1. STATEMENT

Accidental injuries is the leading cause of global disease burden. According to WHO, about 16.000 people die each day as a result of injuries[139]. In Viet Nam, accidental injuries are gradually becoming one of the leading causes of death in hospitals with a high rate of injury mortality compared to infectious diseases and non-communicable diseases.

Thevessel is the place that seafarer and fishermen living and working when cruising on the sea.Marine working conditons is extremely difficult, frequently working in harsh environments: powerful waves, strong winds, and theworking conditons are not qualified such as vibration, noise, high temperature, humid and slippery… These are the potential risk factors for occupational injuries [8],[17], [35].

Vietnam already has a national action plan for injury prevention [4]. However, For maritime workers, the prevention of injury has its own characteristics. Therefore, the study of working conditons, the situation of injuries, some related factors and solutions for injury prevention for maritime workers are necessary and practical significance.

Objectives:

1. Description of working conditions , injury rates and some factors related to occupational injury among fishermen and seafarers in Hai Phong area, 2014-2016
2. Description of first aid and evaluating the results of injury prevention training solutions for fishermen and seafarers in Hai Phong area, 2014-2016

2. Scientific contributions

The thesis has identified that working conditions on offshore fishery ships and Ocean ships have many unfavorable factors: sound intensive, Vibrartion level exceeds occupational hygiene standards, same-gender micro-social, 88,83% fishers working at night, 100% seafarers work on shifts.

Determining the incidence of injuries in fishermen and seafarers. The accident rate of fishermen is much higher than seafarers (41,6% and 3,68%)

Determining some related factors to injuries in fishermen and seafarers: Fisherman and seafarers don’t use labor protection or seldom use it more

likely to suffer from injuries than those who use it regularly. Fishermen and seafarers who are working on the deck are more likely to be injured than others.

Training intervention results illustrated that knowledge and practice in the prevention of injuries of fishermen and seafarers changed positively. It allowed fishermen and seafarers could handle first aid injuries at sea and reduced the impact of injuries.

3. Dissertation outline

Consisting of: 145 pages;Introduction: 02 pages; Dissertation outline: 36 Pages; Subjects and methods: 19 pages; Results: 02 pages; Discussion: 35 pages; Conclusion: 02 pages; Suggestion: 01 pages; There are 45 charts; 5 pictures and 3 boxes; 13 references: 49 documents in Vietnamese and 89 documents in English

Chapter 1
OVERVIEW

1. Characteristics of the marine environment and labour environment on board

1.1. Characteristics of the marine environment

The natural environment is considered to be the first factor that affects workers' health. Especially marine environemt. Onshore workers have safety measures to restric the harsh environemt but offshore worker have to work hours, even days on sea and directly affected by marine environemt

1.2 .Working conditions onboard

Working onboard is a special occupation. On the sea journey, there are 9 to 12 months on sea-going vessels and 2-3 weeks on fishing vessels. The vessel is the place that fishermen and seafarers use for working, living, and entertaining.Fishermen and seafarers are affected by marine environment and they are also influenced by the working environment on board [8],[28],[98].

2. The reality and some factors related to injuries in fishermen and seafarers

2.1. Definition

- According to WHO, Acccident is an unfortunate incident that happens unexpectedly and unintentionally [138]

- Injury is the physical damage that results when a human body is suddenly or briefly subjected to intolerable levels of energy

2.2. Risk factors for work injury among maritime labour

-*Ships Lighting*: Ship lighting: If the lighting system on the ship is not enough the light intensive, unexpected light, especially fishing vessels use high power fishing light attractor which can be a high risk of marine injury

-*Noise on martime vessels*: A risk factor arising from the working environment when the ship is moving on the sea. When the ship is moving on the sea, the noise affects the crew continuously 24/24, Noise make difficult to hear the alarm signal and command, Causing lack the ability to focus on working, causing psychological stress…As a result, accidents can happen to the crew at any time [8], [45], [115].

-*The risk of psychological stress when cruising the maritime vessels*: Marine enveronment is a special enveronment, It is drastically different from onshore working: Isolation from the land, living far away from family, monotonous labor, the distinction of rank on board, lack of social life, Sexual tension…All of these factors have become the risk factors for injury to the maritime vessels [7], [37], [69], [71]

-*Machinery and tools*: There are some part of the ship which can cause injury: ship machinery, generators, cranes, winches, anchors, hatch covers, ladders, netting and trawling…[23],[28],[74].

-*The risk of working time, age and age of experience*: Overstressed, night shifts, lack of experience and health ageing are the risk factors influencing the incidence rates of marine injuries [28],[35],[78].

3. Measures preventing maritime injuries

Fishermen and seafarers are more likely to be injured than people who work on land[11],[27],[58],[122].Therefore, to minimize marine injuries, there a some measures that fishermen and seafares have to be fully implemented:

-*Organizational Solution*: Compling with the regulations on occupational safety and health. All personal protective equipment should be equipped and ensure proper use of personal protective equipment.

-*Policy solution*: Substantive list of essential medicine and medical equipment on shipping vessel [10],[34].

-*Technical solution*: Developing telemedicine for ships to provide medical care on board ship [10],[34],[36].

-*Training Intervention*: First aid training for seafarers and fishermen

Within the scope of this desertation, we chose to implement measures to prevent injury by training interventions for fishermen and seafarers, Provding them knowledge and skills in first aid and emergency at sea so that they can tackle emergency situations at sea without health officer. The purpose of this intervention is to minimize the consequences and severity of the injury, to reduce the mortality from injuries. Training the fishermen and seafarers to make good use of Telemedicine so they can apply for medical assistance from land in dealing with emergency situations at sea.

Chapter 2
SUBJECTS AND OBJECTIVES

2.1. Subjects, location, and timeframe of the study

2.1.1. Subjects:

- *Working* conditions on offshore fishery ships and Ocean ships: Study of working environment, organization of labor and daily life, medical work on fishery ships and Ocean ships in Hai Phong area

- *Worker*: 420 fishermen in Hai Phong area and 1250 seafarers on Ocean ship.

- *Standard for injury selectio*n: Injuries caused by marine traffic accidents, falls, occupational accidents, collisions, electric shocks resulting in bleeding, sprains, edema, rubbing, broken bones, broken teeth Pneumoperitoneum, brain injury; decompression accidents, drowning, burns, poisoning, suicide ... that require medical attention, out of work or restriction of at least one day [4],[5].

- *Injury exclusion criteria*: The injuries caused by natural disasters and catastrophes such as tsunamis, whirlwinds caused shipwreck ... [4], [5].

2.2.1. Location and time of the study

-*Location*: Three Hai Phong's fishing villages: Lap Le Commune - Thuy Nguyen District, Dai Hop Commune - Kien Thuy District, and Bach Long Vi District, Hai Phong

+ *3 shipping companies*: VOSCO ; VIPCO; Lien Minh Marine Joint Stock Company

- Timeframe: The research was carried out from January 2014 to December 2016.

2.2. Research methodology

2.2.1. Research design

- A cross-sectional study

-Investigating the reality of injury in fishermen and seafarers through data collection at shipping companies and Vietnam Fisheries Society.

- Interventional study

2.2.2. Sample size

- Carry out epidemiological investigations

+ Working condition: 30 offshore fishery ships and 30 ocean ships

+ Workers: 420 fishermen and 1250 seafarers

+ Training intervention: 100 fishermen and 100 seafarers

2.3. Variables and Method of data collection

2.3.1. Research on working conditions, injury rates, risk factors for injury in fishermen and seafarers

-Research on working condition onboard

+ The labor environment factors are determined according to the routine technique Occupational Medicine - Environmental Hygiene of the Institute of Occupational Medicine and Institute of occupational health and environment (2002). Evaluation of results, analysis of measurement, application of Hygiene standard 3733/2002 / QD-BYT [3].

+*Microclimate factors:* Temperature (oC), air humidity (%), wind speed (m / s): measured by Climate Measuring Instrument - Testo 445 made by Japan.

+*Physical Factors*: Noise (dbA): measured by Testo 815 - Sound Level Meter - German. Vibration (m / s): Measured by Vibration Meters VM-82A - Japan. Light (Lux): Measured by Model 401025 Digital Light Meter - the US

+ *Toxic gas*: determined by Microtector II G460 – Germany

+ *Vapor density*: measured by Drager CMS – Germany

+ Organization of labor and daily life of fishermen and seafarers was assessed by direct observation and interview through questionnaires.

- The *current status of injuries of fishermen and seafarers*: Interviewed by investigation paper format

- *Several factors related to injuries of fishermen and seafarers*: Interviewed by investigation paper format

2.3.2. First aid measures and results of training solutions to prevent injuries of fishermen and seafarers.

- The First aid measures of fishermen and seafarers: Investigate by interview

- Evaluating the results of training solutions to prevent injuries of fishermen and seafarers

+ *Intervention contents:* Training for fishermen and seafarers in knowledge and skills in first aid and dealing with accidents at sea.

+ *Training curriculum*: Using the first aid emergency training program was built by the Institute of Marine Medicine Training Center, approved by the Ministry of Health,Training session has 16 lessons including theory and practice

Interventions: Organizing classes, each class has 15-20 fishermen or seafarers. Students learn the theory and practice in traditional teaching methods combined with hands-on instruction in the model and the "hands-on" approach.

+Evaluation method after the intervention: *:*

+ Prior to intervention, subjects were assessed for knowledge and practical skills in first aid when the injury occurred with a set of multiple-choice questions and checklists.

+ At the end of the training course, trainees will be assessed on knowledge and practical skills on first aid when the injury occurs with a set of multiple-choice questions and checklists . Then, compare the results of training knowledge and practical skills before and after the course to evaluate the training results.

2.4. Data processing

The research data were processed according to the statistical method based on SPSS software for Windows 16.0

2.5. Ethics in research: To comply with regulations

Chapter 3
RESULTS

3.1 The current status of working conditon, the rate of injuries and some related factors to injuries in fishermen and seafarers

Table 3.4. **Results of micro-climate on ships at ports**

Targets / Measuring position		**Temperature (°C)**	**Humid (%)**	**Wind speed(m/s)**
		$\overline{X}$ ± SD	$\overline{X}$ ± SD	$\overline{X}$ ± SD
Fishery ships (n=30)	Bridge Accomodation(1)	29,23 ± 1,50	67,93 ± 3,34	1,23± 0,31
	Engine room (2)	37,10 ± 1,12	71,93 ± 2,98	0,38± 0,20
	Deck (3)	33,47± 1,59	83,10 ± 2,51	2,21± 0,31
p		$p_{1,3-2} < 0,001$	$p_{1,2-3} < 0,001$	$p_{1,2-3} < 0,001$
Ocean ships (n=30)	Bridge (4)	25,37± 2,0	66,20± 2,52	0,72± 0,28
	Accomodation(5)	22,30± 1,42	66,60± 2,71	0,45 ± 0,18
	Engine room (6)	36,83 ± 1,37	63,53 ± 3,94	0,49 ± 0,21
	Deck (7)	35,23 ± 1,89	67,10 ± 3,58	2,70 ± 0,39
p		$p_{4,5-6} < 0,001$	$p_{4,5,7-6} < 0,001$	$p_{4,5,6-7} < 0,001$
Sanitation and Hygiene Standards (3733/ 2002/ QĐ-BYT) Summer		**18 - 32**	**75 – 80**	**≤ 1,5**

From table 3.4, some outputs shows as following:The temperature of engine room is highest (37,1±1,12), exceeds Sanitation and Hygiene Standards Temperature of engine room is higher than temperature of deck, accommodation, bridge with statics with p<0,001.

Table 3.5. **Light levels on ships**

Targets / **Measuring position**		Light level (Lux) $\overline{X}$ ± SD	
		Day	Night
Fishery ships(n=30)	Deck	Natural Light	2866,9 ± 78,5
	Navigation bridge	280,03 ± 32,39	1666,02± 127,7
Ocean ships (n=30)	Navigation bridge	370,16 ± 18,51	
	Deck	Natural light	
	Engine Room	312,46± 15,17	
	Crew Cabin	312,10 ± 11,46	
Sanitation and Hygiene Standards (3733/ 2002/ QĐ- BYT)		300- 500 lux	

Table 3.15 shows us that Light on fishing board and shipping vessels in daytime are within the limits of the Sanitation and Hygiene Standards. Light on fishing boats at night at the deck and bridge positions exceeds Sanitation and Hygiene Standards

Table 3.6. **Noise level on ships at port (dBA)**

Results / **Subjects**	**Measuring position**			
	Navigation Bridge(1)	Accommodation (2)	Engine room(3)	Deck(4)
	$\overline{X}$ ± SD	$\overline{X}$ ± SD	$\overline{X}$ ± SD	$\overline{X}$ ± SD
Fishery ships (n=30)	83,96± 4,91	83,96± 4,91	95,37± 5,30	82,06± 1,91
p	$p_{1,2,4-3} < 0,001$			
Ocean ships (n=30)	73,47 ± 2,94	55,17± 2,59	94,70± 3,27	81,90± 2,37
p	$p_{1-2} < 0,001$; $p_{2-3} < 0,001$; $p_{1,2,4-3} < 0,001$			
Sanitation and Hygiene Standards (3733/ 2002/ QĐ- BYT)	≤ 85 dBA			

Table 3.6 shows us that Noise on the fishing vessel at the port when engine is operated is exceeding Sanitation and Hygiene Standards. In the engine room, the noise was higher than the deck, the bridge, accommodations was statistically significant with p <0.001. On shipping vessels, the noise in the engine room exceeds Sanitation and Hygiene Standards, the noise in the accommodations, the bridge, the deck reached the Sanitation and Hygiene Standards.

Table 3.7. **The speed of vibration at port**

Results / **Subjects**	**Measuring position**			
	Navigation Bridge	Accommodation	Engine room	Deck
	$\overline{X} \pm SD$	$\overline{X} \pm SD$	$\overline{X} \pm SD$	$\overline{X} \pm SD$
Fishery ships (n=30)	$12,71.10^{-3} \pm 1,48.10^{-3}$	$12,71.10^{-3} \pm 1,48.10^{-3}$	$15,54.10^{-3} \pm 1,59.10^{-3}$	$12,19.10^{-3} \pm 0,82.10^{-3}$
Ocean ships (n=30)	$6,13.10^{-3} \pm 1,02.10^{-3}$	$4,41.10^{-3} \pm 0,87.10^{-3}$	$12,08.10^{-3} \pm 1,28.10^{-3}$	$7,35.10^{-3} \pm 0,72.10^{-3}$
Sanitation and Hygiene Standards (3733/ 2002/ QĐ- BYT)	$\leq 11.10^{-3}$ (m/s)			

Table 3.17 shows us that When the ship is berthing at the wharf, the engine runs without load, the speed of vibration on the ship at the position of accommodations, engine room, deck are over the Sanitation and Hygiene Standards . On sea-going vessels, when the vessel is berthing at the port, generator system is operating only, the vibration velocity in the engine room exceeds Sanitation and Hygiene Standards , the vibration velocity in other positions reaches the Sanitation and Hygiene Standards

Table 3.11. **Occupational safety equipment for offshore fishermen (n = 420)**

Occupational safety equipment	n	Rate (%)	Using			
			Usually		Seldom	
			n	Rate (%)	n	Rate (%)
Protective clothing	130	30,95	86	20,47	44	10,48
Glove	219	52,14	132	31,42	87	20,72
Anti-slid boots	191	45,47	127	30,23	64	15,24
Helmet	0	0	0	0	0	0
Soundproof earplugs	0	0	0	0	0	0
Goggles	0	0	0	0	0	0

Table 3.11 shows us that 100% of the fishermen working on fishing vessels are not equipped with safety helmets, soundproof earplugs, protective goggles. Number of fishermen equipped with protective clothing, anti-slippery boots, gloves are: 30.95%, 45.47% and 52.14%

Table 3.12. **Working time on fishing vessels and seagoing vessels**

Subjects / **Working time**	**Fishery ships(n= 30)**		**Ocean ships (n=30)**	
	n	Rate(%)	n	Rate (%)
Day shift	5	16,67		
Night shift	25	83,33		
Working shift	0	0	30	100
Rest periods at work	Non	Non	Yes	Yes
Average time a trip($\overline{X}$ ± SD)	15,33 ± 2,17 (Day)		12,40 ± 2,76 (months)	
Average working time of day (hours / day) ($\overline{X}$ ± SD)	10,50 ± 0,90		8	

Table 3.12 shows us that For fishing vessels, the mean time for a sea voyage is 15.33 ± 2.17 days, the average working time of fishermen was

10.50 ± 0.9 hours, 100% of fishermen do not have a mid-shift break. Most of the fishermen on off-shore fishing are working overnight (83.33%)

Table 3.13. **Medical work on fishery ships and Ocean ships**

Results / Medical work	Fishery ships (n=30)		Ocean ships (n=30)	
	n	Rate(%)	n	Rate(%)
Medical Officer	0	0	30	100
Got first aid	5	16,67	25	83,33
Trained of medical officers on board	0	0	14	46,67

Table 3.13 shows us that 100% of fishing vessels of offshore fishermen have no medical officer; 16.67% of fishing vessels have fishermen who were trained first aid on the sea. 100% of Sea-going vessels have medical officers

3.2.2 The situation of injuries of fishermen and seafarers

Table 3.18. **Rate of injury in fishermen and seafarers**

Results / Subjects	n	Rate (%)	p
Fishermen (420)	175	41,67	< 0,001
Seafarers (1250)	46	3,68	

Table 3.18 shows us that the rate of injuries of fishermen and seafarers is 41.67% and 3.68%, respectively. The difference is statistically significant with p <0.01.

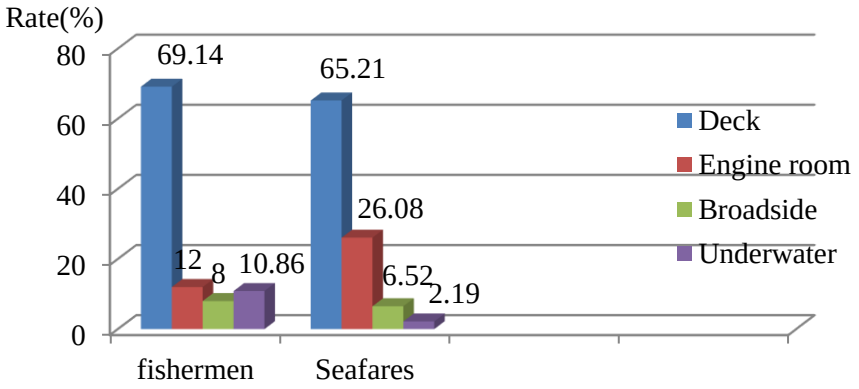

Chart 3.5. **Distribution of workplace injuries on board**

Table 3.5 shows us that deck is the place where injuries are highest for fishermen and seafarers (69.14% and 65.21% respectively), followed by engine room (12.00% and 26.08%). Injury in broadside and underwater(8.0% and 6.52%) and (10.86% and 2.19%).

Table 3.21. **Distribution of injuries of fishermen by causes**

Causes	**Results**	
	n	**Rate (%)**
Pressure injury	8	4,57
Repair, install machine	11	6,28
Poisoning	6	3,42
Sea snake bite, finned fish	14	8,00
Winch	40	22,85
falling	48	27,42
Ship Crash	14	8,00
Work tools on board	13	7,43
Burn	12	6,85
fight	9	5,14
total	175	100

Table 3.21shows us thatthe cause of injuries caused by fishermen is slipping (27.42%); winches, broken ropes accounted for 22.85%; ship crash 8%, fish finned (8%).

Table 3.22. **Distribution of injuries of seafarers by causes**

Causes	**Results**	
	n	Rate (%)
Repair, install machine	5	10,86
Poisoning	2	4,34
Winch	2	4,34
Falling	15	32,60
Work tools on board	4	8,69
Burn	3	6,52
Fight	1	2,17
suicide	1	2,17
Pirate shot	1	2,17
Close the hatch cover, remove the goods	12	26,14
Total	46	100

Table 3.22 shows us that the cause of the injuries of the seafarers is falling (32.60%); hatch cover, remove cargo (26.14%).

3.2.3 Several factors related to injuries of offshore fishermen and seafarers

Table 3.35. **Multivariate analysis of injuries related to injuries (n = 420)**

Factors		Results		
		OR	95%CI	p
Education	High school, college,	Matched-group		
	Unlettered	1,51	0,96-2,34	0,071
	Junior high school	1,62	0,71-3,69	0,253
Power engine	Over 400 CV	Matched-group		
	150-400 CV	5,39	2,35-12,38	<0,001
	90-149 CV	8,61	3,46-21,45	<0,001
Positon	Navigator	Matched-group		
	Engineering officer	1,46	0,35-6,11	0,606
	Fellow work	4,09	1,18-14,15	0,026
Ranks	Ship's owner	Matched-group		
	Fellow work	1,34	0,32-5,52	0,688

Table 3.35 shows us that multivariate analyzes showed that the power engine and fishermen with occupational groups in the comparison group tended to be higher than those of other groups, with a statistically significant difference at p <0.05.

Table 3.36. **Multivariate analysis of factors related to injuries seafarers (n = 1250)**

Factors		Results		
		OR	95%CI	p
Experience age	≥10 years	Matched-group		
	<10 years	1,64	0,86-3,14	0,129
Education	TC, CĐ	Matched-group		
	ĐH	0,91	0,28-2,95	0,873
Capacity	> 50 thousand tons	Matched-group		
	< 30thousand tons	6,61	2,36-18,56	<0,001

	30-50thousand tons	1,82	0,93-3,54	0,078
Position	Other	Matched-group		
	Deck group	1,75	0,89-3,43	0,101
	Engine group	1,86	0,54-6,39	0,325
Ranks	officer	Matched-group		
	Seaman	2,28	0,65-7,96	0,194

Table 3.36 shows us that Multivariate analysis showed that seafarers working on vessels with a capacity of less than 30,000 tons tended to be more likely to have higher injury rates than those above 50,000 tons, the difference is statistically significant at $p < 0.05$.

3.3 First aid measures and assessment of the results of injury prevention training solutions for fishermen and seafarers

3.3.1 First aid measures of fishermen and seafarers

Table 3.37. **Fishermen's first aid measures were taken on board**

First aid measures	Results	
	n	Rate (%)
Applying oil	32	18,28
Bandge the wound with nicotiana rustica	41	23,42
Cleaning, bandge wound bleeding	71	40,56
Fracture immobilization	9	5,18
Cardiopulmonary resuscitation	8	4,57
Raise blood pressure	8	4,57
Other	6	3,42
Total	175	100

Table 3.37 shows us that first-aid measures that the fishermen used to do on board when injury occurred were wound cleaning, bandge wound bleeding (40.56%); followed by hemostasis, bandge the wound with nicotiana rustica (23.42%); applying oil (18.28%).

Table 3.38. **First aid at seafarers was carried out onboard**

Methods	Results	
	n	Rate (%)
Applying oil	7	15,21
Wound cleaning, bandge wound bleeding	32	69,56
Fracture immobilization	5	10,89
Other	2	4,34
Total	46	100

Table 3.38 shows us that first-aid measures on the ship were wound cleaning, bandge wound bleeding (69.56%); applying oil (15.21%); Fracture immobilization (10.89%)

Table 3.39. **Locations of fishermen and seafarers continue to treat injuries after first aid**

Results / Treatment location	Fishermen		Seafarers	
	n	Rate (%)	n	Rate (%)
At port	86	49,14	35	76,10
Island	68	38,85	0	0
Mainland, port	21	12,01	11	23,90
Total	175	100	46	100

Table 3.39 shows us that 49.14% of fishermen continued treated on the vessel after first aid, 38.85% transferred to the island for further treatment, 12.01% transferred to the mainland. After first aid, 76.10% of seafarers continued treated on board; 23.90% of seafarers is transferred to the nearest port.

Table 4.40. **Means of transportation**

Transportation	Results			
	Fishermen		Seafarers	
	n	Rate (%)	n	Rate (%)
Dock at the port	76	85,39	11	100
Rescue ship	13	14,61	0	0
Total	89	100	11	100

Table 3.40 shows us that The means of transportation the injured fishermen to the island or mainland is going to the dock at the port (85.39%), docking ships combined with rescue ship (14.61%). The means of transportation the injured crew to the nearest port is landing the ship (100%)..

3.3.2 Results of injury prevention training solutions for fishermen and seafarers

Table 3.44. **Proper knowledge of fishermen and seafarers about fracture symptoms and fracture immobilization**

Results / Proper knowledge	fishermen (n=100)				Seafarers(n=100)			
	Before interventio		After interventio		Before interventio		After interventio	
	n	Rate (%)	n	Rate (%)	n	Rate (%)	n	Rate (%)
Signs of fracture	9	9,0	75	75,0	15	15,0	85	85,0
p	< 0,05				< 0,05			
Signs of open fracture	7	7,0	71	71,0	13	13,0	82	82,0
p	< 0,05				< 0,05			
The principle of fracture immobilization	6	6,0	65	65,0	12	12,0	78	78,0
p	< 0,05				< 0,05			

Table 3.40 shows us that fishermen have the proper knowledge about detecting signs fracture before the intervention was 9.0%,After the intervention increased to 75%, the difference is statistically significant with p <0.05. Seafarers had the correct knowledge about signs of fracture before the intervention is 15.0%, after the intervention this ratio increased to 85.0% (p <0.05). Beforethe intervention only 5% of fishermen had the correct knowledge about the principle of fracture immobilization, after intervention , it increased to 65.0%

Table 3.45. **Practicing of fishermen and seafarers on the management of fractures**

Results / practicing	Fishermen(n=100)				Seafarers(n=100			
	Before intervention		After intervention		Before intervention		After intervention	
	n	Rate (%)	n	Rate (%)	n	Rate (%)	n	Rate (%)
Management of fracture	8	8,0	68	68,0	21	21,0	79	79,0
p	< 0,05				< 0,05			
Fracture immobilization	6	6,0	74	74,0	11	11,0	75	75,0
p	< 0,05				< 0,05			

Table 3.45 shows us that before intervention, only 6.0% of fishermen had immobilized fracture, before intervention. After intervention, the rate of fishermen had immobilization reached 74.0% (p <0.05). Seafarers immobilized fracture pre-intervention is 11.0%, after intervention the proportion of seafarers immobilized fracture increased to 75%, the difference was statistically significant with p <0.05.

Table 3.47. **The practice of fishermen and seafarers on wound management bleeding**

Results / Practicing	Fishermen(n=100)				Seafarers (n=100)			
	before intervention		after intervention		before intervention		after intervention	
	n	Rate (%)	n	Rate (%)	n	Rate (%)	n	Rate (%)
Bandge the wound	8	8,0	74	74,0	23	23,0	86	86,0
p	< 0,05				< 0,05			
Use a tourniquet	5	5,0	62	62,0	15	15,0	79	79,0
p	< 0,05				< 0,05			

Table 3.22 shows us that 3.47 usage of tourniquetsof the fishermen before intervention reached 5.0%, after the intervention, it increased to 62.0% (p <0.05). Tourniquet was used to prevent hemostasis before intervention, reaching 15.0%. After intervention, 79% of patients had usedtourniquets (p <0.05).

Table 3.53. **The practice of fishermen and seafarers for using Telemedicine technology**

Results / Practicing	fishermen (n=100)				seafarers (n=100)			
	before intervention		after intervention		Before intervention		after intervention	
	n	Rate (%)	n	Rate (%)	n	Rate (%)	n	Rate (%)
Using Telemedicine effectively	2	2,0	62	72,0	5	5,0	79	79,0
p	< 0,05				< 0,05			
Telemedicine counseling	2	2,0	54	61,0	4	4,0	73	73,0
p	< 0,05				< 0,05			

Table 3.53 shows us that the practice of fishermen and seafarers for using Telemedicine technology before intervention is very low (2.0% and 5.0%), after the intervention, the percentage of fishermen and seafarers who have used Telemedicine effectively increased markedly by 62.0% and 79.0% (p <0.05)

Box 3.2. Clinical case of fishermen injured on foot

Fishery ship named HP905…TS is catching fish on a body of water on Gulf of Tonkin.

Ship position: 40 Knot from Bach Long Vi Island

Berthing period: 02 hours

Medicine chest are equipped, fishermen is educated on fist aid.

Fishermen, Mr. Nguyen Huy T, 32 years old, was in the process of pulling the net, slipping down the rope, the rope wrapped in two ankles, causing the

fisherman to break his left ankle and half his right foot, deforming his right leg. He was provided with pain killer, garrot his leg and foot care in a clean bucket.

Ship owner required the advising from experts from Vietnam National Institute of Maritime Medicine:

+ Put his line on bed without pillow, warm he up.

+ Fix his right leg with a splint, losing garrot gradually every 20 minutes

+ Berthing Ship at Bach Long Vi Insland.

+ Required help from Bach Long Vi Frontier Post.

After 1h45 minutes, fishermen is taken in to Island in the state of blood loss, pale skin, wounds have garrot rusty blood. Fishermen is continue to be covered by medical centers of Bach Long Vi Island, hemorrhoids before transporting fishermen to shore, treated in Vietnam Germany hospital.

After 18 hours, he is transported to Vietnam Germany hospital for advanced treatment of connecting right foots.

Currently status: Right foot must be removed by necrosis; Left foot grafted live no necrosis.

Fishery ship HP927…Fishermen were trained on first aid, and the vessel was equipped ship's medicine chest and essential medical equipment. Fisherman Nguyen Huy T was cut off the legs, Owner was trained in first aid and know how to apply for medical assistance should be able to bring fishermen into the island safely

Chapter 4
DISCUSSION

4.1. Labour conditions of fishermen and seafarers on offshore fishery ships and Ocean ships

**Ship lighting:* We conducted light measurements on offshore fishing vessels from 7p.m to 8p.m at cockpit and deck positions was out-of-boundsSanitation and Hygiene Standards (1666,02± 127,7 Lux và 2866,9 ± 78,5 Lux). The results of our research are also consistent with Le Hong Minh's research on offshore fishing vessels in some southern provinces, at night the intensity of illumination at all positions on the deck is above 2500

Lux [28]. Fishermen working at night, affected by high intensity of light causes eye strain, dazzle, reduced vision and the potential danger of the injury.

Ship vibration*: The results of our study on offshore fishing vessel showed that when the vessel landed at an unloaded engine landing, the velocity of vibration on the fishing vessel at the cockpit positions, Bridge accommodation, engine room, deck were out-of-bounds Sanitation and Hygiene Standards. When sea-going vessel stay at port, the main engines of the ship are not working but only the light bulbs operate but still create the vibration, the vibration level was frequency range around 12,4.10-3 ± 2,5.10-3 **(out-of-bounds Sanitation and Hygiene Standards). The results of our study are consistent with Le Hong Minh [28], Do Thi Hai [22], Le Hoang lan [26].

**Protective clothing and equipment of fishermen and seafarers*: Study on 420 fishermen in Hai Phong area, The results showed that 100% of fishermen are not equipped with safety helmets, safety goggles, noisy ear plugs during work on board. The rate of fishermen is equipped with protective clothing, gloves, anti-slippery boots were quite low: 30,95%; 52,14% and 45,47% respectively. The number of fishermen regularly use protective clothing, gloves, slippery boots: 10.48%; 20,72% and 15,24%. A study by Le Hong Minh [27] on the working conditons of fishermen offshore in some southern provinces showed that 100% of fishermen were not equipped with safety goggles, masks. Number of fishermen with protective clothing, anti-slippery boots, gloves were 34.9%; 51.6% and 53.6% respectively. Fishermen used regular protective clothing, slippery boots, gloves were low : 23.2%; 50.3% and 43.6% respectively.

4.2. The current status of injury in fishermen and seafarers

The Research's results on 420 offshore fishermen and 1,250 seafarers on the current status of injuries: The rate of injuries in fishermen and seafarers is 41.67% and 3, 68% respectively

Le Hong Minh's research on the current status of injury in offshore fishermen in some southern trade villages in 2012 shows that the injury rate of fishermen was 11.80% [28].

Research by Nguyen Hong Hanh et al. (2012 - 2013) on the current status of injury of offshore fishermen in Van Don district, Quang Ninh province shows that the injury rate of fishermen was 54.30% [23].

* The location of injuries in our study was mostly on deck (69.14% and 65.21%). The results of our study were suited to the research of some authors.

Nguyen Bich Diep, Nguyen Dinh Khue et al. (2014) [11] studied 319 offshore fishermen in Cua Lo town, Nghe An province showed that the injuries mostly occurred on deck (80.5%). The study of Nguyen Hong Hanh et al. (2012 - 2013) on the status of trafficking of fishermen in Van Don district in Quang Ninh province showed that the location of the injuries occurred mainly on the deck (76, 7%).

The causes of injuries among fishermen in our study are mainly fall (27.42%); winches, broken winches (22.85%), ships crash (8.00%). Causes of injuries of the seafarers were mainly due to slipping (32.60%), dismantling of cargo hold (26.14%), repairs (10.86%).

4.3. Some risk factor related to injury in fishermen and seafarers

Research on Does the relationship between the position of the fishermen on the boat affects the injury?. Our results showed that fishermen working on the deck (occupational group) had the risk of injury was 5.02 times higher than the engine part (p = 0,001)) and 1.77 times higher than the navigation part (p = 0.042).Le Hong Minh's research on 612 fishermen in some southern provinces showed that fishermen had the highest rate of injury (12.4%), engine part (10.4%), navigation part (6.5%) [28].

In terms of engine power and injury:The results show that engine power was closely related to the injury. Fishing vessels and fishermen working on vessels 90-150 CV, there was a risk of injury of 4.33 times higher than fishermen working on vessels 150-400 CV (p = 0,001) and 6.36 times higher than ships with engine power over 400 CV (p = 0.001). Sea-going vessels, seafarers working on ships with a capacity of less than 10,000 tons are 6.34 times more likely to suffer from injuries than seafarers working on ships with a capacity of over 30,000 tons.

The Aasjord HL study (2006) [50] on 1690 cases of injuries from 1998 to 2002 in the Norwegian fishing fleet indicates that small vessels, especially vessels of less than 13m in length the rate of injuries and fatalities are higher than in larger vessels. Smaller vessels have the risk of injury as high as 4.1 times the mean (13-28 m) average, the risk was 11.3 times higher than the larger ones.

4.4. First aid measures and results of training solutions to prevent injuries to fishermen and seafarers

* First aid measures of fishermen and seafarers: The results of our study show that after the injury, fishermen and seafarers mostly used wound cleaning and bandage the wound(40,56% và 69,56%). However, during the interview we found that most of the sea-going vessels were equipped with ship's medicine chest and first aid equipment, some ships with seafarers were trained in medical officers so the first aid initially was more effective, Most fishing vessels did not have medical chest, emergency equipment and fishermen were not trained in first aid emergency, so when the injuries occurred, fishermen did not know how to rescue such as: bandages, braces, hemostatic bandages, fixed fractures**.**

We conducted training for 100 fishermen and 100 seafarers in the form of theoretical teaching combined with on-the-spot practice (hand-held practice) with the content of first aid management when the accident occurredat sea, The results show that: After training,Knowledge and practical skills in emergency cardiac arrest, apnea, management of bleeding wounds, detection and management of fractures, management of gas poisoning, food poisoning, management of burns…Positive changes were statistically significant compared to pre-training ($p < 0,001$). In addition to the first aid injuries, we also provide training to fishermen and seafarers on how to proceed for Telemedicine. In the case of severe injuries beyond the capacity of the fishermen and seafarers, they may know how to apply for medical assistance from land medical facilities to support them.The results of our study are consistent with the research conducted by Nguyen Thi Hai Ha [18], Tang Xuan Chau [6] on the effectiveness of interventions to improve knowledge and practical skills for fishermen and seafarers

Limitation of the research

The research was conducted for 3 years, when interviewed about when interviewed about the situation of injuries of fishermen and seafarers, recall may be inaccurate. Some mild injuries are easily missed

The research only interviewed fishermen and seafarers who are working on board. Cases who have lost their ability to work are not included in the research.

CONCLUSION

1. The current status of working conditons, the rate of injuries and some related factors to injuries in fishermen and seafarers

1.1. The current status of working conditon of fishermen and seafarers

Working conditons on offshore fishery ships: Engine room had temperature, noise, vibration, petrol vapor exceeds Sanitation and Hygiene Standards. Humidity, wind speed, night lighting on the deck exceeds Sanitation and Hygiene Standards. 45.47% of fishermen were equipped with anti-skid boots (30.23% of regular use); 83.33% of fishermen worked at night. Same-gender environment. 100% of the vessels had no medical officer, 83.33% did not receive first aid training.

Working conditions on Ocean ships: Engine room had the temperature, noise intensity, vibration exceeds and Hygiene Standards. 100 seafarerswere equipped with labor protection (79.6% regularly use anti-slip boots). Same-gender environment, 100% of seafarers do shift work, 100% of the vessels had medical officer,medical chest and essential equipment.

1.2. The injury rate in fishermen and seafarers

The injury rate of the fishermen was 41.67%, injuries occurring on the deck occupied the highest proportion (69.14%). Injuries were caused by slipping (26,85%), winches (22,85%). Causes of fatalities caused by ship crash (45.45%), winches (36.36%), falling into the sea (18.19%).

The injury rate of the seafarers was 41.67%, injuries occurring on the deck occupied the highest proportion (65,21 %); Injuries were caused by slipping (32,60%), Removal of hatches (26.14%), repairs (10.86%). Causes of death due to: brain injury, suicide, pirates shot..

1.3. Several factors related to injuries of fishermen and seafarers

The illiterate, primary school students with autism are 2.34 times higher than the high school level; Fishermen working on ships with power engine less than 150CV have a higher 4.33 to 6.36 times than those of 150-400 CV and over 400CV. Fishers who used irregular anti-skid boots or did not use it were more likely (2.93 to 3.48 times) than those who used them regularly.

The seamen's crew was reported to be 2.62 times higher than the officers; Workers on the ship with a capacity of <3,000 tons are subjected to titanium 6.78 times higher than> 50,000 tons. Experience age <10 years who have been injured by 2.03 times more than seafarers who had > 10 years experience age. Seafarers using non-slip non-slip boots suffered injuries as high as 2.89 times frequently used crew members.

2. First aid measures and results of training solutions to prevent injuries to fishermen and seafarers

First aid measures and results of training solutions to prevent injuries to fishermen and seafarers

First aid measures of fishermen: bandage the wound (40,56%); immobilising(5,18%), Fishermen treated at the vessel (49,14%), evacuation to a shore-based medical facility (50,86%). Transportation: Vessel Berthing 85,39% , 14.61% called for rescue. Transport time: 13,78 ± 4,33 hours

First aid of seafarers: Bandage the wound (69,56%); immobilizing (10,89%). Fishermen treated at the vessel (76,10%); evacuation to a shore-based medical facility (23,90%). Transportation: Vessel Berthing 100%.Transport time: 43,11 ± 8,82 hours

The knowledge of fishermen and seafarers on injury prevention after training increased higher than before training: Signs of fractures before and after training (9% -15% and 75% - 85%); The principle of immobilizing before and after training (6%-12% and 65%-78%).

The practice of fishermen and seafarer on the prevention of injury after training increased higher than before training: immobilising before and after training (6%-11% và 74%-75%); bandage the wound before and after training (8%-23% và 74%-86%); tourniquet before and after training (5%-15% và 62%-79%); Telemedicine before and after training: (2%-4% và 54%-73%).

SUGGESTION

1. Owner of offshore fishery ships should be equipped with adequate means of labor protection for fishermen, especially anti-slip boots. Fishermen and seafarers have to use labor protection during their work onboard.

2. Training should be strengthened to provide knowledge and practical skills in emergency first aid injuries for fishermen and seafarers. Every offshore fishery ship should have at least one fishermen that trained first aid and emergency care to be able to handle the accident

3. Each offshore fishery ship should be equipped with medicine cabinets and medical equipment according to regulationsof the Ministry of Health in order to handle marine accidents. Ocean ships should be equipped with medical equipment and essential medicine cabinets on board in accordance with the International Maritime Labor Convention (MLC/2006)