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Original Research Article

An e-learning platform for managing seafarers' health issues on board: pilot use on the Greek shipping industry

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ABSTRACT

Background: It is well known that health management on board is a major challenge for maritime authorities, shipping companies, and seafarers. This paper presents the outcomes of the pilot use of an e-learning platform for dealing with mariners' health issues aboard.
Methods: The survey took place in the Piraeus port (Attica, Greece) during November 2021-February 2022. Data were gathered from merchant ship mariners (n=41) by questionnaires at the Piraeus port, Athens, Greece. A descriptive statistical analysis was performed by the SPSS v23.0® and Microsoft excel© 365.
Results: Twenty-one seafarers (51.21%) were at the age group 31-40 years old, fifteen (36.58%) were at the age group 41-50 years old, four (9.75%) were at the age group 51-60 years old and 1 participant (2.43%) was over 60 years old. Twenty-six (63.41%) of the participants were occupied on deck department while fifteen (36.58%) in the engine room. A statistically significant higher score on web-test after the use of SeaHealth platform was confirmed by paired t test ($p<0.001$) (Figure 3).
Conclusions: The participants who used the e-learning platform improved their knowledge on first aid, increased their basic skills on medical care, and achieved more confidence in handling emergencies effectively aboard.

Keywords: Seafarers, Maritime, Health issues, E-learning platform, Training

INTRODUCTION

Maritime Industry in a leading economic power in throughout the globe. More than 1,5 million seamen and seawomen are employed in the worldwide fleet and around 55,000 commercial ships carry 90% of the world's supplies. Approximately 85% of the international fleet is comprised by oil tankers, bulk carriers, and container ships.[1] At the beginning of 2020, the total world fleet amounted to 98,140 commercial ships of 100 gross tons and above.[2] At the same time, naval life remains burdened by various health related issues. Various studies have suggested that an unhealthy lifestyle and work-related diseases are the main health related difficulties of seamen.[3] Furthermore, limited scientific attention has been pointed to this problem, despite the considerable number of seamen and the severity of their health issues.

For centuries, a major concern for seafarers on merchant fleet was the management of medical issues on board. Lack of communication with ashore was overcome with the discovery of radio waves by Nicola Tesla and Guglielmo Marconi.[4] The first radio medical assistance on board was carried out in 1920 by the Seamen's church institute on New York.[5] On 2006, in the maritime labour convention (MLC) on Geneva the international labour organization (ILO) the "Guideline B4.1-Medical care on board ship and ashore" was declared. The goal was to protect the seafarers' health and provide their immediate

access to medical care aboard by telemedicine assistance services (TMAS). TMAS was described as "a prearranged system that medical advice by radio or satellite communication to ships at sea, including specialist advice, is available 24 hours a day".[6]

Several health-related issues arise in higher proportions among seafarers, than in general population. Cardiovascular disease is the leading cause of death among seafarers, and mortality rates on board are higher than those observed on shore.[7] Workers at sea have high mortality, injuries, and illnesses, probably as a consequence of working in hazardous environments. Widespread, but non-fatal conditions include musculoskeletal pain, often with limitation of movement, and psychological distress as well as other forms of mental health issues which can be disabling for the individual and may lead to early termination of a career at sea. Oldenburg et al. evaluated the emergencies among 465 officers by interview over a 6-year period. Almost 28,6% of mariners reported at least one severe medical case aboard. They complained of injuries (37,9%), cardio vascular diseases (18,2%), gastrointestinal (15,9%), skin or respiratory infections (9,8%), neurological (9,1%) or urological (4,5%) diseases and burns (4,5%).[8]

It is well established in the literature that seafarers still have increased mortality after adjustment of sociodemographic characters.[9] Recently and even more so, due to restrictions relating to the outbreak of COVID-19, large numbers of seafarers had their service extended on board ships after many months at sea, unable to be replaced or repatriated after long tours of duty; conditions unsustainable, both for the safety and well-being of seafarers and the safe operation of ships.[2]

There have been a number of initiatives to improve the health of seafarers by means of health-promoting interventions. One of the greatest challenges, comprised of the manner of delivering interventions, to a regularly isolated group which spends part of each year at sea, in port and at home on leave.[10] Recent reports show that the issue of difficult, and sometimes absent, management and treatment of medical issues that arise at sea, is still a major drawback leading to job losses and offshore transfer of seafarers, ultimately causing a consequent modification of the ships planned course. The aforementioned issues subsequently affect the maritime industry in total, both employees and employers, and a need for resolution arises. A worthwhile option, to overcome this problem, is to take advantage of the technological potential provided through the use of electronic devices.

To date, ship Captain's medical Guide, and TMAS remain the main tools for receiving a proper medical care at sea.[10-12] Although shipping companies, national maritime authorities and global organizations have cooperated to improve the medical services for mariners aboard, this is still a major challenge for seafarers. Previous research has demonstrated that approximately 7% of mariners per year will be evacuated due to medical reasons.[13] Therefore, the management of diseases or emergencies aboard is a crucial issue for merchant fleet, which carry more than 90% of the worlds' trade by nearly 1.5 million seafarers.[12,14]

Despite the prolonged use of TMAS to ships, it is recognized that health services aboard are not the same as onshore. Even though internet and satellites systems have improved telemedicine at sea, there are still several limitations. Apart from poor networks, difficult weather conditions and language barriers, there is also a lack of proper medical exams, equipment, and medicines aboard.

A computer-based training of officers directly on board could keep medical knowledge up to date and promote the seafarers' self-confidence in handling real emergencies.[7] Over half of the mariners, as described in the MarITD survey, have used an internet or video e-learning training system. The majority of vessel operators and training institutions are indicated high to medium use of e-learning courses, but with only 7.5% in the area of safety and health on board.[15]

The aim of this study was to present and evaluate the outcomes associated with using an e-learning platform for managing seafarers' health issues on board.

METHODS

SeaHealth platform, an e-learning asynchronous system, was presented to the participants. It was developed in the field of the research project "E-learning platform for Seafarers for first aid and health issues"- SeaHealth. This project was co-financed by the European union and Greek national funds through the operational program competitiveness, entrepreneurship, and innovation, under the call research-create-innovate. It was created in order to equip every member of the ship crew with necessary skills and knowledge for acting properly under any medical incident circumstance that might emerge onboard. The educational material, in English language, is aimed to be a useful tool for the seafarers' ship routine.

During the program "Seahealth" the working group created an asychronous e-learning platform with the aim to improve health education and make medical training for seafarers adequate and more attractive. An e-learning education system by animation or digital presentation aimed to improve the ability and self-confidence of seafarers to deal with emergencies or diseases and upgrade good health on board. The e-learning tool targeted three basic objectives: to clarify common sources of misunderstanding regarding the use of visual cues, to make the transfer of information during medical emergencies at sea more reliable and effective, and support some basic medical skills like CPR or injections, given that they are commonly necessary due to the

circumstances on board and the lack of access to healthcare.

During the preliminary phase, elicitation of user requirements was conducted. The scientific research team carried out a literature review, regarding the health issues of workers in the maritime industry and submitted proposals that were given to potential users of the e-learning platform for evaluation.

Aiming towards dissemination, the use of the platform in the shipping industry, the training courses were developed in a way compatible with the model of the IMO (International maritime organization) for training of crews (IMO model course). At the same time, the exact content of the platform was based in the already obligatory medical training for seafarers, which is described in the book "International medical guide for ships", published from the WHO.[16]

In order to establish the initial version of the e-learning platform, working groups were formed with the participation of six specialized doctors, representing the fields of internal medicine, general surgery, cardiology, orthopedics, otolaryngology and psychiatry.

The educational design concerned a well-organized and categorized content, multimedia and interactive elements but also evaluations and feedback, which was integrated in the e-learning course. The platform was selected to have 12 different learning groups that included several different learning modules each (Figure 1). The total amount of training modules at the platforms first presentation was 82 and included a large variety of different medical emergencies, training in basic medical skills and presentation of medical prevention strategies. The final produced result, contains interactive elements, multimedia (animation, video, images, etc.), has an easy navigation and user-friendly environment, is compatible with the SCORM standard (LMS independent) and gives the user the ability to watch from mobile devices/tablets. The estimated time for each user to go through all modules, was about 2.5 hours.

The survey population were adult's officers, with a valid "Certificate of medical care", and non-officers, for at least 6 months of sea service, and position in Greek shipping industry. The survey took place in the Piraeus port (Attica, Greece) and via online assessment during November 2021-February 2022.

A one-day seminar was performed to introduce the structure and the content of the twelve educational modules, included in the platform (Figure 1). Furthermore, access was provided to seafarers in order to navigate themselves in the environment of these modules, for a period of three months. Moreover, the participants had the opportunity to test their knowledge on various health care issues, before and after watching each course. To this end, a consensus-based medical quiz was created, including 20 multiple choice questions, aiming to evaluate the valid and targeted knowledge of the users about basic and common medical conditions. Most of the questions were provided in the form of a scenario. Examined medical conditions included, but were not limited to, basic life support, use of a defibrillator, heart attack, trauma, various injuries, burns, psychiatric conditions and bleeding. These questions where chosen based both on a previously conducted systematic review of the most common medical conditions and incidents occurring in seafarers, by the research group, as well as on the information obtained by focus groups and questionnaires.[17] The required time for accomplishing the questionnaire was set in 10 minutes.

Figure 1: The different learning modules included in each learning group.

An observational cross-sectional analysis was performed using the SPSS v23.0®. Paired t-test statistic was used to examine differences and similarities among the results. Statistical significance was reported on $p \leq 0.05$.

Moreover, user acceptance and user friendliness, as well as overall perception of the educational tool was evaluated, using a tailored adaptive questionnaire, with four closed-ended questions, concerning the content provided in each one of the modules, their duration, whether the way the content was presented was understandable and the overall design. The answers were given in terms of a 1-5 Likert scale, in which 5 corresponded to "very satisfied, whereas 1 to "very unsatisfied" with the intermediate values corresponding to satisfied, adequate, unsatisfied and very unsatisfied. All the responses were collected anonymously and online.

RESULTS

The study population that concluded the survey and provided feedback included 41 seafarers. Twenty-one seafarers (51.21%) were at the age group 31-40 years old, fifteen (36.58%) were at the age group 41-50 years old, four (9.75%) were at the age group 51-60 years old and 1 participant (2.43%) was over 60years old. Twenty-six (63.41%) of the participants were occupied on deck department while fifteen (36.58%) in the engine room.

There were participants from different nationalities with eighteen (43.9%) being Russian, 9 (21.95%) Ukrainian and 14 (34.14%) Greek. Modules that had the highest completion rates were basic life support, orthopedic emergencies, cardiovascular emergencies, trauma and infections with a completion rate over 70%.

After the presentation of SeaHealth platform, seafarers' comments focused on the user-friendly environment of the platform and the comprehensive course design. Overall scores in the Likert scale were 4.32 in regards of the content of the modules, 4.4 about the duration, 4.43 about their ability to understand the content and 4.32 about the overall design. Their feedback for each one of the modules is summarized in Figure 2.

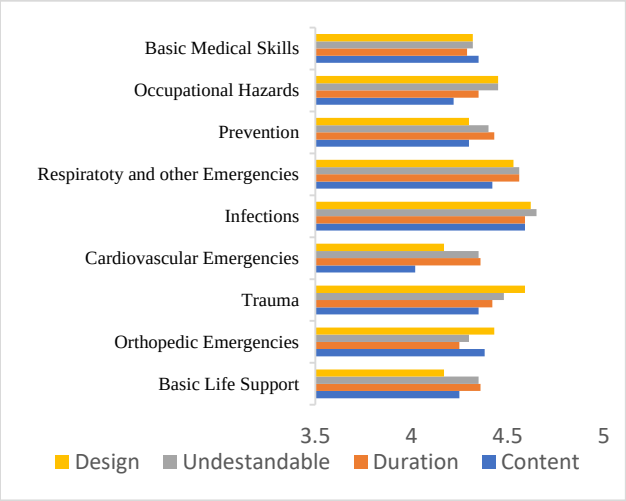

Figure 2: Seafarers' feedback regarding each of the learning modules based on Likert scale scoring.

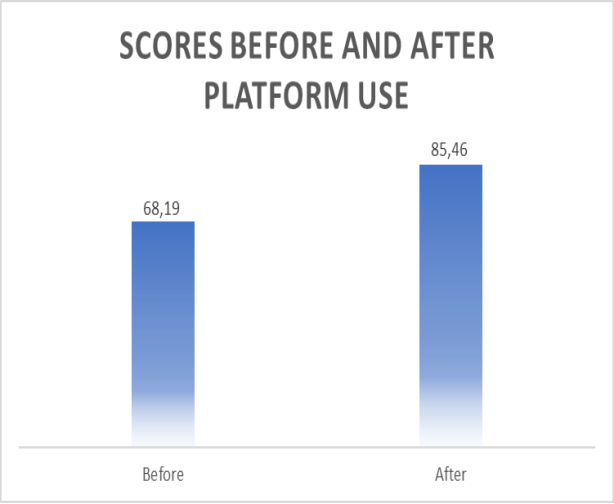

Figure 3: Chart showing scores before and after the use of the e-learning platform.

The required time for completing a median course, was estimated in approximately two hours and 30 minutes. Twenty six out of the 41 participants were able to complete the whole course. The mean score was recorded in percentage (%), before (68.19±10.19) and after (85.46±7.79) the attendance of the twelve courses. A statistically significant higher score on web-test after the use of SeaHealth platform was confirmed by paired t test ($p<0.001$) (Figure 3).

All the participants (100%) reported that the use of SeaHealth platform improved their knowledge. Also, increased their confidence to control issues according to emergencies, diseases, or hazards on board.

DISCUSSION

SeaHealth platform includes 12 educational modules and covers more than 80 different health topics, through which seafarers will receive reliable and structured knowledge on how to provide first aid and manage incidents or hazards aboard. The aim of each course is to raise awareness regarding diseases, emergencies or hazardous events that might happen on board. By the end of the course the seafarers will be able to understand and suspect what these cases really are, comprehend and identify the basic causes, symptoms, and signs, provide vital support, and know when specialized medical treatment is needed. The platform users are taught by advanced e-learning methods about diseases and emergencies approach and treatment algorithms, via real-life scenarios. Texts, videos, and animation are included on the training procedure.

Recently and even more so, due to restrictions relating to the outbreak of COVID-19, large numbers of seafarers had their service extended on board ships after many months at sea, unable to be replaced or repatriated after long tours of duty; conditions unsustainable, both for the safety and well-being of seafarers and the safe operation of ships.[2]

In previous studies, researchers have reported that 1 in 5 vessels annually will reroute course for medical causes, despite telemedicine having reduced the annually preventable evacuations by 20%. The estimated cost per year and ship was 32,750 euro for shipowners and 760 million euro for the whole industry.[13] On merchant vessels, first aid and management of diseases or emergencies aboard are performed by officers. These seafarers have to attend a medical educational course at university (120 hours) and a refresher training course (40 hours) each five years. A medical computer-based training method on board could promote seafarers' self-confidence in handling emergencies in real time and up to date knowledge.[8]

Presently, maritime industry adopts a critical view on training methods to guarantee that appropriate skills are regularly available to seafarers. E-learning is a distance educational tool that allows someone to learn at any place and time through internet or a blend of computer-based methods.[15,17] With different training techniques such as

learning management systems (LMS) offer faster, cheaper, and potentially up to date knowledge compare with a face-to-face course in a classroom. Over the half seafarers who participate on MarITD survey have used an internet or video e-learning training system. Most training institutions and vessels operators have high to medium use of e-learning courses but no more than 7.5% in the field of health aboard.[15]

Our study was cross-sectional descriptive with undoubtable limitations. Data collection via questionnaires presented validation weakness. There was no discrimination of confounders to the outcomes. A small sample of seafarers was included with possible selection bias of population.[18,19] Our findings shows that an e-learning education system as SeaHealth platform could improve seafarers' knowledge, ability, and self-confidence to deal with emergencies, diseases, or hazards at ship.

SeaHealth is an e-learning asynchronous platform for managing seafarers' health issues on board. It offers effective and pleasant training methods to seafarers directly on board. Officers and non-officers platform users could improve their knowledge, skills and self-confidence on dealing with diseases, emergencies, and hazards aboard and finally a possible reduction of unnecessary evacuations or diversions.

CONCLUSIONS

SeaHealth is an e-learning asynchronous platform for managing seafarers' health issues on board. It offers effective and pleasant training methods to seafarers directly on board. Officers and non-officer's platform users could improve their knowledge, skills and self-confidence on dealing with diseases, emergencies, and hazards aboard and finally a possible reduction of unnecessary evacuations or diversions. Validation pilot has confirmed that their performance in relevant questionnaires has been significantly improved.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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