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INFECTION PREVENTION HAND-BOOK FOR SEAFARERS WORKING IN CARGO SHIP

THESIS REPORT

DEGREE PROGRAMME IN NURSING
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ABSTRACT

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The fact that cargo ships are involved in the transportation of almost all commodities sold worldwide is well documented. These cargo ships need the services of healthy and skilled seafarers for their maintenance, operations, and repair. The seafarers are confronted with a lot of health challenges as dictated by the nature of their job as they voyage across different parts of the world and the ship's limited space and cramped environment have made them highly susceptible to contract and spread infectious diseases. Evidence has shown that enough research has not been done to acquaint and familiarise the seafarers with information regarding the infection prevention measures.

This is a project-based thesis which has a product in the form of a handbook as its scope. The purpose of this thesis was to prepare electronic handbook in English that contains guidelines for the prevention of infections among seafarers who work in cargo ships. The objective was premised on improving the infection prevention knowledge of cargo ship seafarers all over the world. It is believed that this will help to considerably reduce the morbidity and mortality of infectious diseases among the seafarers and mitigate the spread of these diseases by them. This project has enabled the authors to deepen their intellectual acumen, broaden their knowledge of the topic and sharpen their research skills to provide a worthwhile, informative, and incisive product.

The product is an electronic handbook which was created using Adobe InDesign and FlipHTML5. It is a 48-page handbook that is divided into eight chapters. It contains twenty-one infections commonly faced by the seafarers. Each of the infections was concisely addressed under six headings namely key facts, mode of transmission, incidence, health implications, symptoms, and prevention. Prevention is further discussed under three sub-headings – primary, secondary, and tertiary.

Scrum agile project methodology was used for the implementation of the project as it was carried out in five phases namely initiation, planning and estimation, implementation, reviewing and releasing. The method was adopted due to its ability to accommodate modifications.

It is imperative to assert that the information provided in this thesis was extracted from credible and reliable sources in accordance with SAMK guidelines. Ethical principles were strictly adhered to according to SAMK and TENK guidelines.

Keywords: Infections, infection prevention, seafarers, cargo ship

CONTENTS

1 INTRODUCTION

The role of cargo ship seafarers in maintaining and sustaining global economy cannot be overemphasized. It is imperative to state that overwhelming majority of the world's commodities and manufactured goods are delivered by sea. By implication, virtually all commodities traded worldwide are transported through ships, which require adept and healthy seafarers to ‘’operate, maintain, and repair.’’ (Raunek, 2019.) Seafarers are a unique occupational group in that their travels to different parts of the world and the enclosed environment with close contacts in the ship expose them to different types of infections (Wickramatillake, 1998). This tendency of exposure of seafarers to infectious diseases has led to the escalation of the threat of global transmission of infectious diseases posing a severe danger to the seafarers, human population, and global economies (Iteraera, 2010).

During the Covid-19 pandemic, seafarers were one of the occupational groups that was badly affected in terms of high morbidity and mortality rate because of the proximity of their working conditions (Battineni et al., 2021). While it is true that seafarers are at a great risk of contracting infectious diseases as a result of the nature of their jobs, research has also shown that seafarers also contribute to the global spread of infectious diseases to the international community (Iteraera, 2010). This high vulnerability to contract infectious diseases has contributed to the argument of seafarers being branded as a deprived and disadvantaged group of professionals.

In a retrospective study utilizing medical logbooks from merchant ships registered under the German flag, Schlaich et al. (2009) demonstrated that respiratory infections are the leading contributors to communicable diseases on cargo vessels. These infections have the potential to trigger significant outbreaks, leading to a notable burden of illness among the crew. A comprehensive understanding of the chain of infection is very important for the prevention and control of any infectious disease, as a break at anywhere along the chain will stop or prevent transmission of the infectious agent. Unfortunately, there

is evidence that health promoting interventions, that can trigger the break along the chain of infection, have, to date, been limited in scope among the seafarers. (Carter & Karlshoej, 2017.)

While it is acknowledged that few research has been done to highlight the imperativeness of infection prevention of a particularly individual infection (e.g., Covid-19, Sexually transmitted Infections, etc.) among seafarers working in cargo ship, little research has been done to comprehensively create the much-needed awareness regarding the infection prevention and control of all possible infections that can potentially affect the seafarers working in cargo ship. It is believed that nurses are, by nature of their profession, partly re-sponsible to educate and give information regarding appropriate preventive measures and guidelines to ensure infection prevention and control in the society (Mukhtar, 2022).

Based on the foregoing, the purpose of this project-based thesis is to prepare an electronic handbook in English that contains the guidelines for the prevention of infections among seafarers in cargo ship. The objective is to improve the infection prevention knowledge of seafarers who work in cargo ships all over the world. SAMK Maritime Logistics Research Centre ordered the topic. The agency's tasks are transportation of logistics and infrastructure at sea, in ports, and on land. They also include the digitalization for improved efficiency and safety in logistics. Minimization of harmful emissions in operations of logistics and development and growth of the Finnish maritime cluster.

2 THEORETICAL BACKGROUND

In this chapter, it is presented the theoretical background and the key concepts are described. The key concepts infection, infection prevention, global pandemic, epidemic, seafaring crew, cargo ship, electronic guidelines, isolation, and quarantine periods for ships.

2.1 Infection

Infection is a very broad concept which has many definitions. Infection occurs when a microbe or pathogen enters human body and causes harm (White, 2020). The pathogen can be virus, bacteria, fungi, or parasites. An infection can be grouped into infectious and non-infectious, while infectious can further be categorised into contagious and non-contagious as shown in Figure 1. (CDC Website, n.d.) Non-infectious is an infection that is not caused by pathogens or microbes, rather it is caused by genetic variations, old age, anatomical mutations, environment, etc. (Clevelandclinic website, n.d.)

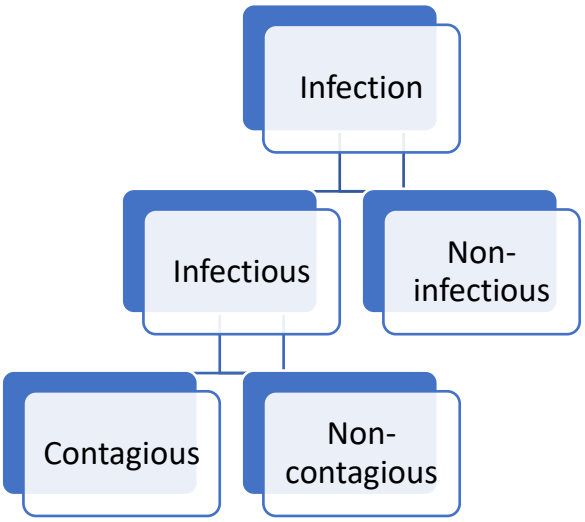

Figure 1. Groups of infection (Modified from CDC Website, n.d.).

Infectious diseases occur from the reciprocal actions of agent, host, and environment. In other words, transmission occurs when the agent leaves its reservoir or host through a portal of exit, then is devolved by some mode of transmission, and enters through an appropriate portal of entry to infect a susceptible host. This sequence is what is known as the chain of infection. (Barreto et al., 2006.) The chain of infection also known as chain of transmission, as vividly depicted in Figure 2 below, is one way to envisage the transmission of an infectious agent.

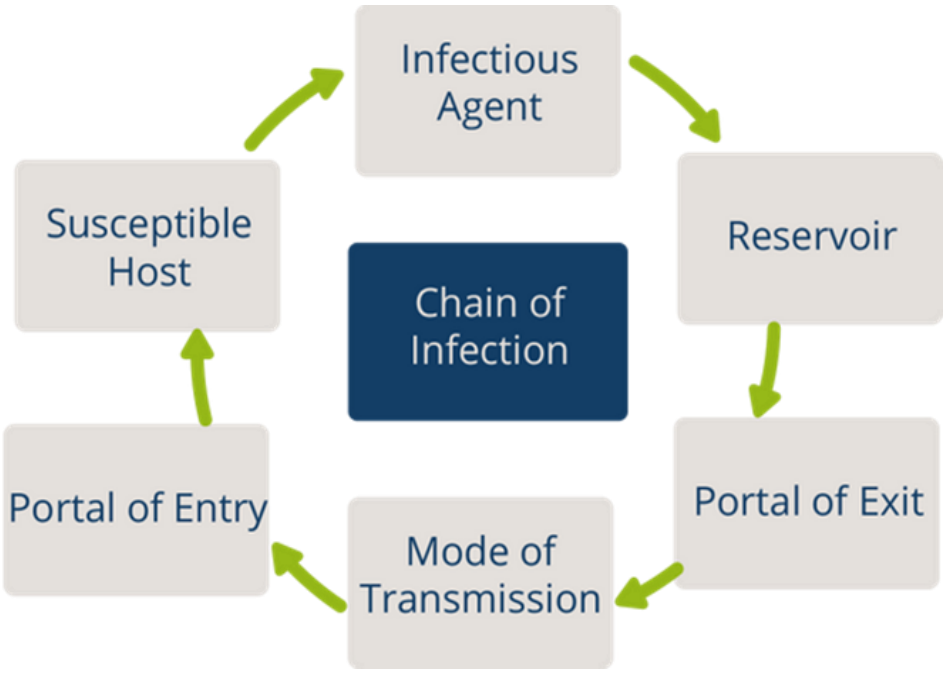

Figure 2. Chain of infection (WHO, n.d.)

Infectious diseases are diseases caused by infectious agents for example, microorganisms, microbes, or germs such as bacteria, viruses, fungi, and parasites as illustrated in Figure 3. Illnesses occur when a person's body is invaded by a pathogenic agent and flourishes in it. This causes toxins to be produced that can impair and harm the body or, better still, incapacitate the body's defence mechanism by making it vulnerable to be attacked by other infectious agents. It can also trigger autoimmune attack whereby the immune system which naturally protects the body becomes impaired and compromised, and consequently attacks its host while trying to destroy the invading pathogens. (Drexler, 2010.)

It should be noted that infection can be transmitted through different channels. It can be transmitted from an infected person to a healthy person; it can be contracted from animals or insects; or transferred via exposure to unhealthy, infected, and contaminated food, water, or lifeless objects. According to American Centres for Disease Control and Prevention (CDC), Infectious agents are organisms that have the ability of producing infection or infectious disease. The agents that cause diseases can be grouped into four main groups. These are bacteria, virus, fungi, and parasites. (CDC, 2017.) Infectious agents also

known as pathogens have different or diverse ways of which they move from a natural reservoir to a susceptible host.

The categorization of mode of transmission are direct and indirect mode of transmission. A direct transmission is when the infective form of the agent is transferred directly from the reservoir to an infected host. Direct mode of transmission of infective forms of agents are, direct contact, through the spread of droplets, exposure to an infectious agent in the environment, through bites by the infective agent. (Van Seventer & Hochberg, 2017.) An indirect mode of transmission is when transfer of the infective agent takes place through an inanimate intermediary. Indirect transmission of infective agents spreads to a host via suspended air particles, fomites or via vectors such as insects.

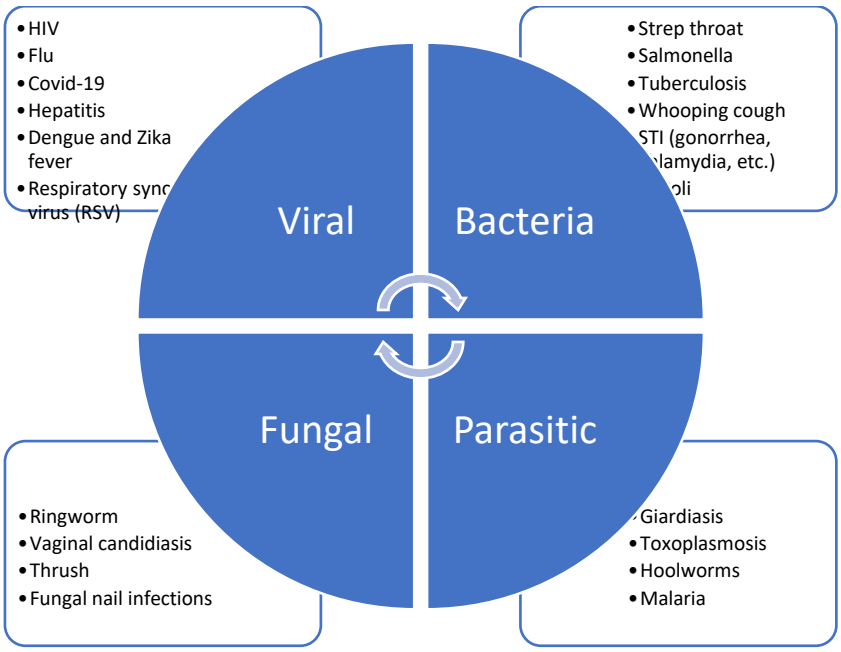

Figure 3. Causes of infection (Modified from Van Seventer & Hochberg, 2017).

2.2 Infection prevention

Infection prevention depends on a rigorous understanding of the factors determining the disease transmission (Van Seventer & Hochberg, 2017). Infection

prevention can be grouped into three stages namely primary prevention, secondary prevention, and tertiary prevention (CDC Website, n.d.). Primary prevention is an act of intervention before health effects occur, through measures such as vaccinations, altering risky behaviours (poor eating habits, tobacco use), and banning substances known to be associated with a disease or health condition. Secondary prevention is an act of screening to identify diseases in the earliest stages before the onset of signs and symptoms, while tertiary prevention is an act of managing disease post diagnosis to slow or stop disease progression. (CDC Website, n.d.)

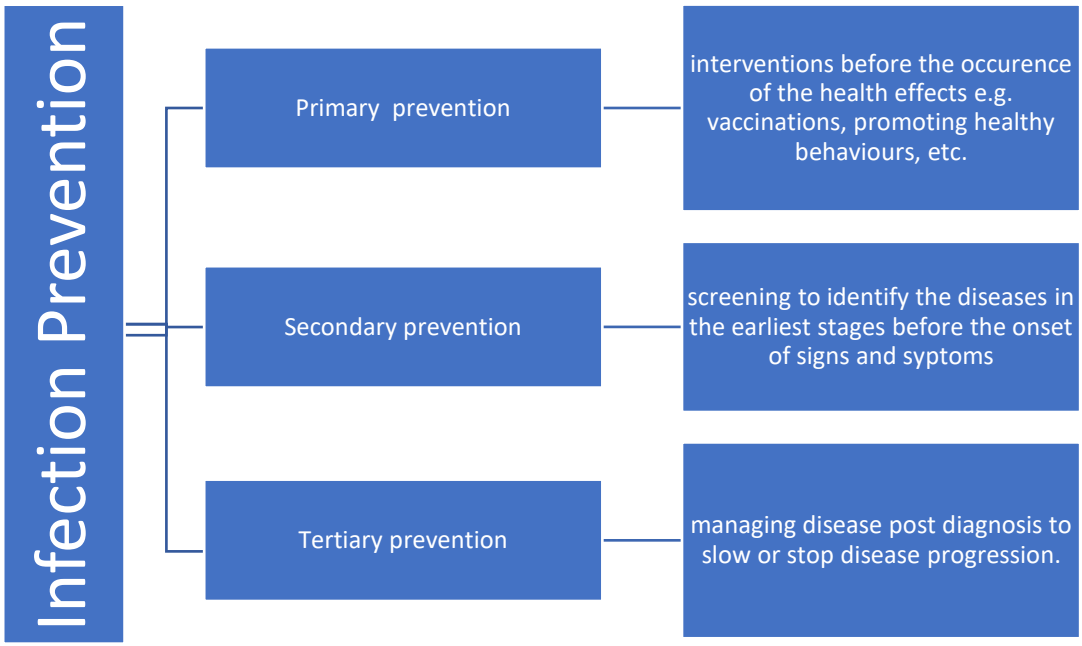

Figure 4. Stages of infection prevention (Modified from CDC website, n.d.).

2.3 Global pandemic

Pandemic is defined as outbreak of infectious disease that occurs over a wide geographical area and that is of high prevalence, generally affecting a significant proportion of the world's population, usually over the course of several months (Rogers, 2022). Pandemics arise from epidemics, which are outbreaks of disease confined to one part of the world, such as a single country (Grennan, 2019). World Health Organisation (WHO) has developed an alertness plan that consists of six phases of pandemic outbreak:

Phase 1: the lowest level of pandemic alert; indicates that an influenza virus, either newly emerged or previously existing, is circulating among animals. The risk of transmission to humans is low.

Phase 2: isolated incidences of animal-to-human transmission of the virus are observed, indicating that the virus has pandemic potential.

Phase 3: characterized by small outbreaks of disease, generally resulting from multiple cases of animal-to-human transmission, though limited capacity for human-to-human transmission may be present.

Phase 4: confirmed human-to-human viral transmission that causes sustained disease in human communities. At this stage, containment of the virus is deemed impossible, but a pandemic is not necessarily inevitable. The implementation of control methods to prevent further viral spread is emphasized in affected parts of the world.

Phase 5: marked by human-to-human disease transmission in two countries, indicating that a pandemic is imminent and that distribution of stockpiled drugs and execution of strategies to control the disease must be carried out with a sense of urgency.

Phase 6: characterized by widespread and sustained disease transmission among humans. (Rogers, 2022.)

2.4 Epidemic

Epidemic occurs when an agent and susceptible hosts are present in adequate numbers, and the agent can be effectively conveyed from a source to the susceptible hosts. (CDC website, n.d.) More specifically, an epidemic may result from a recent increase in amount or virulence of the agent; the recent introduction of the agent into a setting where it has not been before; an enhanced

mode of transmission so that more susceptible persons are ex-posed; a change in the susceptibility of the host response to the agent, and/or factors that increase host exposure or involve introduction through new portals of entry. (CDC website, n.d.) This definition of epidemics presumes only infectious agents, but non-infectious diseases such as diabetes and obesity can also exist in epidemic proportion. The WHO defines pandemics and epidemics diseases based on a disease's rate of spread. Thus, the difference between an epidemic and a pandemic isn't in the severity of the disease, but the degree to which it has spread.

2.5 Seafaring crew

This is a group of people (seafarers) who are employed to work and serve aboard a marine vessel. According to Edumaritime website (2022) the tradition of seafaring includes a range of occupations and positions. Each of these positions carries duties that are essential to a maritime vessel's efficient operation. The deck department, the engineering department, the steward's department, and other departments make up the majority of a ship's crew. Approximately 90% of all trade goods move by sea. Most international seafarers spend six to nine months on board their vessel before they can return home. They work long hours and may not have access to medical facilities or even to telecommunications to contact their families, except for those times when their vessel is in port. (Edumarine Website, 2022.) The safety and health risks associated with working on board ships are a major issue for seafarers be-cause seafaring has been regarded as a high-risk profession. The growing demand for efficient and rapid transportation of goods necessitates ongoing technological and organizational change, as well as increased risks to health and safety. (Jensen et al., 2006.)

2.6 Cargo ship

Maritime transport constitutes most of global trade and is carried by cargo ships. The variations between them is seen in the different ways cargo can be

carried and the diverse cargo that can be transported. According to Hitsehk (2021), cargo ships can be grouped into four different kinds, which are classified according to the cargo they carry. The category of the different kinds is grouped as followed, general cargo vessels, multi-purpose vessels, dry-bulk carriers, and tankers. The General cargo vessels mostly convey goods like foods, footwear, garments, chemicals, machinery, furniture, and motor vehicles. The tankers are vessels with specially designed containers to transport liquid cargo like petroleum products. The dry-bulk carriers transport non-packaged loose materials like food grains, coal, and other similar products. With the multi-purpose cargo ships, the name speaks for itself. These vessels transport all kinds of goods, whether liquid or general cargo. They have separate containers and storage systems for all these goods. (Hitsehk, 2021.)

2.7 Electronic guidelines

Electronic format, according to the website of LawInsider (n.d.), is the ‘’computerized format of a document.’’ It is believed that electronic guidelines will be more user-friendly and easier to access. There is evidence that most users prefer electronic guidelines because of its comprehensiveness, timeliness, accessibility, ease, and simplicity (Claase et al., 2013). Electronic guidelines are often contained in e-book. E-book is a digital form of a normal book that is designed to be read on electronic devices like tablets, mobile phones, laptops, etc. The benefits of codifying guidelines in e-book include easy accessibility, low production costs, portability, advanced design capabilities, print on demand, etc. (Hussain, 2023.)

2.8 Isolation

Isolation, in simple terms, is the separation of people who have been infected with a contagious disease and have shown signs of sickness from those who have not been infected. Isolation period is the time during which a patient suffering from an infectious disease is isolated from others. This physical separation of an infected or colonized host, which in this case a crew member, is

deem necessary to prevent transmission of the specific agent to the latter group (Schliach et al., 2009).

The period of isolation differs in relation to the infectious diseases. Generally, the period of isolation for a contagious disease is proportional to the period at which the disease can be transmitted to another person. Some infections require that the isolation room should have independent ventilation and/or negative pressure, while other infections, especially caused by chemical agents, may require short isolation period until, for example, the traveller or seafarer takes a shower and disinfect clothing. It is instructive that the isolation procedures carried out by the assigned crew should be documented in the Maritime Declaration of Health (MDH). Isolation can occur either on the vessel, within a cabin, or onshore in a healthcare facility or other institutional setting. When moving individuals in isolation from the ship to land-based facilities, it is very essential to observe appropriate precautions, safeguard their fundamental rights and ensure that the pain or discomfiture that may be associated with the movement is lessened. (WHO, 2016.)

2.9 Quarantine period for ships

According to CDC (2017) Quarantine is a public health practice that involves the separation and imposition of movement restrictions on individuals who have been potentially exposed to a contagious disease, with the primary objective of closely monitoring their health over a specified period to ascertain whether they develop any symptoms or become ill. Schlaich et al., (2009) explains quarantine period for ships as the period port authorities typically enforce the isolation of a ship from shore contact when there are justifiable instances of severe epidemic diseases, such as plague, cholera, or yellow fever, either currently onboard or having been recently reported on the vessel.

The duration of quarantine for infectious diseases varies. It is typically determined by the combined duration of the incubation period and the period during which the disease can be transmitted. Conversely, for other infectious agents

such as chemicals, the quarantine period may be significantly shorter, often limited to the time it takes for the traveller to just shower and disinfect clothing. (WHO, 2016.) Public health practises like quarantine and isolation have been used for ages to stop the spread of contagious diseases. The difference between quarantine and isolation is that people are placed in quarantine if they have been exposed to an infection but asymptomatic. In this case, they are separated from people who have not been exposed to the infection and their movement will be restricted and they will be put under close monitoring and observation. This proactive step is taken to prevent the spread of the infection in case they are possibly infected. Isolation, on the other hand, is enforced to separate sick people who have been infected with a contagious dis-ease from those who have not been infected to prevent the spread of the infection (Kilic et al., 2020).

3 PURPOSE, OBJECTIVE, AND SCOPE OF THE PROJECT

The purpose of this project-based thesis was to prepare an electronic handbook in English that contains the guidelines for the prevention of infections among seafarers in cargo ship. The objective is to improve the infection prevention knowledge of seafarers who work in cargo ships all over the world.

4 PROJECT PLAN AND IMPLEMENTATION

4.1 Project methodology

The project was implemented using the agile scrum methodology. Agile scrum methodology is one of the types of agile methods that is premised on simplicity-ty, visibility, sprint planning, transparency, continuous integration, early identification, and resolution of issues. (Milne, 2022.) It works by breaking projects

into pieces (sprints) that allow greater transparency and numerous opportunities to inspect and adapt the next sprint, the overall project, and the process. Scrum is inherently customer-centric, recognizing that requirements often change, and the overall product backlog will continue to evolve after each sprint cycle. (Milne, 2022.)

It is a project management methodology that is best suited for projects which require some form of feedback and changes, and collaboration with stakeholders at every stage of the product development. This aptly fits into the structure of this project and informs the reason why it has been chosen as the project implementation methodology. Since the structure of this project re-quires constant or periodic feedback and instructions from the supervisor which could be subject to amending and correcting portions of the project, agile scrum methodology is deemed best suitable to accommodate these changes. This allows changes to be responded to more quickly, which lowers the possibility of a project failing entirely. (Agbejule & Lehtineva, 2022.) Adoption of this method really contributed to the successful implementation of this project as feedback, corrections or instructions given by the supervisor, at different phases of the project, were seamlessly accommodated and integrated into the project without obstructing its structure and execution.

4.2 Implementation process

The scrum development process starts with a wish list of features, also called the product backlog. The product backlog is an ordered list of everything a team needs to complete to build the product. (Milne, 2022.) Literature and other materials needed to implement the project had been sourced and extracted by the time the project implementation began. This list of materials was constantly evolving as a result of the constant feedback gotten from the supervisor and new ideas proposed by the authors.

In this stage, the authors discussed tasks they needed to complete and the time it would take to complete the sprint. A sprint is a set period of time during

which specific work has to be completed and made ready for review (Rehkopf, 2023). Sprints play a critical role in Scrum. The project was divided into the sprints. When one sprint was completed, another sprint would be initiated. Each sprint ended with a sprint review where the authors would evaluate and brainstorm on it to arrive at a logical conclusion and then sent to the supervisor for evaluation and feedback.

This process continued until the project was completed. One big advantage of using scrum is that it enables a big and complex project to be broken down into simpler pieces in the form of sprints. Periodic scrum meetings were also scheduled to help keep track of the activities, monitor the progress of the project and plan for next sprints. It also needs to be emphasized that the adoption of the scrum agile methodology for the implementation of the project fol-lows the three concepts of scrum: product backlog, sprint backlog and product increment as shown in Figure 5 below.

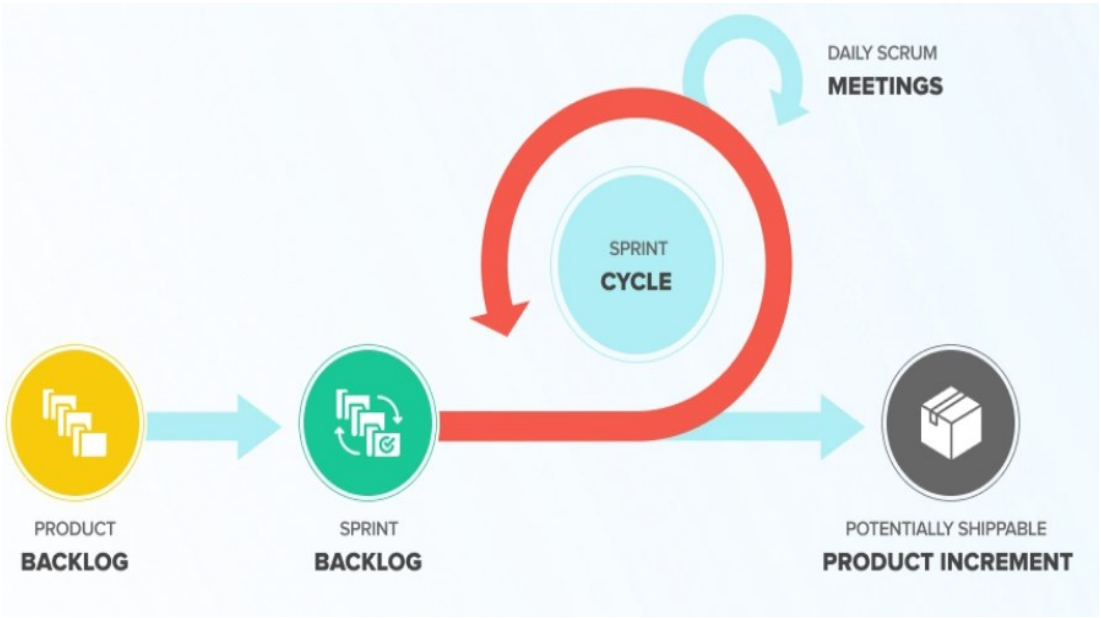

Figure 5. The three concepts of scrum viz-a-viz sprint cycle (Milne, 2022).

Apart from the product backlog which had earlier been defined in the previous page, sprint backlog is a fixed set of tasks a team needs to complete in a single development cycle (sprint). This is strictly followed by ensuring that at every scrum meeting that was had, tasks were set and shared among the authors

and specific deadline was always given for the completion of the task. The product increment was achieved after the completion of the sprint backlog. (Milne, 2022.)

Furthermore, the scrum process is not complete without mentioning the three principles upon which the methodology is based which are transparency, inspection, and adaptation. It is ensured that these principles were strictly adhered to while implementing the project. (Milne, 2022.)

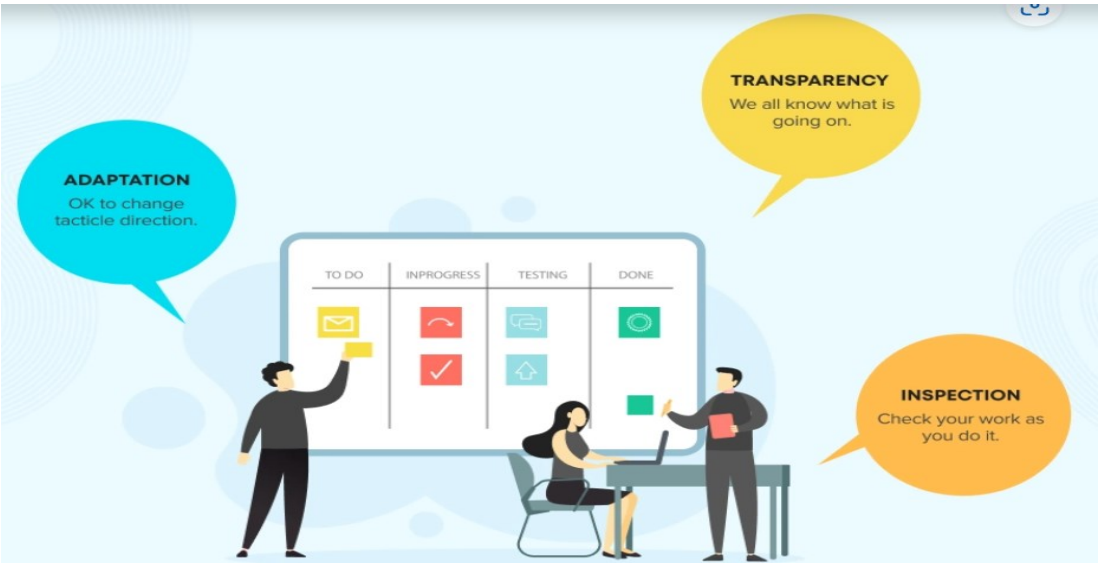

Figure 6. How scrum works (Milne, 2022).

Transparency is a core principle of scrum. This was done by ensuring a transparent flow of information to ensure that the authors were conversant with what was happening in the project and perfectly understood their roles and responsibilities. This transparent culture helps to minimize dereliction of duty and maximize efficiency as the authors knew what to do, how to do it and when to do a given task. Scrum board was created detailing the to-do-list, work in progress, tasks under reviews and tasks done as shown in Figure 6 above. This is intended to enable the authors track the progress of the project so that no one would be kept in the dark. In addition to this, communication was enhanced in the meetings as everyone was encouraged to share their opinions without fears. (Milne, 2022.)

Inspection is another cardinal principle of scrum. Scrum process allows the product orderer and the stakeholders to inspect deliverables and share their feedback. This was achieved by collecting feedback from the supervisor at the end of every sprint cycle. This feedback was always reviewed and implemented to improve the standard and quality of the product. It is ensured that this was done before another sprint cycle would start.

Adaptation is the third principle. The scrum agile approach allows the authors and stakeholders to make and accommodate slight changes and adaptations to the product based on the feedback received from the supervisor as the project progressed. The adaptation allows for flexibility and opportunity to integrate the views and feedback of the stakeholders into the product. By conforming with all these scrum principles and concepts, the authors were able to effectively implement the project and achieve the intended purpose and objective of the project. (Milne, 2022.)

4.3 Literature retrieval

Evidence-based literature and materials were sourced and retrieved from credible databases such as Google Scholar, SAMK Finna, PubMed, Cochrane, and ProQuest. Open search was conducted for credible materials and literature for the project without limiting the years of publication because the topic is under-researched and there was need to include any reasonable and relevant material that could be useful to the project irrespective of the year of publication. Literature and materials were searched and sourced for in both English and Finnish languages. Efforts made to source information from few maritime professionals were unsuccessful. Manual search was used, and the references of articles found by the literature retrieval were acknowledged. As much as little or no limitations were put in place while retrieving the literature, it is imperative to emphasize that few exclusions were noted as shown in Table 1 below.

Table 1. Inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
Literature and materials in English and Finnish Languages	Literature and materials in other languages other than Finnish and English Languages
Literature and materials in infectious diseases	Literature and materials in non-infectious diseases
Information related to seafarers	Information not connected with seafarers

The information retrieved from the literature and materials found was used to describe the key concepts and gather the information to produce the handbook. A table that briefly outlines the literature retrieval from the databases used is attached as Appendix 1. Link such as''Astu terveysturvalliseen laivaan-webinaari - https://www.youtube.com/watch?v=A88zCre0M4U, and materials from International Maritime Organization'' received from the SAMK Maritime Logistics Research Centre, the orderer of this project, provided in-sights into the project and were of immense importance.

Results of literature search conducted using different but relevant search words such as cargo seafarers AND infections; infections AMONG cargo seafarers; contagious infections AND cargo seafarers; infections AMONG cargo seafarers AND preventions; infection AND prevention AND seafarers; etc. were impressive. A total of 207 articles were included in the review using the CASP model for evaluation. CASP is an acronym for Critical Appraisal Skills Programme which is defined as ''the process of carefully and systematically examining research to judge its trustworthiness, and its value and relevance in a particular context.'' (CASP, 2018.) In accordance with the CASP model of literature appraisal, CASP checklists were drawn (see appendix 2) which are usually structured around three main sections asking: Are the results of the study valid? What are the results? Will the results help locally? (CASP, 2018.) Those questions were critically considered while determining the quality of the literature to be used in developing the project. Majority of the articles were

deemed to have ticked the CASP checklists which were part of the materials used to develop the product.

4.4 Description of the Handbook

The infection prevention handbook was made initially using the latest version of the Microsoft Word 365 so that it would be much easier to amend. The guidelines were compiled in the Microsoft word. The first thing that was done was to identify the infectious diseases commonly faced by the seafarers in different continents of the world using different literature and materials. Twenty-one infections were identified and grouped under eight chapters according to their prevalence in different parts of the world. Each of these infections was concisely addressed under six headings namely key facts, mode of transmission, incidence, health risks, symptoms, and prevention. The prevention was further addressed under three sub-headings – primary, secondary, and tertiary – as described earlier in the definitions of concepts and illustrated in Figure 4.

The final product is a 48-page electronic handbook including the cover page, table of contents, introduction, main contents, and references. A brief introduction was done to justify the importance of the handbook and its objective. Moreover, the infections were discussed chapter by chapter as listed on the table of contents under the six headings previously stated. Contrasting colours and themes were carefully used to add aesthetics to the handbook and make it appealing to read and connect with the readers (Barker, 2021). The font type (Calibri) and font size (11) of the texts were chosen to give clarity and legibility to the handbook.

The seamless transition from Microsoft Word 365 to FlipHTML5 was executed flawlessly, preserving the logical progression of ideas. This ensured that readers could effortlessly navigate the chapters, absorbing the material with clarity. An essential aspect of this transformation was the aesthetic design and layout.

Leveraging software tools such as Adobe InDesign and FlipHTML5, the content was elegantly presented on virtual pages reminiscent of a traditional book. The integration of fonts, headers, photos, tables was harmonious, contributing to a visually pleasing and engaging presentation. All these features make the handbook interesting, and a must read. Essentially, the handbook is mobile compatible as it is compatible with all mobile electronic devices such as mobile phones, tablets, laptops, etc. Here is the link to the electronic handbook: **THESIS HANDBOOK.1, xx**

4.5 Description of the target group

It should be emphasized that the target group for this project is the seafaring crew working in cargo ship worldwide. This is an endangered occupational group that is increasingly faced with the threat of contracting and spreading infectious diseases due to their voyaging across different countries of the world, the limited space of the environment of the ship and close contacts of people on board. All these are fertile grounds for the spread of contagious diseases. (Hadjichristodoulou et al., 2013.) The strategic significance of these seafarers to international trade and global economies is not in doubts. Therefore, concerted efforts should be geared towards providing information that could possibly reduce their risks of contracting infectious diseases that can negatively impact on their health and cause adverse multiplier effects on the society in general.

4.6 Schedule

Jirasoftware® was adopted for scheduling the project milestones and deliverables because it is a modern technique for managing schedule irrespective of locations and it is also very easy and flexible to us. (Website of Jirasoftware, n.d.) Jirasoftware® is compatible with agile method. It was used to track the progress of the project, to-do-list, milestones and completed tasks.

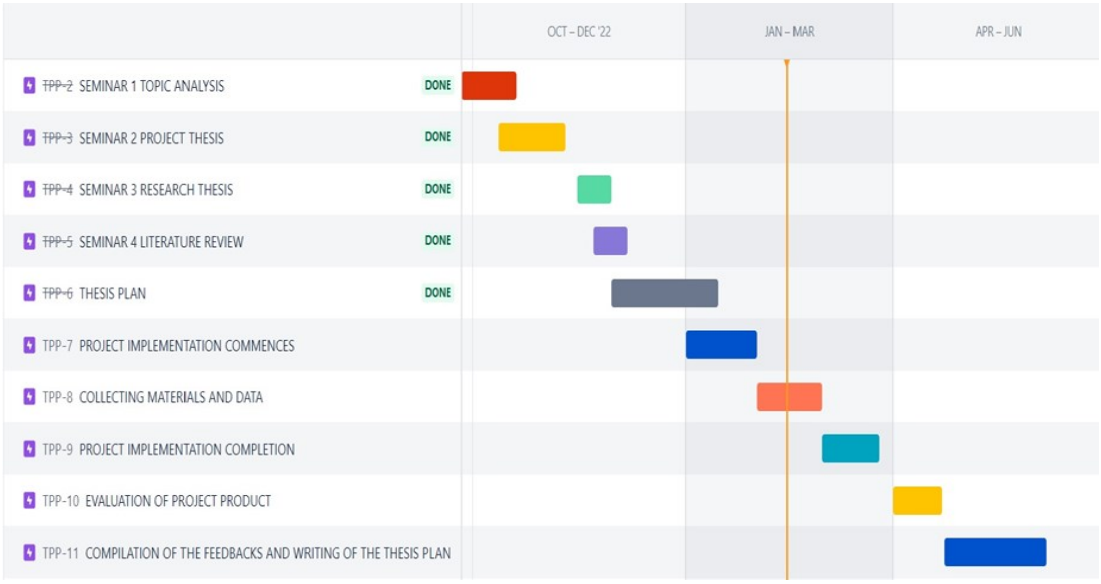

Figure 7. Timetable for the project milestones and deliverables (Jirasoftware, n.d.).

4.7 Phases

By using the scrum agile methodology, the project phases were grouped into five namely initiation, planning and estimation, implementation, reviewing, and releasing. (Milne, 2022.)

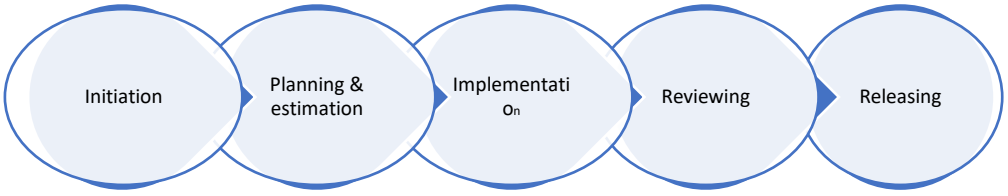

Figure 8. Stages of the project (Modified from Milne, 2022).

4.7.1 Initiation

This is the ideation and topic analysis phase. This was done in august 2022 and the preliminary thesis topic was selected. Project scope, purpose and objective were defined. The stakeholders were identified, and clarifications were made regarding the expectation of the stakeholders out of the project.

4.7.2 Planning and estimation

This is the stage where it was decided to determine the steps to achieve the project scope, purpose, and objective. The project was broken into time-boxed iterations known as sprints. Timelines and milestones were established during this phase as well as the materials (product backlog) that were needed to complete the project were sourced. It was decided to use the scrum agile methodology for the project implementation because of its sheer simplicity and adaptability. It was agreed to use Critical Appraisal Skills Programme (CASP) to determine the quality and relevance of the literature to be used for the implementation and development of the product. CASP was decided to be used because it is proven to be efficient and easy to use even though the top-ic is under-researched. Critical appraisal skills programme was used to systematically assess the trustworthiness, relevance, and results of the literature used. It is regarded as the most commonly used tool for quality appraisal in health-related qualitative research. (Long et al., 2020.)

4.7.3 Implementation stage

This is the stage where the project was executed. A web-based electronic handbook for seafaring crew was produced that contains infection prevention guidelines. The authors worked on the items in the sprint backlog and regularly checking them off as the authors completed the tasks.
Progress was constantly measured; two of the anticipated risks actually came to reality and were properly managed. One of the members was sick, and his portion of the tasks was divided and completed by the other members; relevant literature was retrieved and used for the theoretical validation of the project; changes and feedbacks were responded to and adapted into the project where necessary; and the thesis was written.

In implementing and developing the product, content analysis was used for the data analysis because of its usage for both quantitative and qualitative data analysis (Luo, 2019). Two research questions were set. Firstly, what are the infections commonly faced by seafarers working in cargo ship? Secondly, what

are the infection prevention procedures for each of those infections? The databases to explore data and retrieve literature were decided and exclusion and inclusion criteria defined. It was decided to code for phrases like ‘’infections commonly faced by seafarers’’, ‘’infection prevention and seafarers’’, etc. Deductive and inductive reasonings were used to draw inferences from the data collected.

Scrum board was used to track the progress of the tasks, set new to-do-list, show work-in-progress and tasks completed. The adoption of the scrum agile method significantly enabled the authors to adjust to the flexibility and disruption in the execution of the project that occurred with the feedback and amendments gotten from the supervisor.

4.7.4 Reviewing

This is the phase the project got reviewed at the end of the project to discuss what went well and areas that could be improved upon. At this stage, the project had been completed and thesis written. Product was evaluated by the stakeholders. Feedback received from the evaluation of the product was documented and recorded in the thesis report, please see chapter 5. Presentation of the product was done in a seminar on September 28, 2023, to a select group of maritime professionals. Additional feedback gotten from the presentation of the product was also documented (see chapter 5 – Evaluation).

4.7.5 Releasing

This is the phase the final product was released to the product owner. This phase signals the end of the entire process. It needs to be emphasized that the process for the release of the handbook to the public is determined by the product owner

5 EVALUATION

The evaluation of the product was done in two stages. Firstly, the product was evaluated by the product orderer – product owner. Secondly, it was done by a select group of maritime professionals. It was decided to have the product extensively and holistically evaluated so as to improve the quality of the product and determine if it had met its objective.

5.1.1 Evaluation by the orderer (product owner)

The product was ordered by SAMK Maritime Logistics Research Centre. After the completion of the project, a link to the finished product was sent to the orderer with an attached SAMK feedback form. The feedback form contains six evaluation criteria namely:

1. if the thesis met the needs of the orderer,
2. if the thesis/ thesis results can be utilized in working life,
3. if the thesis demonstrates the ability for creative solutions,
4. if the thesis demonstrates ability from the perspective of working life to credible solutions,
5. if the authors were able to be independent and self-directed for working in the thesis process, and
6. if the authors were guided by the orderer in the process of the thesis.

Each evaluation criterion was measured using 4-point rating scale from strongly agree (which is the highest scale and equates to 4), somewhat agree (3), somewhat disagree (2), and strongly disagree (the least scale - 1).
The feedback was received after the product had been critically evaluated. The product was scored the maximum point of 4 (strongly agree) in five (1 to 5 evaluation questions stated above) of the six evaluation questions. It was only the sixth question which demanded to know if the authors were guided by the orderer in the progress of the thesis that received a rating score of 2 (somewhat disagree). This information is aptly illustrated in Table 2 and Figure 9 below respectively.

Table 2. The feedback received from the orderer

Evaluation criteria	Strongly agree (4)	Some-what agree (3)	Somewhat disagree (2)	Strongly dis-agree (1)
the thesis met the needs of the orderer	✓			
the thesis/ thesis re-sults can be utilized in working life	✓			
the thesis demon-strates the ability for creative solutions	✓			
the thesis demon-strates ability from the perspective of working life to credible solu-tions,	✓			
the authors were able to be independent and self-directed for work-ing in the thesis pro-cess	✓			
the authors were guided by the orderer in the progress of the thesis			✓	

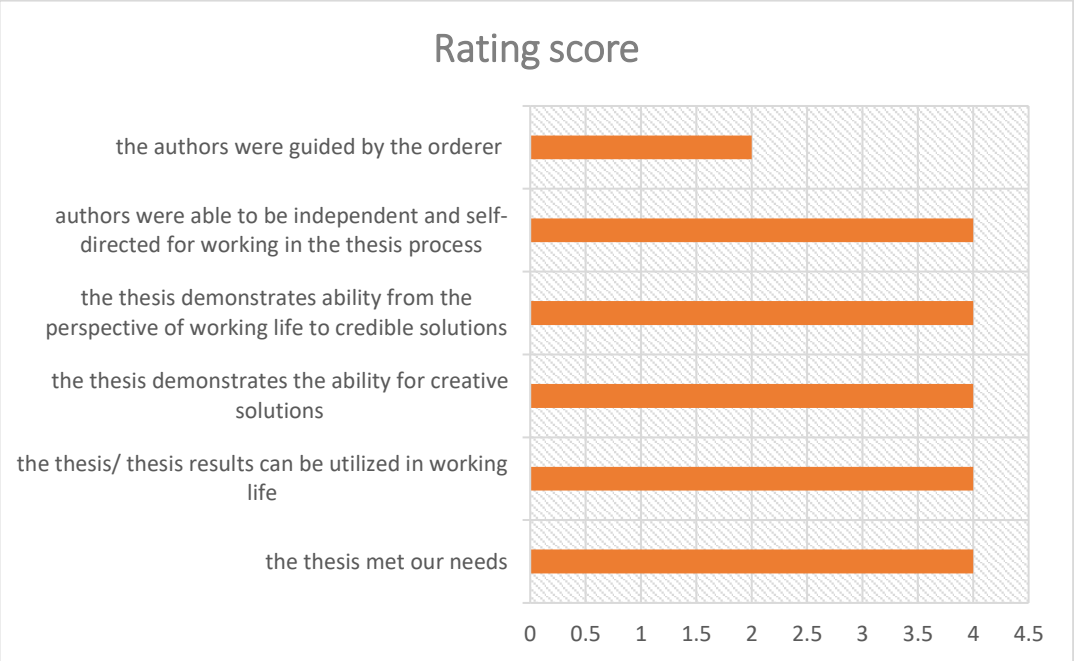

Figure 9. Bar chat illustration of the feedback received from the orderer.

Finally, the product was described by the orderer as being great and excellent.

5.1.2 Evaluation by a select group of maritime professionals

The product was also evaluated by a select group of maritime professionals after the product was presented to them by the authors on September 28, 2023, in a seminar organised by the orderer of the product at SAMK. It was an oral evaluation of the product that was given by the maritime professionals. Generally, the product was applauded as excellent by the maritime professionals and unanimously voiced their approval of the product. However, areas that needed modifications and corrections were highlighted during the oral evaluation. For example, one of the maritime professionals registered his dis-pleasure regarding the authors' use of the phrase ''secondary infection prevention'', and rather suggested that mere ''secondary prevention'' could be more appropriate since an infection which could not have been initially pre-vented had already occurred. Therefore, it would be inappropriate to have termed it ''secondary infection prevention''. It needs to be stressed that those areas have been corrected and modified accordingly before the product was released to the orderer.

5.2 Resources

Resources are key and strategic to any project (Mirabela, 2018). In this project, the resources used can be grouped into human and material resources. The human resources for this project comprise three authors (Adeniyi Ajayi, Janet Pitkänen and Selim Unal) who make up the team. The authors' time and knowledge were used for this project.

The material resources are the financial resources, machinery and equipment that are used for the implementation of a project. As far as this project is concerned, no money was budgeted and spent on the project. Personal equipment

(e.g., laptops and internet) of the authors were used to implement the project. Besides, the databases used for the retrieval of literature and in-formation were also one of the resources used for the implementation.

5.3 Risks management

Risk management is the practice of identifying, assessing, preventing, or reducing project-related risks that may affect the desired results. Usually, risk management is handled by project managers. (O'Connor, 2020.) At the planning phase, all the anticipated risks that could inhibit the execution of the project were highlighted and planned to be managed in advance. However, two of the anticipated risks came into reality during the implementation phase of the project. One of the authors was sick and his portion of the tasks was shared and done by the remaining two authors as already planned. The other risk that actually happened as anticipated was time management as the authors were faced with different time schedules. This risk was managed by making sacrifices to attend meetings and being more prudent with time.

Additionally, the risks were also analysed by using the SWOT analysis to critically put into perspective the authors' positive potentials and negative attributes regarding the execution of the project as shown in Figure 10 below.

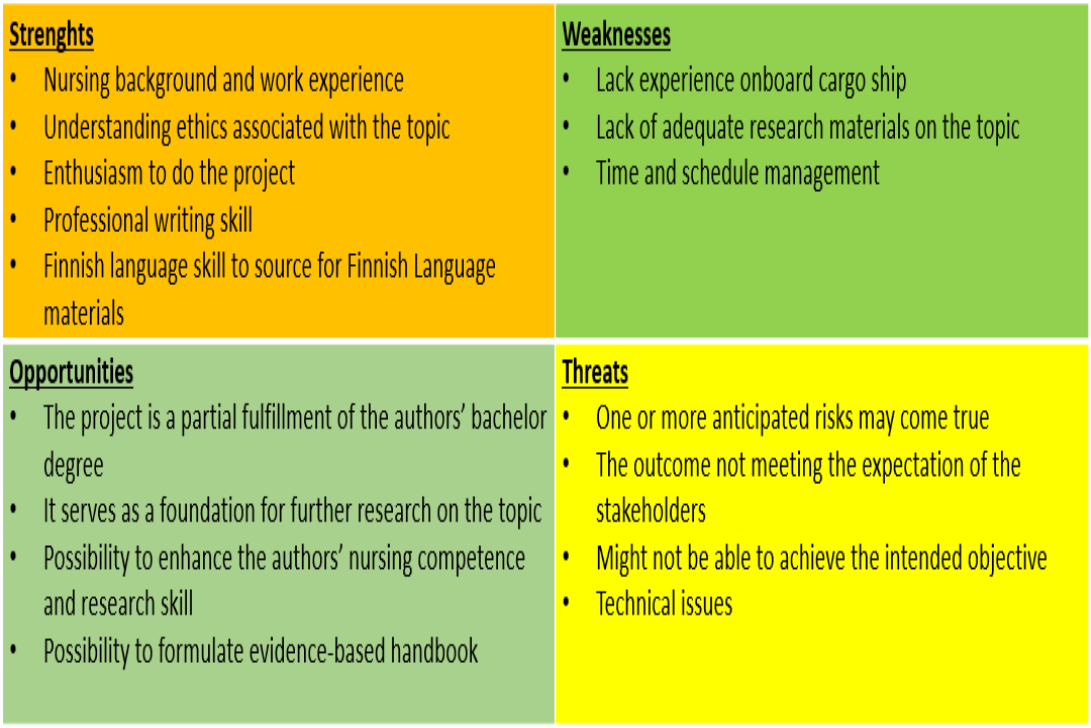

Figure 10. SWOT analysis of the project (Kenton, 2022).

It is imperative to state that the application of SWOT analysis enabled the authors to identify strengths that were maximized, and opportunities derived from the project. Conversely, it also enabled the authors to identify grey areas that could potentially undermine the progress and impede the successful implementation of the project by devising effective plans to address those grey areas through effective communication between the authors and supervisor, shared responsibilities among the authors and in-depth research undertakings by the authors. (Kenton, 2022.)

5.4 Ethical considerations

Ethical research can be described as demonstration of integrity, honesty, and responsibility in the conduct of research as well as compliance with established ethical guidelines and protocols (TENK, 2021). Before the commencement of the project, the authors had cause to attend lectures on research ethics and complete a mandatory assignment. These lectures equipped the authors with the requisite skill and knowledge to be conversant and well-grounded in research ethics. This project was done in accordance with the ethical principles

and guidelines as stipulated by Satakunta University of Ap-plied Sciences (SAMK) and Finnish National Board on Research Integrity (TENK).

Ethical consideration for literature retrieval: The project followed the SAMK and TENK ethical guidelines. The thesis was done to avoid plagiarism as the data were paraphrased and references and citations of all data collected were done in accordance with SAMK guidelines. Credit was given to all sources and writers to comply with SAMK's data accuracy and ensure credibility (SAMK website, n.d.).

Ethical consideration for anonymous source: Strict compliance and conformity with the principle of protecting the privacy of the people that were involved in the project was adhered to. Since the topic is under-researched and limited materials are available, individuals with professional experience were also used as a source. The personal information of these individuals was not visible in the thesis (SAMK website, n.d.), and their data were safeguarded by making sure that our laptops are strongly passworded to prevent unauthorized use and data leakage. It was ensured that the data of the maritime professionals and data of any other individual that was captured during the project was effectively destroyed at the end of the project. This was made known to them ‘’in a concise, transparent, easily understandable, and accessible form in clear and simple language.’’ (Informointi henkilötietojen käsittelystä - Tietoarkisto (tuni.fi, n.d.)

Ethical consideration for developing the product: A meeting was scheduled with a select group of maritime professionals to evaluate the finished product where the product was presented to them by the authors. In this case, oral feedback was received from the maritime professionals after the presentation of the product. The oral feedback and the willingness of the maritime professionals to attend the presentation were considered as informed consent. The oral feedback and their voluntary attendance for the presentation of the product were deemed to have justified the three key conditions of a valid informed consent in research ethics with human participation which are voluntariness, capacity/competency to consent and proper comprehension. (Shah et al.,

2022; Gupta, 2013; TENK website, n.d.) It should also be emphasized that information got from the maritime professionals was considered individual opinion and treated as such. Based on this, it was deemed unnecessary to get a research permit from their organisation since the research subjects were not recruited from the organization. (Kuula-Luumi, n.d.)

The outcome of the product was made original as much as possible to the best of authors' ability based on the data collected from articles and anonymous sources. (SAMK website, n.d.; TENK website, n.d.) Furtherance to complying with SAMK ethical guidelines, approval of the SAMK thesis agreements was applied for and gotten, before the implementation of the project to give legitimacy to the project (SAMK website, n.d.; Kuula-Luumi, n.d.).

6 DISCUSSION

The objective of the project was to improve the infection prevention knowledge of seafarers who work in cargo ships all over the world. This objective has been achieved because of the positive and excellent feedback received from some maritime professionals and the orderer of the project who had evaluated the product and expressed their satisfaction in it. Besides, the objective can also be confidently said to have been achieved because evidence-based infection prevention strategies were carefully explored and critically examined in the handbook that are capable of improving the knowledge of the seafarers regarding the prevention of contagious infections commonly associated with them. However, it needs to be stated that not all infections are covered in the handbook as further studies are needed to explore other infections that are not mentioned in the handbook and provide preventive measures against them. This project can serve as the foundation for other research works to be built upon as it is well documented that the topic is un-der-researched.

6.1 Reflection

Working together as a team and embarking on this project together has provided an opportunity for everyone in this team to improve their team player and communication skills. Completing the thesis has been a transformative journey for the authors as both anticipated and unforeseen challenges were encountered and eventually surmounted. These challenges pushed the authors to refine their research methods and deepen their critical thinking skills.

The authors worked together harnessing and optimally utilising their strengths as each author specialised in area that the author was really proficient at, The authors collaborated effectively to achieve the intended objective from the beginning of the project. This was made possible because of the pre-existing cordial relationship that existed, and still exists, among the authors before the commencement of the project. The authors had, prior to the initiation of this project, been working together as a team in numerous assignments and, overtime, developed a very strong bond among themselves. This has contributed, in no small measure, to the success recorded in this project as the authors can tolerate and accommodate individual weaknesses and were eager to cover up in case one of the authors was indisposed. Basically, friendship was key to the successful implementation of the project.

On the other hand, as it is expected of three different people with different ideas and orientations, conflicts and arguments cannot be found wanting. When there was conflict of ideas and opinions, superior argument held sway and consensus would be reached. The appointment of one of the authors as a scrum master who doubled as the project manager also helped to give direction and leadership to the team and enhanced their conflict resolution.

One of the authors' anticipated weaknesses was made manifest at different stages of the project as they were unable to effectively manage the time because of their tight schedules. This weakness was eventually overcome as deadline was always given to every task and it was strictly enforced. This

enabled the authors to prioritise the tasks, manage the time and complete the project as scheduled.

As nursing students, the authors have not only deepened their knowledge about infection prevention for seafarers working in cargo ships but also acquired valuable insights into developing problem-solving abilities. This experience has left the authors with a sense of accomplishment, a thirst for further exploration, and a newfound appreciation for the research process.

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Appendices

Appendix 1

Table of few literature used in the thesis

Author(s) of research, publication year, country of publication	Aim and purpose of the research	Target group, number of participants, project methodology	Results/findings of the research	References
Battineni et al., 2021 Basel	Understanding the effectiveness and success of the infection control measures implemented by shipping corporations requires assessing the seafarers' awareness of the present outbreak.	Target groups: Seafarers, Methodology: an online questionnaire survey	Study indicates that sailors exhibit good COVID-19 understanding and behaviors, suggesting that shipping companies should develop new campaigns to promote positive practices and guidelines on ship	Battineni, G., Sagaro, G. G., Chintalapudi, N., Di Canio, M. & Amenta, F. (2021). Assessment of Awareness and Knowledge on Novel Coronavirus (COVID-19) Pandemic among Seafarers. Healthcare (Basel); PMID: 33503921. doi: 10.3390/healthcare9020120

Van Seventer & Hochberg 2017	Provides an in-depth understanding of infectious disease transmission principles, emphasizing the agent, host, and environmental determinants that are crucial for public health professionals.	Target groups: Public health professionals. Method: Qualitative	Possess the necessary tools to comprehend transmission dynamics and execute effective prevention and control programs, based on clear terminology and fundamental principles.	Van Seventer JM, Hochberg NS. Principles of Infectious Diseases: Transmission, Diagnosis, Prevention, and Control. International Encyclopaedia of Public Health. 2017:22–39. Doi: 10.1016/B978-0-12-803678-5.00516-6. Epub 2016 Oct 24. PMCID: PMC7150340.
Shah et al., 2022	Educate a patient about the risks, benefits, and alternatives of a given procedure or intervention.	Target group: Patient and health care providers Method: Qualitative method	Providers should receive expert education on common procedures and interventions, and effectively communicate this knowledge to patients and	Shah, P., Thornton, I., Turrin, D., & Hipskind, J. E. (2023). Informed Consent. In StatPearls. StatPearls Publishing.

			the healthcare team.	
Roberts et al., 2016 United Kingdom	To establish a long-term trend in mortality from six acute infections among seafarers employed in the UK merchant shipping since 1900. To review the importance of the transmission and effect of the preventative interventions on the observed trends.	Target population: Merchant seamen and men in Royal Navy Methods: A population mortality study using annual government mortality returns and death inquiry files for British merchants and Royal Navy and statistical records of general male aged population	Relative mortality risks for each disease were increased significantly in British merchant shipping when compared with the general population. For example, malaria increased 58.2 fold, yellow fever (6276), typhoid (9.5), cholera (1734), dysentery (20.6) and smallpox (142).	Roberts, Stephen E., and Tim Carter. "British Merchant Seafarers 1900-2010: a History of Extreme Risks of Mortality from Infectious Disease." Travel medicine and infectious disease 14.5 (2016): 499–504. doi.org/10.1016/j.tmaid.2016.06.009

Long et al., 2020 United Kingdom	To discuss the suitability and usability of the Critical Appraisal Skills Programme (CASP) qualitative checklist tool for quality appraisal in qualitative evidence synthesis in order to support and improve future appraisal exercises framed by the tool.	Target population: No target population. Focus is on qualitative studies on health experiences Method: Systematic review using Critical Appraisal Skills Programme tool	Drew attention to the importance of appraising a qualitative study's approach to inquiry. Explained how CASP tool's given response options and hints may influence how the tool is interpreted and affect usability and proposed pragmatic tool modifications to help improve suitability and usability.	Long HA, French DP, Brooks JM. Optimising the value of the critical appraisal skills programme (CASP) tool for quality appraisal in qualitative evidence synthesis. *Research Methods in Medicine & Health Sciences*. 2020;1(1):31-42. doi:10.1177/2632084320943209475 59

Appendix 2 CASP Checklists

Section A

Are the results valid

Was there a clear statement of the aims of the research?	Yes	Can't tell	No
Is a qualitative methodology appropriate?	Yes	Can't tell	No
Was the research design appropriate to address the aims of the research?	Yes	Can't tell	No
Was the recruitment strategy appropriate to the aims of the research?	Yes	Can't tell	No
Was the data collected in a way that addressed the research issue?	Yes	Can't tell	No
Has the relationship between researcher and participants been adequately considered?	Yes	Can't tell	No

Section B

What are the results?

Have ethical issues been taken into consideration?	Yes	Can't tell	No
Was the data analysis sufficiently rigorous?	Yes	Can't tell	No
Is there a clear statement of findings?	Yes	Can't tell	No

Section C

Will the results help locally?

How valuable is the research?	Yes	Can't tell	No