from various ships. They have been summed up in Table 2 along with the most commonly reported life threatening conditions along with the total cases CIRM recorded and assisted from the year 2005-2015.

Table 2. Life threatening conditions for which CIRM received more often requests of medical advice.

YEAR	TOTAL CASES	1	2	3	4	5	6
2005	**1,593**	7	66	82	48	5	1
2006	**1,643**	2	6	7	5	2	0
2007	**1,813**	1	9	7	6	0	1
2008	**1,958**	1	9	7	7	2	1
2009	**2,318**	2	1	8	1	0	0
2010	**2,528**	1	1	1	1	2	2
2011	**2,659**	1	1	1	9	3	2
2012	**3,206**	2	1	1	1	0	5
2013	**3,518**	2	1	1	1	2	1
2014	**4,091**	2	2	1	1	5	1
2015	**2,146**	2	9	7	5	0	2
TOTAL	**27,473**	**214**	**1,303**	**1,141**	**1,018**	**21**	**16**
		%	%	%	%	%	%
		0.78	4.74	4.15	3.70	0.08	0.06

1: Loss of consciousness/convulsions; 2: Serious accidents; 3: Loss of blood; 4: High fever; 5: Serious respiratory problems; 6: Serious diabetes complications

The specificity wanted by the founders of the Centre and that has characterized the mission of CIRM from the beginning of its activity was to provide medical assistance to seafarers of all nationalities in all the seas of the world. This feature differentiates CIRM from some other similar centers operating in different maritime countries, which limit their activity primarily to ships of their flag and / or sailing in the vicinity of their national waters (11,12). Figure 2 shows the nationality of ships requiring medical advice to CIRM from 2010 to 2014 divided into Italians and non-Italians. As shown, the Centre provides the largest majority of his assistance to non-Italian flag ships.

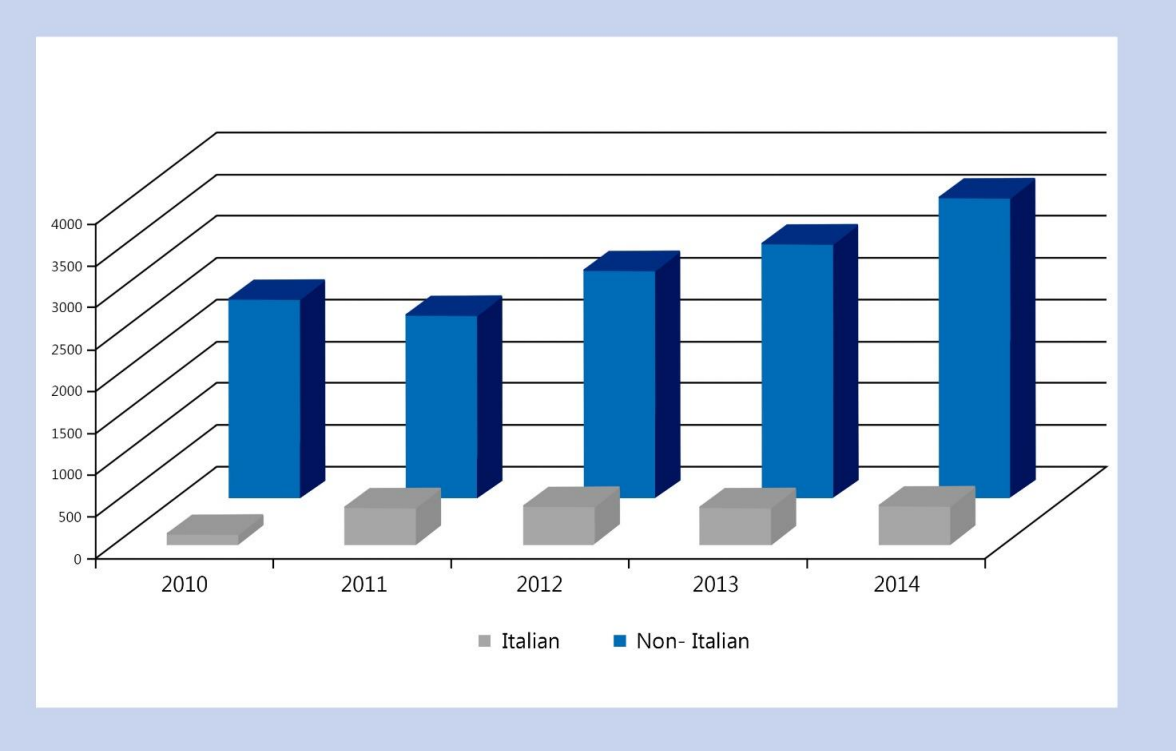

Figure 2: Requests of medical advice received by CIRM from Italian and non-Italian flag ships from 2010 to 2014

An analysis of the trend of different groups of main pathologies assisted by CIRM along the years of activity of the Centre is detailed below. Some analyses were performed starting from 1952, others from more recent years depending on disease classification followed at the time.

Infectious and parasitic diseases: During the period from 1952-84 infectious and parasitic diseases ranged from 2% to 7% of the total diseases managed .From the year 1984-1994 these disease totaled around 5% of the total pathologies assisted by CIRM. A peak of these pathologies was noticeable in 1995-96 (Figure 3), followed by a gradual decrease. Infectious and parasitic diseases showed an upward trend from 2006 to 2011 (Figure 3). It cannot be excluded that the recent increase of these diseases may be due to a greater antibiotic resistance noticeable in the lest few years. In 2012-2014, 3.9% of the diseases managed were due to infections (Figure 3).

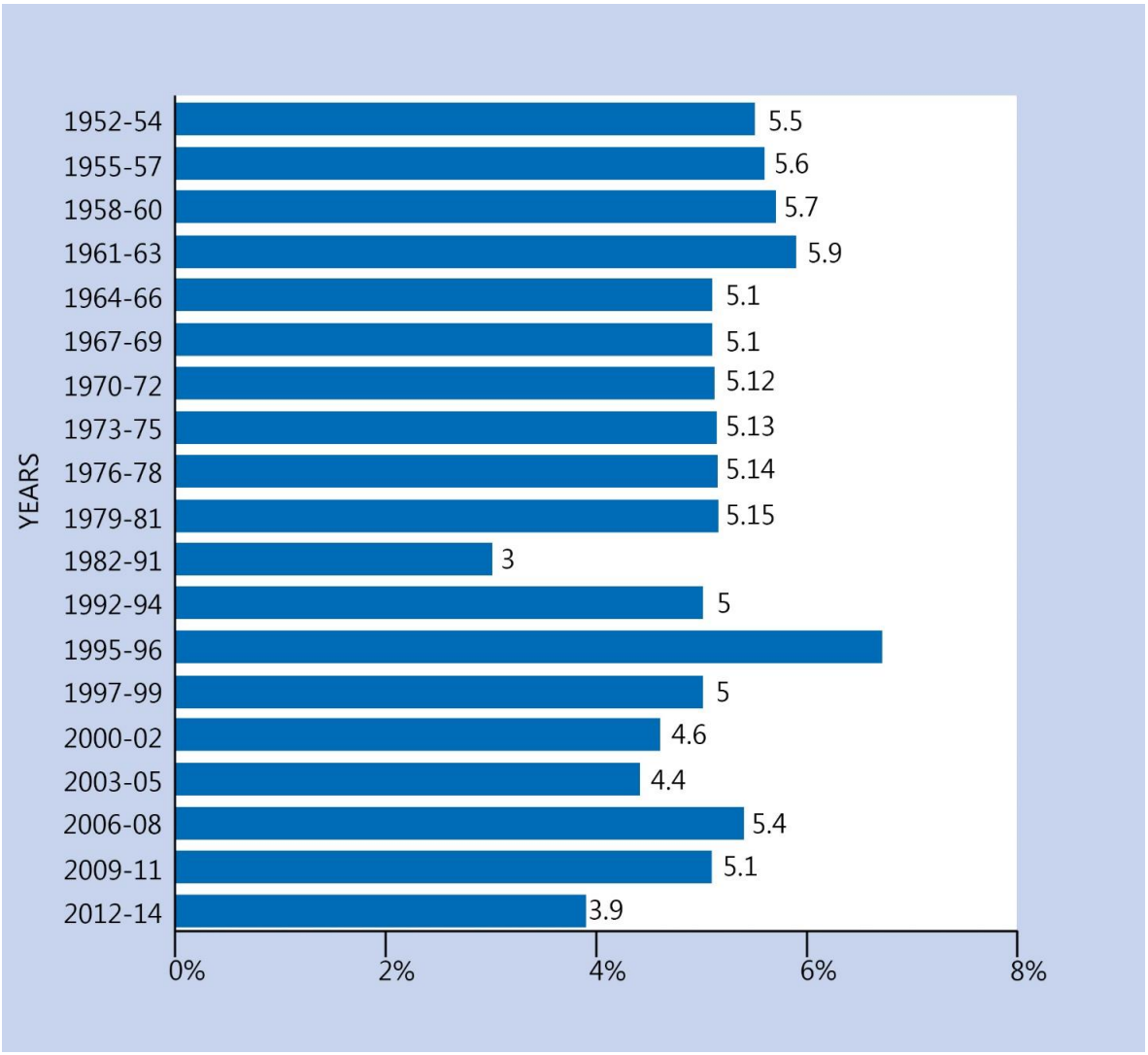

Figure 3: Infectious and parasitic diseases assisted by CIRM from 1952 to 2014. Data are expressed as the percentage of the total cases assisted by the Centre in the years of observation

Diseases of the nervous system: Until 2007, CIRM followed the previous version of the WHO International Classification of Diseases, namely the ICD-9 (13). According to this classification disease of the nervous system and sense organs were grouped together. This makes difficult comparison of the trend of nervous system and eye or ear pathologies along the years. From 1952 to 1972 these pathologies showed a reduction. An increase was noticeable from 1973 to 1982-1991, when these diseases reached the peak of the 6.1% (Figure 4). From 2006 this group of pathologies averages more than the 7% of total pathologies assisted (Figure 4). In

2014 the cases of nervous system and sense organs pathologies assisted were 300, with 116 cases of nervous system diseases (Bell's palsy, neuralgia, transient ischemic attack, stroke) and 184 cases of sense organs diseases (mainly conjunctivitis, and otitis).

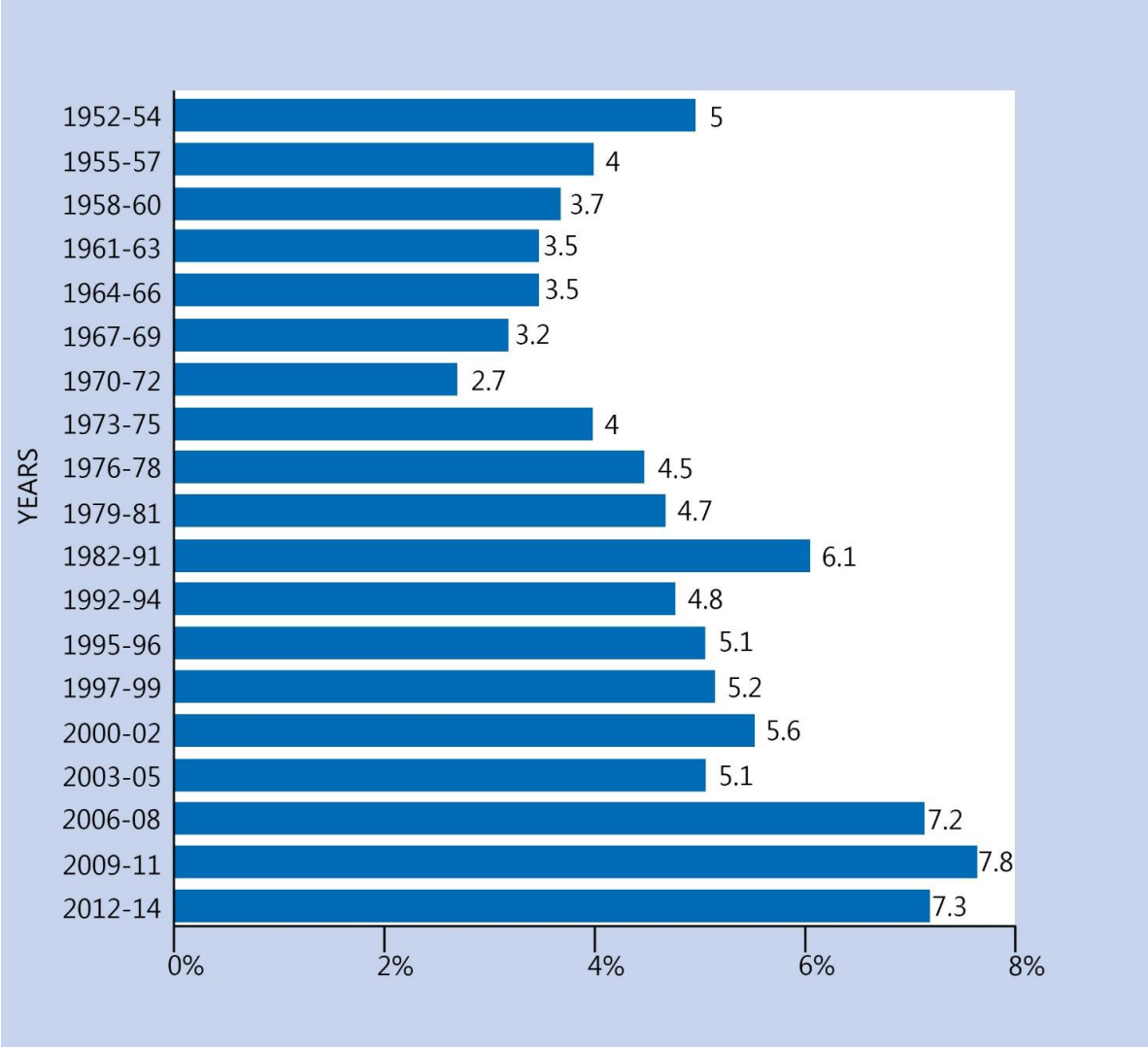

Figure 4: Diseases of the nervous system and organs of sense assisted by CIRM from 1952 to 2014. Data are expressed as the percentage of the total cases assisted by the Centre in the years of observation

Diseases of the circulatory system: Cardiovascular diseases managed by CIRM have seen a steady increase since 1982 (Figure 5) clearly matching the data from other studies which have demonstrated that diets rich in fats and carbohydrates, which become prevalent after introduction of fast food culture has taken a toll on the health of seafarers as well. In the

1970-1975 only 2% of the total cases were due to cardiovascular diseases which jumped to 5% in the period from 1982-84. The most common cardiac complains were ischemic disease and myocardial infarction. From 1992-1994 these cases reached 7% of the total cases dropping marginally only in 2005 to 5.2% only to rise again from 2006-2009 in which cardiac cases accounted for 6.77% of all cases. In 2014 CIRM treated 240 sailors with cardiac issues which is 6% of all cases treated that year (Figure 5).

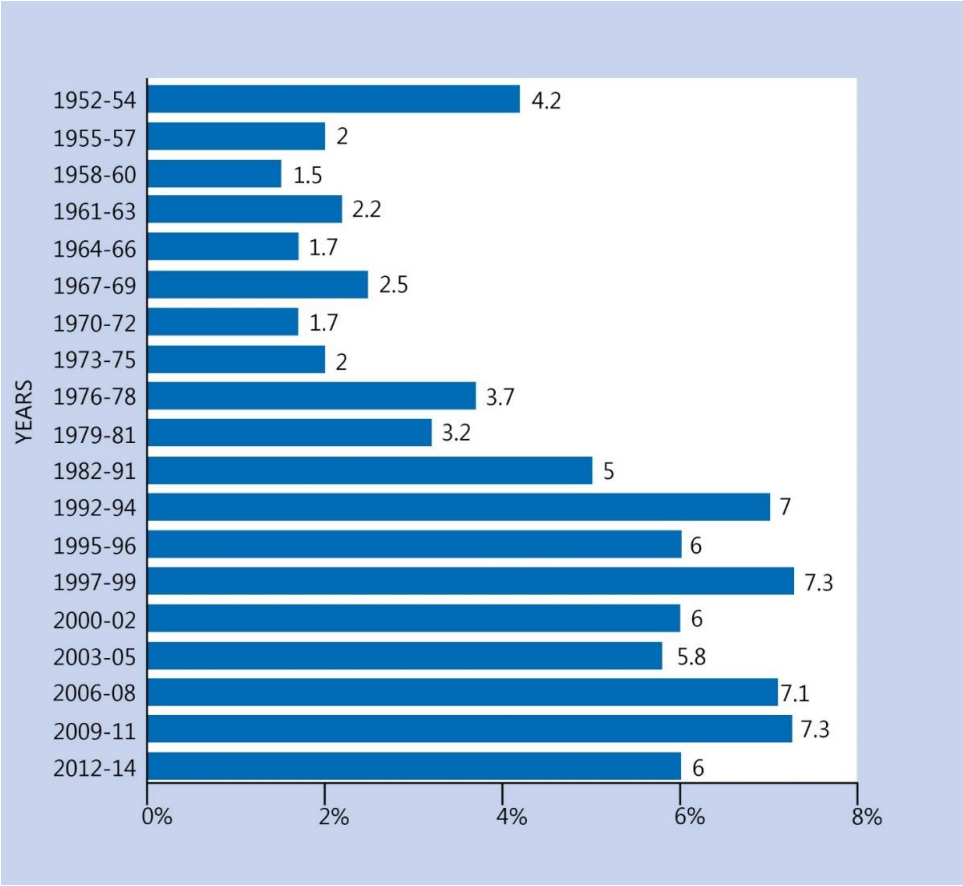

Figure 5: Diseases of the cardiovascular system assisted by CIRM from 1952 to 2014. Data are expressed as the percentage of the total cases assisted by the Centre in the years of observation

Cardiovascular diseases represented the first cause of death among seafarers assisted by CIRM (14).

Diseases of the respiratory system: Respiratory disease rates treated by CIRM have shown a very consistent rate. From the period of 1995-2004 the respiratory disease rates were 5.5%

and in 2014 ,184 cases of respiratory problems were treated at CIRM which represents 5.3% of all diseases treated (data not shown). The most common respiratory issues suffered by seafarers are asthma and bronchitis.

Diseases of the digestive system: From the period of 1952-1984 digestive tract pathologies were the number one cause of referral to CIRM (Figure 6). During the period of 1952-61, 22% of all diseases treated by the organization were digestive issues. The trend declined slightly from 1973-75 to 16.8% only to increase from 1982-91 to 20% (Figure 6). The most frequent digestive tract ailments suffered by seafarers are gastritis, colitis ,ulcers and gallstones. The rates remained more or less same between 1995-2014 and with better hygiene and medicines digestive tract diseases accounted for 17% of all the cases treated by CIRM in 2014. More recently, CIRM has also started collecting data for dental problems faced by a seafarers and a new program to deal with dental hygiene has commenced under supervision of a dentist (15,16).

Diseases of the skin and subcutaneous tissue: Data on diseases of the skin and subcutaneous tissue were collected starting from 1994 (Figure 7). Prevalence of dermatological ailments averaged 3.7% in 2005 to reach the 8.3% of total cases assisted in 2012-2014 (Figure 7). Diagnosis and treatment of dermatological problems on board is today much easier compared to the past as pictures attached to e-mail messages of request of medical advice are in general send to the CIRM. In these specific cases pictures help much more of the otherwise limited and imprecise description can be obtained from a ship's captain or his delegate.

Diseases of the musculo-skeletal system : Similarly, as mentioned above regarding diseases of the skin, data on pathologies of the locomotor system were also collected only since 1994. At the beginning the incidence of these diseases was limited, whereas in 2014 we had 249 cases (6.14) % of musculoskeletal pathologies (Figure 8).

Diseases of the genitourinary system: From 1952-1957 genitourinary diseases represented the 8% of the total cases managed by CIRM. They reached 12% in the period of 1982-84 ,this can be explained by a universal surge in urethritis and genital herpes .During the period of 199-94 there was a slight decrease and these cases went down to 11.4% of all the cases managed.

From 1995-2004 the diseases of the genitourinary system went down to 10% but still represented the third most commonly treated disease onboard. In 2014 they remained at 8.5% (Figure 9).

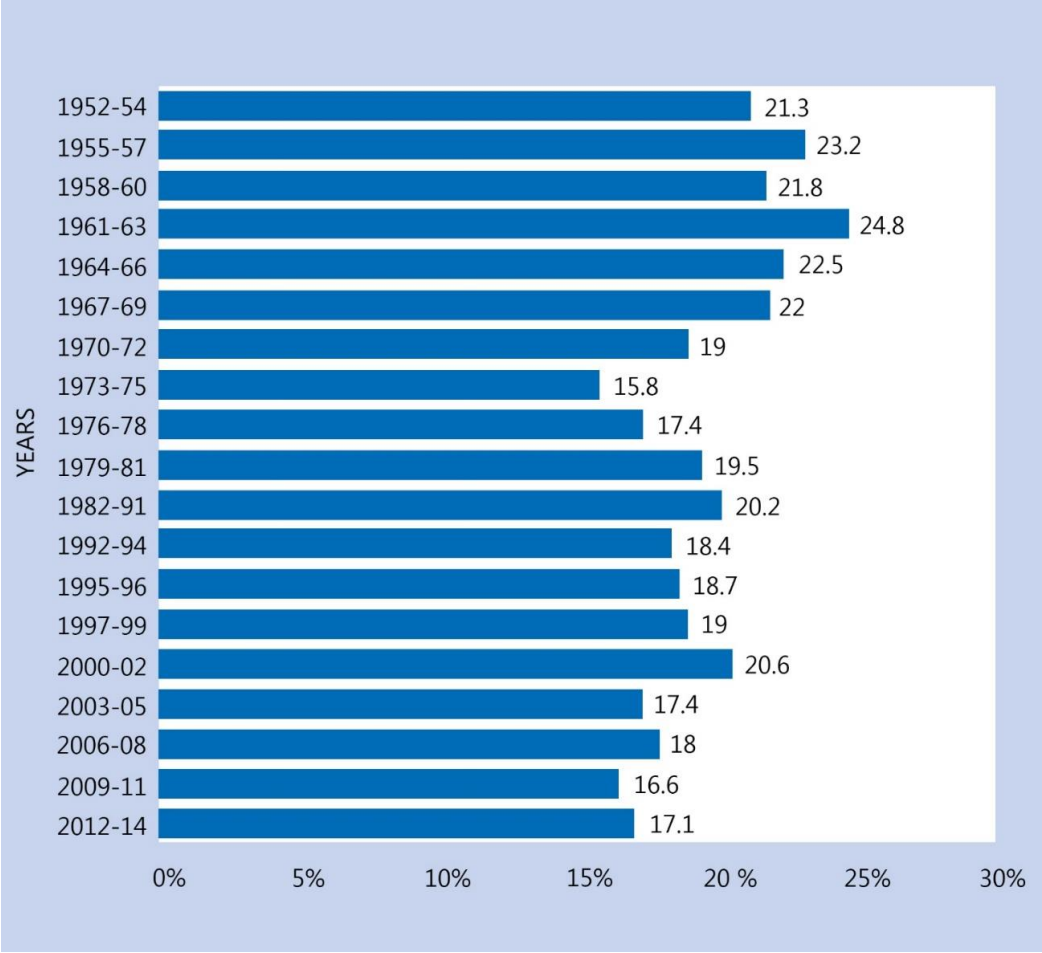

Figure 6: Diseases of the digestive system assisted by CIRM from 1952 to 2014. Data are expressed as the percentage of the total cases assisted by the Centre in the years of observation

Injury, poisoning and certain other consequences of external causes: Occupational injuries have plagued seafarers from antiquity and represent a major portion of all reported cases to CIRM. From 1952 (12%) till 2014 (17%) these occupational injuries have accounted from a high of 23% (1995-2004) to a low of 15% from 1982-84 (Figure 10) .These injuries have decreased a little in the last few years probably due to technological advancements and improved conditions onboard.

The topic of accidents on board of merchant ships, their causes and how to prevent these events was extensively investigated by CIRM (17,18). The human factrs are the prevalent cause of accidents on board ships (17,18) in agreement with data reported in the literature (19). Campaigns for preventing accidents on board ships are also regularly proposed by international organizations such as International Labour Office (ILO) (20) as well as by CIRM (21) Technology and education could contribute remarkably to reduce the incidence of accidents on board ships.

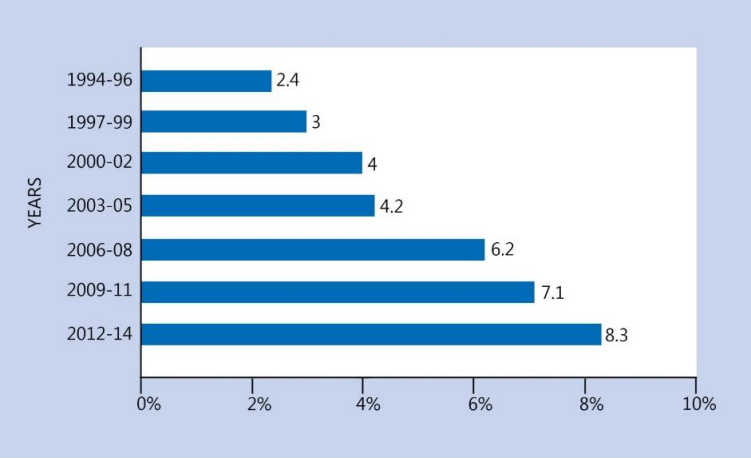

Figure 7: Diseases of the skin assisted by CIRM from 1994 to 2014. Data are expressed as the percentage of the total cases assisted by the Centre in the years of observation

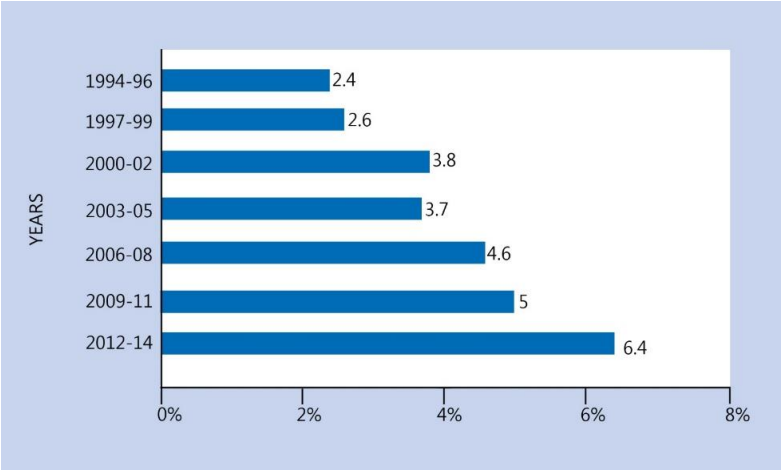

Figure 8: Diseases of the musculo-skeletal system assisted by CIRM from 1994 to 2014. Data are expressed as the percentage of the total cases assisted by the Centre in the years of observation

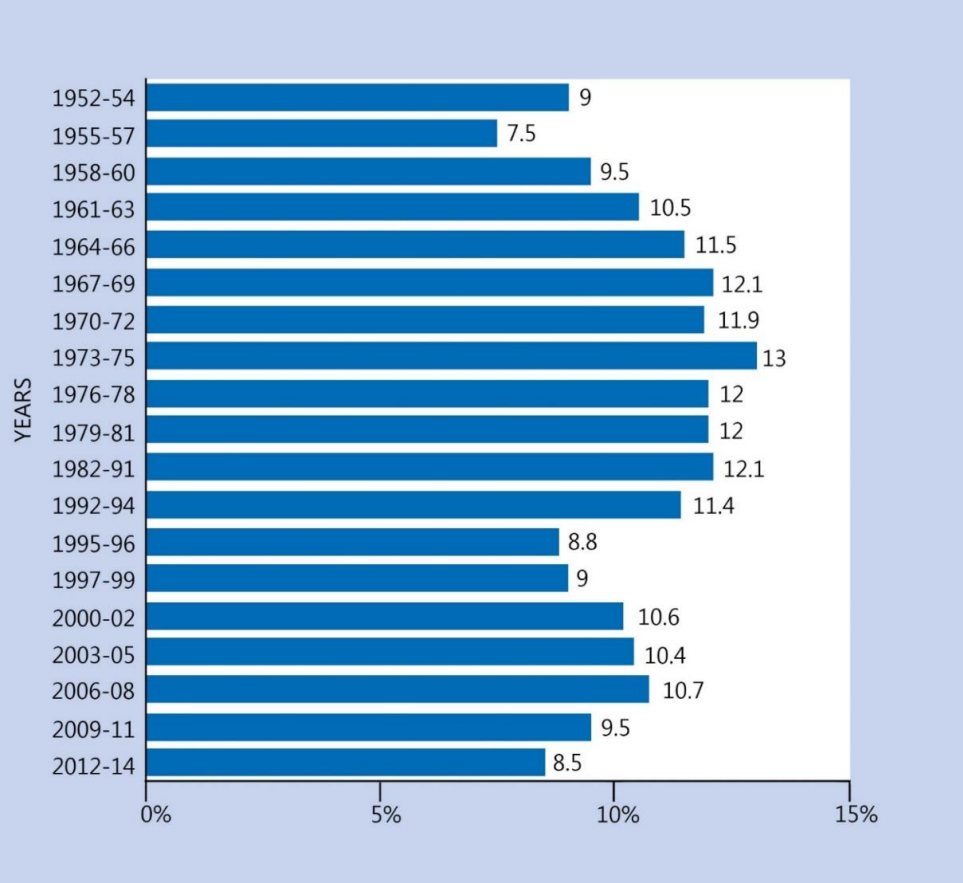

Figure 9: Diseases of the genitourinary system assisted by CIRM from 1952 to 2014. Data are expressed as the percentage of the total cases assisted by the Centre in the years of observation

Discussion

Before the 90s communication was a major problem, it was usually very slow but in the last two decades with great advancements in telecommunication technologies and the advent of satellites and internet, things have changed for the better (1,2,4,7). Today, telecommunications technology allows to connect in real time with TMAS to ships and there is also an increase in awareness about the need for addressing of health problems. This change should also make us reflect on how to organize services of maritime telemedical care, operating procedures more efficiently, to reduce the amount of time taken between a request and response. In short, the technology speeds up everything, allows the center to increase potential, but we also need to consider and adapt our pace to this changing scenario.

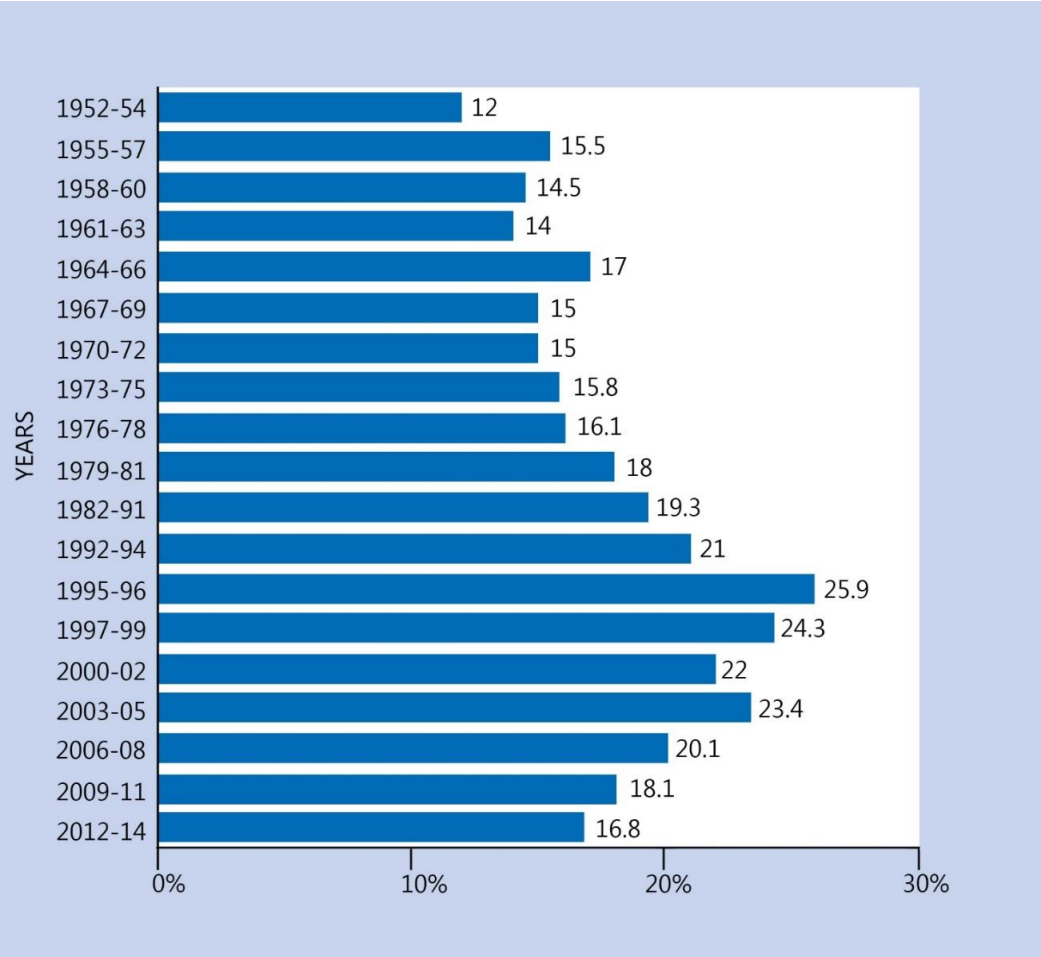

Figure 10: Cases of injury, poisoning and certain other consequences of external causes assisted by CIRM from 1952 to 2014. Data are expressed as the percentage of the total cases assisted by the Centre in the years of observation

In 1980, in general, a message from the China Sea to Rome took no less than 8-10 hours and you had to pass through a sluggish terrestrial telecommunications system supporting maritime communication at the time (1,2,4,7). Today's satellite networks are communicating in real time, the technology improves both the quality of our communications, the kind of information we send is a challenge, an opportunity and that the CIRM , despite some difficulties, is trying to improve its services continuously. These efforts appear to be bearing fruit, given that the number of requests for assistance and, of tele-consultations have increased significantly. During the period of from 1995-2004 CIRM saw a remarkable increase in both capacity and number of calls of assistance from ships. As technology became more efficient, CIRM was able

to assist more sailors than ever. In the past, probably due to possible telecommunication problems, recommendations on medical assistance at sea did not emphasize the role of radio medical advice. The predominant view was "try to help yourself and in case of difficulties ask for radiomedical advice" (22). Today thanks to technological evolution, communications from ashore to a ship are much easier and this can result in an improvement of medical assistance to people on board seagoing vessels. There is general agreement that medical background of ship captains or officers with medical assistance duties on board is quite limited (23). Hence, if technology helps to get connected why do not use telemedical advice at any time.

Telemedicine is the only means by which is possible to get expert advice at sea, and there is significant experience in its advantages as well as its limitations. In spite of the technological progress, medical assistance to seafarers was not always improved in parallel with advances of medicine and of telecommunications. On the other hand, the need to seek medical advice does not occur very often on each ship. Hence, any system developed for maritime telemedicine purposes must be extremely simple on the ship end. Still, the systems must preserve the security and integrity of patient data, as well as help document the information exchange that has taken place between the doctor and the medical officer.

Requests of medical assistance from ships to a specialized ashore centre in general continue to follow the same procedure used probably 100 years ago. The simple description of the symptoms or of the lesions of a seafarer hampered by the limitation of the rudimental medical expertise of ship's captains or officers in charge of medical assistance on board. This description is followed by several questions from the doctor of the telemedical centre to reach a presumptive diagnosis which will bring to the best treatment of the problem(s). Thanks to the progress of technology, a TMAS doctor can assess a patient in person even if not on board, using digital medical devices that can gather vitals, monitor progress, view external lesions, capture images of skin, ears, eyes and other areas. Availability of digital devices such as these take telemedicine a step further.

Based on its own experience of more thousand patients assisted per year on board ships, CIRM has developed a telemedicine cart loaded with high quality peripherals. Peripherals are

assembled to guarantee their mobility. Cords, leads, probes, cameras and other such items are integrated and interfaced with a computer specifically prepared to guarantee the best change of information and the full compatibility of components of the system. This system (Figure 11) is being installed on board of 50 ships belonging to the CMA Ships company in Marseille. These ships will be the first in the world to have available in a large scale a real telemedicine system allowing without a doubt a significant improvement of the quality of medical care could be delivered on board.

Figure 11: Telemedicine case already installed or being installed in 2015 on board of 50 ships belonging to the France company CMA Ships in Marseille. The case contains an artificial intelligence system for helping to prepare a more precise request of medical advice (24) and the telemedical devices listed below: Infrared thermometer, High quality photocamera, Electronic phonendoscope, Blood pressure monitor, 12 derivations ECG, Spirometer and SPO2, Glucometer

Conclusions

CIRM is a center of medical excellence and has provided medical assistance to more remotely located patients on sea vessels than any other organization in the world. 81,016 patients have been assisted so far by CIRM during the course of 80 years along with more than 500,000 requests for medical assistance. These are exciting times for CIRM as the speed and ease of communications continues to get better with time. Apart from the traditional medical services,

the center has now expanded its services to include assessment of stress on bard merchant ships (25) and an increased involvement in training and education for seafarers which has already commenced. The future looks bright for CIRM to advance its goal to provide effective health services to remote patients.

Acknowledgements

Special thanks go to the Presidents and to the members of the Board Trustees of CIRM that in 80 years have guided the Centre, sailing not always in tranquil seas. The CIRM is also particularly grateful to all the doctors who over the years cared with dedication the thousands of seafarers assisted by the Centre. The results achieved in 80 years of activity would not have been possible without the commitment of medical consultants, the telemedicine assistants and administrative and technical support personnel who collaborated with the Centre. The continuous support and help of the Italian Ministry of Infrastructure and Transport (Directorate General for the supervision of port authorities, port facilities and maritime transport and inland waterways) to the activity of CIRM is gratefully acknowledged. A special thank to the Director General Dr Enrico M Puja for the continuous attention and commitment on the side of the CIRM in times of trouble. CIRM is also indebted to the society Telemedware (Ferrara, Italy) for the development of the telemedicine case described in this paper. Graphic assistance of Mr Vincenzo Del Regno in preparing figures of this manuscript is also gratefully acknowledged.

References

1. Rizzo N, Amenta F. I Cinquanta Anni del Centro Internazionale Radio Medico (Italian). Rome: CIRM , 1985

2. Amenta F, Dauri A, Rizzo N. Organization and activities of the International Radio Medical Centre (CIRM). J Telemed Telecare. 1996;2:125-31

3. Goethe WHG, Watson EN, Jones DT (eds). Handbook of Nautical Medicine. Springer-Verlag Berlin, Heidelberg 1984

4. Amenta F. I Sessanta Anni del Centro Internazionale Radio Medico (Italian). Rome: CIRM , 1995

5. Amenta F, Dauri A, Rizzo N. Telemedicine and medical care to ships without a doctor on board. J Telemed Telecare. 1998; 4 Suppl 1:44-5

6. International Maritime Organization (IMO). Medical Assistance at Sea. Circular MSC/Circ.960. IMO, London, 2000

7. Rizzo N, Camerucci S. Telemedicine in radio medical assistance for seafarers: new developments and technical evolutions. In: Bracale M, Denoth F (eds) Proceedings of the Health Telematics '95. Pisa: CNR, 1995:209–12

8. World Health Organization. International Statistical Classification of Diseases and Related Health Problems 10th Revision. Geneva: WHO, 1994

9. D. Lgs. 27 luglio 1999, n. 271. Adeguamento della normativa sulla sicurezza e salute dei lavoratori marittimi a bordo delle navi mercantili da pesca nazionali, a norma della L. 31 dicembre 1998, n. 485 (Italian). Italian Republic Official Gazette 19 August 1999, No. 185

10. Amenta F, Dauri A. Activities of the International Radio Medical Centre (CIRM) in Rome during the last five years (1996-2000). Int Maritime Health.2001;52:68-73

11. Westlund K, Attvall S, Nilsson R, Jensen OC. Telemedical Maritime Assistance Service (TMAS) to Swedish merchant and passengers ships 1997–2012. Int Maritime Health.2016; 67:24-30

12. Vallé B, Camelot D, Bounes V, Parant M, Battefort F, Ducassé JL, Pujos M. Cardiovascular diseases and electrocardiogram teletransmission aboard ships: the French TMAS experience. Int Marit Health. 2010;62:129-36.

13. World Health Organization. International Statistical Classification of Diseases and Related Health Problems 9th Revision. Geneva: WHO, 1975

14. Grappasonni I, Petrelli F, Amenta F. Deaths on board ships assisted by the Centro Internazionale Radio-Medico in the last 25 years. Travel Med Infect Dis, 2012; 10:186-91

15. Mahdi SS, Mancini M, Sibilio F, Amenta F. Research questionnaire on perception of seafarers about oral hygiene and oral dietary habits. World J Dent 2015; 6:1-4

16. Mahdi S, Sibilio F, Amenta F. Dental hygiene habits and oral health status of seafarers. Int Marit Health. 2016;67:9-13

17. Rizzo N, Amenta F. Accidents on board merchant ships. In: Cullen J, Siegrist J (eds) Breakdown in Human Adaptation to Stress. Boston: Nijhoff, 1984:469–83

18. Napoleone P. Accidents on board merchant ships. Suggestions based on Centro Internazionale Radio Medico (CIRM) experience. Int Marit Health. 2016;67:21-23.

19. Hetherington C, Flin R, Mearns K. Safety in shipping: the human element. J Safety Res. 2006;37:401-11

20. International Labour Office. Accident Prevention on Board Ship at Sea and in Port. An ILO code of practice. Geneva: International Labour Office, 2nd edition, 1996

21. Amenta F, Sibilio F. Buone Pratiche in caso di Infortuni a Bordo delle Navi (Italian). Rome: CIRM , 2014

22. International Labour Organization. Medical Advice at Sea Recommendation No. 106. Geneva: ILO, 1958

23. Ricci G, Pirillo I, Rinuncini C, Amenta F. Medical assistance at the sea: legal and medico-legal problems. Int Marit Health. 2014;65:205-9

24 Carletti G, Giuliodori P, Di Pietri V, Peretti A, Amenta F. An ontology-based consultation system to support medical care on board seagoing vessels. Int Marit Health. 2016;67:14-20

25. Carotenuto A, Fasanaro A, Molino I, Sibilio F, Saturnino A, Traini E. The Psychological General Well-Being Index (PGWBI) for assessing stress of seafarers on board merchant ships. Int Marit Health. 2013; 64:215-20

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VIA MEDICA

ORIGINAL PAPER

Dental hygiene habits and oral health status of seafarers

Syed Sarosh Mahdi[1], Fabio Sibilio[2], Francesco Amenta[1, 2]

[1]Telemedicine and Telepharmacy Centre, University of Camerino, Camerino, Italy
[2]Research Department, International Radio Medical Centre (CIRM), Rome, Italy

ABSTRACT

Background: *This study has assessed the dental hygiene habits and problems of seafarers and their attitudes/perceptions regarding oral hygiene using a dental hygiene/habits questionnaire.*

Materials and methods: *A research questionnaire on oral hygiene habits was prepared along with a summary of all the questions and sent to ships via e-mail by Centro Internazionale Radio Medico (CIRM) networks. CIRM, is the Italian Telemedical Maritime Assistance Service (TMAS), and represents the Centre with the largest number of seafarers assisted on board ships worldwide. CIRM proposed the questionnaire to all ships (n = 1,198) asking for medical advice from 1 July 2014 till 31 October 2014. Two dental professionals were involved in the development and analysis of the questionnaire.*

Results: *Seafarers are at risk of several dental health problems due to their oral hygiene and dietary habits, smoking and alcohol consumption, poor oral hygiene knowledge and motivation. Dietary habits during voyages were also questionable and seafarers consume food rich in fermentable carbohydrates, which is a major risk factor for dental caries.*

Conclusions: *Seafarers need better oral hygiene education and care to enable them to manage their oral health in a better way. Life at the sea, under challenging circumstances is not without stress, that is why it is important that seafarers are given complete information about correct oral hygiene protocols and dental hygiene and the advantages for their health of keeping a healthy mouth.*

(Int Marit Health 2016; 67, 1: 9–13)

Key words: seafarers, dental hygiene, questionnaire, oral health, prevention

INTRODUCTION

Dental problems and oral pathologies are not infrequent among seafarers and these workers represent a group of special needs as they are isolated during long sea voyages [1]. On the other hand, provision of health care (including dental care) to sailors is a problematic task, as a large majority of merchant ships do not carry health professionals and are at sea for days or weeks before they can reach a port [2]. For centuries, the captain of the ship has been in charge of the treatment of diseases and the health protection of the crew, while at sea. The possibility of providing medical advice to ships via telecommunication systems became possible with the development of radiotelegraphy by Guglielmo Marconi in 1897. At present, telemedicine is the only mean by which it is possible to get medical advice of a reasonable quality at sea, and there are significant advantages as well as limitations with this approach [3].

Poor oral health of seafarers is considered as a main cause of their dental problems that can result in complications (landing of the patient, diversions from the route) for shipping companies during voyages [1]. Another reason of frequent oral pathologies encountered in sailors is the use of excessive amounts of snacks. They also consume large quantity of tea, coffee and beverages because of their odd working hours and unique lifestyle. Most of dietary substances mentioned above contain fermentable carbohydrates and sugars, which are considered to be prime risk factors of dental caries and associated dental diseases [4, 5]. The

✉ Dr Syed Sarosh Mahdi, School of Life Science (E-Health and Telemedicine), University of Camerino, Via Madonna delle Carceri, 9, 62032 Camerino (MC), Italy, tel: +39-3662280520, e-mail: syedsarosh.mahdi@unicam.it

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