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Could an e-learning training system promote good health to seafarers on board? A survey on the Greek shipping industry

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Abstract
It is generally accepted that one of the main difficulties of employees on maritime industry is the effective approach of medical care at sea in harsh weather conditions and long distances from ashore by absence of on-board doctor and limited equipment or medicines. The objective of the present study was to examine the health issues of seafarers and to approach an e-learning platform that could promote good health aboard. Data were collected from merchant ship personnel in the Piraeus Port, Athens, Greece (n = 61) via web-questionnaires and interviews. A descriptive data analysis was performed. The research results revealed that participants were interested in an e-learning education system by animation or digital texts for first aid and management of work-related emergencies and chronic or acute diseases as well as basic skills on medical care aboard. Seafarers reported that this system could achieve to improve their communication with a health specialist by telemedical assistance services, to keep medical knowledge up to date, and to promote their self-confidence in handling real emergencies effectively, leading to the prevention of unnecessary evacuations or deviations.

Keywords: Seafarers; maritime; health; telemedicine; e-learning system; training

1. Introduction
For centuries, a major concern for seafarers on merchant fleet was the management of medical issues on board. The lack of communication with ashore was overcame with the discovery of radio waves by Nicola Tesla and Guglielmo Marconi [1, 2]. On November 18, 1920 the first radio medical service to ships was operated to the Seamen's Church Institute on New York. Between 1920s and 1930s Sweden, Netherlands and Germany developed radio medical advice for their own vessels. On 1935, the International Radiomedical Centre (Centro Internazionale Radio Medico, CIRM) on Italy was the first successful attempt of radio medical assistance to ships traveling through international sea waters [3].
On 2006, in the Maritime Labour Convention (MLC) on Geneva the International Labour Organization (ILO) was declared the Guideline B4.1 – Medical care on board ship and ashore. 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" [4].
Over the last decades, the rapid development in telecommunication technologies, especially with the contribution of internet and satellites systems, attempted an upgrade on the medical services efficiently [3, 5]. However, telemedicine at sea is still limited due to the bad weather condition, insufficient bandwidth, language barriers and lack of complementary medical exams, equipment, or medicines on board [6, 7].
The aims of this study were: 1) to estimate the main health issues aboard and 2) to approach an e-learning platform for the promotion of good health on board.

2. Materials and Methods
The target population included seafarers over 18-years-old, with at least 6 months of sea service, and occupation in Greek ship industry. The duration of study was from December 12, 2018 to May 15, 2019.
At the outset, was designed and prepared a web-questionnaire in English language based on international standards. It involved three sections such as demographic and employment data as well as requests and approaches for the promotion of good health on board. In total, the survey consisted of 15 closed- and open-questions which were detailed, short, and formulated in simple language. The required time for accomplishing the questionnaire was estimated in 15 minutes. Forty-three seafarers took part in the online survey through the following link: http://survey.sqlearn.gr/index.php/734783?lang=en from December 12, 2018 to February 28, 2019.
Furthermore, interviews of mariners were carried out from February 28, 2019 to May 15, 2019. Eligibility criteria required the participants to be officers with a valid "Certificate of Medical Care". Informed consent was taken from all men and women who wanted to be part of the research. A total of 18 interviewees (3 women and 15 men) were divided into groups of 4 to 5 individuals. Each group answered to open-questions, in English or Greek language, about: 1) medical cases that they had managed or would like to have the knowledge of how should deal with them on board, 2) their ability, confidence and reply according to emergencies and 3) their intention of using an e-learning educational system for upgrading their skills on the management of health issues on board as well as the benefits of this procedure. Their responses were collected by recording.

Data assessment via web-questionnaires and interviews was followed. Initially, two data capture methods were selected by researchers. The answers of wed-questionnaires were administered through the CAWI method (Computer-Assisted Web Interviewing). Also, after the interviews' transcription, a manual entry of the stored responses was performed. The results of both methods of captured data were kept in a digital form [8, 10]. Subsequently, the data were sifted by codes based on the list of topics of the observed data. Then, the results were organized into categories [10, 14]. Furthermore, charts were formed. The results were pasted on these charts into different segments of categories. Finally, they typed into Excel files and the data were studied and analyzed under these identified categories.

Statistics analysis was performed to describe the basic characteristics of the data using the STATA© 13.1 and Windows Excel© 2010.

3. Results

The study population of 61 seafarers consisted of two groups: 43 respondents of the web-questionnaire and 18 interviewees (Table 1).

In the web-questionnaire group, six to ten seafarers were up to 40 years-old while 32.56% were in the age group of 41-50 years-old and 6.98% were 51-60 years-old. When the participants where asked about their nationality, the 69.77% of them commented that was Greek, 9.30% Russian, 9.30% Ukrainian, 4.65% Philippines as well as by equal proportions Bulgaria, Portugal, or India (2.33%). Approximately half of the respondents employed on container ships (53.49%) while 18.60% occupied on Oil/Chemical tankers, 11.63% on RO/RO ships, 9.30% on LNG/LPG carrier and 6.98% on general cargo vessels. The majority of seafarers served on deck (55.81%) followed by the engine room (32.56%) and the steward's department (9.30%), with only one not classifiable as to these separate classes. According to the rank, in the study sample were 29 officers (21 on deck and 8 on engine room) and 14 non-officers (3 deck personnel, 6 engine ratings and 5 other staffs).

Almost two-thirds of seafarers (65.12%) had received medical education but only two of them reported that they had used an online educational system. Besides, from 15 subjects who were not skilled on dealing health issues aboard, 33.3% would be interested to undergo an online medical training course. Also, six to ten seafarers were claimed that they were interested in updating their aptitudes. Surprisingly, about the half persons of those surveyed (44.19%) indicated that they had never used an e-learning system.

Thirty participants (69.77%) suggested that a specialized e-learning educational system could promote good health to seafarers on board while a face to face training course were selected from 24 persons, websites or apps from 19 subjects as well as leaflets and booklets only from 7. Further, into the question: "Do you think that an e-learning educational system for managing health issues on board would be helpful?" the 93.02% among mariners replied positive. When the subjects were asked about the structure of this system, was reported a medical scenario by animations from 67.44%, followed by a medical advisor avatar (58.14%), videos (48.84%), digital presentation (37.21%) or a text of questions and answers (16.28%).

Approximately similar ratios of the respondents reported that this system could help them to learn first aid (74.42%) and to communicate better with a doctor for medical advice (69.77%). Furthermore, they commented that they might achieve a better understanding or using of medical terms (48.84%). Besides, they noticed that they could gain the ability to make informal decisions about their own health (39.53%) and they might learn to control issues of chronic diseases (18.60%).

The respondents identified that would be interested in the following topics: work accident protection (81.40%), management of tiredness (58.14%), sleep improvement (55.81%), controlling of chronic/acute pain (41.86%) or anxiety (39.53%), approach of medical conditions (39.53%), management of hypertension (32.56%), diabetes mellitus (23.26%), gastrointestinal diseases (20.93%), obesity (18.60%), respiratory diseases or tinnitus (6.98%) as well as to learn first aid and deal with emergencies cases (9.30%). Also, when the seafarers asked about the skills that they would like to acquire the majority of participants reported first aid (93.02%), trauma care (81.40%) as well as fracture treatment (55.81%). The response rate was 30.23% for the chocking management and 27.91% for the measurement of blood pressure, the ability of an intramuscular injection and the noise protection while was 13.95% for the management of shortness of breath. Although, thirty-two seafarers would be interested in participating in a test regarding their level of acquired knowledge, twenty-five participants answered that this procedure was undesirable.

Eighteen Greek officers were participated in the interviewees group. The study sample involved 3 women with mean age 38.7±3.05 years-old and 15 men with mean age 44.4±16.3 years-old. Almost 50% of them served on container ships followed by 22.2% on Oil/Chemical tankers, 16.7% on general cargo vessels and 11.1% on LNG/LPG carrier. Fifteen seafarers were employed on deck while only three were occupied in the engine room.

In total, officers were skilled on medical care aboard and they had been confronted with at least one serious emergency case at sea. However, they admitted that 10% of these incidents resulted to diversions and evacuations with most frequently fields trauma and diseases. Also, they had already took part on e-learning training courses. A common view amongst interviewees was that an e-learning education system for first aid and health issues management on board could be useful and should be offered in two versions, one basic for personnel and another advanced for officers with a valid "Certificate of Medical Care". All seafarers agreed that the structure of this system could involve either an animation or a digital presentation of a medical scenario. However, more than the half (55.6%) considered that photos should not be included in this system while fewer participants argued that videos (33.3%) were not desirable too.

A variety of perspectives were expressed about the management of health issues on board such as basic knowledge about injuries care and treatment, basic life support and first aid, occupational hazards, hygiene rules, smoking, alcohol and drug using, cardiovascular, respiratory, or gastrointestinal diseases, infections and mental emergencies. Also, they were interested to know how could measure blood pressure, blood glucose, breathing respiratory rate, pulse, or body temperature. Besides, they concerned about the appropriate way of taking a medical history, examination of a person and reporting a medical case.

A significant theme that came up in discussions by officers was a gap between the medical care on board and the doctor's response by TMAS. They reported that in real time, under the stress of a

medical incident aboard, they had a lack of confidence or awareness to follow the instructions of the medical advisor. Also, they identified that the understanding or using formal medical terms were not always accomplished as an inconsiderable and simple task. They noticed that the insufficient bandwidth at sea, extreme environmental conditions and limited equipment or medicines made harder the implementation of effective medical assistance. However, the participants indicated that the access on an e-learning system about health care could improve their communication with a doctor for medical advice and their ability and self-confidence to control issues according to emergencies or diseases. Besides, they supported that it could help them to refresh their prior knowledge and upgrading their skills on the section of medical education.

Our study was descriptive with undoubtedly limitations. The data collection via questionnaires and interviews 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 [13, 14].

4. Discussion

The worldwide maritime industry involves nearly 1.5 million seafarers and carry more than 80-90% of the worlds' trade by 90,000 merchant vessels such as bulk carriers (43%), oil tankers (29%) and general cargo (4%) [5, 15, 16]. Even if global organizations, national maritime authorities, and shipping companies are collaborated with aim to improve the access to medical services for mariners, the health and safety management aboard is still a major challenge. On merchant fleet, Ship Captain's Medical Guide and radio assistance by TMAS are remained the main tools to approach a proper medical care at sea [4, 17, 18]. However, it is remarkable that among seafarers around 7% each year will be evacuated due to medical reasons [19].

There are similarities between our study and the systematic review of scientific literature on maritime health issues among various ethnic groups and fleets. The most frequently reported topics by seafarers are occupational injuries or accidents, emergencies, fatigue, stress, chronic diseases, and infections [20]. Among 6,759 medically repatriated cases, work-related trauma was the most important cause for 21.4% of 388,963 Filipinos seafarers between 2010 to 2014 [21]. Further, 67% of the deck as well as 77% of the engine personnel asked for medical advice about work-related accidents and injuries in a study of 1,963 seamen registered in Swedish Authorities [22]. For 465 German officers, in the medical refresher course in Hamburg, trauma was the most frequently emergency on board (37.9%) which had led to a port call, course deviation, or evacuation [23]. In our study, over than 80% of participants concern about the management and prevention of the work-related injuries or accidents. This result may be explained by the fact that the vast majority of them are officers who served on deck or engine department (Table 1) and match with previous observed outcomes [20, 23]. Also, the medical trained officers report that almost 10% of emergencies cases that had resulted to diversions or evacuations are injuries and diseases.

In emergencies cases at sea, TMAS is a commonly process to transmit medical data or information by email (30%), telephone (28%), radio (21%), telefax (14%) and videoconference (7%) [5]. However, the harsh weather conditions, the nonexistence of on-board doctors and the absence of equipment and medicines are limited the delivery of appropriate medical care aboard [24]. Our study supports the previous results and adds in the limitations of medical assistance on board the "human factor" that manage medical emergencies at sea sufficiently (stress, confidence, ability, up-date knowledge).

Even if telemedicine achieves to reduce the unnecessary evacuations by 20% per year, 1 in 5 ships per year will be forced to divert course by medical causes with an annual cost per vessel nearby 32,750 euro for the shipowners and 760 million euro for the entire industry [19]. On merchant ships, first aid and medical treatment on board are carried out by officers who have a 120 hours medical training at university and 40 hours medical refresher course every five years [23]. A computer-based training of these officers directly on board could keep medical knowledge up to date and promote the seafarers' self-confidence in handling real emergencies [23].

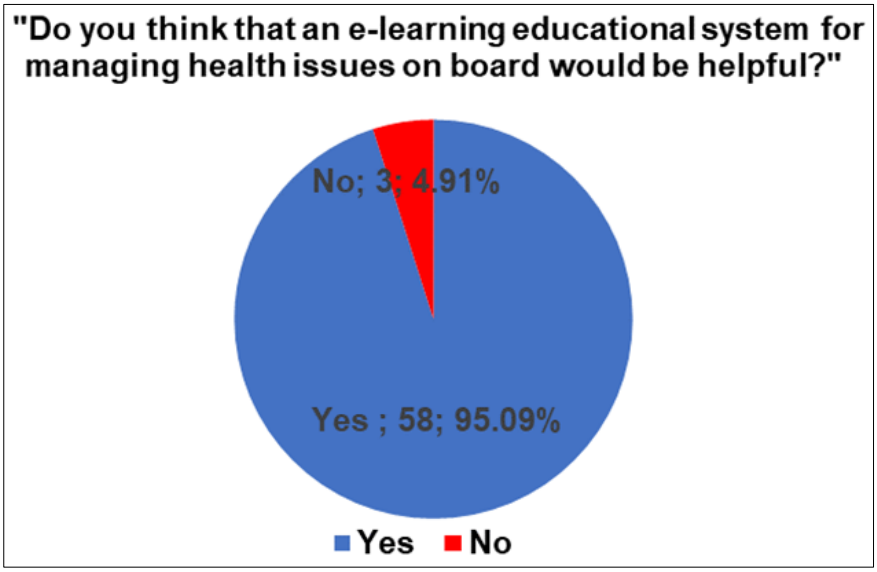
Today, maritime industry focus on a critically review of training methods to ensure that the proper skills are continuously available to seafarers. Shipping agents and maritime institutions answer to global developments, trends, and challenges by a range of e-learning courses which are filled with video, graphic or audio sequences and interactive texts. Seafarers are interested in reducing accidents and improving safety aboard, complying with external regulations and operating an autonomous vessel [16, 25]. Over the half among mariners of the MarITD survey have used an internet or video e-learning training system. The majority of vessels operators and training institutions are indicated high to medium use of e-learning courses with only 7.5% in the area of safety and health on board [16]. In our study 42.5% of mariners have already undergone an online training course. Also, our findings suggest that an e-learning education system by animation or digital presentation in two versions, one basic for personnel and another advanced for medical trained officers could improve their ability and self-confidence to deal with emergencies or diseases and upgrade good health on board (Figure 1).

The vast majority in our sample were Greek officers who occupied on Greek ownerships agents. However, with 4,536 ships over 1000 gross tons (gt) Greek shipowners' control 62.58% of world tanker fleet, 23.12% of dry bulk carriers, 10.38% of general cargo and 8.25% of container fleet. They hold a leading market share by 18% and over 50% of the global and European Union's (EU) fleet's capacity, respectively, while Greek masters and officers are approximately 19,000 and rank third in population among EU seafarers [26, 27].

Table 1: Descriptive demographic and employment data of the 61 participants in the study.

Descriptive demographic and employment data			
Participants		**Count**	**Percentile**
Age group	18-30	13	21.31%
	31-40	19	31.15%
	41-50	23	37.70%

	51-60	6	9.84%
Nationality	Bulgarian	1	1.64%
	Greek	48	78.69%
	Indian	1	1.64%
	Philippines	2	3.27%
	Portuguese	1	1.64%
	Russian	4	6.56%
	Ukrainian	4	6.56%
Sector	Oil/Chemical tanker	12	19.67%
	General cargo	6	9.84%
	Container ship	32	52.45%
	LNG/LPG carrier	6	9.84%
	RO/RO	5	8.20%
Department	Deck	39	63.93%
	Engine	17	27.87%
	Steward's	4	6.56%
	Other	1	1.64%
Rank	Officer	47	77.05%
	Non-officer	14	22.95%



Graph 1: Answers by the participants in the study into question: "Do you think that an e-learning educational system for managing health issues on board would be helpful?"

5. Conclusions

An e-learning system by animation or digital presentation for first aid and management of medical issues aboard could be an effective way of training seafarers to provide health care at sea. It offers more convenient and pleasant education conditions according to their requirements into several parts of the world, by free to arrange time to learn or update previous knowledge, directly on board. Seafarers could improve their skills and self-confidence on dealing with medical emergencies and achieve a better communication with a health specialist with result a reduction of unnecessary evacuations or diversions.

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Fig 1

Statement on conflicts of interest
There are no conflicts of interest to declare.

7. References

1. Marinčić A, Civrić Z, Milovanović B. Nikola Tesla's Contributions to Radio Developments. Serbian Journal of Electrical Engineering, 2006; 2: 131–148. 10.2298/SJEE0603131M
2. Guglielmo Marconi-Biographical. NobelPrize.org. Nobel Media AB, 2020. Accessed: July 17, 2020: https://www.nobelprize.org/prizes/physics/1909/marconi/biographical/
3. Mahdi SS, Amenta F. Eighty years of CIRM. A journey of commitment and dedication in providing maritime medical assistance. Int Marit Health. 2016; 4:187-195. 10.5603/IMH.2016.0036.
4. MLC - Maritime Labour Convention, 2006 (MLC, 2006). Accessed, 2020. https://www.ilo.org/wcmsp5/groups/public/---ed_norm/
5. Sagaro GG, Amenta F. Past, present, and future perspectives of telemedical assistance at sea: a systematic review. Int Marit Health. 2020; 71:97-104. 10.5603/IMH.2020.0018
6. Woldaregay AZ, Walderhaug S, Hartvigsen G. Literatures Review of Telemedicine Services in Maritime and Extreme Weather. Int J Integr Care. 2016; 16(5):S46. 10.5334/ijic.2597
7. Horneland AM. Maritime telemedicine - where to go and what to do. Int Marit Health. 2009; 60(1-2):36-9.
8. Patton M. Qualitative evaluation and research methods. 2nd Edition, Newbury Park, Calif, Sage Publications, 1990.
9. Morse JM, Field PA. Qualitative research methods for health professionals. Calif, Sage Publications, 1995.
10. Lavrakas PJ. Encyclopedia of survey research methods (Vols. 1-0). Thousand Oaks, CA: Sage Publications, 2008. 10.4135/9781412963947
11. Polit D, Beck C. Essentials of Nursing Research: Appraising Evidence for Nursing Practice. 7th Edition, Philadelphia, Wolters Kluwer Health/Lippincott Williams & Wilkins, 2010.
12. Bowling A. Research Methods in Health. Buckingham, UK and Philadelphia, Open University Press, 2002.
13. Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, *et al*. Cochrane Handbook for Systematic Reviews of Interventions. 2nd Edition, Chichester (UK), John Wiley & Sons, 2019.
14. Sterne JA, Hernán MA, Reeves BC, Savović J, Berkman ND, Viswanathan M, *et al*. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. BMJ, 2016, 355:i4919. 10.1136/bmj.i4919
15. UNCTAD. UNCTADstat. Maritime Transposrt. Merchant Fleet, 2020. Accessed: July 17, 2020: https://stats.unctad.org/handbook/MaritimeTransport/MerchantFleet.html
16. World Maritime University. MarTID 2019 Training Practices Report, 2019. Accessed: July 17, 2020: https://www.wmu.se/news/martid-2019-report-released
17. Bygvraa DA, Adhikari TB, Charalambous G, Jensen OC. Maritime doctors' skills and competencies: A review for policy analysis. Marit Techn Res. 2020; 2:40-51. 10.33175/mtr.2020.206375.
18. MacLachlan M, Kavanagh B, Kay A. Maritime health: a review with suggestions for research. Int Marit Health. 2012; 63(1):1-6.
19. Henny C, Hartington K, Scott S, Tveiten A, Canals L. The business case for telemedicine. Int Marit Health. 2013; 64(3):129-135.
20. Drylli A, Papanikolaou V, Chrysovergis A, Zerva K, Kikidis D, Kyrodimos E. Seafarers' health problems, emergencies, diseases and risk factors. A systematic review of the literature. Inter J of Med Health Res. 2019; 2:43-48.
21. Abaya AR, Roldan S, Ongchangco JC, Ronquillo-Sarmiento RM, Sarmiento RF, *et al*. Repatriation rates in Filipino seafarers: a five-year study of 6,759 cases. Int Marit Health. 2015; 66:189-95. 10.5603/IMH.2015.0038.
22. Forsell K, Eriksson H, Järvholm B, Lundh M, Andersson E, Nilsson R, *et al*. Work environment and safety climate in the Swedish merchant fleet. Int Arch Occup Envir Health. 2016; 90:161-168. 10.1007/s00420-016-1180-0.
23. Oldenburg M, Rieger J, Sevenich C, Harth V. Nautical officers at sea: emergency experience and need for medical training. J Occup Med Toxic. 2014, 9:19. 10.1186/1745-6673-9-19.
24. Woldaregay AZ, Walderhaug S, Hartvigsen G. Telemedicine Services for the Arctic: A Systematic Review. JMIR Med Inform. 2017; 5(2):e16. 10.2196/medinform.6323.
25. Chen X, Bai X, Xiao Y. The application of E-learning in maritime education and training in China. TransNav. 2017; 2:349-354. 10.12716/1001.11.02.19
26. Union of Greek shipowners (UGS). Greek Shipping and Economy, 2019. (2020). Accessed: July 16, 2020: https://www.ugs.gr/en/greek-shipping-and-economy/greek-shipping-and-economy-2019/
27. Seafarer's Statistics in the EU. Statistical Review (2017 data STCW-IC). ESMA (2019). Accessed: July 16, 2020. https://data.europa.eu/88u/dataset/seafarer-s-statistics-in-the-eu