

Improving telemedicine onboard Norwegian ships and drilling platforms – A study of intersectoral co-operation in Maritime Medicine

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– Thesis –

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Abstract

Background:

Using telemedicine to provide health services for seafarers represents a special case of intersectoral co-operation. Since 2006, several North Sea drilling platforms and internationally operating Norwegian merchant ships have used onboard telemedicine equipment continuously. Experience gained through this new technology has improved intersectoral co-operation regarding seafarers' health care.

Aim:

This study aimed to analyze the need for intersectoral co-operation and networking in maritime medicine by using telemedicine equipment at sea. Various Norwegian maritime organizations and institutions participated in the study.

Methods:

I conducted a qualitative descriptive survey using a *Web-organized interactive interview technique*, a new mode of interaction based on a semi-structured interview guide for data collection. After conducting exploratory personal interviews in October 2006, I developed a Web-based questionnaire comprising 53 questions. Participants received an e-mail invitation containing an online link to an Internet-based questionnaire. Individuals unable to use the Web-based link could return the completed questionnaire as an e-mail attachment. I collected data between April and June 2007 and evaluated some questions according to the principles of content analysis and others with simple quantitative analysis, e.g., frequency and distribution.

Results:

Among 33 persons contacted, 31 (94%) agreed to participate in the study. Respondents represented 11 various maritime organizations and companies. Fourteen worked as maritime officers, nine as maritime managers, and eight as medical professionals. Importantly, fourteen respondents (45%) had demonstrated practical working experience with telemedicine at sea. According to content analysis, the following categories were developed: communication- and evidence-based telemedicine; maritime e-health standardization and knowledge management; improving telemedicine quality management; organizational, technical, and medical competences and intersectoral approach; technical standardization and networking; and communication and information. Four main categories illuminated the participants' demands, i.e., information, communication, standardization, and centralization, and led to the development of national e-health policy and strategy to support the Norwegian maritime e-health society via networking and intersectoral co-operation.

Conclusions:

Intersectoral co-operation in maritime telemedicine requires interorganizational networking in order to introduce effective and compatible international maritime e-health standards for seafarers' healthcare. The Norwegian Centre for Maritime Medicine (NCMM), a Centre of Excellence in maritime medical research, will participate importantly in this process. The study also showed that a Web-based survey in maritime research offers an easily managed research tool that quickly yields a very good overview of a special situation.

Key words

maritime telemedicine, intersectoral co-operation, Web-based survey, Norway

CONTENTS	page
INTRODUCTION	5
Telemedicine at sea	5
AIM AND RESEARCH QUESTION	6
THE MARITIME PUBLIC HEALTH PERSPECTIVE	6
E-health in Norway	7
Maritime Telemedicine in Norway	9
INTERSECTORAL CO-OPERATION	10
Organisational factors and inter-organisational forms	10
Motives for intersectoral co-operation	11
METHODOLOGY	13
Research design	13
The researchers pre-understanding	14
Telemedicine equipment	14
Participants	14
Data collection	20
Questionnaire	21
Ship and platform position	22
Data analysis	22
ETHICAL CONSIDERATIONS	23
RESULTS	24
Need for maritime co-operation and networking	27
Establishing maritime intersectoral co-operation	32
Facilitation of maritime intersectoral co-operation	36
DISCUSSION	46
CONCLUSIONS	49
Telemedicine co-operation	49
Future aspects	50
ACKNOWLEDGEMENTS	50
REFERENCES	52
APPENDIX 1	57
Participant information	57

	page
APPENDIX 2	58
Study consent	58
APPENDIX 3	59
Online Information	59
APPENDIX 4	60
Web-based Questionnaire	60

Ubuntu is a very old African term in the Zulu language and means: only through other people does a person become a person. As an ideal, Ubuntu asks for co-operation among individuals, organisations, cultures and nations.

1. INTRODUCTION

This project is about health service for seafarers. In Norway there is a great deal of interest in telemedicine. This is probably related to the country's geography and the technology's ability to overcome distance (Aas 2001). The country has a long telemedicine tradition and the first telemedical services started around two decades ago. This advanced technology represents a special opportunity for medical collaboration and co-operation in maritime fields. On shore, telemedicine has been introduced to improve access to healthcare services for people living in remote areas, as well as in cities. On ships, however, telemedical technology has only to a small extent been introduced to improve access to specialist advice beyond what can be given over radio or telephone (Flesche et. al. 2004, Aujla et. al. 2003, Norum et al. 2002).

The shipping industry is more and more becoming aware of the need for this technology on board of the international fleet. Tele-co-operation systems have become an essential component, facilitating the joint work of geographically distributed persons or groups (Sandkuhl & Fuchs-Kittowski 1999). On board merchant ships the captain and second officer are usually in charge of medical care for a patient at sea. Merchant vessels do not carry qualified doctors or paramedics on board and the training of persons responsible for medical treatment on merchant vessels varies considerably. Evacuation of patients is expensive and sometimes impossible due to the cost of transportation under extreme weather conditions. The delivery of healthcare services to the merchant fleet also differs from the way passenger ships receive medical advice. Maritime telemedicine systems can enable a rapid assessment of the sick crew member so that decisions can be made together with medical specialists on land.

In July 2003, telemedicine equipment was firstly installed on board *MS Jupiter* (Fjord Line), a Norwegian passenger ship which travels from Norway to England. The ferry is at sea for 17 hours during the crossing and part of the time, the ship is so far from land that it cannot be reached by helicopter. Fjord Line has improved the information flow between the ship and the medical care units prior to any evacuation and to get more precise advice from the hospital

for the treatment of their passengers. The results from the first years have shown that several unnecessary evacuations have been avoided. Since 2006 telemedicine equipment is continuously in use on board several international operating Norwegian merchant ships and also on North Sea platforms.

The experiences gained with the use of this new technology has led to an improvement in intersectoral co-operation in connection with seafarer's health care on board merchant ships and platforms.

2. Aim and research question

The aim of this master thesis was to study the experiences of intersectoral co-operation in maritime medicine by using telemedicine technology on board merchant ships and platforms. The study tried to answer the following research questions:

- I. Is there a need for co-operation and networking in the field of maritime medicine?
- II. Are the different maritime organisations ready to establish intersectoral co-operation and networking by using telemedical equipment?
- III. Can telemedicine equipment facilitate intersectoral co-operation in maritime medicine?

3. The maritime public health perspective

The ILO convention 164 Article 4 point b states that:

"Each Member shall ensure that measures providing for health protection and medical care for seafarers on board ship are adopted which aim at providing seafarers with health protection and medical care as comparable as possible to that which is generally available to workers ashore."

According to ILO's maritime labour convention (ILO 2006) each member state must ensure that all seafarers on ships that fly its flag are covered by adequate measures for the protection of their health and that they have access to prompt and adequate medical care whilst working on board. The competent authority shall ensure by a pre-arranged system that medical advice by radio or satellite communication to ships at sea including specialist advice, is available 24 hours a day.

Co-operation in health, education and social services is one of the World Health Organization's strategies to improve the health of all human beings. In 1998, the WHO presented a definition of health which says that "*health is a resource for everyday life, not the objective of living, a positive concept emphasizing social and personal resources, as well as physical capacities*" (WHO 1998).

The building of networks, alliances and partnerships for health is emphasized in the WHO's strategies (WHO 1998) to improve the health of all human beings. According to the *WHO Health 21* program, health is a fundamental human right and companies should adapt a "*healthy company or enterprise concept*" which includes health promotion for their staff and countrywide health programmes.

New and continuing environmental demands and competitive forces require health care organizations to be increasingly careful in thinking about their strategies (Young & Ballarin 2006). E-health has recently appeared on the governmental agenda of EU Member States and is likely to be implemented on a broader scale. E-health has been defined as a means of applying new low cost electronic technologies, such as web-enabled transactions and advanced networks approaches to healthcare delivery. In this connection, the integration of telemedical solutions and regional health secure networks for seamless care has been given a high priority (Olsson et al. 2004).

Two projects were implemented during 2003 and 2005, funded by the EU, and involving three projects partners: the WHO, the European Space Agency (http://www.esa.int/SPECIALS/Telemedicine_Alliance/ESAZHP7708D_0.html), and the International Telecommunication Union (ITU). The objective was to develop a road map for the selection, implementation and use of e-health services for the year 2010 with the ultimate goal of improving access and quality of care, and reducing cost of health service provision i.e. to try and formulate an overlying policy for the application of telemedicine in support of primarily the European citizen by the year 2010.

3.1 E-health in Norway

The geography of Norway and its dispersed population poses a significant challenge for developing a telecommunications infrastructure. In principle, the Nordic countries already provide web-based health information for citizens and health personnel by net-based health education and video conferencing (Bergström & Heimly 2004). Norway provides extensive health services and has a well-developed social security net (Baardseng 2004). The specific Norwegian challenge is the low population density, the consequences of which include that patients might have long travelling distances to medical services and not all of the 85 Norwegian hospitals can contain every medical discipline.

A significant contribution to the Norwegian development in health informatics is given by four different national centres.

- The “*Norwegian Centre for Telemedicine (NST)*” is a part of the University Hospital in Tromsø and provides research and development in telemedicine on a national and international level. Since 2002 it has been designated by the WHO as a collaborating centre for telemedicine.
- The “*Norwegian Centre for Health Informatics (KITH)*” is a company owned by the Ministries for Health and Social Care and The Association for Municipalities and located in Trondheim. This institution is working e.g. with development and implementation of standardised secure information exchange and coding systems.
- Another institution is *Kokom* which is operating as a national centre in Bergen. This institution gives advices concerning national standards for radio communication in emergency services to governmental institutions on a central and local level.
- The research centre *NSEP* is situated at the Norwegian University of Science and Technology (NTNU) in Trondheim. The centre is working with education related to EHR systems (implemented by hospitals, GP`s or other healthcare providers) and performs multidisciplinary research.

In principle, telemedicine systems are used for teleconsultation in order to receive a medical expert opinion. Often these systems are especially intended to support delivery of medical expertise to rural areas. Regulations to protect the privacy and security of individual patient data were introduced in 1980 and have been rated as extremely effective. In the mid nineties the Norwegian Ministry of Health and Social Affairs published a plan of action “*More health of Each bIT*” on the use of information technology in health care. The plan was to connect all Norwegian health care institutions in the northern regions in order to increase the competence of health personnel to improve diagnostic practices, patient treatment and coordination (Petterson et.al 1999).

In 2004 a national policy to reduce the costs of ICT infrastructure for the health sector was introduced. Norway indicates in this context that it works very effectively with intersectoral and non-governmental partners to promote infrastructure development.

According to a recent WHO report (WHO 2006), the establishment of the Norwegian HealthNet (http://www.norsk-helsenet.no/tiki-view_articles.php), has been described as the backbone of e-health services and systems. The Norwegian HealthNet was created through the development of regional networks and their merging into the national HealthNet proved a significant

challenge, as the various regions had chosen different technologies. Today the Norwegian HealthNet is implemented in all regions of the country. It is reported to be the most effective action in this field (http://europa.eu.int/information_society/).

It has been stated that the national co-ordination of financial, legal and security aspects of e-health in Norway poses the most significant challenge in this area. Te@mwork 2007 was the national strategy for ICT development in the health and social sector for the period from 2004-2007. The strategy's three years programme was organised by the Directorate for Health and Social Affairs (2007) for the municipalities has contributed to increase and improve teamwork between municipal health, social services, specialist health services and general practitioner services.

3.2 Maritime telemedicine in Norway

Access to healthcare has always been one of the most critical issues for offshore crews. On board merchant ships, an emergency evacuation can be very difficult, sometimes even impossible, because of the long distance to shore. In general maritime medicine includes a lot of different medical specialities such as general practice, surgery, emergency medicine, occupational health and telemedicine. Sommerfelt-Petterson (2006) has pointed out, that a lot of various actors with different national, professional and cultural background are normally working together in order to solve health issues in maritime medicine.

According to Moksness et al (2002), the panorama of diseases and injuries varied between the different maritime settings. Patients representing cruise liners and ferries reported frequently coronary heart diseases, while accidents were the main problem among the others. Seamen on merchant ships usually contacted Radio Medico for medical support, while the fishermen most frequently contacted the coast guard or the emergency medical dispatch centres.

There are also other medical problems that are not emergencies but nevertheless should be handled in an optimal way to reduce risks. It comprises medical diagnosis and treatment performed using digital information technology to transfer patient information. The number of people on board merchant vessels is also significantly lower than on passenger ferries, but the number of days on board increases the need for a medical call centre. The delivery of health services to the merchant fleet also differs from the way passenger ships receive medical advice.

Usually the second officer is responsible for the medical care of the crew (WHO 2007). Radio Medico is normally contacted by phone and the advice is given verbally. Co-operation via telecommunication in general represents a special

situation in health care and may be defined as working together with one another for a common goal. (Aas 2005, 1999).

According to Schreiner (2003) Norwegian maritime telemedicine has existed since the introduction of radio communication some 75 years ago. It provides rapid access to share and to remote medical expertise. Information about the patient, especially vital signs will be transferred electronically in forms of images, video, sound, text, data of medical devices to a telemedicine competence centre where it is processed and, if necessary, distributed to a network of medical experts. The physician in the telemedicine competence centre is informed about the circumstances, external symptoms and first orientating findings. The involved physician directs the further diagnostics and treatment.

A telephone based system has limitations when it comes to documentation of workflow, and documentation also represents a new situation of medical work flow and co-operation (Darkins & Cary 2000). It is also known that the requirements for quality of video communication within a tele-co-operation session are much higher in a medical scenario where video data forms the basis for diagnosis and therapy planning, than they are in a business-orientated situation (Sankuhl & Fuchs–Kittowski 1999).

The Norwegian Centre for Telemedicine (NST) has been using the following definition:

“Telemedicine is the investigation, monitoring and management of patients and the education of patients and staff using systems which allow ready access to expert advice and patient information no matter where the patient or relevant information is located” (European Health Telematics Research Program Advanced Informatics in Medicine, 1991).

For the purpose of this study the term *telemedicine* was narrowed down to the use of technology to send data such as text, images and patient data (ECG, blood pressure etc) for medical advice or training purposes.

4. Intersectoral co-operation

4.1. Organisational factors and inter-organisational forms

The objective of co-operation in public health is the provision of integrated health services. Today there are many organisations involved in public health issues. These organisations may represent different parts of the social and welfare services, sometimes also different sectors of the society. In 1986, the Ottawa Charter for Health Promotion pointed out that what is needed most of all is intersectoral co-operation in public health (WHO 1997).

In the organisational literature, inter-organisational relations have been described as partnerships, networks or coalitions (Kickert & Koopenjan 1999).

Some authors talk about inter-organisational relationships, others about strategic alliances, inter-organisational or strategic networks (Bunton & Macdonald, 2002; Sullivan & Skelcher, 2002, Child & Faulkner 1998). Organisational networks are social forms of inter-organisational activity based on the exchange of information, coordinated action and the joint solving of assignments between units from legally distinct organisations that constitute non-hierarchical social systems (Gustafsson 2004).

According to Axelsson & Bihari-Axelsson (2006), public health is a field of welfare with a strong inter-organisational and also intersectoral character, where many different and sometimes contradictory definitions of concepts like co-ordination, co-operation or collaboration are used. The theoretical connection between these various concepts is not always clear (Hvinden 1994). In this study, the term co-operation is used to cover all the different forms of working together across professional, organisational or sectoral boundaries.

As mentioned above, co-operation in public health deals with the provision of integrated health services. In 1967, two organisational researchers, Lauwrence and Lorsch, developed a *contingency theory* which describes organisations as a question of balancing differentiation and integration, which may occur on different intra- and inter-organisational levels. In this context, the term *differentiation* means differences in orientation and in the formality of structure between various organisations, while the term *integration* represents the quality of the state of co-operation between the involved organisations or units. According to this theory, differentiation and integration depends on the circumstances at any given time.

According to Hjern (2001) the importance of integration lies in its capacity to relate to the demands of the environment and to meet people's multiple needs. Payne (2000) describes different reasons for intersectoral work, like sharing information, bringing together skills and achieving of continuity of care, co-ordinating planning resources, co-ordinating and delivering resources for professionals to apply for the benefit of service users, apportioning and ensuring responsibility and accountability.

4.2. Motives for intersectoral co-operation

In analysing intersectoral action it is also important to understand the vision, commitment and networks of the individuals involved. It is the relation between these factors that makes many intersectoral projects possible and highlights the need for longer term organisational support. Whether such co-operation works poorly or well will be important with an increasing volume of telemedicine in

healthcare services (Aas 2001, 2002b). In principle co-operation works better when working relationships were durable and trust drew on a history and evidence of reliability. Understanding the strength of the motivation for organisations to work together assists in understanding the level of commitment they will be willing to make, and of risk they will be willing to take. Figure 2 presents motives for intersectoral co-operation.

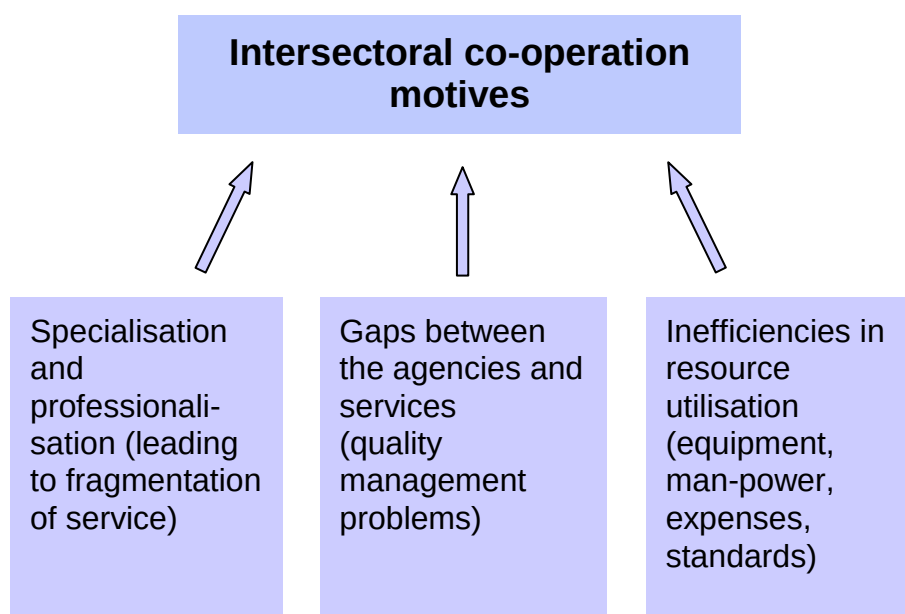


Figure 1. Motives for intersectoral co-operation.

In public health specialisation, formalisation and professionalisation lead to increased need for co-operation. The negative consequences of sectorisation can be seen in the fragmentation of services (Axelsson & Bihari Axelsson 2006). Fragmentation of task and responsibilities leads to less ability to see comprehensive solutions. Each professional group is too specialised to find comprehensive solutions to complicated problems. Gaps between the co-operating organizations will have an effect on the quality of the common work.

Health care deals with an increasing amount of knowledge. During the last years the prevalence of telemedicine is gradually increasing in all sectors of healthcare management. Sankuhl and Fuchs–Kittowski (1999) state that the requirements for quality of telecommunication within a tele-co-operation session are much higher in a medical scenario where video data forms the basis for diagnosis and therapy planning, than they are in a business-orientated situation.

The European Union Research and Development Programmes (EU R&D) strongly encourage international co-operation. During 2000-2003 a collaboration initiative on e-Health was set up by the European Commission and

governmental authorities in order to build up different international working groups on eHealth (Olsson 2004).

This master study addresses intersectoral co-operation related to various maritime organisations working with healthcare services for seafarers. The involved maritime organisations and institutions from different sectors of the Norwegian society have presented different structures, different professional attitudes and behaviours.

5. Methodology

5.1. Research design

In qualitative research (Bowling 2004, Endacott 2005, Sofaer 2002, Hallberg 2002, Dahlberg et al. 2001, Robson 1999, Øvretveit 2002,1998) it is important to be aware of the theoretical background designed by the researcher. Therefore research design, data collection, data analysis and interpretation of the results must minimize all kinds of error and bias (Kvale 1989, 1997).

The study was carried out as a qualitative descriptive survey study by using a web-based survey which gives a new mode of interaction with respondents. It was used a *web organized interactive interview technique* with a semi - structured interview guide for data collection. The web- based questionnaire was developed after some exploratory personal interviews in October 2006. The persons contacted were asked to participate in the survey study and those who said yes were asked the same set of questions. The participants received an e-mail invitation which contained a link to the internet based questionnaire. The open form of some of the questions allowed the procedure to be adapted to the specific situation of each participant and gave deeper insights and information into very different types of experiences.

To complete the survey, the participants were required to answer questions by clicking on specific buttons on a scale or entering free text in specific boxes. In the next step they scrolled down the entire questionnaire and finally clicked on the submit button when the survey was completed. The leading representatives and responsible managers of various maritime organisations as well as the involved ship officers on board merchant ships and platforms and medical doctors and nurses working with seafarers health had been interviewed. The data were collected between April and June 2007.

The web-based questionnaire is attached in Appendix 4

5.2 The researcher`s pre-understanding

As Specialist in General Practice with many years hands-on working experience in a wide range of different medical specialities, multidisciplinary collaboration has been an area of my interest for many years. During my work as a seaman`s physician as well as researcher in maritime medicine, I have experienced e-health as a new challenge. I have as a researcher been as open minded as possible to the data and the evaluation process.

5.3. The telemedicine equipment

It is a portable and rugged suitcase with a touch screen PC, 12 lead ECG, SpO₂, temperature sensor, blood pressure and / or digital camera for exchange of digital pictures.

The equipment was easy to use and all equipment was placed in a small, specially designed bag that allows the entire solution to be easily carried to any location on board. The patient`s ECG recording was sent via a encrypted email to the hospital, which can then quickly diagnose the patient`s condition and give medical advice to the officer. On board, the system is used by a maritime officer or ships commander, who has regular telephone contact with emergency unit at the regional hospital in Norway. Secure standard protocols were used.



Figure 2. Telemedicine equipment, IMED Norwegian Telemedicine AS.

5.4. Participants

The participants of the involved companies and institutions were chosen because they were considered to have important information to contribute in relation to the aim and research question in terms of variation of professional education, institution thus providing a wide spectrum of experiences and a nuanced picture of the phenomenon under study. All these organisations have

different working attitudes and behaviours and provide best practices in operating the vessels and a safe working environment.

Maritime and other medical institutions:

- Norwegian Centre for Maritime Medicine (Bergen)
- Radio Medico Norway (Bergen)
- Rogaland Radio (Stavanger)
- Medi 3 AS (Ålesund)
- iMed Norwegian Telemedicine AS (Tromsø)
- Global Medical Support AS (Oslo)

Shipping companies:

- Odfjell ASA
- Aries Offshore AS
- Troms Offshore AS
- Maersk Contractors
- Norwegian Coast Guard
-

Norwegian Centre for Maritime Medicine

The Norwegian Centre for Maritime Medicine (NCMM) collects and mediates knowledge about maritime medicine to seafarers and fishermen, shipowners, ships authorities, workers' organizations, employers' organisations and others. The centre is the Norwegian point of contact for national and international co-operation in maritime medicine and Radio Medico Norway is incorporated in the operational activities of the NCMM. The centre is performing maritime research projects, register incidence of illnesses and accidents at sea, support education and teaching on maritime medicine.

Radio Medico / ACU Haukeland University Hospital

Radio Medico Bergen was built up in the 1940s and since that time the medical doctors supported for many decades successfully Norwegian seamen in case of medical emergency. Since 1985 Radio Medico Bergen is working with four medical doctors, all of them are specialists in internal medicine. Radio Medico is normally contacted by phone and the advice is given verbally. The medical specialists receive approximately 1000 medical inquiries a year, primarily regarding accidents and medical problems ((Schreiner & Aanderud 2005). The doctor on duty has a possibility of contacting other specialists of the ACU Haukeland University hospital, if necessary. The service is for free, but the running expenses are covered by the National Office for Social Insurance Abroad. With the help of Rogaland Radio the doctor's medical advice will be given within 15 minutes, when a call is made. The patient on board is diagnosed and medical instructions are given mostly to the second officer who in charge of medical treatment on board. The ACU unit of Haukeland hospital is available for acute service for a lot of ships and ferries in the coast near areas.

Rogaland Radio

Maritime Radio has three main departments and covers the requirements for radio communication services by the shipping trade, the fishing fleet and leisure crafts in Norway. Maritime Radio also provides expert advice on maritime radio matters to shipowners, installation firms, shipyards and Norwegian authorities. Conveying and coordination of inquiries regarding assistance is one Maritime Radio's main tasks. With on-call-duty 24 hours a day, the Radio is an important asset to the seafarers. If there is a medical emergency on board Rogaland Radio has direct contact with Radio Medico Bergen and the Rescue Coordination Centre.

Medi3 AS Alesund

Medi3 Marine is a subsidiary of the private medical centre Medi 3, located in Ålesund on the west coast of Norway. Medi3 AS has its own hospital specification for construction of medical facilities on board ships according to official rules and regulations, and delivers complete medical systems, sickbays and fully equipped hospitals to ships. The company has a close corporation with the ship owners, authorities, medical centres such as Radio Medico Bergen, AMK-sentraler (helpline centres) or directly to Norwegian Air Ambulance / Global Medical Support for medical assistance or to the Norwegian Centre for Maritime Medicine. Medi 3 is developing all types of medical facilities for ships and encrypted software for transferral of medical data such as ECG, pictures and text between doctor and ship (ShipMed). The company provides different medical equipment to computing software for logistics, maintenance, treatment and communication with the doctor ashore.

iMed AS

iMed As was founded in 2001 to help customers find their way in the jungle of technological, medical and organisational issues that emerges when eHealth is introduced in a health care organisation. Building on the experience gained through the last decade at the Norwegian Centre for Telemedicine in Tromsø (NST). iMed started in 2002 the development of a product solution called *merMAid* in co-operation with Well Diagnostics AS and MediT AS. The development was based on the survey of the needs for improved health care services in the maritime market presented by NST at a Maritime Conference by SND to combine the Norwegian knowledge within Telemedicine and the strong market position in the maritime market. The development of the mermaid solution was supported by SND, and the result was a small portable suitcase where ECG, thermometer, oximeter and a digital camera can be connected to a rugged computer.

Global Medical Support AS

Global Medical Support AS (GMS) is a daughter company of *Norsk Luftambulanse AS*. They operate the 24 hours / seven days Call Centre for the members of *Norsk Luftambulanse* several offshore operators, international industry and insurance companies. The GMS call centre is operated by professional healthcare personnel and has a team of acute care doctors

available. GMS is located at Ulleval University hospital and is cooperating with medical experts within all segments at Ulleval and other hospitals when requested. GMS is logging all phone calls and connects the client (patient) with the right medical expert within 15 minutes. All data are filed and available if needed. GMS has built up a large database and network of health care institutions and transport partners worldwide. GMS has implemented solutions to receive digital health care information and patient data in secure formats.

Odfjell AS

The Odfjell fleet consists of close to 100 ships trading in a global network worldwide. The company has been a frequent user of Radio Medico. Within the last years the company had experienced the need for better healthcare services to improve the pre-hospital care in acute situations. The company equipped five merchant ships with this telemedicine technology. Odfjell participated with four of the five ships in the survey. Three telemedical units had been placed on board during July, August and August 2005, two other units in December 2005.



Figure 3. Odfjell tanker (http://havenkade.nl/tankers_b.htm)

Aries Offshore AS (Ugelstad AS)

Aries Offshore Services A/S, formerly S.Ugelstads Rederi A/S, was established in 1929 by founder Samuel Ugelstad Sr, the company was sold and became a part of the Aries Group, Athen. Aries Offshore Services A/S has a fleet of five modern vessels; Active Girl, Active Lord, Skandi Waveney, Active Swan and Island Scout. Ugelstad Management AS has decided that the company's safety priorities are as follow: safety for live and health, for the environment and for ship and cargo. Ugelstad Management AS shall for motivation of the crew emphasize the necessity of training and information, the improvement of new technological systems. One telemedical unit was installed on board one of the vessels in April 2005 and since then has been continually in use.



Figure 4. MS Active Lord (www.ugelstad.net/Index2.htm)

Troms Offshore

Troms Offshore AS was founded in 2005. At the end of 2005 the fleet consists of 13 vessels, operating from the Barent Sea in the north to Antarctic in the south and to Singapore in the east. Troms Offshore AS is a privately owned company operating offshore service vessels and other special vessels related to research, sub sea and coastguard operation. The fleet consists of both owned vessels and vessels on management from other ship owners. The offshore fleet consists of both AHTS (anchor handling tug supply vessel) and PSV (platform supply vessel), supporting offshore activity world wide. The company's superior goal is that our operations shall not cause accidents, damages or losses and that safety at sea is ensured. The company's operations shall take consideration of the environment, particularly the marine environment, through continuous improvement of their operations. The telemedical unit was placed on board of one the platform supply vessel in December 2005, the telemedical training of the crew started in August 2005, since this time the telemedicine equipment was officially in use.



Figure 5. MS Troms Fjord, supply vessel (www.troms-offshore.no)

Norwegian Coast Guard

The Norwegian Coast Guard was established in 1977. The fleet currently possesses 14 ships, six helicopters and two hired civilian aircraft. Five new vessels for service in the Coast Guard's control of coastal fishing became operational in 2007. Around 70 percent of the Coast Guard's resources are used on inspections; other tasks are in the areas of exercise of sovereignty, search and rescue preparedness, ambulance service and assistance to the fishing fleet. The Coast Guard provides assistance to scientific expeditions and transportation of equipment to remote areas. This is particularly the case in Polar Regions like the meteorological station on the remote islands of Jan Mayen, Hopen and Bjørnøya. Also voyages have been conducted to the South and North Pole. The Norwegian Coast Guard has also participated in the International Maritime Organisation (IMO) and in the Norwegian delegation as adviser on various security related matters that are relevant for the day-to-day work of the Coast Guard. In 2005 the telemedical equipment was tested for 10 months on board.



Figure 6. Norwegian Coast Guard (www.mil.no)

MAERSK Contractors

Mærsk Contractors is part of the A.P. Møller - Maersk Group and is a leading drilling contractor and supplier of floating production solutions. The fleet counts 27 drilling rigs and three floating production units, including high efficiency platforms so called jack-up rigs. Mærsk Contractors employs an international staff of 2,800 well-trained people.

Three MAERSK platforms participated in the survey: MAERSK Giant, MAERSK Gallant and the world's largest and most advanced harsh environment jack-up rigs MAERSK INNOVATOR, operating in the North Sea. This ultra harsh environment jack-up platform was delivered in 2003 and represent a new generation of harsh environment jack-up rigs due to their size, efficiency and

automation. With a leg length of 205 m (673 ft) the rig is capable of operating in the most harshed environment at water depths up to 150 m (492 ft); more than 30 m (98 feet) deeper than other jack-up rigs. The new jack-ups can accommodate up to 120 people and are equipped with a hospital for medical emergencies. Three telemedical units had been placed on board of three platforms in July 2005. In May 2007 the company equipped two more platforms with two more units.



Figure 7. MAERSK Giant (www.northseaguide.com)



Figure 8. MAERSK Gallant (<http://about.maersk.com>)



Figure 9. MAERSK Innovator (<http://about.maersk.com>)

5.5. Data collection

When designing a web-based survey it is determined which respondents to aim for. E-mail addresses and other background information have to be collected. The survey can be sent via e-mail or e.g. a web site. The distribution and data collection are completely automated. In principal the respondents can be reached via e-mail, a link, or via a pop-up window on a web page or a tactile screen. Many possibilities are available. The data collection process is directly monitored using a dialog manager (see Appendix 3).

5.5.1 Questionnaire

Online information and knowledge services for professionals are becoming increasingly popular and highly successful. According to the results of a research study of Andreassen et al (2002) Norwegian health personnel will need more to respond of Internet generated expectations and behaviour of their users

The proportions of Norwegians who used the Internet for health purposes increased from 19 % in 2000 to 31% in 2001.

Participants in a co-operative effort need a reason to co-operate in the form of an evident gain. In order to identify the views of the various involved maritime partners in this field on intersectoral co-operation a web-based questionnaire was created. For further details please see Appendix 2.

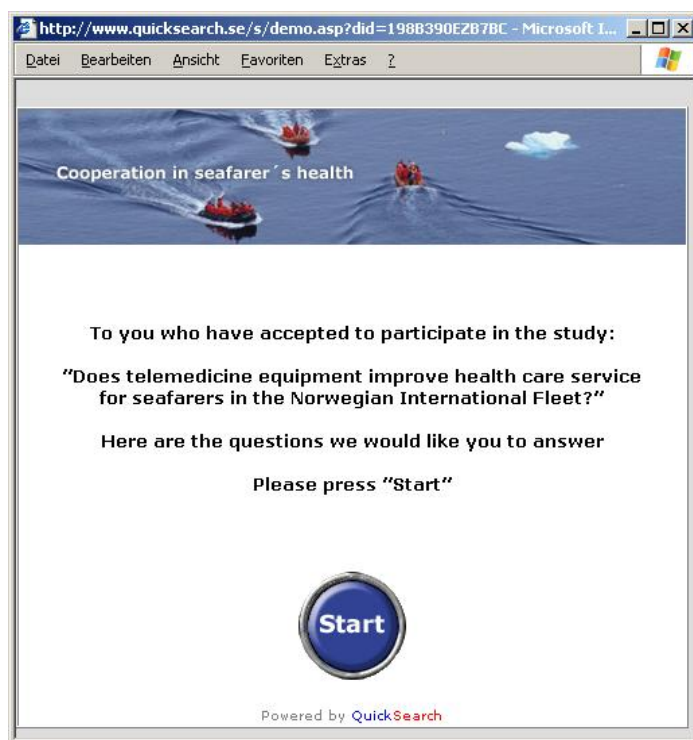


Figure 10. Start of the questionnaire

Every respondent received an individual code number. A link was activated by pressing the "Start" button and the individual answers had been processed online while answering the questions. It was recommended to reserve 30-60 minutes to answer all 53 questions at once, but if the respondents needed to shut down the link they had automatically get back to the next question by activating the link again.

When all questions had been answered and the respondent came to the last "Thank you" page – the respondent could no longer activate the link. Those who had no possibility to use the webbased online link had the possibly to send the answered questionnaire as e-mail attachment. Nine participants used the email possibility.

5.5.2. Ship and platform positions

Figure 12 illustrates the position of participating Norwegian ships and platforms by answering the web-based questionnaire.

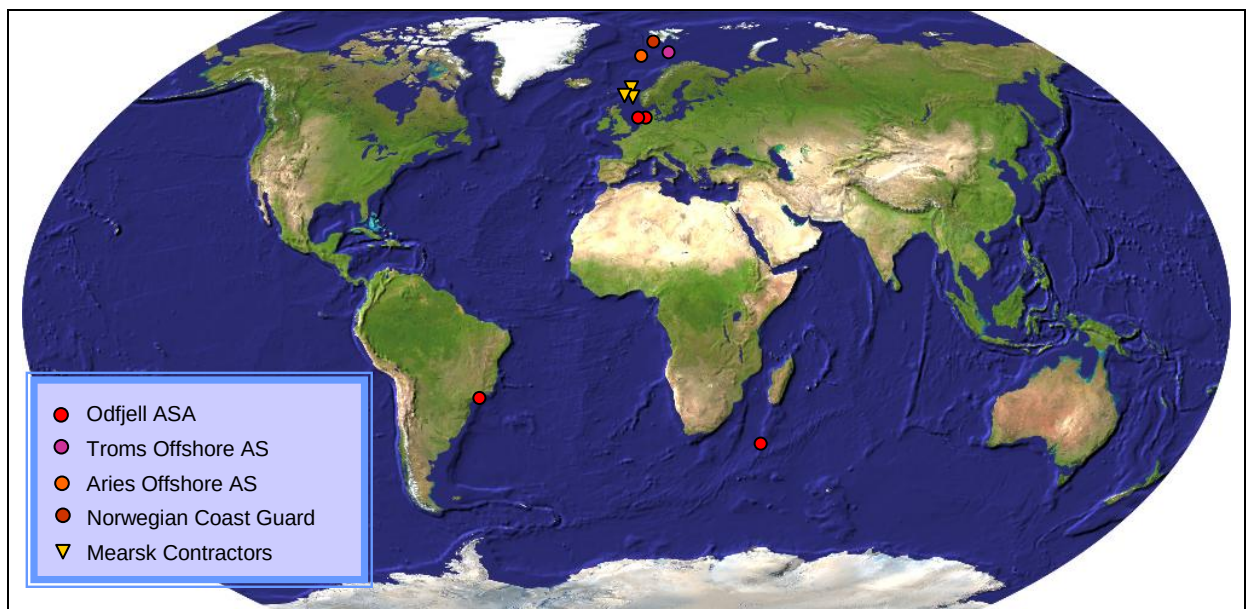


Figure 11. Position of participating Norwegian ships and platforms by answering the questionnaire

5.5.3 Data analysis

Qualitative methods have seen an increased acceptance in the last decade in health services research and health technology assessment (Aas 2002b). According to Kvale (1989) qualitative data gathering methods are ways of recording and understanding people's experiences and the meanings which they give to events and their behaviour in natural settings. He mentioned that the question of what we do, how we do and why we do it in qualitative research should be studied from the beginning of a research to the end. Qualitative data

are often gathered as part of an inductive approach, which seeks to build up categories of meaning out of the data, usually from people's reported experiences and perceptions or observations of their behaviour.

Shortell (1999) has pointed out that qualitative methods may be especially appropriate when little is known about a phenomenon. To study intersectoral co-operation in maritime medicine here the qualitative research tool of content analysis was used.

According to Patton (2002) content analysis means analysing the core content of interviews in order to determine what is significant. Thus, identifying, coding, categorising, classifying and labelling the primary patterns in the data are parts of the analysis process. Krippendorff (2004) mentioned that content analysis as research technique is making replicable and valid inferences from texts to the context of their use.

The answered questions were first read in order to obtain a sense of the whole and form an idea about possible concepts. The text was read several times and meaning units were identified by the researcher as tentative codes. Meaning units were labelled and similar codes were abstracted into categories. According to Graneheim & Lundmann (2004) the categories refer to the descriptive level of content and may be regarded as the manifest content. The categories were developed and the researcher discussed and reflected on what would be the most appropriate label. Relevant literature was also reviewed, which constituted a process of going back and forth between data, method and theory.

The results of this master thesis permit some quantification of the qualitative data. Therefore some of the questions were evaluated according to the principles of content analysis, while other parts of the questionnaire were evaluated with simple quantitative analysis (e. g. frequency, distribution). The percentage figures given for six of the questions represent a summary of the findings.

6. Ethical considerations

In order to safeguard the rights of the participants the ethical issues in this master thesis were addressed in accordance with formal ethical guidelines of the Helsinki Declaration (World Medical Association 1964 /2004). Several authors claim that ethical issues are important to all phases of the research process.

Information about the purpose, aims and the organisation of the project was initially provided in written form (Appendix 1 and 2) followed by an oral presentation (by phone or personally) some months or weeks before the web

based questionnaire was sent to the participants (Appendix 3 and 4). The participants were assured of confidentiality and informed about their right to withdraw from the project at any time and have their information deleted. This information was sent via email to all of them; all data material had been handled confidentially and with great respect (Kvale 1997).

As a master student in public health the opportunity to study intersectoral co-operation in maritime medicine in depth has proved both relevant and beneficial. During the research project the researcher has become familiar with the Norwegian and International maritime society including different e-health initiatives.

7. Results

33 people were asked to participate (100%). Two of the 33 persons contacted, refused to be involved in the study owing to lack of time, giving a response rate of 94%. The 31 participants worked in 11 organisation, institutions and companies. Table 1 illustrates the professional background of the 31 participants.

Table 1. Professional background in which the participants were engaged

Profession	Number	Participants
Ship command	14 (45%)	Captains and chief officers
Manager maritime organisation /company	9 (29%)	Management staff on land with diverse professional background
Medical staff	8 (26%)	Doctors and specialised nurses
Total	31 (100%)	

Figure 13 shows one question out of the web-based questionnaire. The participants had been asked if they already have had practical working experience with telemedicine. 14 (45%) respondent answered the question with

yes. These respondents used the telemedical equipment practically on board merchant ships and / or platforms.

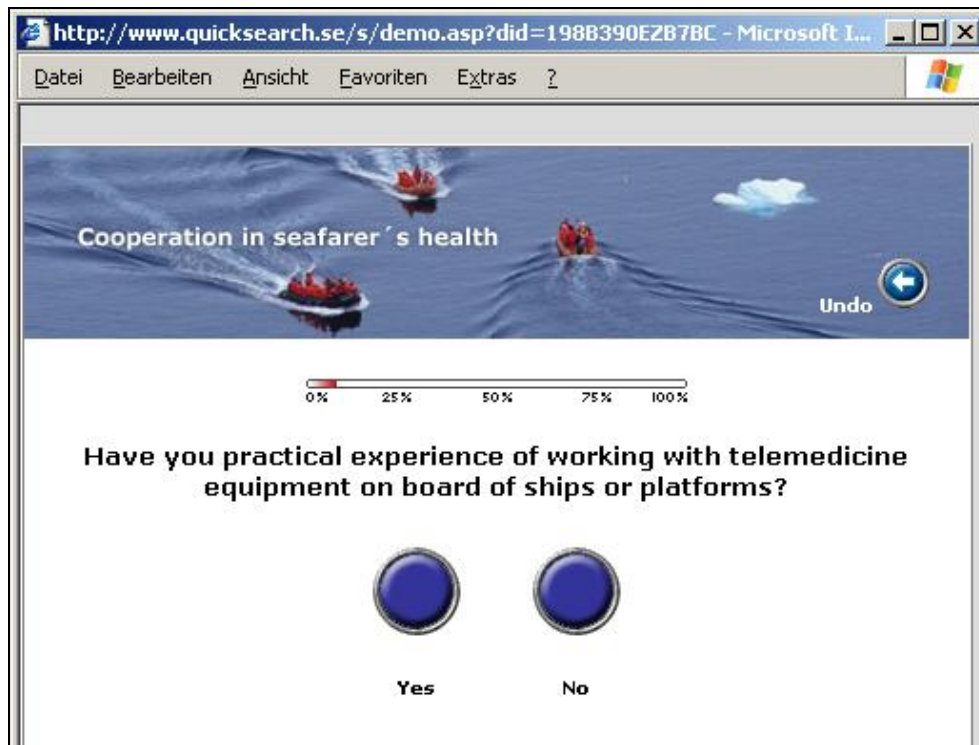


Figure 12. Web-based questionnaire

Eight of the 14 respondents worked as master or chief officer on board ships or platforms, five showed a medical profession and one respondent was involved as maritime manager. They furthermore had been asked how often they used the telemedical equipment in the last 12 months.

Figure 13 illustrates that two participants (14%) used the equipment weekly, eight (57%) monthly and four (29%) never, 11 (79%) of these 14 users had the opinion that telemedical technology was easy to use, two (14%) of them judged it as very easy, one (7%) had no opinion about it.

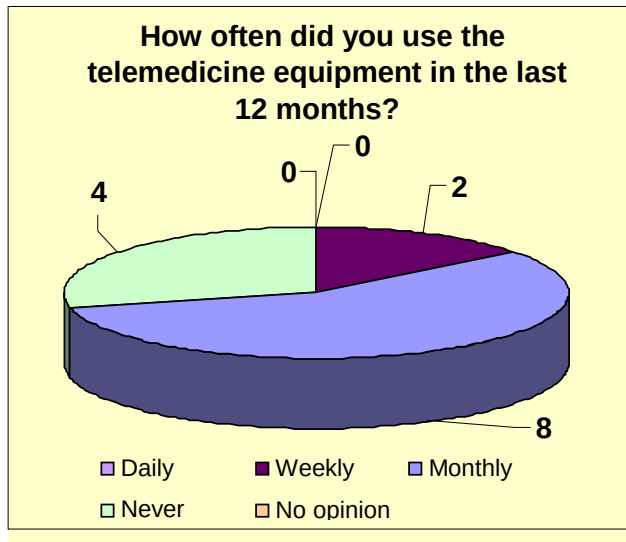


Figure 13. Practical use of telemedicine equipment during a year period.

A need for change in the daily routine on board ships or platforms was only in five (36%) cases of the users necessary, one participant (7%) declared much change in the daily routine, four participants (29%) mentioned some changes. In three cases (21%) the telemedicine equipment enabled the users to avoid an emergency patient transport.

Figure 14 illustrates that 13 (93%) out of the 14 (100%) respondents who were in charge of practical use of telemedicine equipment, stated that there is a need for further telemedical training programs.



Figure 14. Need for telemedical training programs

7.1.

Research question I:

Is there a need for co-operation and networking in the field of maritime medicine?

The web - based questionnaire included the following questions about co-operation and networking:

Q: Do you think there is a need for more co-operation and networking between the different Norwegian maritime organisations?

There had been 23 respondents to the questions. 17 of 23 respondents who answered the question mentioned that there is “very much” or “much need” for more co-operation and networking between the different Norwegian maritime organisations. Two respondents stated that there is “a bit” of a need for co-operation and networking, eight participants didn’t answer this question.

Q: What does co-operation with maritime medicine mean to you? Please specify

Out of the 31 respondents 28 participants answered the question. 12 respondents showed a ships command background, eight worked as medical professionals and nine worked as manager in maritime organisations.

One master stated as followed: "A lot, online- communication with qualified personnel ashore giving us a better platform for making the correct decisions".

One medical specialist mentioned "Co-operation ensures qualified help when needed", one maritime manager said: "The people of different organisations are working together in achieving the same goal to improve the health of the sailors. This is relevant both as they are healthy (prevent illness) and when they are ill or injured".

Another manager expressed it like this: "It's very important. Why shouldn't seafarers have the same opportunity to get help than onshore?" and another put it like this: "A lot because we need to develop this together maritime industry ship owners and doctors or maritime medicine together".

The categories and codes that emerged during the analysis of the question are shown in table 2. Additional findings related to the aspects of the meaning of co-operation in maritime medicine include following categories: communication and evidence based medicine.

Table 2. Meaning of maritime co-operation, categories and codes

Participant	Ships command	Nurses and doctors	Manager
Categories	COMMUNICATION & EVIDENCE-BASED MEDICINE		
Codes	professional help	qualified help	working together in achieving the same goal
	"online" communication	assistance	prevent illness send/receive relevant information
	good feedback.	discuss cases	safety and help
	information	provide better health care	support and help
	safety for the crew	indispensable	best possible medical availability
			the required know how

Q: Please tell why you think there is a need for more co-operation and networking between the different Norwegian maritime organisations:

Ten out of the 14 ship command respondents, five of the medical staff and eight maritime managers answered the question.

One captain commented: *“We all know that- together we stand tall- i.e sharing information and use of equipment is to the benefit of the doctors and sailors etc.”*

Another ships` officer reported: *“Not necessary only between Norwegian maritime organisations but also between international maritime organisations. Telemedicine should be included as a mandatory part of the vessels medical preparedness”.*

One respondent with a medical background wrote about one technical system which all can use: *“To be able to build a medical org which is the best interest of maritime organisations. If we all worked together more money could be spent on telemedicine and the result would be one system which all could use. Today there are several systems and this is bad economy”.*

Another one commented: *“To improve the service, co-operation among medical advisors transporters and rescue services is obviously necessary.”*

One of the managers expressed that: *“It is very important that those responsible for health on board have enough and the relevant qualifications. So schooling and courses must be appreciated by authorities and shipowners. Although the importance of adequate and practical sickbays, equipment and medicines on board. The cost for this must be appreciated not only by the seafarer`s organisations but by the government authorities and the whole shipping community”.*

The categories and codes are presented in table 3 below.

Table 3. Need for more co-operation and networking between the different maritime organisations, categories and codes

Participant	Ships command	Nurses and doctors	Manager
<u>Categories</u>	MARITIME E-HEALTH STANDARDISATION & KNOWLEDGE MANAGEMENT		
Codes	coordination of knowledge, skills, experience	the quality of pre-sea medical examinations needs an improvement	sharing knowledge no or little networking today
	one system	one system which all could use	avoid duplication
	be more coordinated to the benefit of all parties involved		exchange experience
			update solutions

Furthermore the participants were asked if they had been satisfied with co-operation on board merchant ships. Figure 15 illustrates the results.

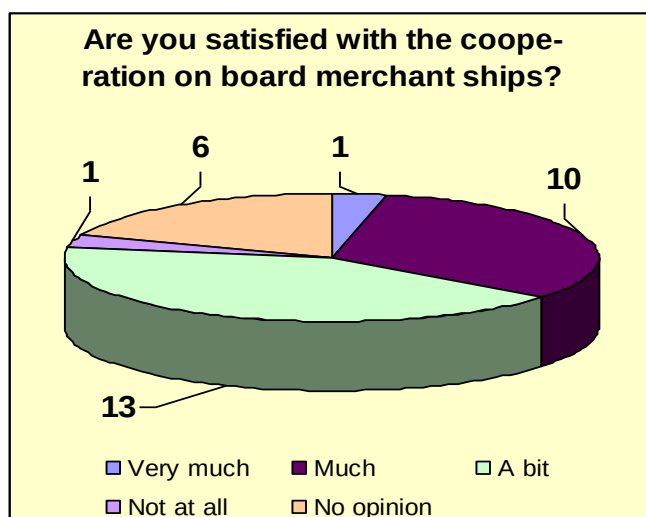


Figure 15. Satisfaction with co-operation on board merchant ships

31 participants answered the question. One respondent stated that he had been “very much” satisfied how co-operation had been developed on board. 10 respondents judged it as “much”, 13 “a bit” and one “not at all”. Six respondents didn’t answer the question.

Q: What kind of information regarding telemedicine in maritime services do you need?

25 respondents out of the 31 participants answered the question. All of the 12 respondents with ships command background stated that there is in general a need for more information about telemedicine systems. One captain mentioned: *“Telemedicine is presently not so well known except on these vessels equipped with ECG and such equipment. Need more information which equipment and services that are available”*.

Further comments made by respondents with ships command background regarding information about available telemedicine equipment. One master mentioned: *“It is important to inform that the equipment is available and how it works. Also the price is important for the ship owning companies”*. Another one stated: *“Because most of the seafarers are very little or not at all informed about this.”*

Out of the respondents with a medical background one respondent put it like this: *“What is available today and in the near future? What are the technology*

problems today? What is not possible? Cost`s? What`s about co-operation with our national healthcare system?"

A medical professional mentioned: *"About the different possibilities. Telemedicine updating is not a priority I have more than enough updating the medical bit."*

A maritime manager questioned: *"What is possible cost benefit? Why this can save life and be good economy? Who can deliver and what can be delivered".* Another manager stated: *"...all sort of relevant information about the seafarers health and cares".*

Q: Is there anything missing in your ability to co-operate? Please specify:

23 respondents out of the 31 participants answered the question. Nine respondents showed a ships command background, seven had been medical professionals and seven worked as maritime managers.

Six respondents with a ships command background didn't miss anything. One captain stated that *"...there is a lack of knowledge and training"*, another one looked forward to *"the use of a WEB camera"* and another ships officer was *"looking forward to online education in maritime medicine"*.

Three out of the 23 respondents with medical background wanted a technology which can be paid by the companies. One manager is missing marketing strategies and plans. One medical respondent didn't understand the question.

Q: Do you think telemedicine leads to better healthcare for seafarers? Please give examples:

30 persons answered this question. 13 captains or ships officer have the opinion that telemedicine leads to a better healthcare for seafarers. *"No doubt about that. The seafarers in the age of 50-60 years are representing about 50% of the Europeans today. A lot of these people are in the risk zone for heart conditions and it is much easier to start the correct treatment if a proper diagnosis can be given by the use of telemedicine"* or *"...it is a very easy way to cooperate and therefore a better opportunity to save a seaman`s life."* One ship`s commander didn't answer the question.

Out of eight respondents with a medical background seven answered with yes. Only one respondent mentioned: *"Do not really know"*. This respondent stated furthermore: *"...besides of voice communication and some times still digital photo sent by e-mail or mms for data and picture transmission, it is very seldom noticed a need for any special equipment and I know of no study that shows beneficial improvements of seafarers health although I know that seafarers fancy technical equipment on board whether or not this is real or imaginary. I*

think it is more important that seafarers have good skills in medical procedures and have a proper education”.

All involved managers thought that telemedicine leads to better healthcare. Comments like: *“Of course. Time and relevant information is of the utmost essence. The better information the doctor has available as soon as possible saves lives at sea or a crew member save his life because the vessel could send a ECG to a specialist on land and return an answer that at defibrillator was needed. A bad wound was healed with best results on board because the on scene (video) get the right instructions from the doctor”* were made.

Summary of the results research question I:

It became clear from the answers of the participants that there is a need for co-operation and networking in maritime telemedicine.

Maritime e-health standardisation and an ongoing knowledge management are essential. Excellent inter-organisational communication between all partners is of great importance in order to safeguard intersectoral co-operation.

7.2.

Research question II:

Are the different maritime organisations ready to establish intersectoral co-operation and networking by using a telemedicine equipment?

The web - based questionnaire included the following questions about readiness to establish intersectoral co-operation and networking:

Q: Do you have any idea how co-operation in telemedicine could improve?

25 out of 31 participants answered the question. 10 respondents with a ships command background, eight respondents showed a medical background and seven had been managers.

One master stated: *“The seafarers need more and better training in use of equipment.”* Another captain described it like: *“More exercises - and implementation of the equipment on all vessels.”* But there was also a comment about improvement of co-operation in telemedicine like: *“Certain standards in IMO / SOLAS regarding the”standards” of the equipment used for*

telemedicine etc.” Three respondents out of this group didn’t know how telemedicine can be improved.

One medical adviser mentioned:”co-operation between the IT- depts in the companies.” Another one wanted more tele-technology on board vessels, he wrote: “...e-mail and digital cameras should be on board all ships and larger fishing vessels”.

Another medical professional commented: “It is an organisational question. In the future all contributors to maritime medicine should be connected to the same digital net. Medical records should be accessible for medical advisors. Education of ship officers in basic medicine should be strengthened”.

Another medical respondent commented: “I cannot sort out telemedicine as a field for special co-operation. In my opinion telemedicine is a part of the co-operation in the field namely maritime medicine. Telemedicine is a remedy not the goal”. Another wanted the “strengthening the Centre for Maritime Medicine” and one respondent was looking for more standards, he wrote: “...yes. Get the standards and a better co-operation between specialists and organisations”.

One maritime manager put it like this: “By appointing a single point of contact where you can get all assistance needed. The private initiative has been very important in this matter but if it becomes a “business” with great economical interests this will not benefit this sector”.

Q: What are your expectations about co-operation in maritime medicine by using telemedicine? Please specify:

All 31 participants answered the question. One ship’s officer reported: “Should make it easier to make a correct diagnosis.” Another one mentioned: “To get correct professional assistance.” One master commented: “None less than saving lives.”

A medical doctor summarised his expectations like: “Easier access to medical personnel. To give medical care which is in our patient’s best interest. To give non - medical personnel medical support.”

A maritime manager mentioned: “co-operation is necessary when using telemedicine and it also makes it possible to share resources and information in a good way.” Another expressed it like: “high, communication from vessel to onshore will have high attention in the future (internet, email etc.) and that will also include telemedicine because of its need. The behavior of user will change”.

Table 4 shows different codes and the category “improvement of telemedical quality management” split up by professional background of the participants.

Table 4. Expectations about co-operation in maritime medicine by using telemedicine, categories and codes

Respondent	ships command	nurses and doctors	manager
<u>Categories</u>	IMPROVEMENT OF TELEMEDICAL QUALITY MANAGEMENT		
Codes	professional assistance	improved communication diagnosis and therapy	to become confident
	fast response	good communication	high expectations
	a better chance to save lives	to develop what improves quality	to share resources and information
	monthly routines for practicing	easier access	to develop good routines
	medical advise on board by telemedicine		more exactly diagnosis

Q: Why do you think telemedicine will improve working with the following institutions?

Table 5 illustrates the categories and codes of the improvement of working with the seven involved Norwegian maritime organisations and institutions. The statements were made by the respondents of the three different professional groups.

The ship commanders wanted to receive a high qualified medical advice and fast feed back. The medical professionals` expect good communication in order to improve medical quality mangement. For the maritime managers professional competence is of great importance. The results have shown that the Norwegian Centre of Telemedicine with its excellent expertise and the hospital on shore should be involved in the co-operation processs. There is also a demand for international telemedical standards organised by the different international organisations like IMO, ILO, Veritas or others.

Institution	Radio Medico Bergen	Radio Rogaland	Norwegian Centre for Maritime Med.	Ship Owning Company	Global medical Support	IMed AS, Norwegian telemedicine AS	Medi3 Marine AS	Others
Categories	ORGANISATIONAL, TECHNICAL AND MEDICAL COMPETENCE & INTERSECTORAL APPROACH							
Codes: Ships command	professional doctors, correct and fast diagnosis, specialist in maritime medicine	helps with the diagnosis service provider	good ideas for development of maritime telemedicine	easy information to ship owners the improvement of communication worldwide better chance for proper and correct treatment	tons of experience with all kinds of illness, specialist in paramedic	because IMED AS is the leading with this technology	good understanding for sailors health and working environment	presenting the vessel for new contracts with this equipment on board.
Nurses and doctors	decades of experience, 24 hours free of charge	know the maritime field very experience long tradition and experience operators	do research in the field of HSM will be a participant in the development of the telemedicine equipment	easy form of communication and documentation often useful. information that could be vital for medical advise	more global system good access to medical expertise	future projects wanted	high technical competence, provide a system which is easy in use and cost effective.	the Norwegian Centre for Telemedicine have great experience in land based telemedicine the hospitals, Using the same technology is often a term in co-operation between companies.
Manager	be an active part in developing a system that will work, access with competent personell	good contact with the maritime industry close link to the authorities	best unit to organise the experienced technology, a lot of competence.			knowledge on the equipment connection with the University of Tromsø	application for good telemedicine solutions	need to work with Veritas, IMO, ILO, NMD etc to assure that telemedicine are here to stay and to help crew all around the world to secure good health and life saving on ships rigs and others success will come through "teamwork" and on standards that are accepted in the international maritime market

Table 5. Improvement of working with different maritime Norwegians organisations and institutions, categories and codes

Summary of the results of research question II:

The involved maritime organisations and institutions are ready to establish networking and intersectoral co-operation in maritime telemedicine. The expectations are high regarding the use of telemedicine and an efficient communication network between the crew on board and the medical team on-shore. An intersectoral approach, which includes organisational, technical and medical competence, is needed for a sufficient medical health service for seafarers. .

7.3

Research question III:

Can telemedicine equipment facilitate intersectoral co-operation in maritime medicine?

The web - based questionnaire included the following questions about facilitation of intersectoral co-operation in maritime medicine:

Q: Do you think the new technology is easy or difficult to use? Please grade:

The 14 respondents who already used telemedicine on board answered the question. 11 respondents expressed that the equipment was “easy” to use, two respondents stated that it was “very easy” and one respondent had “no opinion” to the question.

25 participants answered the question, ten ship officers, seven respondents with medical professional background and eight maritime managers answered the question.

Table 6. Facilitation of co-operation, categories and codes

Participant	Ships command	Nurses and doctors	Manager
Categories	TECHNICAL STANDARDISATION & NETWORKING		
Codes	same system	same technology	setting the standards in telemedicine, efficient working group
	creating industry standards	establishing a network	efficient working group
	telemedicine equipment should be mandatory	by organisational means	getting people to communicate and cooperate
	more information		
	training		

Q: Have you found any need for change in your daily routine?
Please grade:

Eight respondents answered this question. All of them showed a ship's command background. Three stated that there was "not at all" a change to see, four said that some change appeared and only one mentioned "much" change in the daily routine by using telemedicine on board.

Q: Is there anything that has made your daily routine more difficult because of the new technology?

Six ships commander, five medical professionals and one manager out of the 14 practical telemedicine users answered the question. All six maritime officers stated: *"not at all"*. One medical professional said: *"...mobility is sometimes difficult as one need to be on the location where telemedicine receiver systems are installed. Alternatively one has to carry a PC which is more bothersome due to its weight more complex operation and the need of a service area for the communication"*. A maritime manager expressed that there were no significant changes in his daily routine.

The 14 respondents with practical experience with telemedicine on board answered furthermore the questions, which are represented in Figure 16 and Figure 17.

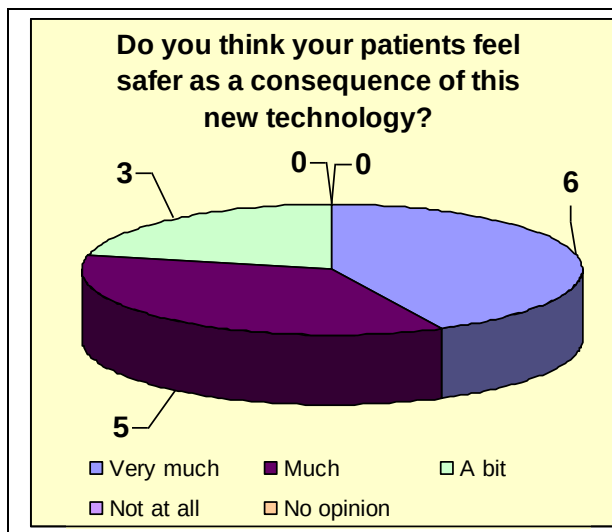


Figure 16. Patients medical safety

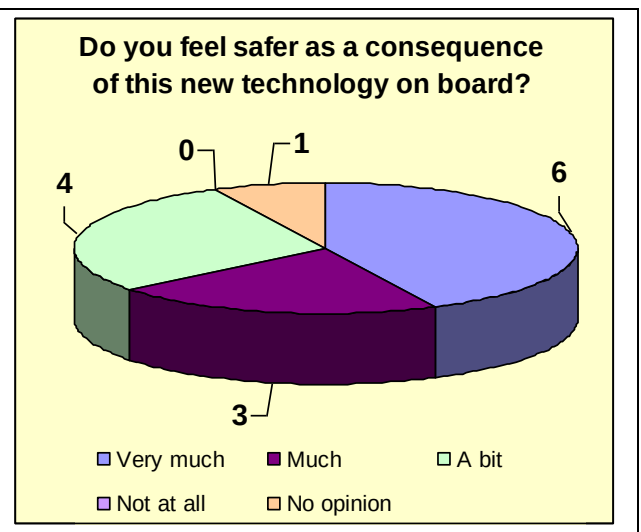


Figure 17. Officer`s feeling about patients medical safety

Figure 16 illustrates if the respondents who used telemedicine on board merchant ships or platforms thought that their patients felt safer by using the equipment. 11 respondents had the opinion that the patients felt “very much” or “much” safer by using this technology for them. Three respondents stated “a bit” safer.

Figure 17 illustrates how the practical user felt about the new technology. Nine respondents stated that they felt “very much” or much safer, 4 felt “a bit” safer and one respondent had “no opinion” about it.

Q: Has telemedicine changed your relationship with other employees?

All of 31 participants answered the question. Figure 18 illustrates changes of working relationship with other employees. Three respondents stated “much” change, five “a bit”, 16 “not at all” and seven mentioned “no opinion” about it.

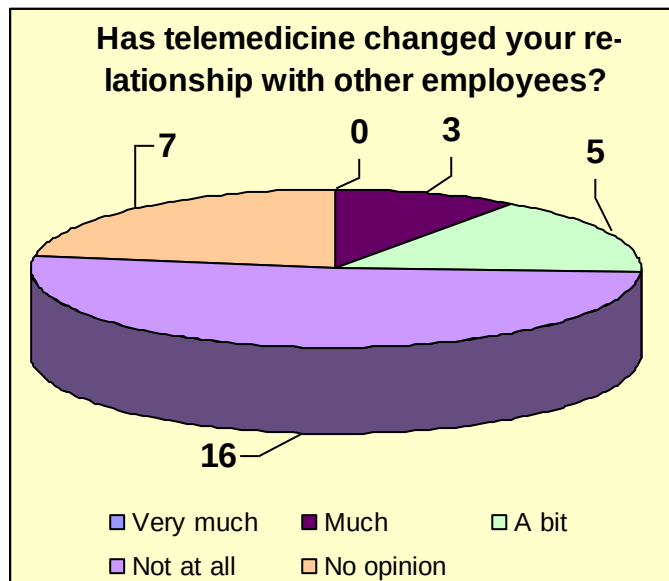


Figure 18. Change of working relations with other employees

Q.: Has telemedicine helped you co-operate more with persons of your organisation?

31 participants answered this question. One respondent stated that he could co-operate “very much” better within his own organisation.

Four other participants stated that co-operation was “much” better, eight that co-operation had been “a bit “ and nine respondents didn’t comment any change they answered by “not at all”. Nine participants answered with “no opinion”.

Q: How important do you think it is to give more information about telemedicine in maritime services?

All 31 participants answered the question. 12 respondents with ships command background stated that it is “very important” to give information about maritime telemedicine, two ship’s officers judged it like “important”. The respondents with a medical background showed the following distribution: one respondent judged it as “slightly important”, four respondents judged it as “important” and three as “very important”. The maritime managers respondent as followed: two saw it as “important” on to receive further information about maritime telemedicine, six respondents meant that it is “very important” and one manager had “no opinion” about it.

Q: What kind of information regarding telemedicine in maritime services do you need?

25 participants answered the question. They split up into 12 respondents with a ship commands background, six medical professionals and seven maritime managers.

One captain wrote: *"Telemedicine is presently not so well known except on these vessels equipped with ECG and such equipment, need more information which equipment and services are available"*. Another maritime officer mentioned: *"more info about the organization and activities"* and one ships commander said: *"It is important to inform that the equipment is available and how it works. Also the prices are important for the ship owning companies"*. other one put it like this: *"because most of the seafarers are very little or not at all informed about it"*.

One medical professional stated like this: *"what is available today and in the near future? What are the technology problems today? What is not possible? What is? Cost? Co-operation with our national healthcare system?"*
One maritime manager mentioned: *"Focus on the seafarers risk on board vessel far away from ports and how modern comm. Modern medical equipment and high qualified officers will eliminate the distance"*.

Q: Please state your opinion about how the patients feel as a consequence of the new technology:

Only 6 respondents out of 14 ships commanders and one manager answered the question. One of these respondents didn't have paractical experience by using telemedicine equipment. The other five respondents mentioned that there are better opportunities to get a correct diagnosis. One master stated: *"...we have the possibility to send an ECG to a hospital and get an opinion from qualified people about the symptoms we suspect and we all on board agree that we are safer in respect of starting the correct treatment of the patient."*

Four respondents to the question showed a medical profession. One of them gave following statement: *"patients feeling of safety is partly based on a tendency to rely on technical equipment taking the occurrence of such as a proof of modern and updated qualification and best practice. The use of such equipment however from the doctor's point of view often does not have influence on the course of the illness sometimes delay the process and sometimes distract the seafarer from being aware of the clinical symptoms. Not so often the use of telemedicine equipment improves the quality of the radio medical advice."*

Q: In which areas have you experienced the most important changes?

One master, two medical professional and five managers answered the question. In the medical field the most changed had been seen in sending digital photos by email. Also in acute medical emergencies and repatriation some changes had been seen. The managers stated changes in *“level of action, it was easier to communicate”* and the attitude towards telemedicine was changed. One manager said: *“the involved maritime partners started to take a larger interest in health related issues for sailors”*.

Q: What do you think is the most important factor in co-operation using telemedicine to achieve better healthcare for seafarers? Please give examples:

10 ship's commanders, seven respondents with medical education and eight maritime managers answered the question. One captain stated: *“The more participants are in the system the more seafarer to be covered by this”*. Another one answered like: *“Getting the equipment on the vessel, instructions in correct use of the equipment and more exercises vessels / shore.”* One medical specialist stated: *“I hope we will be able to develop what we need to have- what improves quality of medical assistance on board not only what is nice to have according to what the producers and dealers want to sell.”* One maritime manager wrote: *“easier access to medical personnel. To give medical care, which is in our patient's best interest. To give non medical personnel medical support.”* Another colleague of him mentioned: *“Make doctors ashore able to receive telemedicine, learn about telemedicine and cooperate with each other”* and a third manager stated: *“Availability of specialists at any time and at any place seafarers are travelling”*.

Furthermore the categories communication and information were emerged by content analysis. Table 7 provides an overview about the achievement of better healthcare for seafarers by categories and codes.

Table 7. Achievement of better healthcare for seafarers by co-operation and telemedicine, categories and codes

Participant	Ships command	Nurses and doctors	Manager
<u>Categories</u>	COMMUNICATION & INFORMATION		
Codes	log transfer if needed with picture	carry out the medical procedures according to medical advice or guidance	common goals and lobby together, to co-operate with each other, the <i>human factor</i> on board
	better information and communication	improved communication	good communication to/from shore
		sound feed back, speed and competence	availability of specialists at any time and at any place

Q: Please state which kind of problems with co-operation there were:

On board:

One captain who answered the question mentioned, that only in the beginning when the equipment was installed, there had been problems. One medical professional stated as followed: *“Telemedicine equipment which should mediate to the receiver onshore took focus away from clinical examination and good patient history. Besides the parameters which the seafarer was going to collect was of no value in the situation”*. One respondent wrote about : *“technical problems”*.

On platforms:

“Seafarers Health must get a higher status. We have high hopes for the NCMM (Norwegian Centre for Maritime Medicine) in Bergen. Higher status and research will also make it more interesting for younger doctors to enter the field av Radio Medico and Telemedicine”.

Summary research question III:

Telemedicine equipment can facilitate intersectoral co-operation in maritime medicine. The telemedical equipment on board merchant ships is easy to handle and can be used to improve the medical treatment of seafarers. It is very important that all participants receive up to date information in telemedical

technology and a regular training in the use of maritime telemedical equipment. A part from that standardisation of the telemedical equipment is required.

Q: What do you think about answering the questions like this through a web-based questionnaire in comparison with other interview techniques (e. g. personal, postal etc.)?

28 of 31 participants gave comments on the used web based questionnaire: 22 of the 28 participants appreciated the web-based survey method.

Comments like: *"it is good but it takes time"* or *"very good, this is the future"*. Another respondent stated like this: *"it saves time and it is individual when it suits to answer the questionnaire"*.

One participant preferred this method because: *"it is available whenever you have time and the possibility to answer"*.

Two respondents, one medical professional and one ship's commander, preferred face to face interviews, but both of them mentioned that the use of a web-based method was also OK. One participant who used e-mail attachment on board for answering the questionnaire had the following comments: *"....it did not work as you planned, so I am doing this the old fashioned way"*.

Q: Is there anything you wish to add before the questionnaire now ends? Please write comments or questions:

16 participants took the chance and answered the question. One captain mentioned: *"as written before, more information is required on a common basis e.g. through maritime magazines."* One medical professional stated: *"it is very important to have somebody you know ashore to co-operate with."* A maritime manager said: *"I appreciate that the medical side of the maritime industry is being taken more seriously and that research is being done. It is about time..."*

Development of a policy and strategy to support the Norwegian maritime e-health society:

In the process of analysis it became clear that four different main categories had been developed. These four categories illuminated the participant's main demands: *information – communication – standardisation – centralisation*. The different maritime partners should take action to develop together a national policy and strategy in order to support the maritime e-health society in Norway. There is a need for a systematic and coordinated implementation of standards in maritime telemedicine. The implementation of maritime e-health standards can be more effectively and transparently managed based on intersectoral co-operation and networking.

By analysing the data following *categories* have been developed by the method of content analysis:

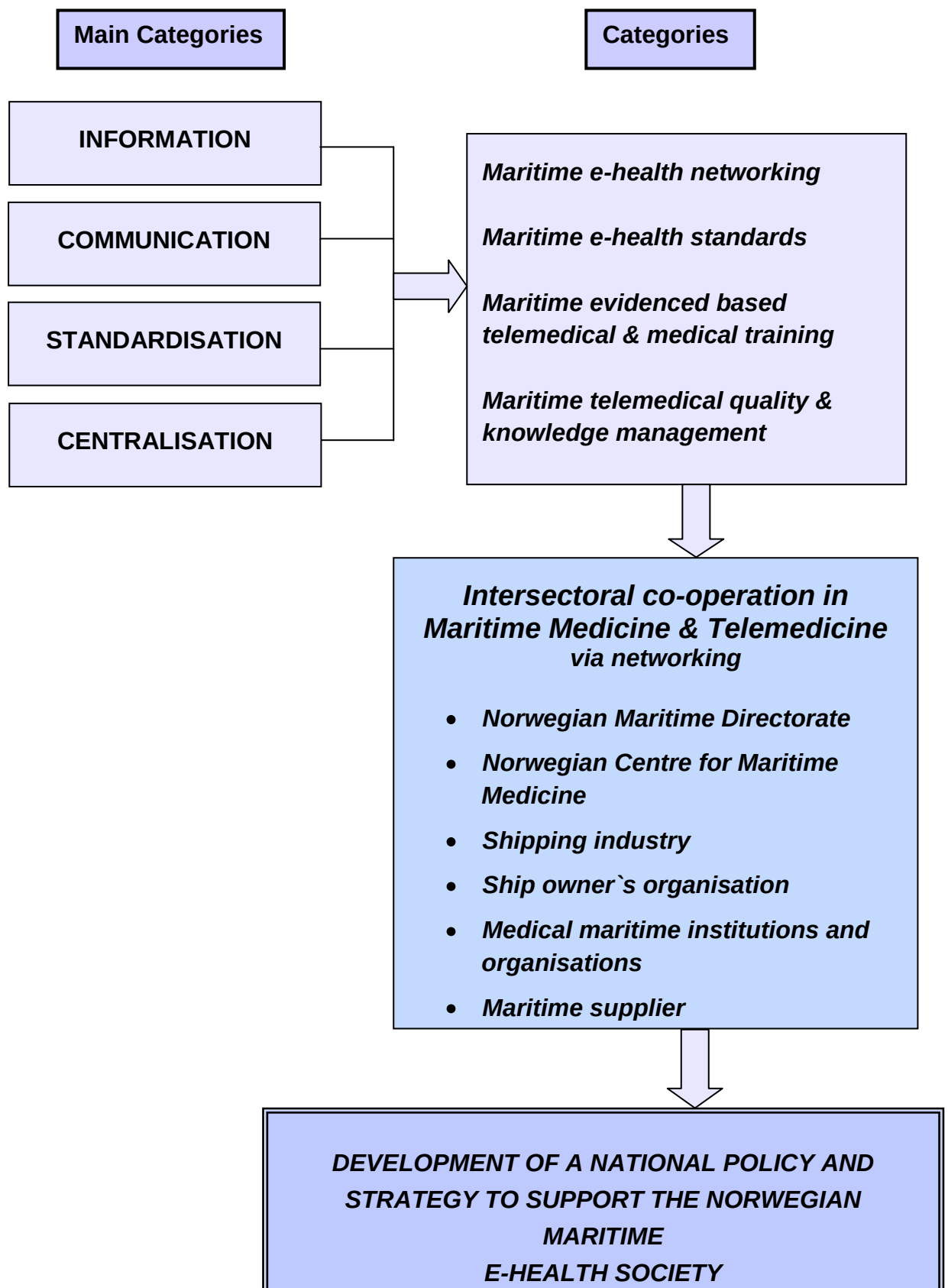
- communication & information
- communication & evidence-based medicine
- maritime e-health standardisation & knowledge management and networking
- improvement of telemedical quality management
- organisational, technical and medical competences & intersectoral approach

This lead to the development of four *main categories* which are:

- COMMUNICATION
- INFORMATION
- STANDARDISATION
- CENTRALISATION

A visualisation of a model for the development of a national policy and strategy to support the Norwegian maritime e-health society is shown in figure 19.

Figure 19. Development of a policy and strategy to support the Norwegian maritime e-health society



8. Discussion

Public health is field where many different organisations and sectors of the society are involved and at the same time a multidisciplinary co-operation is needed. In health care the specialisation, formalisation and professionalisation requires an increased co-operation and networking. This fact is also valid for the maritime society.

Intersectoral co-operation in maritime medicine may be dependent on personal, situational and organisational factors. The negative consequences of sectorisation can be seen in the fragmentation of services. A basic pre-condition for a successful use of telemedical co-operation is integration into the existing organisational environment. Fragmentation of task and responsibilities leads to less ability to see comprehensive solutions (Axelsson & Bihari-Axelsson 2006).

Telemedicine is defined as remote medical care of patients via telecommunication and other new information technologies. Interactive audiovisual communication between medical professionals ashore and first aid provider on board requires a specific medical expertise. This includes an online communication which is based on telediagnosis, telemonitoring and competent treatment in order to work together to achieve the same goal, the healthcare of seafarers.

The most important factor for improved co-operation by using telemedicine on board seems to be practical experience and continuous medical / telemedical education. Among the 14 ship captains and chief officers there were only eight that already had practical experience with telemedical equipment on board. In other words six of them did not have any practical experience with telemedicine at sea. Telemedicine training and education is therefore of great importance, not only because of the fact that 93% of the practical users stated that there is a need for further telemedical training.

Maritime personnel on board merchant ships need not only continuous medical education in telemedicine but also education that enables them to use the new technologies and new media in an efficient way (e.g. e-learning, technology supported learning etc.). The maritime professionals involved wanted more access to information and communication infrastructure technologies. The use of such equipment however from the medical point of view often does not have influence on the course of the illness, sometimes delays the process and sometimes distract the seafarer from being aware of the clinical symptoms. Therefore it will still be essential to have a standard medical exam as well as to train all future officers to the practice of telemedical advice and to the practical use of telediagnosis. Shipowners starting with telemedicine may arrange regular telemedical training sessions together with other maritime health authorities. The regularly carried out medical refresher courses for ship officers will remain very important within the framework of their medical training.

Healthcare deals with a constant increase in medical knowledge. There is a good reason for the demand of an effective knowledge management. In fact the maritime professionals need to get more and continuous information about updated technical telemedicine solutions as the results of this study have shown. The ship officers need also to know where and how to get the required information. The results have furthermore shown that especially the maritime managers would like to have an ongoing exchange of experiences and knowledge. This comprehensive knowledge management in telemedicine should include all professional groups at an early stage. Certainly, it will be a challenge and requires an effective inter – organisational networking in maritime medicine which will work across both administrative and professional boundaries.

According to the ILO`s Maritime labour convention 2006 every seafarer has a right to health protection, medical care, welfare measures and other forms of social protection. In order to achieve high quality treatment of seafarers, the resources must be utilised in such a way that telemedical users on board and the Norwegian maritime society ashore (The Norwegian Maritime Directorate, ship owning companies, shipping industry, maritime institutions, hospitals, ship supplier etc.) as a whole, receive the best possible benefits.

The results have furthermore shown that all respondents wanted to give and to receive best qualified medical assistance. Good communication, particularly in a remote situation, is fundamental for effective co-operation in telemedicine. Especially ship`s officers have high expectations regarding good communication. They expect evidence - based medical advices and a fast response nearly to the same standard as on shore. On the other hand the medical professionals require good communication in order to improve high medical quality management on board.

It seems that there are no doubts that telemedicine technology will lead to a more comprehensive healthcare for seafarers. With the exception of one respondent, all the other participants mentioned that maritime telemedicine will lead to improved medical care for seafarers. The results have shown as well that more comprehensive co-operation and networking within the Norwegian maritime e-health society should be encouraged.

The results emphasise also that a standardisation of maritime telemedical technology is essential. At the moment too many different technical systems are involved and only few medical institutions in Norway can receive the patients`s data online. A generalized system for longer term maintenance and quality control should be established. Interoperability and the adaption of ehealth standards to ensure that telemedicine systems can communicate effectively will be one of the most important challenges in the future. Understanding how to do this most effectively has the potential to have profound impacts on seafarer`s health.

Working with telemedicine represents a change in work situation (Aas2002b). The telemedical technology does not seem to represent a barrier to co-operation (Aas 2002a, 2003). Barriers to development of e-health interaction may instead be caused by economic and organisational factors. Almost all of the practical users of telemedicine equipment on board stated that this technology was easy to use. An important change of inter-organisational working relations was also seen by the participants who used practical telemedicine at sea.

The improvement of telemedicine by inter-organisational and intersectoral co-operation demands a multi-professional approach. The achievement of possible efficiency gains through the development a multi-professional and intersectoral approach was illustrated in table 5. The involved institutions seemed to be highly qualified and willing collaborators. The findings have furthermore shown that improvement of maritime telemedicine needs more coordination between the actors of the healthcare system and the involved maritime organisations. There is need to develop a national policy and strategy to support the Norwegian maritime e-health society.

Concerning the methods applied in this study, it is clear that, qualitative methods may promote a more deep understanding of social settings and they may be especially appropriate when little is known about a phenomenon (Shortell 1999).

The present volume of this study does not allow the collection of large samples suited for statistical analysis. Nevertheless the sample size of 31 respondents can be considered quite large for a qualitative study 31 participants out of 33 who had been asked to participate, agreed to the study, which gives a response rate of 94% and this can be considered as sufficient.

When a group of respondents is multidisciplinary, from different sectors, different organisations and different levels, this allows the problems to be viewed from different perspectives (Devers 1999). The conclusion may therefore be drawn that a wide range of the problems dealing with telemedicine on merchant ships are represented in the results. The respondent's potential experience with telemedicine equipment seemed to be sufficient to answer the questions about telemedical co-operation in maritime medicine. The sample may be representative for the recent situation on board merchant ships and platforms by using telemedicine equipment. Therefore the researcher has no reason to believe that the sample is biased with regards to the studied intersectoral co-operation process.

Of course the choice of a different methodology could have given other results, e.g. focus group interviews or a sample of other questions. Nevertheless the research method of content analysis demonstrates a wide variation in views to the topic of the research question. The answers cannot easily be claimed to be due to a few individuals social influence in their own working environment, as

the respondents represented 11 maritime organisations, institutions and / or companies. Furthermore a researcher bias in the preparation of the results seems to be unlikely, as the results are reported much as they were written answered by the single respondent.

9. Conclusions

9.1. Telemedicine co-operation

The aim of this master thesis was to study and interpret the co-operation between seafarers, medical professionals and various maritime organisations and institutions by using telemedicine on board merchant ships. Although the empirical material may be considered limited and the results cannot be generalised to other populations, it provides a useful basis for further research.

Certainly telemedicine will grow as a tool within the public health sector of maritime healthcare. The implementation of new e-health solutions and guidelines within the maritime sector will be even more essential in the future. Interprofessional information, communication and networking will help to support and enhance healthcare service for seafarers.

The results of this master thesis give reason to expect that internet based communication between patients at sea and maritime health professionals onshore will be more important in the future. According to Kummervold et al (2004) electronic communication appears to replace some consultations and telephone inquiries. An electronic logbook system for medical records of seafarers and the ability to respond to whatever telemedicine system may be used on board, could be an important advantage. Maritime telemedicine management should therefore focus more on the available infrastructure and technology than on the development of software or hardware components.

According to Patel (2002) and Stoloff et al. (1998), maritime telemedical technology can provide substantial cost-savings for the shipping industry and enhance quality of care considerably. Further research is needed in order to investigate how the shipping industry, maritime suppliers, the shipping owner's organisations, the Norwegian Maritime Directorate and other maritime institutions can facilitate telemedicine services and knowledge exchange on board merchant ships. To obtain more knowledge about these issues a more holistic concept of maritime health should be the future.

Co-operation in maritime telemedicine needs inter-organisational networking in order to introduce effective and compatible national and international maritime e-health standards in healthcare for seafarers. The Norwegian Centre for Maritime Medicine (NCMM), as a Centre of Excellence in maritime medical research, will certainly have a key position for further research.

The study showed that a web-based survey in maritime research is easy to manage and as a research tool it is able to give the researcher quite a good overview about a special situation within a short time. Focus group interview techniques should be discussed for further research concerning a deeper understanding of the intersectoral process in which the members of the various maritime organisations and institutions are involved.

9.2. Future aspects

There are important questions pertaining to the concepts of telemedicine approach to maritime medicine. Telemedicine will grow as a tool within the sector of maritime health care. It is considered important that future research includes investigations on maritime co-operation in telemedicine on an international level. According to Pillon and Todini (2004) telemedicine is no longer a technical problem, but it is a management problem and much must be done to improve the efficiency of the organisational and procedural systems.

According to Eriksson et al (2007) a new form of management should have as ideal starting point a new understanding which integrates the different perspectives and areas of competence. Public - private partnerships are increasingly being utilized in moving forward to build an infrastructure and to advance specific e-health programmes. This approach is gaining more and more acceptance in different public health areas and it could be a recommendation for further inter-organisational co-operation and collaboration in maritime medicine. Standardisation and harmonisation also need intersectoral co-operation in order to introduce effective and compatible international maritime e-health standards for seafarers. Let`s hope that all these actions will be based on the spirit of Ubuntu.

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Appendix 1

TIL AKTUELLE DELTAKERE I UNDERSØKELSEN

Du inviteres til å være med ved å bidra til å utvikle det tverrfaglige samarbeidet i sjøfartsmedisin.

Jeg har tidligere muntlig informert om studien: *“Does telemedicine equipment improve health care service for seafarers in the Norwegian International Fleet?-A study about intersectoral co-operation in Maritime Medicine-”* som jeg skal gjennomføre i ramme av mine MPH studier ved *Nordiske Høgskolen for Folkehelsevitenskap (www.nhv.se)* i Gøteborg, Sverige.

Dette prosjektet er relatert til ivaretagelse av helse til sjøfolk. Det generelle formålet med prosjektet er å gi en oversikt over muligheter og grenser for tverrfaglig samarbeid og samband innen maritime medisin ved å bruke telemedisinsk utstyr. Studien skal hjelpe til å forstå bedre kompleksiteten av samband og *samarbeid (co-operation)* innen denne offentlige helsesektoren.

Jeg ville gjerne intervju ansatte i forskjellige sjøfartsmedisinske organisasjoner (daglig ledere, managere) og brukere (kaptein /offiser på båt eller på plattform) som har vært med i det tverrfaglige samarbeidet.

Intervjuene vil foregå som web basert spørreskjema som skal bli sendt en gang til alle deltakerne. Det skal her brukes en web-organisert interaktiv intervjueteknikk med semistrukturert intervju-guide for data kolleksjon. E-mail-invitasjonen kommer til å inneholde en link til det internett-baserte spørreskjemaet. For å fullføre det skal svarene bli gitt ved å klikke i spesielle svarbokser på en skala eller ved å skrive inn fri tekst i spesifikke bokser.

Hvis det telemedisinske utstyret skulle brukes står deltakerne en spesiell link til disposisjon for å føre inn de aktuelle datene.

Etter at jeg fikk tilbakemelding av alle deltakere vil jeg analysere dem og lage en rapport og skrive artikler. De opplysningene jeg har fra dere vil bli presentert i en anonymisert form, sånn at de ikke kan spores tilbake til enkeltpersoner. Når prosjektet er avsluttet vil alle opplysningene bli slettet.

Jeg vil sette stor pris på om du kunne tenke deg å bli med i undersøkelsen.

Det er ikke foretatt så mange studier av tverrfaglig samarbeid generelt i folkehelsevitenskap og spesielt i sjøfartsmedisin. Det er derfor viktig at vi får systematisert erfaringer fra dette området slik at vi kan forbedre arbeidet og utvikle en bedre ivaretagelse av helsen til sjøfolk.

Vedlagt finnes en svarslipp som jeg ber deg fylle ut og sende til meg via Fax: 0049 511 80740778 eller E-mail dersom du vil delta i undersøkelsen.

Jeg kan også kontaktes på telefon 00491712128828 eller 0049 511 80740777, e-post: eskimonika20@hotmail.com eller mpuskeppeleit@t-online.de;

Adressen: Dr. med. Monika Puskeppeleit, D- 30171 Hannover, Papenstieg 5, Tyskland.

Ta gjerne kontakt hvis det er noe mer du lurer på.

På forhand takk for hjelpen!

Med vennlig hilsen

Monika Puskeppeleit

Appendix 2

Ja, jeg ble muntlig informert om studien og har lest den ovenstående skriftlige informasjonen.

Jeg er klar over at min deltakelse er fullt frivillig og at jeg når som helst og uten nærmere forklaring kan avbryte min deltakelse.

Datum:

Sted:

Underskrift: _____

E- mail: _____

Appendix 3

To you who have accepted to participate in the study: "Intersectoral co-operation in Maritime Medicine - "Does telemedicine equipment improve health care service for seafarers in the Norwegian International Fleet?"

Here is your personal link to answer the questions.
Do not send it to anyone else.
Please answer the questions before May 2.

You can activate the link by clicking on it. You have to be connected to Internet. Your answers will be processed *online* while you answer. We recommend you to reserve 30-60 minutes to answer all the questions at once; but if you need to shut down the link you will automatically get back to the next question by activating the link again.

When you have answered all questions and come to the last "Thank you" page - you can no longer activate the link.

If you have problems activating the link, please contact
PhD Kristina Arheden at: kristina.arheden@quicksearch.se

For questions about the study, please contact:
Dr. med. Monika Puskeppeleit at: mpuskeppeleit@t-online.de

Thank you for your participation!

Appendix 4

Questionnaire

Nr.	Frågetext	Frågetyp	Kategori	Frågetyp/Koppling
1.	Have you practical experience of working with telemedicine equipment on board of ships or platforms? 1. Yes 2. No		TELEMEDICINE EQUIPMENT	Enval
2.	SOME EVALUATION QUESTIONS Please press "Continue"		TELEMEDICINE EQUIPMENT	Information
3.	Who operates the telemedicine application? Please give details:		TELEMEDICINE EQUIPMENT	Fritext
4.	Please grade how much you have integrated the telemedicine equipment into your daily work practice on board, on platform, in your institution: 1. Not at all 2. Some 3. Much 4. Very much 5. No opinion	Indexfråga	TELEMEDICINE EQUIPMENT	Enval
5.	For which condition(s) do you use the telemedicine box / ECG belt? (If not - just press "Continue")		TELEMEDICINE EQUIPMENT	Fritext
6.	How often did you use the telemedicine equipment in the last 12 months? 1. Daily 2. Weekly 3. Monthly 4. Never 5. No opinion		TELEMEDICINE EQUIPMENT	Enval
7.	Do you think the new technology is easy or difficult to use? Please grade: 1. Difficult 2. Quite difficult 3. Quite easy 4. Easy 5. No opinion	Indexfråga	TELEMEDICINE EQUIPMENT	Enval

8.	Have you experienced any need for change in your daily routine? Please grade:	Indexfråga	TELEMEDICINE EQUIPMENT	Enval
	1. Not at all			
	2. Some			
	3. Much			
	4. Very much			
	5. No opinion			
9./10	If yes, please specify:		TELEMEDICINE EQUIPMENT	Fritext
11.	Is there anything that has made your daily routine more difficult because of the new technology?		TELEMEDICINE EQUIPMENT	Fritext
12.	Do you feel safer as a consequence of this new technology on board? Please grade:	Indexfråga	TELEMEDICINE EQUIPMENT	Enval
	1. Not at all			
	2. Some			
	3. Much			
	4. Very much			
	5. No opinion			
13.	Do you think your patients feel safer as a consequence of this new technology? Please grade:	Indexfråga	TELEMEDICINE EQUIPMENT	Enval
	1. Not at all			
	2. Some			
	3. Much			
	4. Very much			
	5. No opinion			
14.	Please specify your opinion about how the patients feel as a consequence of the new technology:		TELEMEDICINE EQUIPMENT	Fritext
15.	Why do you think your patients do not feel safer?		TELEMEDICINE EQUIPMENT	Fritext
16.	Has the telemedicine equipment enabled you to avoid an emergency patient transport?		TELEMEDICINE EQUIPMENT	Enval
	1. Yes			
	2. No			
	3. No opinion			

17.	Please give example of how the telemedicine equipment enabled you to avoid an emergency patient transport:	TELEMEDICINE EQUIPMENT	Fritext
18.	Do you think there is a need for further telemedical training programs? 1. Yes 2. No 3. No opinion	TELEMEDICINE EQUIPMENT	Enval
19.	QUESTIONS ABOUT THE NEED OF CO-OPERATION AND NETWORKING <i>Please press "Continue"</i>	TELEMEDICINE EQUIPMENT	Information
20.	What does co-operation with maritime medicine mean to you? Please specify:	TELEMEDICINE EQUIPMENT	Fritext
21.	What are your expectations about co-operation in maritime medicine by using telemedical equipment? Please specify:	TELEMEDICINE EQUIPMENT	Fritext <u>24</u>
22.	Do you think there is a need for more co-operation and networking between the different Norwegian maritime organisations? Please grade: 1. Not at all 2. Some 3. Much 4. Very much 5. No opinion	Indexfråga TELEMEDICINE EQUIPMENT	Enval
23.	Please specify your opinion if there is a need for more co-operation and networking between the different Norwegian maritime organisations:	TELEMEDICINE EQUIPMENT	Fritext
24.	Are you satisfied with how co-operation in the field of telemedicine on board of merchant ships has developed? Please grade: 1. Not at all 2. Some 3. Much 4. Very much 5. No opinion	TELEMEDICINE EQUIPMENT	Enval
25.	Has telemedicine changed the relationship with other maritime	TELEMEDICINE EQUIPMENT	Enval

	organisations?		
	1. Yes		
	2. No		
	3. No opinion		
26.	Please give example of how telemedicine has changed the relationships with other maritime organisations:	TELEMEDICINE EQUIPMENT	Fritext
27.	Has telemedicine helped you cooperate more with other persons in your own organisation? Please grade:	Indexfråga	TELEMEDICINE EQUIPMENT
	1. Not at all		Enval
	2. Some		
	3. Much		
	4. Very much		
	5. No opinion		
28.	Has there been any co-operative working problems?	TELEMEDICINE EQUIPMENT	Matris
	1. Very much		
	2. Much		
	3. Some		
	4. Not at all		
	5. No opinion		
	On board		
	On platform		
	On land		
	Others		
29.	Please specify which co-operative working problems there were on board:	TELEMEDICINE EQUIPMENT	Fritext
30.	Please specify which co-operative working problems there were on platforms:	TELEMEDICINE EQUIPMENT	Fritext
31.	Please specify which co-operative working problems there were on land:	TELEMEDICINE EQUIPMENT	Fritext
32.	Please specify which other co-operative working problems there were:	TELEMEDICINE EQUIPMENT	Fritext
33.	Do you have any idea which could improve co-operation in the telemedical situation?	TELEMEDICINE EQUIPMENT	Enval
34.	Do you think telemedicine equipment will give you better possibilities to work with the following	TELEMEDICINE EQUIPMENT	

	institutions?		
35.	1. Not at all		
	2. Some		
	3. Much		
	4. Very much		
	5. No opinion		
36.	Radio Medico Bergen		
	Rogaland Radio		
	Norwegian Centre for Maritime Medicine		
	Ship owning company		
	Medi 3 AS		
	iMed Norwegian		
	Telemedicine AS		
	Global Medical Support Oslo		
	Others		
37.	Please specify why you think telemedicine equipment will give you better possibilities to work with Radio Medico Bergen:	TELEMEDICINE EQUIPMENT	Fritext
38.	Please specify why you think telemedicine equipment will give you better possibilities to work with Norwegian Centre for Maritime Medicine:	TELEMEDICINE EQUIPMENT	Fritext
39.	Please specify why you think telemedicine equipment will give you better possibilities to work with ship owning company:	TELEMEDICINE EQUIPMENT	Fritext
40.	Please specify why you think telemedical equipment will give you better possibilities to work with Medi 3 AS:	TELEMEDICINE EQUIPMENT	Fritext
41.	Please specify why you think telemedical equipment will give you better possibilities to work with iMed Norwegian Telemedicine AS:	TELEMEDICINE EQUIPMENT	Fritext
42.	Please specify why you think telemedical equipment will give you better possibilities to work with Global Medical Support Oslo:	TELEMEDICINE EQUIPMENT	Fritext
43.	Please specify why you think telemedical equipment will give you better possibilities to work with others:	TELEMEDICINE EQUIPMENT	Fritext

44.	Has the telemedicine technology resulted in a better or worse co-operation?	TELEMEDICINE EQUIPMENT	Enval
	1. Worse		
	2. Slightly worse		
	3. Neither better nor worse		
	4. Slightly better		
	5. Better		
	6. No opinion		
45. / 46.	In which areas have you experienced the most important changes? Please specify:	TELEMEDICINE EQUIPMENT	Fritext
47.	How can co-operation be facilitated? Please specify:	TELEMEDICINE EQUIPMENT	Fritext
48.	Is there anything missing in your ability to cooperate? Please specify:	TELEMEDICINE EQUIPMENT	Fritext
49.	Do you think that telemedicine equipment is better for healthcare of seafarers? YES NO NO OPINION IF YES: What do you think is the most important factor in co-operation by using telemedicine equipment to achieve better healthcare for seafarers? Please give example:	TELEMEDICINE EQUIPMENT	Fritext
50.	How important do you think it is to present more information about the telemedicine in maritime services? 1. Not at all 2. Slightly important 3. Important 4. Very important 5. No opinion	Indexfråga TELEMEDICINE EQUIPMENT	Enval
51.	What kind of information regarding telemedicine in maritime services do you need?	TELEMEDICINE EQUIPMENT	Fritext

52.	What do you think about answering the questions through a web based questionnaire, in comparison with other interview techniques (personal, postal etc)?	TELEMEDICINE EQUIPMENT	Fritext
53.	Is there anything you wish to add before the questionnaire now ends? Please write comments or questions: <i>To end, please press "Continue">/i></i>	TELEMEDICINE EQUIPMENT	Fritext Tacksida

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