such as oils or scented water for aftershave and or mercury globules. In the 16th century, the book Specchio Universale inscribed by Fioravanti talks about scented water to be thrown over the face after washing if the person desired so. The scented water would have been confined in a small phial just like the ones retrieved from the Mary Rose.

MA49. Vial is one of the two bottles still intact. It is composed of a colorless cylindrical body that is tapered to some extent at either ends. The vessel has a short narrow neck with wide lips. A black residue tint on the inside of the bottle was identified as a carbon-based material. The content of the ware were prevented from leaking out by a cork stopper (Campbell & Gesner 2000:93).

MA91. Bottle fragment recovered was that of a neck and lip.

MA107. Bottle fragment was that of a base.

MA132. Bottle retrieved is the second bottle still intact. Unlike container MA49 that is cylindrical, bottle MA132 is square shaped with rounded corners, short neck and wide flat lips. MA132 likewise had a cork stopper containing a residue coating on the inside identified as pungent clove oil (Campbell & Gesner 2000:94). Oil of clove was used as an antiseptic and mild anesthetic.

From analytical study, MA91 and MA107 would have been pale green colored glass. It would be a wide mouthed bottle that has a squared body with a rudimentary neck and pronounced curved lips. These type of jars were likely covered in parchment paper that would be held in place with a string of sorts (Campbell & Gesner 2000:93).
Chapter 6 – Hygiene Instruments

6.1 Shaving Instruments

If one thinks of a man in the age of sail, one might have a misconception of a hairy, bewhiskered sailor with long hair and a long unkempt beard. This is illustrated both in publications of sorts and in movies. However, archaeological excavations illuminate an entirely different picture, one of a clean shaved and orderly seaman, particularly in the navies. Razors were common items carried both by barber surgeons as well as the common seamen. Numerous razors are salvaged from wrecks, most likely for both personal and surgical use.

Bleeding was a universal, if erroneous practice in the treatment of many ailments and maladies. They would require a sharp instrument to cut the vein open letting huge quantities of blood drain. Lancets were likely used in the procedure but straight razors could function for the same purpose.

True to their name the barber-surgeon in the 16th century was known to provide shaving services as well. However, it was more likely that barbering and shaving of the crew was the role and part of the education of a mate or assistant. Rory McCredie suggested that unlike today where an individual can shave himself, barbers were more commonly used in the Tudor time because razors were very expensive (Kehoe 2014:3). McCredie also noted that the men also did not have the time, skill or courage to shave themselves. It makes sense that men in the Tudor time did not have the skill or courage. Unlike modern razors which have a blade that is partially sharpened, razors of the time would have a full blade that is sharpened to the handle. Surgeon Fioravanti penned down in 1565 the contents employed by a barber-surgeon;

“...a basin, two razors...two pair of scissors, half a dozen towels, a small chaffing dish for heating with some charcoal, a small phial with scented water to throw over the face after washing if the person wishes it.” (Mary Rose Trust 2005:216).

The majority of the razors (10 of them) retrieved from the Marie Rose were located in the barber’s equipment rather than the individual crew’s possession (80A1913, and 80A1922) while one mirror was also recovered from the Mary Rose (81A4139). Only two razors were retrieved from elsewhere and not from the barber-surgeon’s cabin. Both razors have curved handles representing a common form of personal razor. Only three razors will be looked into in this paper. It was more than likely that the ship-surgeon employed on VOC ship Batavia, HMS Pandora, St. George and other had a collection of razors with him.

80A1913. Razors were worked from a single piece of wood. Razors were noted of having an iron pin at the solid end of the handle. Those pins were suggested to be contemporary fixes to the solid piece which in time would have accidentally split. An iron pin was inserted at the end of the handle where the iron blade could be installed and pivoted to open and close the blade.

80A1922. Razors was also worked from a single piece of wood and was also noted of having an iron pin at the solid end of the handle. Those pins were suggested to be contemporary fixes to the solid piece which in time would have accidentally split. An iron pin was inserted at the end of the handle where the iron blade could be installed and pivoted to open and close the blade.

81A4139. This artefact was retrieved within the same chest from the Mary Rose. Object was a thin squared object composed of wood. That piece had a small circular depression to one side and an integral wooden protrusion to one edge of the square. The circular depression might have represented the remains of a small mirror. Although no traces of mirroring was noted, two fragments of glass adjacent
that object were retrieved. The integral protrusion on the edge of the square may have functioned as the handle.

The kit seems likely that of a shaving kit with the razor, mirror to look at the face, shaving brush to administer shaving cream, and a comb to brush the facial hair.

Part of any shaving gear were shaving brushed. One brush was recovered from the Mary Rose (81A1322) and two brushes were recovered from the St. George (6000/321 and 6000/960).

81A1322. One brush handle was retrieved from the Mary Rose. The brush handle was found inside the chest 81A1415. The handle was composed of two parts. A disc and a cone. The disc had 19 pierced holes where tuffs of bristles would have protruded from the underside. No bristles survived. The coned handle was glued to the disc probably functioning as a handle. The cone was decorative and turned. 81A1322 is recognized as a shaving brush not by its shape but rather because within the assemblage it was found with. It was linked to a razor amongst a comb and a whetstone which were also retrieved from the same chest. The brush could equally function as a normal hair brush or other grooming accessory. Because of the assemblage retrieved within the chest, it was noted that the objects belonged to an individual who was fairly finicky about his personal appearance.

6000/321. Brush is composed of bone. The artifact has 62 holes with a larger central hole. On the opposite sides are six grooves running the length of the artifact while two grooves at either ends runs across the six other grooves. It was suggested that artifact 6000/321 functioned as a brush used in shaving. The middle central hole used to have the handle (now disappeared) while the 62 holes where the hair tuff would come out from. The six grooves in the back probably secured the tuff of hair.

6000/960. Artifact is composed of bone and covered with a thin layer of pewter. It has a circular base which has three rings of holes. Inside of those three rings of holes was a central hole which holds the protruding handle of the opposite side of the base. The handle is made of wood with some ornate lips at the bottom where the handle meets with the base. The three rings of holes where the tuffs of hair would protrude. None of the bristles survived.

6.2 Combs

Early seafarers may not have been particularly knowledgeable about hygiene, or aware that lice transmitted a potentially lethal disease. Nonetheless; grooming for biological comfort and aesthetic was undoubtedly important.

The anaerobic mud and silt environment in which the Mary Rose sank produced the remains of bedding and clothing impregnated with traces of lice infestation. A rare physical evidence of the parasite that habitually plagued seafaring communities. The lice infestation was thought to be linked to the ship’s dog but with further analysis, it was determined that the flea was a human flea and probably brought onboard by one of the crew.
It is not surprising that the crew of the *Mary Rose* were infested with lice. The practice of forcefully and involuntarily pressing seamen into service was likely a contributing factor in the lice infestation. The VOC were known to have “soul sellers” who employed Germans soldiers. Many of their clothes were infested with lice.

Itchy lice bites on the body and head can often turn out to be infected from unwarranted scratching producing ‘ship fever’, also commonly mentioned in the modern age as typhus fever. The fever can ensue between a few hours and up to two weeks. Symptoms comprise of high fever, chills and fatigue and can be combined with splotchy skin and foul odor emitted by the victim.

Combs were so common that Northern Europeans had a long history of fashioning combs out of bone, ivory, tortoise shell and wood. It will be a custom that the Europeans explorer would transport and transmit them to other countries including the New World. The excavation done by the Odyssey Marine Exploration on the Dutch vessel *De Wasbleecker* would illustrate the large numbers of combs that were transported. The cargo consisted of a lot of tradable artefacts including a cargo of some 300 combs and 65 comb cases (Odyssey Marine Exploration 2013:38).

Combs composed of ivory and bone which were used only by officers and crew with high status, other combs being transported to the New World would have been traded with the indigenous people. Combs also signify the wealth and status of that person. Related delousing combs crafted from tortoiseshell, bone, ivory, horn and wood have been recovered from shipwreck spanning centuries and described in abundant historical sources.

The earliest recovery of such combs was recovered from the 11th century shipwreck off southwest Turkey.

Eighty-two combs were recovered from the *Mary Rose* (81A4295, 82A0945, 78A0248, 79A0460, and 81A3241) six combs were recovered from the HMS *St. George* (7546/464, 7546/112, 7546/449, 6000/4304, 6000/3141A and 6000/3127A) and two combs were recovered from the *Batavia* (BAT4490 and BAT4400). The combs from the *Mary Rose* were all composed of boxwood with the exception of one that was made from alder while another one was made from ivory. 80 of the combs were double-sided while two had only one row of teeth.

Because the *Marie Rose* had a huge number of combs recovered, only five combs were chosen to be analyzed. During excavations of the *Mary Rose*, the assembly and distribution of the combs found many stored in the wooden chest while others were stored in leather cases. It suggests that the combs were part of the crew’s most common personal possession. The 82 combs were composed of two types, double sided combs with a row of teeth in each side or single sided with only a single row of teeth.
Sixteen combs were retrieved from chest (80A1413) where they were found with a comb case and one was found in the barber-surgeon chest along with the razors. Because the comb in the barber-surgeon cabin was inside the chest with the razors, it was possibly part of the grooming kit.

81A4295. Comb made of alder wood.

82A0945. Comb made of ivory. The only ivory comb retrieved from the *Mary Rose* likely belonged to a high status officer since combs made of bones, ivory and antler were more expensive.

78A0248. Comb has two parallel lines.

79A0460. Comb has a simple zig-zag decoration with parallel lines along the length.

81A3241. Carried a small mark stamped there.

81A4652. Has a “W” inscribed at the center.

7546/464. Comb composed of bone. The artifact was suggested to be worked from a single piece of bone. The comb is double sided similar to many of the combs from the *Mary Rose*. One side of the comb, the teeth are still in place while on the opposite side, all of the teeth were gone. The comb despite being made of bone is brownish/reddish in color probably due to the traces of iron dioxide on it. It might also suggest that this particular comb when it went under was close to materials composed of iron. It was said that it was damaged during its preservation. The teeth of the comb are finely cut.

7546/112. Comb is composed of a bone. Similar to 7546/464, this comb was also made using one piece of bone. Unlike comb 7546/464 that is missing a row of teeth, this one is well preserved and still has its majority of teeth with only one end of the corner that is missing some of the teeth. Because of the drying process, the teeth have been pulled apart by the bend of the bone. The comb is also brownish/reddish due to the iron dioxide. A small hole has been drilled near the end suggesting that this comb could have a string attached to it permitting one of the crew to wear it around the neck or it could have been carried in the pocket and secured by the string to the pants.

7546/449. Half of a comb also shaped using a piece of bone and brownish/reddish in color. The corners of the comb are intact with most of its teeth there. Few teeth are missing at the point where the comb was broken off.

6000/4304. Comb composed of an animal horn, probably from a cow. This comb is well preserved with only a few teeth missing at one end of the corner while on the opposite site, one corner is missing.

6000/3141A. Comb composed of bone. Unlike the other combs from the *St. George*, this one has been worked from a single cross section of a bone. The comb is well preserved still retained the four corners. Also unlike the other combs, this one is bulkier with the central shaft being thicker than the rest. This comb is also stained in brownish/reddish due to being adjacent to iron.

6000/3127A. Comb composed of a single section of a bone and is also double sided. The comb is well preserved with all of its corners still intact and missing only a few teeth. This bone was not stained and is beige in color.

BAT4490. Comb composed of tortoise shell. The comb was recovered from one of the shaving bowl and other objects. The comb retrieved from the bowl could suggest that the barber - surgeon was initially shaving or grooming before the ship was rebelled.

BAT4400. Comb like BAT4490 was also composed of tortoise shell. This comb was recovered under the second cannon adjacent the shaving bowl and the first comb.
The finer teeth from the recovered combs suggest that one of the sides was used as a ‘nit’ comb intended for removing lice eggs, nits, ticks, and fleas. The fine narrowly spaced prongs on one side of the combs would have allowed the owner to look for and remove both louse eggs and adult lice from head hair and beards. The other side of the comb with the regular teeth was probably intended for hair combing and grooming. Lice combs renowned for thwarting these bloodsucking creatures have been depend on for hundreds of years and are still considered effective today.

The *Mary Rose* and *St. George* were not the only wreck from the sixteenth to the nineteenth century that had combs recovered from. The ship La Trinidad Valencera, part of the Spanish Armada that sank of the coast of Ireland in 1588 had combs made of tortoise shell. Wrecks from the seventeenth century counting the Vasa lost in Sweden (1628), VOC Kennemerland lost in Scotland (1664), Vergulde Draeck (1656), Santo Antonia de Tanna; a Portuguese man-o’-war (1697) and La Belle lost in Texas (1686) all had similar combs used in the aide for grooming purposes.

Most combs are simplest with no decorations while others have few ornaments of sorts.

Many of the combs recovered from the *Mary Rose* were composed of boxwood. Combs composed of wood especially boxwood were common in the Tudor time but also pre – Tudor as noted from the artifacts excavated from the Romano-British sites in Britain but also from the Serce Limani which were all composed of wood. Combs from the 15th and 16th century, especially those made out of wood have been single and because of the poor preservation, studies have been concentrated on combs composed of other materials like ivory, husk and bone. Boxwood combs are noted to be particular popular in the 15th century and that the composition of the material from animal bones to wood changes dramatically in the 15th century reflecting on the change in agricultural priorities. In the 16th century, vast numbers of combs started to be imported from abroad. Wider spaced teeth combs would become common within bone combs of the 16th century up until the 18th century.

The number of boxwood combs found onboard the *Mary Rose* also signified that wooden combs, especially those made of boxwood, were significantly cheaper than the rest.

### 6.3 Manicure Set

Manicure instruments were of great importance for the care of the hands for those who were wealthy. They have been found to have been used as far back as 3,000 years ago where archaeologist has excavated objects related to the care of the hands dating from 3,200 BC. Manicure in Europe was simple; cleaning, shortening and polishing of the nails. This was done by means of a special stick covered with suede and in later time, special brushes were invented.

Three manicure sets have been retrieved from our wrecks begging the question whether those sets were used only by the wealthiest. Other evidence indicates that might be the case. Manicure sets were used equally amongst the women and men.

Only the wealthiest of the crew could afford the manicure instruments. The crew of the *Mary Rose* was only male indicating their care the more wealthy members took in their appearance and cleanliness. The number of manicure instruments retrieved might support that idea.

Two manicure sets were retrieved from the *Mary Rose* (81A4130 and 83A0654) and one was recovered from the *St. George* (6000/3131).

81A4130. This artefact was retrieved from the chest 81A1415. Manicure set well preserved and composed of bone and comprised of five components each altered in shape.
83A0654. Likely fell while the hull was being raised as it was retrieved adjacent to the stern of the hull. 6000/3131. Remains of a manicure set made from a section of a worked bone. The set is composed of a handle with three sets of blades that could be opened or closed. Those blades are held together by an iron pin which runs through the ends of the blades and at the end of the handle. The ends of the blades are decorated with flexural motifs.

6.4 Earscoops

Earscoops were used to remove wax build-up in the ear. The presence of two in the Barber-surgeon's cabin suggests this was considered necessary for all crew members. Clearly washing and clearing one's ears wasn't part of every sailor's daily routine.

Four earscoops have been retrieved from the *Mary Rose*. Two were recovered from the barber-surgeon's cabin (80A1577 and 80A1524) while two others from elsewhere. The earscoops retrieved within the cabin indicate that cleaning ears was probably one of the barber’s surgeon services and a practice that was done when the individuals were shaved and hair trimmed. It could also have been used on himself but then again, it if was the barber-surgeon’s personal possession, he would not have two of them.

80A1577 / 80A1524. The two of the earscoops retrieved from the *Mary Rose* were similar in compositions. One was made from ivory and had a twist in the carved stem and banded end while the second earscoops was also made of ivory but had a broken spoon at the end.

6.5 Whetstone

As long as humans used blades, they needed ways to sharpen them. A whetstone was used to hone and keep the edge of a knife sharp. For thousands of years; stones; particularly those with a hard and rough surface were used just for that purpose.

For those that couldn’t afford a whetstone or grinder, it was uncommon to see sharpening services in the towns. There usually was also a “moletas” who would travel from town to town offering their sharpening services. Moletas were commonly found in northern Italy and in America.

Companies such as The Company of Cutlers in Hallamshire that usually worked with files probably started to manufacture sharpening steels as early as 1680’s (Egginton). As blade materials became even more advanced, so did the sharpening tools. Also, the type of sharpening instrument depended on the type of blades. A sword for instance was probably sharpened using a large circular stone that was turned with a handle while smaller sized blades like those of razors where likely sharpened using a smaller, handheld or table mounted whetstone.

One whetstone was recovered from the *Mary Rose* (80A1569) and one was recovered from the HMS Swift (INA375).

80A1569. Was recovered from the barber-surgeon chest. The whetstone was made from a fine crystalized rock in the form of a long rectangular block. The edges were chamfered and in the middle of a side had a groove. The whetstone probably was used onboard the *Mary Rose* to sharpen blades and razors and could have easily been used in both surgical and hygienic scenarios. INA375. Object recovered from the inside of a closet in the stern of the ship where the captain’s cabin was situated. The piece was that of a conifer wood where a stone was inserted. One of the ends reduces in width taken a curved shape just to give in a small handle. The artefact resembles a hair brush or as Chris Underwood noted, an open fan. The edges of the object are curved on the side. The stone is asymmetrical and
projects only a few millimeters from the wooden surface. The stone is that of very fine grain, smooth and even surfaced. Under close scrutiny, it can be noted that the stone bears marks suggesting that it was used. Due to the differential wear, researchers could determine how the stone was used. The sharpener was more than likely held by the right hand while the left hand sharpened the blades. It was noted that the stone was fitted snugly but was not held by adhesive. It was more likely that a draft was made in the wood. That draft would have been smaller than the stone. The next process was to boil water and insert that piece of wood into the boiling water. What would happen is that the wood would expend to the required size for the stone to fit. Once the timber cools, the wood expansion would secure to the stone and hold tightly into place. It was noted that this style whetstone is expensive and labor intense. Because of such, it is suggested that this stone belonged to a rich person for sharpening razors.

6.6 Toilets & Underway Sanitary Health

Before the late fifteenth century, sanitary conditions onboard was not much of an issue as aquatic craft did not journey more than one to two days without the need to land. Those vessels could amass the human waste in buckets for short periods. As we read the easiest way for individuals to relieve themselves was to do it over the side of the ship or by throwing the waste overboard. Such were probably common practice onboard all vessels no matter the origin. As vessels evolved into multi-decked crafts and navigational charts permitted journeys into deeper waters, the unsanitary and unhygienic environment became apparent and started to impact the crew’s health.

Debris, filth and waste would accumulate in the bilges in the lower hull making the area prone to vermin’s such as rats to thrive and with them came disease. A common ailment in the time due to the waste in the bilges was that of dysentery. Dysentery not care for who it affected and was the number one killer in the world. It cared for neither stature nor wealth. The death of Admiral Sir Francis Drake is such a case. While in the Caribbean in 1596, Drake got sick and died off the coast of Panama (BBC 2014). Numerous factors including airflow to spaces between and below decks would be diminished by the enclosed structure, high rise in humidity on the inside and a decrease in lighting all played a major factor for outbreaks of ailments.

In the fifteenth century, it was suggested that platforms consisting of overhangs with a slot in the flooring that lead down below to the water, rails of the beakhead, and holed boards; all functioned as a relief system. Individuals would still relieve themselves overboard by hanging out over the sea clinging to a wall. Because square-rigged sailing ships had a better chance of performing with a tail wind, it was recognized that it was best for individual crew to relieve themselves from the bow of the ship. The bowsprit was usually opened to the ocean and the beakhead was decked with grates. In bad weather, the waves could break aiding in keeping the area hygienic. The practice of going to the bow to relieve oneself would be referred to as the “head”. The head of the ships meant that sailors had to go where the lavatory was situated (Bate 2005:10). The term is still used by sailors today referring to the latrines. Some that are non-experts in nautical terminologies might think that the term ‘poop-deck’ was the place where individuals relieved themselves. The colloquialism for excrement, the word poop, comes from the French word ‘poupe’ which means stern or rear of a ship.

Onboard vessels of the sixteenth to the nineteenth century, there was no such things as privacy because ships lacked the infrastructural sanitary facilities that we have in today’s vessels. Sanitary facilities on ships during the age of sail was not high priority for the captain nor for the ship’s owners. Eugenio de Salazar, a passenger onboard a Spanish sailing vessel in 1573 penned down the following about relieving oneself at sea.
“If you want to relieve yourself . . . you have to hang out over the sea like a cat-burglar clinging to a wall. You have to placate the sun and its twelve signs, the moon and the other planets, commend yourself to all of them, and take a firm grip of the wooden horse’s mane; for if you let go, he will throw you and you will never ride him again. The perilous perch and the splashing of the sea are both discouraging to your purpose, and your only hope is to dose yourself with purgatives.”—Eugenio de Salazar

Such is a description given by one of the passengers of how one would relieve himself onboard a Spanish ship of the 16th century. Luckily for us, this is one of the few who decided to describe what today is reflected as a rudimentary bodily function. Such firsthand accounts are not frequently written about making them ever so vital to researchers.

By the 1620’s, the beakhead was used for human needs and in the 1680’s, ‘toilet’ seats were added. The seventeenth century would realize four vital sanitary infrastructures. Seats of ease, roundhouses, fore turrets and piss dales.

6.7 Latrines & Seats of Ease

Seats of ease, also known as latrines were quartered at the bow of the ship where all crew members used. On later ships, the latrines for officers were situated in the quarter galleries or at the end of the beakhead which was also opened to the sea but enclosed spaces where little privacy could be afforded.

The latrines were simple structures or boxes with one or two circular holes or drainage sluices, where the waste went directly to the ocean below. The two holes were to accumulate two individuals while the one hole was for one individual (Mondfeld 2005:124). By the eighteenth century, man-o’-war and larger merchant ships would see the appearance of three rows of toilet seats. Despite that, many vessels would have only one toilet seat for every 100 individuals. Seats of ease made their first appearance on models followed later with the first archaeological evidence with the excavation of the Vasa wreck where two seats of ease still survives in the beakhead. The model of the HMS Victory (figure 22) illustrates what latrines looked like in the time. They were simple boxes with a hole where a person sat to relieve himself. Figure 23 is the archaeological evidence of the ship’s structure that was excavated intact.

While none of our wrecks have a seat of ease retrieved separately or still attached to the wrecks, we do have two examples of movable objects that could have acted for an individual to relieve himself. Seat of ease usually do not survive in the long term because they are situated on the beakpeak, the area with the top decks. When left uncovered, overtime, that area rots away or gets eaten by shipworms. The two objects that were uncovered came from the Mary Rose (78A0078) one object was recovered from the HMS Swift (INA-NR019) and one from the VOC Batavia (BAT 504).

78A0078. On the Mary Rose, a chamber pot was recovered. Chamber pots were composed of variety of materials, including ceramics, wood, earthenware, and pewter. It was noted by Rosemary Weinstein that the particular pot that was retrieved from the wreck was likely from English origins. It was also noted that the pot is similar to the one retrieved from Baconsthorpe Castle in Norfolk and to the one retrieved from the royal yacht Mary. In other words, the chamber pot from the Mary Rose is a common item in the 16th – 17th century in England.

INA-NR019. The toilet seat might have been part of a seat of ease but there are uncertainties. The artefact is composed of three wooden planks paralleled to each other. Those planks were likely held together by iron nails. The center hole was probably cut out after the main body was constructed. The shape of the artefacts is simple in form. It’s a quadrangular with an opening in the middle. In other words, the toilet seat is very similar to one that we have inside the household today. Another wreck
that had a similar find as the HMS Swift is that of the British transport ship Betsy dating from 1781. Unlike artefact INA-NR019, the object from Betsy was retrieved fragmented in the stern of the boat in the captain’s quarter. It’s shaped in a semicircular and was also identified as a toilet seat or a privy seat. Because the buckets were retrieved from the captain’s quarters, they were more likely used by the officers onboard the HMS Swift as latrines.

BAT 504. Has been recovered from the VOC ship Batavia. Unlike the piss dales which are usually part of the ship’s structure, that artefact is moveable and looks like a pan. The pan is composed of earthenware and is glazed on the inside and outside. The dimension of the pan suggests that this artefact probably a combination of a bedpan and urinal and was likely intended for a child.

Another example are the three basins salvaged from the captain’s galley in the stern of the ship HMS Swift. Such objects as previously noted probably belonged to the captain or officers as they are not commonly used by the rest of the crew.

All three basin varies in its construction. One basin is ceramic, while the second one is of high quality earthenware but no decoration and the third one also being ceramic but highly decorated.

Despite that artefact being called a toilet seat, several questions arose regarding the function of the artefact. Sloops of the 18th century whether they functioned as warships or merchantmen, lacked what Christ Underwood called “Stern Gardens” which could be found in larger man-o’-wars and merchantmen. The stern garden is likely referred to benches situated in the stern of the ship where crew members could relax. Because both the Mary Rose and the HMS Swift lacked seat of ease in the quarter galleries, officers like the captains probably used a chamber pot or bucket of sorts to relieve themselves. INA-NR019 was similar to 78A0078 in terms of functionality. What probably differed is that the object from the HMS Swift was likely used with a bucket or basin below while the chamber pot from the Mary Rose was used as is. The interpretation for both of the wrecks makes since because the toilet seat and the chamber pot were both found at the stern of the boat, inside the captain’s cabin.

Roundhouses, latrines unique to the French, might have first debuted from the fore turrets. As fast as roundhouses debuted, they quickly vanished. Roundhouse were semicircular balconies of sorts which were said to be ‘perhaps the most satisfactory form of convenience found in ships’. The access was by means of a door in the beakhead where an individual would walkthrough. It was likely that the roundhouse or fore turrets had a small port that functioned as a mean for ventilation and light and likely the only private place onboard the whole ship.

Another seventeenth century sanitary structure added on the bulkhead on the upper deck and amidships was the ‘piss-dale’. Piss dales resembles modern urinals or scupper for urination. Historical literatures from 1706 and indicated in a naval dictionary of 1804 both mentioned a piss dale (Richards Maggy 2005:154). The naval dictionary described the piss dale as;

“A place set aside on either side of a ship of war, for people to piss in, to prevent the decks being wetted in other places”

A dale is commonly known as a spout that functioned to carry water off the decks. The Mary Rose trust noted in their fourth volume that a piss dale was probably identified but the timber in question is still being analyzed (Mary Rose Trust 2005). The piss dale was plumbed with lead pipes that extended from a metallic urinal directly through the platform of the head or through the side of the ship. It was noted by author Julian Stockwin that the piss dale could have been used by men on watch to relieve themselves without having to leave their watch (Stockwin 2013). The use of piss dales would be continuous until the nineteenth century.
Figure 23. Seat of ease arrangement HMS Victory. (NRG's Model Ship World)

Figure 24. Seat of ease from the VASA. (Wikipedia 2007)
Chapter 7 – Conclusion

In the modern age, medicine afloat from the sixteenth century to the nineteenth century seemed at most rudimentary but was sufficiently workable for the era and relatively advanced compared to land based knowledge. Their role in advancing medical and scientific endeavor was significant as they had to innovate, observe work in austere conditions that led to rapid integration of several science disciplines including general practice, trauma medicine, preventative medicine, pharmacology, and surgery and mortuary affairs but supplemented with botany, anthropology and psychology. Many barber-surgeons acquired their knowledge and education first by apprenticeship but also through trial by fire; dealing with disease outbreaks, handling mass casualties, or managing the survivors of shipwrecks. Barber-surgeons in the employ of colonial empires or merchant companies were required to treat the masses of a ship’s crew, passengers, sub-contractors and/or slaves who could take ill individually or across the entire community. Sometimes, of a dozen ships in a flotilla, perhaps one or two would come back, and rarely with the whole crew. The conditions on many of the ships were often confined due to the congestion of seamen and soldiers and from the narrow spaces on the inside. These conditions were the perfect condition for an outbreak of an epidemic. The lengthier journeys also meant that many would succumb to nutritional deficiencies most notably scurvy. Yet, the sixteenth century to the nineteenth century led to extraordinary advances in medicine as documented by the archaeological record. Accumulated from archaeological, historical and archival collections, the medicinal instruments can provide an unparalleled foundation for the study of medicine both at sea and ashore.
Yet the development of the barber-surgeons instruments was influenced mostly by mainstream medical science. The recommendations on surgical tools were not always adhered to and so the instruments would vary from surgeons to surgeons. However; barber-surgeons were not mainly academics. Though some were strict followers of mainstream medical science most were required to perform their duties in a near tradesmen’s environment with day-in and day-out sick call duties. Barber-Surgeons borrowed from the formalities of medical science and made dramatic improvisations based on their needs at the time.

From the 16th to the 19th century medical instruments and tools did see much change at least in shape and form. Even today one can see a familiar resemblance to those of this period. The raw materials they were constructed of has likewise not changed dramatically. The most common metal of the time was iron. Despite having no archaeological records of intact iron instruments form our ships, the concretion on many of the wooden handles especially those that were employed for surgery were all composed of iron. Despite that, three iron instruments were recovered. Other commonly found materials involved with the medicinal instruments were copper alloy (7), brass (7), and pewter (6), bronze (3), copper (3), lead (1) and silver (1). The copper alloy and brass were the second metallic materials employed on the instruments followed by pewter. Despite bronze, copper, and lead being common from the sixteenth to the nineteenth century, the number of them recovered from our ship suggest that they were not as preferred as that of iron, brass and pewter.

Wood was commonly used in conjunction with the metallic instruments employed in the handles and apothecary instruments such as spoons and spatulas. Thirty-three wooden objects were recovered from the ships. Many more wooden objects were recovered but not recorded. Of the ten varied wood recovered, the most commonly used was cherry with 11 objects being composed of cherry wood (11) while the secondary largest sample was that of boxwood (4). Oak (3), ash (3), alder (3), poplar (3), and pine wood (3) each had three objects composed from them. The four other woods that were recovered was spruce (1), fruit (1), beech (2) and maple wood (1). One instrument that was recovered was composed of composite wood comprising of walnut, elm and beech.

For the apothecary containers, the most common material used was that of earthenware with 18 of them recorded. The secondary material that was used was glass with 7 glass vessels recovered. Marble was not as common onboard a ship as with all the other materials. Only one artefact; that of a mortar was composed of marble.

Another material that was commonly used afloat as recorded was that of bone. Nine artefacts were composed of bones. Most of them were either related with sheaths, handles or hygiene instruments such as combs and manicure set. Ivory and tortoise shell were also commonly employed with four objects composed from ivory it and two being of tortoise shell.

The recovery of two tourniquets from the HMS Pandora and from the HMS St. George suggest that some medical instruments were manufactured and exported from far away. The screw tourniquet was invented in France and due to archaeological and historical records; we know that they were used by many other nations. England would start its own manufacture that would produce those tourniquets while the American navy would import them to be used by the surgeons employed on their ships. The tourniquets were great examples of the diffusion of medical instruments throughout the world, but they were not the only instruments that were exported. The two scissors recovered from the USS Scorpion were manufactured in England and brought by Hamilton to be employed in his chest while the Raeren and Albarelli earthenware vessels were mostly produced in France, Belgium and Germany but commonly recovered from ships employed by VOC as the case with the Batavia and on the British warship as with the case of the Mary Rose.
The irony in the whole anecdote is that all of the countries that share mutual instruments were also the same countries that for a long period where engaged in war with each other. For example, England and France were at war with each other for a lengthy period and yet, the French petit screw was still exported to England.

During the war of 1812, America and England where engaged in a war that would last for few years. Yet, the surgeons employed by the American navy employed surgical instruments that were manufactured in England. This suggests that despite the conflicts, the surgeons employed by their respective country had one goal in common; the one to save the lives of many injured and wounded as possible. No matter whether nations were at war or not, science and new innovations would spread to the rest of the world to their mutual benefit.

From the sixteenth to the nineteenth century, there were three common vessels that would sail the seven oceans. Those vessels were the warships employed by the navies, merchantmen and pirate ships. If our research showed anything, is that no matter whether you were a merchantmen, a crewmen or a pirate, they would succumb to the same diseases, to the same type of wounds and to the same maladies. Working aboard any vessels no matter by whom it was employed, the life and risks were one and the same. The ship surgeons employed an armamentarium of instruments to save lives and stay good health. The only difference is that archeology lends credence to the understanding in the cross-centuries acquisition and employment of advanced, tools, instruments, implements and apothecary medicines to the benefit of all aboard.
Appendices
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# Appendix B - Museums

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<tr>
<td><em>Erie Maritime Museum</em></td>
<td>150 E Front St #100, Erie, PA 16507</td>
<td>+1 814-452-2744</td>
<td>Bolla, Linda</td>
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<tr>
<td><em>Plimoth Plantation</em></td>
<td>P.O. Box 1620 Plymouth, MD 02362</td>
<td>+1 508-746-1622</td>
<td>Goldstein, Karin</td>
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<tr>
<td><em>Museum of Tropical Queensland</em></td>
<td>70-102 Flinder St, Townsville, Queensland, Queensland, Australia 4810</td>
<td>+1 07-4726-0643</td>
<td>Moran, Vivienne</td>
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<tr>
<td><em>Queensland Museum</em></td>
<td>P.O. Box 3300, S. Brisbane, BC, Queensland, Queensland, Australia, 4101</td>
<td>+1 07-3840-7555</td>
<td>Giorgi, Marisa</td>
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<tr>
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<td>Lloyd, Meg</td>
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<tr>
<td><em>Bureau of Medicine and Surgery</em></td>
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<td>+1 703-681-2473</td>
<td>Sobocinsky, Andre</td>
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<tr>
<td><em>NHHC Archaeology &amp; Conservation Laboratory</em></td>
<td>6700 Taylor Ave, Fort Meade, MD 20755</td>
<td>+1 301-222-6730</td>
<td>Morrand, Kate</td>
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<tr>
<td><em>Naval History &amp; Heritage Command</em></td>
<td>805 Kidder Breese St, SE, Washington Navy Yard, DC 20374</td>
<td>+1 202-433-4882</td>
<td>Kowalsky, Julie</td>
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<tr>
<td><em>Royal Maritime Museum</em></td>
<td>National Maritime Museum, Greenwich, London</td>
<td>+1 44-020-8858-4422</td>
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<td><em>USS Constitution</em></td>
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<td>+1 617-426-1812</td>
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<td>The Mariner’s Museum</td>
<td>100 Museum DR, Newport, VA 23606</td>
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<tr>
<td>National Museum of Health and Medicine</td>
<td>2460 Linden Lane, Silver Spring, MD 20910</td>
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<td>Warren Anatomical Museum</td>
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<td>+1 617-432-2170</td>
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<td>N.C. Department of Cultural Resources</td>
<td>109 E. Jones St, Mail Service Center 4601, Raleigh, N.C. 27601</td>
<td>+1 919- 807-7300</td>
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Appendix C – Articles of Wars of 1790

The following is the extract for the role of the barber-surgeons from the Articles of Wars of 1790 (Privy Council 1739:131-134).

When a surgeon is wanted to serve in any of his majesties ships, he is to provide himself with instruments and a chest of medicines, according to the rules of the navy, and present the same to be viewed by the Physicians in the Commission of Sick and Wounded, or, (if there be none) by the Physician of Greenwich Hospital in conjunction with the Governors of the Surgeons Company; who are to take care that all the instruments, drugs and medicine, be of the sorts, goodness and quantity required, and to give him a certificate thereof. And when the survey is over the chest is to be locked, and the seals of the Physician and of the Surgeons Company is to be affixed thereto, in such manner as to prevent its being afterwards opened, before it comes on boards; not is the captain to admit nay chest into the ship, without those marks upon it.

The like method is to be taken in surveying the remains and recruiting the chest in London; but in the out-ports, the physician and surgeon of the sick and wounded at the port are to make the survey; or if there be none such, the Surgeons of the Yards is to do it singly, and to observe the same methods as in the preceding article, taking care to destroy all such medicines or drugs as shall be found in the chest not fit for use.

He is to provide himself, before his going on board, with a competent number of printed sick tickets, which will be delivered to him at the Sick and Wounded Office; and a sufficient number of smart tickets from the Office of Clerk of the Acts.

He is to examine the necessaries sent on board for the use of the sick men, and if they are not good in their kind to acquaint the captain, that he may represent the matter to the Navy Board. He is to keep the said necessaries in his custody, and not embezzle or misapply any part thereof, but take care that they be well husbanded, and duly served out for the relief of the sick men.

He is to visit the men under his care (at least) twice a day, and oftener, if their circumstances require it; and, at other times, to distribute his mates and assistants amongst them, that none may want due attendance and relief.

In cases that are difficult, if there be a physician in the squadron, he is to resort to him for advice, and follow his prescriptions.

He is to inform the captain every day of the condition of his patients, especially if any of the distempers are infections, that they may be sent out of the ship, or (if that cannot be done) separated from the rest.

When any sick men are ordered ashore to the hospital, or on board the hospital ship attending the squadron, he is to fend along with them to the surgeon, an account (in writing) of the time and manner of their being taken ill, and the methods used towards their recovery.

In an engagement he is to keep himself in the hold, where a platform is to be prepared for the reception of the wounded men; and himself, and his mates and assistants, are to be ready, and have everything at hand for stopping their blood, and dressing their wounds.

He is to keep a day-book of his practice, noting therein the names of the men that come under his care; their hurts or distempers; the day they were taken ill, and the day of their recovery, removal or death; together with his prescriptions and methods of treatment while under care. He is from the said day book, to compose two journals, the one of his physical practice in diseases the other of his chirurgical
operations in cases of wounds or hurts; and at the end of the voyage, to deliver the first to the physicians in the commission of Sick and Wounded, or (if there be no such) to the Physician of Greenwich Hospital, and the latter to the Governors of the Surgeons Company, who are to examine the same, and certify their judgment thereupon.
## Appendix D – Collection of Artefacts: Instruments, Implements, tools & Objects

### Surgical Instruments

<table>
<thead>
<tr>
<th>ID</th>
<th>Wreck</th>
<th>Measurement</th>
<th>Description</th>
<th>Images</th>
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</thead>
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<tr>
<td>80A1530</td>
<td>Mary Rose</td>
<td>Length: 1330mm Width: 485mm Depth: 460 mm</td>
<td>Chest composed of walnut with two elm handles and beech battens. The chest is dove nailed with nailed on base. The lid has marks from the three split iron ring hinges with a rebated square on the front of the chest where an iron lock would be located. Over 60 objects have been retrieved from the chest.</td>
<td>![Image]</td>
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<tr>
<td>INA-NR-001</td>
<td>HMS Swift</td>
<td>Length: 120 cm Width: 52 cm Height: 51 cm</td>
<td>Wooden compartmentalized drawer that was an upper part of a partially excavated wooden box with a lid.</td>
<td>![Image]</td>
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<tr>
<td><strong>INA 521</strong></td>
<td><strong>HMS Swift</strong></td>
<td>Length: 25cm Width: 17.5cm Height: 17cm</td>
<td>Wooden box with a compartmented removable tray. Box had a lid not visible in the image. While the tray contained bottles, the main compartment had a white substance. The content is unknown but probably is calcite.</td>
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<tr>
<td><strong>6000/9661</strong></td>
<td><strong>HMS St George</strong></td>
<td>22.5cm x 16.5cm x 5cm (ext) &amp; 4cm (int)</td>
<td>Ornamented woodcut tray inside. Lock built on structure w/t brass hook fitting to secure it. Concretion was formed inside. Box contained wood cut impressions of tools handles.</td>
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<tr>
<td><strong>6000/965</strong></td>
<td><strong>HMS St George</strong></td>
<td>Box - 50.5cm length x 20cm width x 9.5cm depth Fittings - 4cm length x 2cm width</td>
<td>Box made of oak and reinforced with six brass plates fittings. Box retrieved with concretion on its interior staining the interior. Composed of two parts, built in tray and removable tray.</td>
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<tr>
<td>Instrument</td>
<td>Ship</td>
<td>Description</td>
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<tr>
<td>6000/965 AN</td>
<td>HMS St George</td>
<td>Tray – 41.5cm length x 18.5cm width x 3.5cm depth. Tray is fixed to the bottom of the box and has a range of shapes cut into the wood. One end of the tray is blocked by a wooden wall. Area likely held something big or wide.</td>
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<tr>
<td>6000/996E</td>
<td>St George</td>
<td>Length: 10cm. Smooth dark wood (cherry) made by turning and shaping. In center is an oval shaped hole w/t square hole passing through the center. Ends are decorated with an embossed end.</td>
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</tr>
<tr>
<td>6000/996A / middle</td>
<td>St George</td>
<td>Length: 9.4cm. Diam.: 2.5cm. Cavity: 2cm. Shaft composed of copper alloy. Lower half is hollow but held locking mechanism holding cutting bit in place.</td>
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<tr>
<td>Item</td>
<td>Description</td>
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<td>-----------------------------------------------------------------------------</td>
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<tr>
<td>6000/996B / bottom</td>
<td>St George Length: 9.4cm Cutting bit – 2cm Diam.: 2.5 cm Shaft similar in size and shape as shaft 6000/996A. Has two grooves to aid secure the cutting bit.</td>
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<tr>
<td>6000/996G</td>
<td>St George Length: 3.5cm Width: 1.8cm – 1.3cm Brush handle tapered allowing it to be held with the fingers. Brush is made from one piece of wood with two rows amassed with six holes holding 12 tuffs of hair. Pin held the tuffs of hair in place, indicating that the hair likely was looped around the pins keeping the hair in place on the wooden block.</td>
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<tr>
<td>6000/996D / top</td>
<td>St George Length: 7cm Wood handles remains composed of dark wood likely cherry. Shape of the contour suggests they were used for turning. Oval on one end</td>
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### Ship’s Barber-Surgeon: The Evolution of Naval & Maritime Medical Instruments from the 16th to the 19th Century

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<td>Wood handles remain composed of dark wood likely cherry. Shape of the contour suggests they were used for turning. Oval on one end.</td>
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<tr>
<td>6000/666H</td>
<td>St George</td>
<td>Length: 10cm Width: 1.5cm Narrow 1cm Blade impression Length: 8.5cm Width: 1cm</td>
<td>Lancet composed of thin bone cover held by two iron pins now corroded. Blade likely was folded and covered inside of sheath of handle. Surface is dyed red and brown from the iron oxide concretion.</td>
</tr>
<tr>
<td>6000/996F</td>
<td>St George</td>
<td>Width: 1.5cm Thickness: 5mm Blade impression Length: 7cm 1 Width: 17.5cm</td>
<td>Oval shaped oak handle. From the cut impression, the tool was stored on its side suggesting the blade was blunt and functioned likely as a palette knife.</td>
</tr>
<tr>
<td>Reference</td>
<td>Ship</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>6000/965V</td>
<td>HMS St George</td>
<td>Octagonal wood handle composed with a single piece of wood. The handle is shaped as an eight sided cylinder that bulges at midpoint. In the middle of the handle a square cavity is made to fit on a brass shaft.</td>
<td></td>
</tr>
<tr>
<td>6000/965U</td>
<td>HMS St George</td>
<td>Rounded handle shaped in the corkscrew manner. A cavity is made through the handle. As with other handles, this one is simplified with no decoration.</td>
<td></td>
</tr>
<tr>
<td>6000/965P</td>
<td>HMS St George</td>
<td>Molded copper alloy shafts. The lower half is hollow and filled with concretion.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
| **6000/965O** | **HMS St George** | Length: 9.4cm
Diam.: 2.3cm
2.5cm at base
Cavity
rectangular hole : 2cm | Molded copper alloy shafts. The lower half is hallow and filled with concretion. | N/A |
| **6000/965W** | **HMS St George** | Length: 3.5cm
Width: 2cm
Thickness: 7mm | Brush handle composed of a single piece of wood. Two rows of six holes each held tuffs of hair held in place by two pins. There are traces of white hair amongst the holes. The handle is coated in thick white paint. |   |
| **6000/965AO** | **HMS St George** | Length: 9.5cm
Width: 1cm | Wooden thin handle with a round end. A third of the body has a cavity passing in the top. That cavity held the shaft of the blade held together by two iron pins. The pins despite being visible are corroded. |   |
### Saws & Blades

<table>
<thead>
<tr>
<th>Document Number</th>
<th>Ship</th>
<th>Description</th>
</tr>
</thead>
</table>
| 6000/965S       | HMS St George | Handles Length: 6.5cm Width: 2cm Depth: 
Cut Impressions Length: 7.5cm Width: 1cm Depth: 
Others: cut face is 1cm across
Handles composed of a dark smooth wood, likely cherry wood. Handles are oval shaped and have a carved lip. |
| 6000/965R       | HMS St George | Handles Length: 6.5cm Width: 2cm Depth: 
Cut Impressions Length: 7.5cm Width: 1cm Depth: 
Others: cut face is 1cm across
Handles composed of a dark smooth wood, likely cherry wood. Handles are oval shaped and have a carved lip. |
| 6000/965Q       | HMS St George | Handles Length: 4.7cm Width: 2.5cm Depth: 
Cut Impressions Length: 8cm Width: 1cm Depth: 
Others: cut face 1 cm across
Handles likely made of cherry wood. Handle is bulb shaped and has a void gentle curve shaped which was likely a curved probe or elevator |
<table>
<thead>
<tr>
<th>Catalogue No</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>80A1566</td>
<td>Mary Rose</td>
<td>Composed of ash wood and has a rectangular tang hole. Used to acquire a heavy blade or bar.</td>
</tr>
<tr>
<td>80A1919</td>
<td>Mary Rose</td>
<td>Made of alder and is cylindrically turned handle with a diamond shaped tang hole.</td>
</tr>
<tr>
<td>80A1920</td>
<td>Mary Rose</td>
<td>Spruce wood handle that is cylindrically turned and has a rectangular tang hole.</td>
</tr>
<tr>
<td>Code</td>
<td>Ship/Shipwreck</td>
<td>Details</td>
</tr>
<tr>
<td>----------</td>
<td>----------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>80A1588</td>
<td>Mary Rose</td>
<td>Length: 88mm Diam.: 36mm</td>
</tr>
<tr>
<td>80A1580</td>
<td>Mary Rose</td>
<td>Length: 80mm</td>
</tr>
<tr>
<td>6000/965X</td>
<td>HMS St George</td>
<td>Sheath: 8.9cm Length: 1.5cm Width: 3mm</td>
</tr>
<tr>
<td>Reference</td>
<td>Site of Recovery</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>6000/965Z</td>
<td>HMS St George</td>
<td>Sheath – 7.7cm length x 1.2cm width</td>
</tr>
<tr>
<td>6000/965E</td>
<td>HMS St George</td>
<td>9.6cm length x 1cm thick tempering to 0.5mm at the end of the handle</td>
</tr>
<tr>
<td>6000/965AC</td>
<td>HMS St George</td>
<td>Handle Length : 9.3 Diam.: 1.9cm Thickness: 1cm Handle Wood Cut Length: 10.5cm Width: 1cm</td>
</tr>
</tbody>
</table>
**Ship’s Barber–Surgeon The Evolution of Naval & Maritime Medical Instruments from the 16th to the 19th Century**

<table>
<thead>
<tr>
<th>6000/965AF</th>
<th>HMS St George</th>
<th>Handle</th>
<th>Handle composed of three ebony pieces of wood bound together. A wood cut impression suggest that the blade was long and thin in shape likely that of an amputation knife.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Length : 10.5cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Width: 2.3cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thickness: 1.6cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Handle Wood Cut Length: 16.5cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Width: 1.5cm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6000/965AG</th>
<th>HMS St George</th>
<th>Handle</th>
<th>Wooden handle composed of three pieces of ebony wood bound together. The size and profile of the blade suggest that the blade was used to remove full limbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Length : 11.5cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Width: 2.7cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thickness: 1.6cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Handle Wood Cut Length: 19.5cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Width: 2.1cm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6000/965AE</th>
<th>HMS St George</th>
<th>Handle</th>
<th>Dark ebony wooden handle composed of three parts. The woodcut impression that is linked to the handle with half a circle. Likely a metacarpal bone saw.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Length : 9.9cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Width: 1.6cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thickness: 1.6cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Handle Wood Cut Length: 10cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diam.: 4cm</td>
<td></td>
</tr>
</tbody>
</table>
**Ship’s Barber-Surgeon: The Evolution of Naval & Maritime Medical Instruments from the 16th to the 19th Century**

<table>
<thead>
<tr>
<th>Catalogue Number</th>
<th>Ship</th>
<th>Length</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6000/965Y</td>
<td>HMS St George</td>
<td>9.5cm</td>
<td>Handle composed of two worked pieces of wood. The wood worked into a handle is held together by three iron pins which pass through the wood and the metal shaft. The iron pins were inserted near the end of the handle, near the front of the handle and in the middle of the handle. This handle was suggested to be either part of a probe or part of an amputation knife.</td>
</tr>
</tbody>
</table>

**Tourniquets**

<table>
<thead>
<tr>
<th>Catalogue Number</th>
<th>Ship</th>
<th>Length</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA102</td>
<td>HMS Pandora</td>
<td>80mm</td>
<td>Tourniquet composed of brass and consist of a threaded screw and winder and two rectangular plates with extending flanges. No strap survives.</td>
</tr>
<tr>
<td>7546/153</td>
<td>HMS St George</td>
<td>7.5cm x 5cm x 6.5cm x 7mm</td>
<td>Tourniquet composed of brass and composed of two parts; square base with a screw shaft set in it.</td>
</tr>
</tbody>
</table>

**Syringes**
<table>
<thead>
<tr>
<th>Catalogue Number</th>
<th>Ship</th>
<th>Length</th>
<th>Diameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6000/3278</td>
<td>HMS St George</td>
<td>10.5 cm</td>
<td>1.8 cm</td>
<td>Pewter syringe likely in the treatment of venereal diseases.</td>
</tr>
<tr>
<td>MA74</td>
<td>HMS Pandora</td>
<td>80 mm</td>
<td>91 mm</td>
<td>Syringe composed of Ivory and a wooden plunger. The plunger shaft is broken at the base of the thread. No needles found. Three parts survives. A threaded disk, the plunger and the central cylinder.</td>
</tr>
<tr>
<td>80A1560</td>
<td>Marie Rose</td>
<td>232 mm</td>
<td>138 mm</td>
<td>Brass syringe. Consisted of a barrel, plunger and a pipe. It also consisted of a catch which holds the washer for the plunger.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Length:</td>
<td>Plunger:</td>
<td>Description</td>
</tr>
<tr>
<td>-----</td>
<td>---------</td>
<td>---------</td>
<td>----------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>81A5738</td>
<td>Marie Rose</td>
<td>80mm</td>
<td>136mm</td>
<td>Syringe made of copper-alloy and has a leather washer. Has a shorter pipe.</td>
</tr>
<tr>
<td>80A1741</td>
<td>Marie Rose</td>
<td>260mm</td>
<td>150mm</td>
<td>Has the body and plunger composed of pewter and a bronze pipe.</td>
</tr>
<tr>
<td>QAR1904.000</td>
<td>Queen Anne Revenge</td>
<td>N/A</td>
<td></td>
<td>Two pump clysters were recovered. Both were composed of pewter. Only one was a maker’s mark while the second did not.</td>
</tr>
</tbody>
</table>
**Ship’s Barber–Surgeon** The Evolution of Naval & Maritime Medical Instruments from the 16th to the 19th Century

<table>
<thead>
<tr>
<th>QAR308.001</th>
<th>Queen Anne Revenge</th>
<th>N/A</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Probe</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80A1579</td>
<td>Mary Rose</td>
<td>Length: 78mm</td>
<td>Diam.: 30mm</td>
</tr>
<tr>
<td>80A1563</td>
<td>Mary Rose</td>
<td>Length: 38mm</td>
<td></td>
</tr>
<tr>
<td>80A1917</td>
<td>Mary Rose</td>
<td>Length: 40mm</td>
<td>Handle composed of cherry wood. It’s ornately turned into a small dome.</td>
</tr>
<tr>
<td>----------</td>
<td>-----------</td>
<td>-------------</td>
<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td>80A1918</td>
<td>Mary Rose</td>
<td>Length: 40mm, Diam.: 30mm</td>
<td>Handle composed of boxwood that is ornately turned into a small dome.</td>
</tr>
<tr>
<td>6000/965AQ</td>
<td>HMS St George</td>
<td>7.8cm length x 1cm width x 4-5mm diam., Hole – 2cm depth</td>
<td>Handle short and thin in shape. A hole on the top of the handles where a shaft would have been placed into. No fixings are visible. The method of fixing the blade into the handle suggests that they were not meant to deal with an exerted amount of pressure.</td>
</tr>
</tbody>
</table>
### Ship’s Barber–Surgeon: The Evolution of Naval & Maritime Medical Instruments from the 16th to the 19th Century

<table>
<thead>
<tr>
<th>Instrument ID</th>
<th>Ship</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6000/965AP</td>
<td>HMS St George</td>
<td>7.8cm length x 1cm width x 4-5mm diam. Hole – 2cm depth</td>
<td>Handle short and thin in shape. A hole on the top of the handles where a shaft would have been places into. No fixings are visible. The method of fixing the blade into the handle suggests that they were not meant to deal with an exerted amount of pressure.</td>
</tr>
<tr>
<td>6000/965AI</td>
<td>St George</td>
<td>Length: 5cm Diam.: 1.5cm</td>
<td>Handle composed from cherry wood.</td>
</tr>
<tr>
<td>6000/965A</td>
<td>St George</td>
<td>Length: 6.7cm Diam.: 22cm</td>
<td>Handle composed from cherry wood.</td>
</tr>
</tbody>
</table>

**Trocar & Catheter**
<table>
<thead>
<tr>
<th>Object ID</th>
<th>Ship</th>
<th>Length</th>
<th>Width</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6000/965AB</td>
<td>HMS St George</td>
<td>6cm</td>
<td>1cm</td>
<td>Remains of copper covers that likely covered the outside of trocars spikes. The tubes have a conical end. Still visible is an elongated oval which aided the flow of liquid.</td>
</tr>
<tr>
<td>6000/965AH</td>
<td>HMS St George</td>
<td>4cm</td>
<td>0.5cm</td>
<td>Remains of copper covers that likely covered the outside of trocars spikes. The tubes have a conical end. Artefact is badly decayed and was likely shaped in a bend.</td>
</tr>
<tr>
<td>6000/965G</td>
<td>HMS St George</td>
<td>28cm / strained 30cm</td>
<td>5mm / marginally thinner 4mm</td>
<td>Composite metal wire covered in woven material sack of gum elastic with a vent at the tip for the drainage of fluids. The base has a small ring functioning as a handle</td>
</tr>
</tbody>
</table>
### Apothecary Instruments

<table>
<thead>
<tr>
<th>ID</th>
<th>Wreck</th>
<th>Measurements</th>
<th>Description</th>
<th>Images</th>
</tr>
</thead>
<tbody>
<tr>
<td>80A1672</td>
<td>Mary Rose</td>
<td>Height: 110mm Rim: 144mm</td>
<td>Copper-alloy mortar found inside the chest. Four handles, two rounded and two squared. One of the squared one has a ring through it. On the body outside, an incision with two crosses and a figure ‘4’ over it.</td>
<td><img src="image1.jpg" alt="Mortar Image" /> <img src="drawing1.png" alt="Drawing Image" /></td>
</tr>
<tr>
<td>BAT457</td>
<td>Batavia</td>
<td>Height: 142mm Base: 113mm Neck: 175mm</td>
<td>Has inscription 'AMOR VINCIT OMNIA ANNO1625.'</td>
<td><img src="image2.jpg" alt="Batavia Image" /> <img src="drawing2.png" alt="Batavia Drawing" /></td>
</tr>
<tr>
<td>Artifact Code</td>
<td>Name</td>
<td>Dimensions</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>------------</td>
<td>-----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>BAT562</td>
<td>Batavia</td>
<td>Height: 99mm, Base: 70, Neck: 124</td>
<td>Similar mortar as that of BAT457. Not as well preserved as BAT457. Fragmented.</td>
<td></td>
</tr>
<tr>
<td>MA93</td>
<td>Pandora</td>
<td>Height: 75mm, Base Diam.: 75mm, Rim Diam.: 156mm</td>
<td>Mortar composed of marble with four equidistant ears around the base. One ear has a pouring groove on its upper surface. A groove encircles the outside of the bowl. Scratches on the inside suggests the utilization of the marble.</td>
<td></td>
</tr>
<tr>
<td>QAR-001</td>
<td>Queen Anne Revenge</td>
<td>N/A</td>
<td>Both the mortar and pestle were composed of cast brass but of different composition. The pestle was not recovered with the mortar but rather from another unit during another season work.</td>
<td></td>
</tr>
</tbody>
</table>

**Spatulas & Spoons**
<table>
<thead>
<tr>
<th></th>
<th>Ship's Barber-Surgeon</th>
<th>The Evolution of Naval &amp; Maritime Medical Instruments from the 16th to the 19th Century</th>
</tr>
</thead>
</table>
| 80A1557 | Marie Rose | Length: 114-133mm  
Width: 28-30mm  
Composed of pine with rounded ends resembling modern lollipop. | N/A |
| 80A1587 | Marie Rose | Length: 114-133mm  
Width: 28-30mm  
Composed of pine with rounded ends resembling modern lollipop. | N/A |
| 80A1915 | Marie Rose | Length: 114-133mm  
Width: 28-30mm  
Composed of beech and fragmented. | N/A |
<table>
<thead>
<tr>
<th>Code</th>
<th>Ship</th>
<th>Description</th>
</tr>
</thead>
</table>
| 80A1927 | Marie Rose | Length: 114-133mm  
Width: 20-30mm  
Composed of pine with rounded ends resembling modern lollipop. |
| 80A1675 | Mary Rose | Length: 167mm  
Spoon made from alder wood and curved to suit the right hand. A ‘U’ incision is marked on the back between the handle and the bowl. |
| 80A1733 | Marie Rose | Length: 25mm  
Needle composed of boxwood retrieved from the cabin. |
<table>
<thead>
<tr>
<th>Code</th>
<th>Ship</th>
<th>Material</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>QAR232.014</td>
<td>Queen Anne Revenge</td>
<td>N/A</td>
<td>Needle composed of silver. It was suggested that it could have been used in surgery</td>
</tr>
<tr>
<td>80A1626</td>
<td>Mary Rose</td>
<td>Height: 80mm Rim Diam: 160-184mm</td>
<td>A cast copper-alloy chafing dish was retrieved from the Mary Rose. The rim of the dish has eight crenellations and a succession of ventilation holes in the center of the body. The holes are arranged in eight groups and within each group are five holes arranged in an 'X' pattern. Two larger opposite holes divide the smaller holes across the central line.</td>
</tr>
<tr>
<td>80A1743</td>
<td>Mary Rose</td>
<td>Length: 392mm Width: 200mm</td>
<td>The mallet is compound with an elm head and an oak handle.</td>
</tr>
<tr>
<td>Item Code</td>
<td>Description</td>
<td>Details</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>QAR2590.000</td>
<td>Queen Anne Revenge</td>
<td>Seven nesting cups have been excavated from the Queen Anne Revenge. They are all similar in shape but altered in sizes permitting them to be nested inside each other.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Artificial limb</td>
<td>Limb is composed from one section of wood. It is cylindrical in shape and has a wider top getting narrower at the base. The top was hallowed out into a smooth half-circle while the rim is thinned out and smoothed into the shape of a cup. As with all prosthetic limbs, the narrower part would be in contact with the ground while the top is where the amputee would insert their stump. It was suggested that the carpenter manufactured those.</td>
<td></td>
</tr>
<tr>
<td>7546/1002</td>
<td>St George</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>7546/952</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7546/483</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bandage Roll</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The rolls, primarily thought to be of unguent, were later revealed upon closer analysis by Brendan Derham to be rolls of linen bandages saturated with assortments of oils and resins (Castle 2005:207). Being so, they are ready made plasters.

**Feeding Bottle**

<table>
<thead>
<tr>
<th>80A1555</th>
<th>Mary Rose</th>
<th>Length: 145mm Diam.: 66mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottle composed of maple wood. Has a lid that snugly fits over the body.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Scissors**

<table>
<thead>
<tr>
<th>SCORP-2011-53 (right)</th>
<th>USS Scorpion</th>
<th>Length: 13.4 cm Blade length: 7.5 cm Blade %: 52</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scissors was recovered during the 2011 excavation. It is also composed of iron. Scissors is slightly longer than that of 99-69-AE with the blades also terminating in a sharp point. The blade of the handle is skewed in favor of the blades. It was used in post-mortem procedures such as cutting open large lengths of bowel for examination</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 99-69-AE (Left) | USS Scorpion | Length: 13.2 cm  
Blade length: 5.5 cm  
Blade %: 42 | Scissor was recovered during the 1979 excavation. It is composed of iron. The blades of the scissors are short and slender and each blade terminate in sharp points. The blades meet the base of the handle at a slight angle. Used for both; to cut bandages and to perform delicate procedures such as in the removal of sutures. |

<p>| QAR3291.000 | Queen Anne Revenge | N/A | Scissor was attached to the wreck site. The only archaeological evidence is that of an X-ray (QARX/13/822). The scissor was probably made of iron. |</p>
<table>
<thead>
<tr>
<th>ID</th>
<th>Wreck</th>
<th>Measurement</th>
<th>Description</th>
<th>Images</th>
</tr>
</thead>
</table>
| 80A1534 / Vessel 27 | Marie Rose | Height: 230mm  
Body Diam.: 160mm  
Rim Diam: 23mm  | Thumbed base with single strap handle.  | ![Image](image1.png) |
| 80A1559 / Vessel 28 | Marie Rose | Height: 205mm  
Body Diam.: 135mm  
Rim Diam: 20mm  | Thumbed base with single strap handle. Fitted with a cork bung with waxed leather. | ![Image](image2.png) |
| 80A1573 / Vessel 29 | Marie Rose | Height: 218mm  
Body Diam.: 160mm  
Rim Diam: 46mm  | Thumbed base with single strap handle. Fitted with a cork bung.  | ![Image](image3.png) |
<table>
<thead>
<tr>
<th>Vessel ID</th>
<th>Vessel Name</th>
<th>Height</th>
<th>Body Diameter</th>
<th>Rim Diameter</th>
<th>Base &amp; Handle Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>80A1574 / Vessel 30</td>
<td>Marie Rose</td>
<td>224mm</td>
<td>162mm</td>
<td>64mm</td>
<td>Thumbed base with single strap handle.</td>
</tr>
<tr>
<td>80A1662 / Vessel 31</td>
<td>Marie Rose</td>
<td>196mm</td>
<td>132mm</td>
<td>46mm</td>
<td>Thumbed base with single strap handle. Fitted with a cork bung.</td>
</tr>
<tr>
<td>80A1575 / Vessel 32</td>
<td>Marie Rose</td>
<td>230mm</td>
<td>148mm</td>
<td>47mm</td>
<td>Thumbed base with two opposed strap handles. Jug postdates 1485.</td>
</tr>
<tr>
<td>Item Code</td>
<td>Vessel</td>
<td>Description</td>
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</tr>
<tr>
<td>80A1637 /</td>
<td>33</td>
<td>Marie Rose, Height: 187mm Body Diam.: 145mm Rim Diam: 48mm Thumbed base</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vessel 33</td>
<td></td>
<td>with single strap handle. Fitted with a cork bung.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80A1459</td>
<td></td>
<td>Mary Rose, Height: 212mm Rim Diam.: 34mm Standing costrel with two handles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>retrieved from the barber surgeon cabin. Iberian in origin likely from</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Portugal and discovered with a cork bung and a firing mark in the form of</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>a ‘v’. Contained either fern oil or root extract mixed with milk.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80A1483 /</td>
<td>26</td>
<td>Mary Rose, Height: 57mm Rim Diam.: 33mm A tiny jug that is tin-glazed was</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vessel 26</td>
<td></td>
<td>salvaged from the cabin. Originated and made in the Southern part of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Netherlands, likely at Antwerp. Decorated with a latticed medallion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>painted in yellow and white painted dots. All of those motifs are fenced</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>with a dark blue/grey foliage design.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| MA4016     | Pandora   | Height: 90mm  
|           |           | Lip Diam.: 29mm  
<p>|           |           | Bore Diam.: 21mm  |
|           |           | Stoneware pot with a brown salt-glaze. The pot has a bulbous belly with a flat base, narrow neck and a tick lip. A mark ‘3’ is embedded into the surface of the belly. The vessel still enclosed mercury. |
| INA 516   | HMS Swift | N/A               |
|           |           | The ware is small in the form of a ‘Y’ and globular. It also has a narrow neck. The vessel was retrieved with a cork bung still inside the mouth. Due to the bung, the contents still survived. The content was that of mercury. |
| INA 316   | HMS Swift | Length: 12cm     |
|           |           | Despite that the pottery is fragmented, the vessel originally would have been open, flat and edge base. The ware is decorated in blue and black bands that parallel each other. Content inside comprised of rhizomes which are ginger root like |</p>
<table>
<thead>
<tr>
<th>BAT 2331 / BAT 2326 / BAT 2318</th>
<th>Batavia</th>
<th>N/A</th>
<th>Jars composed of an earthenware comprising of a yellowish buff and white tin glazed body with decoration comprising of blue, orange, yellow and green paint.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAT 2301 BAT 2299</td>
<td>Batavia</td>
<td>N/A</td>
<td>Earthenware’s composed of a red body with a brown glaze on the inside.</td>
</tr>
<tr>
<td>I-28M</td>
<td>HMS Swift</td>
<td>N/A</td>
<td>Motif detailed on the basin 1-27 MB. The motif is comprised of a lion.</td>
</tr>
<tr>
<td>I-27 MB</td>
<td>HMS Swift</td>
<td>N/A</td>
<td>Basin composed of ceramic, stoneware with salt glaze. It has a mixture of blue and gray in color. The container has a handle attached to the body of the basin starting from the lip and finishing approximately ( \frac{2}{3} ) of the way down. The basin is ornamented with a motif of a lion and that of a rosette. That motif is believed to have been molded separately only to be applied after the basin was finished. Both motif are encircled by a frame painted in blue. The rosette is painted the same color of the frame. Two straight bands situated on the upper edge below the lip and down above the base are also painted in the same color.</td>
</tr>
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</tr>
<tr>
<td>I-28 MB</td>
<td>HMS Swift</td>
<td>Height: 12.9cm Diam internal mouth: 16cm Diam external mouth: 20cm Base: 22cm</td>
<td>Terracotta ceramic (earthenware) that is reddish brown in color and overlaid by a green glaze. As with the two other basin, this one also has a handle.</td>
</tr>
<tr>
<td>80A1629</td>
<td>Marie Rose</td>
<td>Rim Diam.: 160-184mm Height: 80mm</td>
<td>Composed of copper-alloy with vertical sides joining at the base with steep curve creating a small basin. Horizontal pairs of plain wire rivets below the rim and blackened on the exterior.</td>
</tr>
<tr>
<td>Parcel</td>
<td>Name</td>
<td>Description</td>
<td></td>
</tr>
<tr>
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<td>-----------------------------------------------------------------------------</td>
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</tr>
</tbody>
</table>
| 80A1618  | Marie Rose | Diameter: 395mm  
                     Height: 138mm  
                     Capacity: 5 Liters  
                     Bowl composed of sheet of brass. The rim has a cutout section where the neck could fit and sit under the chin. On the side of the bowl a small metal ring is protruding. That ring is used to suspend the bowl to a wall. |
| KLM 14383 Kr | Kronan | Inner Diam.: 77mm  
                     Outer Diam.: 84mm  
                     Bowls composed of wood. It constituted of a hollow half-sphere and has a dent on its edge which graded to a minor crack running towards its bottom. |
| BAT 516A  | Batavia | Diam.: 328mm  
                     Depth: 102mm  
                     Bowl composed of brass. Has a hanging ring. Bowl has a typical cut out probably for the neck on the opposite site of the hook. The rim is flattened and slightly upturned |
<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAT 516B</td>
<td>Batavia</td>
<td>Bowl is similar to BAT 516A but a little smaller. Likely fitted inside BAT 516 composed of brass. Has a hanging ring. Bowl has a typical cut out probably for the neck.</td>
</tr>
<tr>
<td>80A1540</td>
<td>Mary Rose</td>
<td>Green glass recovered from the chest. Bottle has a 'wrythen' decoration of protruding spirals running from the base to the lip. No cork bung survived.</td>
</tr>
<tr>
<td>80A1565</td>
<td>Mary Rose</td>
<td>Green glass also recovered from the chest. Similar dimension as that glass 80A1540. Bottle has a 'wrythen' decoration of protruding spirals running from the base to the lip. The cork bung survived but the contents did not.</td>
</tr>
</tbody>
</table>
| 80A1631 | Mary Rose | Height: 55mm  
Rim Diam.: 22mm  
Girth: 48mm | Small green bottle. Unlike the two others, this one was recovered adjacent the chest and has been fragmented. Bottle has a 'wrythen' decoration of protruding spirals running from the base to the lip. The cork bung survived but the contents did not. |
| MA49 | Pandora | Height: 120mm  
Base Diam.: 31mm  
Neck Diam.: 12mm  
Body Diam.: 12mm | Intact bottle composed of colorless glass. The shape is that of a cylindrical body tempering at either end. Has a short narrow neck and wide lips. The bottle has a cork bung that is also cylindrical in shape with a flat top. A black residue stained the bottle on the inside and identified as an organic matter. |
| MA132 | Pandora | Height: 109mm  
Base: 25mm  
Neck Diam.: 23mm  
Bore Diam.: 11mm  
Lip Diam.: 22mm | Integral bottle also composed of colorless glass. Squared body with rounded corners. It has a short neck and wide flat lips. Bottle has a glass bung that is flat and oblong. Bottle has a black residue on its inside. Analysis shows that the residue is that of clove oil that is still pungent. |
<table>
<thead>
<tr>
<th>Item</th>
<th>Vessel</th>
<th>Length</th>
<th>Outside Diameter</th>
<th>Inside Diameter</th>
<th>Width</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INA 513, 515, 517, 518</td>
<td>HMS Swift</td>
<td>N/A</td>
<td>Cylindrical</td>
<td>Glass Plunger</td>
<td>About Same Dimension</td>
<td>Shoulders well marked with short neck and flat lips.</td>
</tr>
<tr>
<td>INA 506</td>
<td>HMS Swift</td>
<td>139mm</td>
<td>70mm</td>
<td>52mm</td>
<td>79mm</td>
<td>Vessel composed of glass. Part of subtype A. Squared shape with little to no neck. Wide open mouth with elaborated lips.</td>
</tr>
<tr>
<td>INA 509, 519, 514</td>
<td>HMS Swift</td>
<td>120mm</td>
<td>30mm</td>
<td>13mm</td>
<td>50mm</td>
<td>Squared green glass wares.</td>
</tr>
<tr>
<td>N/A</td>
<td>HMS Swift</td>
<td>Height: 11cm Diam.: 3cm</td>
<td>Bottle was cylindrical in shape and green in color. A simple was taken by TXRF where the content was that of mercury chloride.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>80A1526 / 80A1531</td>
<td>Mary Rose</td>
<td>Height: 164mm Diam.:110mm</td>
<td>Two wooden canisters retrieved from the Mary Rose. The two are part of the fourteen others that are composed of poplar wood. Those two artefacts are similar to the fourteen others.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80A1690 / 80A1702</td>
<td>Mary Rose</td>
<td>Height: 90-102mm Diam.:25mm</td>
<td>Two wooden canisters that are amongst the three that are composed of ash wood. Just as those made of poplar wood, they are similar in all aspect.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 80A1582 | Mary Rose | Height: 121mm  
Diam.: 88mm | Pewter canister excavated from the chest. Cylindrical in shape locate with slip-on lid. Similar design to those wooden canisters. The only pewter canister stamped with a mark of a rose on the base. |
| 80A1628*/80A1619 | Mary Rose | 80A1628  
Height: 195mm  
Diam.: 95mm  
80A1619  
Height: 80mm  
Diam.: 75mm | Both canisters composed of pewter and retrieved from the cabin adjacent to the chest. Similar to canister 80A1582 in all aspects excluding the mark. |
### Hygiene Instruments

<table>
<thead>
<tr>
<th>ID</th>
<th>Wreck</th>
<th>Measurement</th>
<th>Description</th>
<th>Images</th>
</tr>
</thead>
<tbody>
<tr>
<td>6000/960</td>
<td>HMS St George</td>
<td>Disk Width: 3.5cm</td>
<td>Brush likely utilized as means for shaving. The brush is circular and composed of bone. The disk is also covered in pewter metal. The shaft which acts as a handle is composed of wood. The hair tufts used as bristles all but disintegrated leaving only three rings of holes located in a center larger hole where the handle and disk meets.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thickness: 7mm</td>
<td></td>
<td><img src="image1.jpg" alt="Disk Image" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shaft Length: 3.9cm</td>
<td></td>
<td><img src="image2.jpg" alt="Shaft Image" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thickness: 9mm</td>
<td></td>
<td><img src="image3.jpg" alt="Handle Image" /></td>
</tr>
<tr>
<td>81A1322</td>
<td>Mary Rose</td>
<td>Disc Diam: 55mm</td>
<td>Brush handle composed of two parts. A disc with 19 pierced holes and a turned cone that was glued to the disc to function as a handle. No bristles survived.</td>
<td><img src="image4.jpg" alt="Disc Image" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thickness: 10mm Cone</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Height: 45mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6000/3131</td>
<td>HMS St George</td>
<td>Structure Length: 6.3cm</td>
<td>Artefacts likely that of a manicure set composed of shaped bone. The object has three blade arms pinned together to the handle by means of a thin iron pin folds down to the side of the handle when not in use. The end of the blades are ornamental. Such artefact was likely used for cleaning dirt under the finger nails.</td>
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<tr>
<td></td>
<td></td>
<td>Width: 5mm</td>
<td></td>
<td><img src="image5.jpg" alt="Structure Image" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thickness: 7mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blade Thickness: 3cm</td>
<td></td>
<td><img src="image6.jpg" alt="Blade Image" /></td>
</tr>
<tr>
<td>Object ID</td>
<td>Vessel</td>
<td>Length</td>
<td>Description</td>
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</tr>
<tr>
<td>81A4130</td>
<td>Mary Rose</td>
<td>100mm</td>
<td>Well preserved manicure composed of bone and comprised of five altered shapes. All components are still held together by a single pin functioning as a pivot point allowing the component to open and close. A bone loop is fixed to the pivot functioning as a point of attachment for a lace or piece of rope for securing to belts.</td>
<td></td>
</tr>
<tr>
<td>81A1276</td>
<td>Mary Rose</td>
<td>90mm</td>
<td>Used as a general grooming. Composed of ivory. It has a twist at the in the carved stem and it has a bended end.</td>
<td></td>
</tr>
<tr>
<td>INA-NR019</td>
<td>HMS Swift</td>
<td>64 x 71.8 x 71 Diam: 35.5cm Max Thickness</td>
<td>Toilet seat composed of wood. The shape is slightly skewed and that of quadrangular form. The toilet has a circular hole in its center.</td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Type</td>
<td>Details</td>
<td>Description</td>
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</tr>
<tr>
<td>78A0078</td>
<td>Mary Rose</td>
<td>Diam: 140mm Height: 130mm Capacity: 1.7 liters</td>
<td>Chamber pot composed of pewter recovered from the scour pit (SS11) beneath the Stern castle.</td>
<td></td>
</tr>
<tr>
<td>BAT 504</td>
<td>Batavia</td>
<td>Center Diam.: 131mm Handle Diam.: 30mm Handle Tampering: 18mm</td>
<td>Pan composed of a fine red earthenware with a green glaze on the interior and exterior. Round bottom pan with a hallow handle. The upper session of the rim is flat and rounded. The handle has an everted opening.</td>
<td></td>
</tr>
<tr>
<td>80A1913</td>
<td>Mary Rose</td>
<td>N/A</td>
<td>Razor was worked from a single piece of wood. Razors were noted of having an iron pin at the solid end of the handle. Those pins were suggested to be contemporary fixes to the solid piece which in time would have accidentally split. An iron pin was inserted at the end of the handle where the iron blade could be installed and pivoted to open and close the blade.</td>
<td></td>
</tr>
<tr>
<td>Ship’s Barber–Surgeon The Evolution of Naval &amp; Maritime Medical Instruments from the 16th to the 19th Century</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Ship</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>80A1922</td>
<td>Mary Rose</td>
<td>N/A</td>
<td>Razors was also worked from a single piece of wood and was also noted of having an iron pin at the solid end of the handle. Those pins were suggested to be contemporary fixes to the solid piece which in time would have accidentally split. An iron pin was inserted at the end of the handle where the iron blade could be installed and pivoted to open and close the blade.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Ship</th>
<th>Measurements</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7546/464</td>
<td>St George</td>
<td>Length: 7.2cm Width: 4.2cm Thickness: 1mm</td>
<td>Comb composed of bone. The artifact was suggested to be worked from a single piece of bone. The comb is double sided similar to many of the combs from the Mary Rose. One side of the comb, the teeth are still in place while on the opposite side, all of the teeth were gone. The comb despite being made of bone is brownish/reddish in color probably due to the traces of iron dioxide on it. It might also suggest that this particular comb when it went under was close to materials composed of iron. It was said that it was damaged during its preservation. The teeth of the comb are finely cut.</td>
</tr>
<tr>
<td>7546/112</td>
<td>St George</td>
<td>N/A</td>
<td>Comb is composed of a bone. Similar to 7546/464, this comb was also made using one piece of bone. Unlike comb 7546/464 that is missing a row of teeth, this one is well preserved and still has its majority of teeth with only one end of the corner that is missing some of the teeth. Because of the drying process, the teeth has been pulled apart by the bend of the bone. The comb is also brownish/reddish due to the iron dioxide. A small hole has been drilled near the end suggesting that this comb could have a string attached to it permitting one of the crew to wear it around the neck or it could have been carried in the pocket and secured by the string to the pants.</td>
</tr>
<tr>
<td>Mary Rose</td>
<td>Mary Rose</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
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</tr>
</tbody>
</table>

80 doubled sided combs were retrieved and two with a single row of tooth. They were mostly composed of boxwood with the exception of one that was made of alder while another one was made of ivory.
Ship’s Barber–Surgeon: The Evolution of Naval & Maritime Medical Instruments from the 16th to the 19th Century

Sergei Beliveau-Dubois