



CENTRO INTERNAZIONALE RADIO MEDICO - C.I.R.M.

Ente Morale D.P.R. 29 Aprile 1950 n. 553 – O.N.L.U.S.

CENTRO ITALIANO RESPONSABILE DELL'ASSISTENZA TELEMEDICA MARITTIMA (T.M.A.S.)

BILANCIO AL 31.12.2015

ATTIVO	2015	2014	Variazione
A) CREDITI VERSO SOCI	-	-	
B) IMMOBILIZZAZIONI			
I - IMMOBILIZZAZIONI IMMATERIALI	12.000	12.000	0,00%
FONDO AMMORTAMENTO	7.200	6.000	20,00%
FONDO SVALUTAZIONE	-	-	
VALORE NETTO	4.800	6.000	-20,00%
II - IMMOBILIZZAZIONI MATERIALI	2.252.813	2.244.761	0,36%
FONDO AMMORTAMENTO	511.141	501.514	1,92%
FONDO SVALUTAZIONE	-	-	
VALORE NETTO	1.741.672	1.743.247	-0,09%
III - IMMOBILIZZAZIONI FINANZIARIE	25.000	25.000	0,00%
TOTALE IMMOBILIZZAZIONI	1.771.472	1.774.247	-0,16%
C - ATTIVO CIRCOLANTE			
I - RIMANENZE	-	-	
II - CREDITI			
- ESIGIBILI ENTRO L'ESERCIZIO SUCCESSIVO	20.625	111.764	-81,55%
- ESIGIBILI OLTRE L'ESERCIZIO SUCCESSIVO	403.934	403.934	0,00%
TOTALE CREDITI	424.559	515.698	-17,67%
III - ALTRE ATTIVITA' FINANZIARIE	-	-	
IV - DISPONIBILITA' LIQUIDE	48.211	23.771	102,81%
TOTALE ATTIVO CIRCOLANTE	472.770	539.469	-12,36%
D - RATEI E RISCONTI			

RATEI ATTIVI	-		
RISCONTI ATTIVI	2.348	26.924	-91,28%
DISAGGIO SU PRESTITI	-	-	
TOTALE RATEI E RISCONTI	2.348	26.924	-91,28%
TOTALE ATTIVO	2.246.590	2.340.640	-4,02%

PASSIVO

A - PATRIMONIO NETTO

I - PATRIMONIO	1.126.852	1.224.432	-7,97%
II - RISERVA SOPRAPPREZZO AZIONI	-	-	
III - RISERVA DI RIVALUTAZIONE	-	-	
IV - RISERVA LEGALE	-	-	
V - RISERVE STATUTARIE	-	-	
VI - RISERVE AZIONI PROPRIE	-	-	
VII - ALTRE RISERVE	- 1	1	
VIII - UTILI (PERDITE) A NUOVO	-	-	
IX - AVANZO (PERDITA) ESERCIZIO	- 34.185	- 97.581	-64,97%
TOTALE PATRIMONIO NETTO	1.092.666	1.126.852	-3,03%

B - FONDI PER RISCHI E ONERI	421.828	396.828	6,30%
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C - TRATTAMENTO DI FINE RAPPORTO	168.982	183.974	-8,15%
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D - DEBITI

- ESIGIBILI ENTRO ESERCIZIO SUCCESSIVO	404.883	313.373	29,20%
- ESIGIBILI OLTRE ESERCIZIO SUCCESSIVO	158.231	264.613	-40,20%
TOTALE DEBITI	563.114	577.986	-2,57%

E - RATEI E RISCONTI

RATEI PASSIVI	-	-	
RISCONTI PASSIVI		55.000	-100,00%
AGGIO SU PRESTITI	-	-	

TOTALE RATEI E RISCONTI	-	<u>55.000</u>	-100,00%
TOTALE PASSIVO	<u>2.246.590</u>	<u>2.340.640</u>	-4,02%
CONTI D'ORDINE	-	-	

CONTO ECONOMICO

A - VALORE DELLA PRODUZIONE

1) PROVENTI	846.224	724.793	16,75%
2) VARIAZ.NE RIMAN.ZE PRODOTTI FINITI, SEMILAVO.	-	-	
3) VARIAZ.NE LAVORI IN CORSO ORDINAZIONE	-	-	
4) INCREMENTI PER LAVORI INTERNI	-	-	
5) ALTRI RICAVI E PROVENTI	<u>350</u>	<u>120</u>	191,67%
TOTALE VALORE PRODUZIONE	846.574	724.913	16,78%

B - COSTO DELLA PRODUZIONE

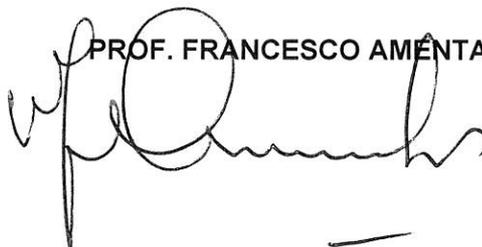
6) ACQUISTI MATERIE PRIME, DI CONSUMO E MERCI	1.451	4.079	-64,43%
7) COSTI PER SERVIZI	398.140	362.792	9,74%
8) GODIMENTO DI BENI DI TERZI	5.095	4.571	11,46%
9) COSTI DEL PERSONALE:			
a) SALARI E STIPENDI	263.226	245.242	7,33%
b) ONERI SOCIALI	62.931	66.745	-5,71%
c) TRATTAMENTO FINE RAPPORTO	19.118	21.176	-9,72%
d) TRATTAMENTO DI QUIESCENZA	-	-	
e) ALTRI COSTI DEL PERSONALE		1.139	-100,00%
10) AMMORTAMENTI E SVALUTAZIONI:			
a) AMMORTAMENTO IMMOBILIZZAZIONI IMMATERIALI	1.200	1.200	0,00%
b) AMMORTAMENTO IMMOBILIZZAZIONI MATERIALI	9.627	9.589	0,40%
c) SVALUTAZIONI DELLE IMMOBILIZZAZIONI	-	-	
d) SVALUTAZIONE CREDITI ATTIVO CIRCOLANTE	-	-	
11) VARIAZIONE RIMANENZE MATERIE E MERCI	-	-	

12) ACCANTONAMENTI PER RISCHI	-	-	
13) ALTRI ACCANTONAMENTI	-	-	
14) ONERI DIVERSI DI GESTIONE	<u>46.474</u>	<u>39.740</u>	16,95%
TOTALE COSTO PRODUZIONE	<u>807.262</u>	<u>756.273</u>	6,74%
DIFFER.ZA TRA VALORE E COSTI DELLA PRODUZ.NE	39.312	- 31.360	-225,36%
C -PROVENTI E ONERI FINANZIARI			
15) PROVENTI DA PARTECIPAZIONI		-	
16) ALTRI PROVENTI FINANZIARI:			
a) DA CREDITI ISCRITTI NELLE IMMOBILIZZAZIONI	-	-	
b) DA TITOLI ISCRITTI NELLE IMMOBILIZZAZIONI	-	-	
c) DA TITOLI ISCRITTI NELL'ATTIVO CIRCOLANTE	-	-	
d) PROVENTI DIVERSI DAI PRECEDENTI	2	4	-50,00%
17) INTERESSI E ALTRI ONERI FINANZIARI	14.129	21.225	-33,43%
17 bis) UTILI E PERDITE SU CAMBI	<u>-</u>	<u>-</u>	
TOTALE PROVENTI E ONERI FINANZIARI	- 14.127	- 21.221	-33,43%
D - RETTIFICHE DI ATTIVITA' FINANZIARIE			
18) RIVALUTAZIONI			
a) DI PARTECIPAZIONI	-	-	
b) DI IMMOBILIZZAZIONI FINANZIARIE	-	-	
c) DI TITOLI ISCRITTI NELL'ATTIVO CIRCOLANTE	-	-	
19) SVALUTAZIONI			
a) DI PARTECIPAZIONI	25.000	-	
b) DI IMMOBILIZZAZIONI FINANZIARIE	-	-	
c) DI TITOLI ISCRITTI NELL'ATTIVO CIRCOLANTE	<u>-</u>	<u>-</u>	
TOTALE RETTIFICHE ATTIVITA' FINANZIARIE	- <u>25.000</u>		
E - PROVENTI E ONERI STRAORDINARI			

20) PROVENTI	647	10.080	-93,58%
PLUSVALENZE DA ALIENAZIONE	-	-	
21) ONERI	10.541	37.382	-71,80%
MINUSVALENZE DA ALIENAZIONE		-	
TOTALE PARTITE STRAORDINARIE	- 9.894	- 27.302	-63,76%
RISULTATO PRIMA DELLE IMPOSTE	- 9.709	- 79.883	-87,85%
22) IMPOSTE SUL REDDITO ESERCIZIO:			
IMPOSTE CORRENTI	24.476	17.698	38,30%
IMPOSTE DIFFERITE	-	-	
IMPOSTE ANTICIPATE	-	-	
23) UTILE (PERDITA) ESERCIZIO	- 34.185	- 97.581	-64,97%

IL PRESIDENTE

PROF. FRANCESCO AMENTA



NOTA INTEGRATIVA E RELAZIONE SULLA GESTIONE

AI SENSI ART.2435 BIS C.C.

Il bilancio d'esercizio di cui la presente nota integrativa costituisce parte integrante è redatto avvalendosi della facoltà di cui all'art. 2435 bis c.c., non essendo stati superati, nei due esercizi precedenti, almeno due dei limiti indicati nell'art. 2435 bis stesso.

Il bilancio è altresì redatto conformemente agli art. 2423, 2423 ter, 2424, 2424 bis, 2425 e 2425 bis c.c. secondo principi conformi a quanto stabilito dall'art. 2423 bis comma 1 c.c. e criteri di valutazione di cui all'art. 2426 c.c.

I CRITERI DI VALUTAZIONE SONO CONFORMI ALLE DISPOSIZIONI DELL'ART. 2426 c.c. e non sono difformi da quelli osservati nella redazione del bilancio del precedente esercizio;

- non si sono verificati casi eccezionali che abbiano reso necessario il ricorso a deroghe di cui all'art. 2423 comma 4 e all'art. 2423 bis comma 2 ;
- non si è proceduto al raggruppamento di voci nello Stato Patrimoniale e nel Conto Economico ;
- non vi sono elementi dell'attivo e del passivo che ricadono sotto più voci dello schema.

IN PARTICOLARE

1) CRITERI APPLICATI NELLA VALUTAZIONE DELLE VOCI DEL BILANCIO

a) Le immobilizzazioni materiali e immateriali sono state valutate al costo di acquisto.

Gli ammortamenti delle stesse sono stati calcolati in funzione dell'effettivo utilizzo e della residua utilità futura dei beni.

b) I crediti sono iscritti secondo il presumibile valore di realizzo.

PIU' IN GENERALE SI OSSERVA:

- i risconti sono iscritti sulla base del principio della competenza dei costi;
- il trattamento di fine rapporto risulta aggiornato secondo la normativa vigente;
- i debiti risultano iscritti per importi corrispondenti al loro valore nominale;
- i costi e le entrate sono stati determinati secondo il principio di prudenza e di competenza;

Le valutazioni di cui sopra sono state determinate nella prospettiva della continuazione dell'attività dell'Ente.

3 bis) L'ENTE NON POSSIEDE IMMOBILIZZAZIONI IMMATERIALI DI DURATA INDETERMINATA.

4) VARIAZIONI INTERVENUTE NELLA CONSISTENZA DELLE ALTRE VOCI DELL'ATTIVO E DEL PASSIVO

VOCI DI BILANCIO	2014	+	-	2015
CREDITI VERSO SOCI	-	-	-	-
IMMOB. IMMATERIALI	6.000	-	1.200	4.800
IMMOB. MATERIALI	1.743.247	8.052	9.627	1.741.672
IMMOB. FINANZIARIE	25.000	-	-	25.000
RIMANENZE	-	-	-	-
CREDITI	515.698	-	91.139	424.559
ALTRE ATTIVITA' FINANZ.	-	-	-	-
DISPONIBILITA' LIQUIDE	23.771	24.440	-	48.211
RATEI ATTIVI	-	-	-	-
RISCONTI ATTIVI	26.924	2.348	26.924	2.348
DISAGGIO SU PRESTITI	-	-	-	-
FONDI RISCHI E ONERI	396.828	25.000	-	421.828
TRATT. FINE RAPPORTO	183.974	16.911	31.903	168.982
DEBITI	577.986	-	14.872	563.114
RATEI PASSIVI	-	-	-	-
RISCONTI PASSIVI	55.000	-	55.000	-
AGGIO SU PRESTITI	-	-	-	-

In maggior dettaglio:

- La voce immobilizzazioni materiali si è incrementata per investimenti effettuati nell'anno (circa 8.000 euro).
- La voce fondo rischi ed oneri accoglie l'accantonamento, relativo alla partecipazione iscritta tra le immobilizzazioni finanziarie, effettuato per tener conto della sua temporanea perdita di valore.
- La voce trattamento di fine rapporto si è incrementata per l'ammontare accantonato nell'anno a norma dell'articolo 2120 c.c., comma 1 e al contempo ha subito un decremento a seguito della liquidazione effettuata per l'interruzione di un rapporto di lavoro con un dipendente.
- La voce debiti evidenzia un decremento netto del 2,5% rispetto all'esercizio precedente e una diversa struttura degli stessi in termini di scadenza: ad un incremento di debiti a breve scadenza, fisiologico non avendo sottoscritto altri finanziamenti, si è contrapposta una significativa riduzione della posizione debitoria a lungo termine.

5) PARTECIPAZIONI IN IMPRESE CONTROLLATE O COLLEGATE

L'Ente, nel luglio 2014, ha sottoscritto l'intero capitale sociale della società "C.I.R.M. SERVIZI S.R.L." a socio unico, come da delibera del Consiglio di Amministrazione. Nel 2015 la società controllata ha registrato un andamento negativo tale per cui si è reso necessario, in ottica prudenziale, accantonare un importo pari a quello della partecipazione immobilizzata ad un fondo svalutazioni; tuttavia la perdita di valore della partecipazione, sulla base delle prospettive operative future, dei contratti sottoscritti e del fatturato 2016, ad oggi pari a tre volte il fatturato dell'intero 2015, può considerarsi contingente essendo possibile il ripristino dell'equilibrio economico in un arco temporale di brevissimo termine.

6) AMMONTARE DEI CREDITI E DEI DEBITI DI DURATA RESIDUA SUPERIORE A CINQUE ANNI E GARANZIE REALI CONNESSE

Tra i debiti iscritti nello Stato Patrimoniale quello nei confronti di Equitalia, articolato in un piano di rateazione, ha ridotto la sua durata residua al di sotto dei cinque anni (nello specifico 2 anni e 2 mesi). Delle 72 rate concesse con decorrenza marzo 2012, infatti, alla data di chiusura del bilancio ne sono state pagate, alle scadenze concordate, 43 per un importo di 233.288,70 euro.

Il finanziamento acceso nel corso del 2013 presso Banca Prossima prevede una durata residua di poco inferiore ai quattro anni: l'importo residuo, pari a euro 168.965,25, è in scadenza per euro 50.632,25 nel prossimo esercizio, oltre per il residuo.

Sono presenti, per ammontari modesti, il deposito cauzionale versato dall'Ente alla Telecom (tra i crediti) e quello versato da un inquilino di uno dei due immobili locati di proprietà dell'Ente al momento della stipula del contratto di locazione (tra i debiti).

È sempre presente una componente invece molto rilevante nel suo ammontare, di circa 400.000 euro, rappresentante i crediti giudizialmente riconosciuti a favore dell'Ente nei confronti dell'ex segretario amministrativo. Non si ritengono realizzabili nel breve periodo.

6 bis) L'ENTE NON HA EFFETTUATO OPERAZIONI SU CAMBI NEL CORSO DELL'ESERCIZIO.

6 ter) L'ENTE NON HA EFFETTUATO OPERAZIONI PRONTI CONTRO TERMINE.

7bis) INDICAZIONE VOCI PATRIMONIO NETTO

VOCI DI BILANCIO	2014	+	-	2015
PATRIMONIO	1.224.432		97.580	1.126.852
RISERVA SOVRAP. AZIONI	-	-	-	-
RISERVE DI RIVALUTAZIONE	-	-	-	-
RISERVA LEGALE		-	-	-
RISERVE STATUTARIE	-	-	-	-
RISERVAZIONI PROPRIE	-	-	-	-
ALTRE RISERVE	1	-	3	- 2
UTILI (PERDITE) ANUOVO		-	-	-
UTILE (PERDITA) ESERCIZIO	- 97.581	- 34.185	- 97.581	- 34.185

Il patrimonio risulta ridotto a seguito della copertura del disavanzo risultante al termine dell'esercizio 2014.

8) AMMONTARE DEGLI ONERI FINANZIARI IMPUTATI AI VALORI ISCRITTI NELL'ATTIVO.

Nell'esercizio non sono stati imputati oneri finanziari a valori iscritti nell'attivo.

11) PROVENTI DA PARTECIPAZIONI DI CUI ALL'ART. 2425 N.15 DIVERSI DAI DIVIDENDI.

Nell'esercizio non sono stati conseguiti proventi di questa natura.

18) AZIONI DI GODIMENTO, OBBLIGAZIONI CONVERTIBILI

L'Ente non ha emesso azioni o titoli di cui all'oggetto.

19) L'ENTE NON HA EMESSO STRUMENTI FINANZIARI

19bis) FINANZIAMENTI

Al 31 dicembre 2015 è in piedi un mutuo chirografario contratto con Banca Prossima del gruppo Intesa San Paolo. L'Ente può, inoltre, avvalersi, all'occorrenza, dello scoperto di conto corrente concesso dalla banca tesoriera.

20) SI DA' ATTO AI SENSI DELL'ART. 2447 SEPTIES C.C. CHE NON ESISTONO PATRIMONI DESTINATI AD UNO SPECIFICO AFFARE.

21) SI DA' ATTO AI SENSI DELL'ART 2447 DECIES C.C. CHE NON ESISTONO PROVENTI DA PATRIMONI SEPARATI .

22) LE LOCAZIONI FINANZIARIE

Non esistono contratti di locazione finanziaria in essere.

Da un primo confronto delle voci di costo e di ricavo relative all'anno 2015 emerge un margine positivo della gestione caratteristica dell'ente. Dal confronto rispetto al 2014 è evidente un notevole miglioramento del risultato tra i due anni.

Parimenti, si registra un netto miglioramento del risultato di esercizio in generale.

In particolare, oltre alle entrate derivanti dal contributo statale e dai contributi liberali si è registrato un incremento di proventi derivanti dalle attività svolta dall'ente derivanti da corsi di formazione e dalla propaganda per il 5 per mille.

Dal punto di vista dell'analisi dei costi, quelli di gestione presentano scostamenti minimi, sia in positivo che in negativo.

Con riferimento specifico all'attività commerciale, il risultato raggiunto al termine del periodo è positivo; tale circostanza la rende una fonte di entrate di fondamentale importanza per l'Ente contribuendo con i suoi frutti al perseguimento di una maggior autonomia finanziaria rispetto al contributo statale. Contributo che, in effetti, risulta insufficiente a coprire i costi di gestione per un'attività dal rilevante impegno tecnologico, quale la telemedicina marittima, che il C.I.R.M. svolge dal 1935. Un'idea dell'impegno umanitario e sociale dell'attività del C.I.R.M., che, negli

ambientanti marittimi è considerato una eccellenza del nostro paese, può venire dall'esame di una pubblicazione scientifica, in lingua inglese perché diretta agli addetti ai lavori – si ricorda che l'inglese è la lingua correntemente utilizzata sia dalla ricerca biomedica, che tra le marinerie – e che riassume, quantitativamente, i dati dell'assistenza sanitaria del C.I.R.M. negli 80 anni della propria attività (SS Mahdi e F Amenta, 80 Years of CIRM . A Journey of commitment and dedication in providing Maritime Medical Assistance, **Allegato 1**). In 80 anni di attività il C.I.R.M. ha assistito 81.016 ammalati a bordo di navi in navigazione, con all'attivo oltre 500.000 radio/teleconsultazioni (visite mediche a distanza realizzate attraverso i sistemi di telecomunicazione). Nonostante la progressiva riduzione del contributo dello Stato determinato da necessità di contenimento della spesa pubblica, il numero dei pazienti assistiti dal C.I.R.M. è in costante aumento, passando da una media di 1.060 casi l'anno nel decennio 1995-2004 a 2.747 nel decennio successivo (Allegato 1).

Dati che fanno dell'Ente il TMAS (Telemedical Maritime Assistance Service) con il maggior numero di ammalati assistiti a livello planetario.

L'attività commerciale inserita nell'ambito della formazione medica e iniziata nel primo trimestre 2013, ha generato risultati netti positivi, come dai dati sintetici di seguito riportati:

Ricavi	225.438
Costi per servizi	58.523
Costi del personale	100.493
Ammortamenti	2.583
Oneri diversi	5.251
Imposte	11.972
Reddito netto*	49.200

*Al lordo dei costi promiscui.

L'ammontare dei proventi complessivi è aumentato rispetto allo scorso esercizio.

Come meglio evidenziato dalla tabella che segue, le componenti che sono venute a crescere sono quelle rivenienti dai settori nei quali la Fondazione sta convogliando i propri sforzi affinché, dotandosi sempre di maggiore autonomia finanziaria, le proprie attività possano crescere, sviluppando servizi, tecnologie e livello professionale adeguati al mantenimento di quella eccellenza finora raggiunta. Attività che hanno visto e vedono nell'impegno nella ricerca e nella formazione la caratteristica principale dell'azione di identificazione di nuovi strumenti di sostegno all'attività dell'Ente. Ente, che, tra l'altro, per il proprio impegno scientifico, è stato iscritto nello Schedario Anagrafe Nazionale della Ricerca (art 64, comma 1, DPR 11 luglio 1980, n 382). Impegno scientifico e di ricerca i cui risultati sono utilizzati principalmente per migliorare la qualità dell'assistenza che il C.I.R.M. offre e per il quale l'Ente ha anche ottenuto contributi economici a supporto di tali attività. Nel 2015 il C.I.R.M. è stato impegnato in uno studio sulle patologie odontoiatriche dei marittimi imbarcati (Allegato 2), ha realizzato un sistema di intelligenza artificiale per guidare la descrizione di sintomi da parte dei comandanti delle navi in modo che la richiesta di assistenza medica sia il più possibile precisa e circostanziata (Allegato 3) ed un software dedicato alla gestione della farmacia di bordo (Allegato 4). Tali esperienze, i cui risultati sono acclusi, sono state oggetto di pubblicazioni su riviste a diffusione internazionale a testimonianza della validità e della qualità del lavoro svolto dal C.I.R.M. nel settore della ricerca. Le pubblicazioni stesse, di cui agli allegati 2-4 sono di seguito elencate:

1: Mahdi SS, Sibilio F, Amenta F. Dental hygiene habits and oral health status of seafarers. Int Marit Health. 2016;67(1):9-13

2: Carletti G, Giuliadori 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(1):14-20.

3: Nittari G, Peretti A, Sibilio F, Ioannidis N, Amenta F. Development of software for handling ship's pharmacy. *Int Marit Health*. 2016;67(2):72-8.

Nel passato il C.I.R.M. non è stato sistematicamente coinvolto in attività di formazione di quelli che poi, con tutta probabilità, sarebbero stati gli utenti dei servizi del Centro. Tale situazione pone numerosi problemi. Le abilità che gli ufficiali della marina mercantile debbono acquisire non possono, per il limitatissimo tempo dedicato alla formazione sanitaria degli interessati, essere altro che frammentarie e dovrebbero mirare, principalmente, ad aumentare la sensibilità del bordo a meglio collaborare con il TMAS scelto come riferimento. Purtroppo non sempre tale aspetto viene adeguatamente sviluppato nei corsi attualmente realizzati in Italia. Per tale ragione il C.I.R.M. ha inteso proporre propri Corsi di formazione (primo soccorso, esecutore BLS/D, medical care, igiene per cuochi di bordo). Corsi proposti al Ministero della Salute per l'autorizzazione e per diversi dei quali la stessa autorizzazione è già stata ottenuta, mentre per altri il percorso autorizzativo è in itinere. Corsi caratterizzati dalla trattazione di tematiche di grande attualità come il Regolamento Sanitario Internazionale e la parte sanitaria della Maritime Labour Convention (MLC) 2006, che, tra l'altro, pongono obblighi a cui, specie gli ufficiali con compiti di assistenza medica, devono adempiere. Tali norme si prefiggono il fine nobilissimo della tutela della salute degli equipaggi, ma, purtroppo, essendo il relativo impianto spesso misconosciuto, sono solo viste come un obbligo fine a se stesso e non vengono considerate per l'apporto alla civiltà della cultura della salute di cui sono portatrici. Stesse considerazioni valgono per la necessità, per il bordo, di sviluppare la collaborazione con il TMAS e le capacità di dialogo e di interazione tra il bordo ed il centro medico di riferimento. In tale ambito si è sviluppato l'impegno del C.I.R.M., che ha voluto enfatizzare, nelle

sedi competenti, i limiti che il know-how che un corso di materia sanitaria della durata di pochi giorni può fare sviluppare, orientando maggiormente l'impegno verso lo sviluppo della consapevolezza, con l'eccezione, ovviamente, dell'automedicazione, di una costante interazione tra il bordo ed il TMAS in caso di patologie o infortuni.

Tale impegno ha avuto anche un discreto ritorno economico e gli spazi del Centro di formazione multimediale che opera nella sede del C.I.R.M. sono sempre più frequentati da persone che vogliono incrementare il proprio bagaglio culturale aderendo alle proposte formative del C.I.R.M. Adesione che, come si diceva, fornisce all'Ente i mezzi per consentire di portare avanti la propria missione in maniera costante e con un occhio rivolto sempre al progresso delle tecnologie. Nel passato la normativa internazionale affermava che ai marittimi imbarcati doveva essere garantita un'assistenza medica di qualità elevata il più vicina possibile a quella che un medico a terra possa erogare ad un paziente che abbia davanti a se. Oggi l'impegno del C.I.R.M. fatto di professionalità, investimenti in tecnologie e formazione sta rendendo una realtà quanto fino a pochi anni fa poteva essere considerato soltanto una chimera.

Analisi delle componenti positive.

Di seguito il dettaglio delle entrate dell'Ente negli ultimi cinque anni:

<u>Natura</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>
<i>C. Statale</i>	671.777	557.517	546.707	541.114	535.824
<i>C. Volontari</i>	155.332	57.472	21.044	17.825	300
<i>Contr. 80° CIRM</i>					33.954
<i>Affitti attivi</i>	8.077	8.077	8.077	5.397	12.930
<i>Cessione spazi</i>			1.200		950

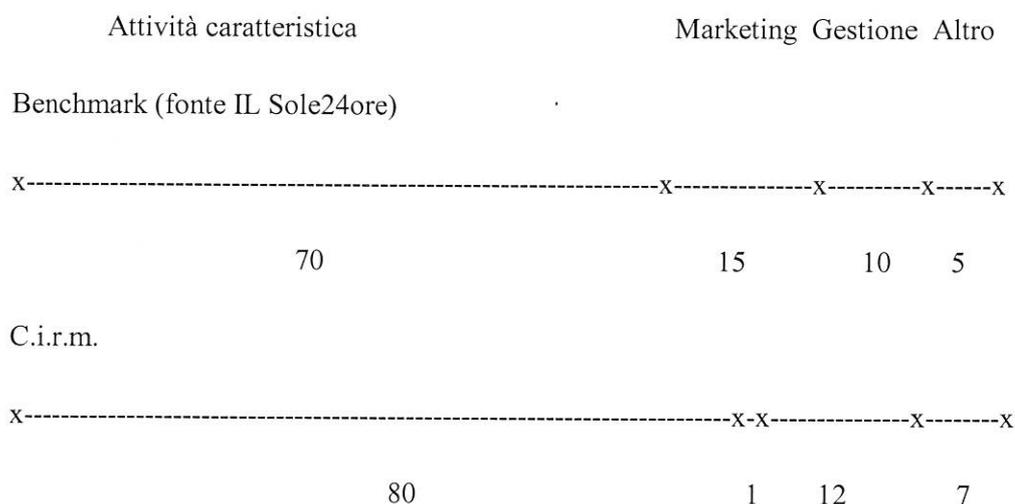
<i>Contr. 5 X 1000</i>	zero	15.931	34.903	38.155	34.552
<i>Eventi Scientifici di promozione Attività dell' Ente</i>	12.570	5.070	950	zero	zero
<i>Corsi formaz.*</i>	300	4.803	36.537	37.076	228.364
<i>Sorv. sanitaria*</i>	zero	17.377	26.861	35.229	zero
<i>Progetti e Contributi Ricerca *</i>	20.000	33.750	63.000	49.998	zero
Totale	868.056	699.997	739.279	724.794	846.524

Le voci contrassegnate dall'asterisco rappresentano i nuovi canali e strumenti di fundraising che l'Ente ha iniziato a sviluppare a partire sin dall'anno 2011 per reperire risorse in materia autonoma e sulle quali l'attuale Presidenza ha intenzione di concentrare ulteriormente i propri sforzi negli anni a venire.

Tali voci, che al termine del primo anno di attività, rappresentavano il 3,8% degli introiti complessivi 2011, sono aumentate per l'anno 2012 all'8,7% delle entrate complessive (7% a parità di costi) incrementandosi ulteriormente nell'anno 2013, grazie alle ulteriori iniziative dell'Ente, tanto da rappresentare il 17,39% delle entrate nel loro complesso. Dopo una leggera flessione registrata nel 2014, nel 2015 gli sforzi profusi dall'ente negli anni passati per rendersi economicamente autonomo tendono a palesarsi registrando un incremento significativo pari al 27,10%.

Analisi delle componenti negative.

In merito al confronto delle modalità di spesa dell'Ente, suddivise per destinazione delle stesse, rispetto al benchmark (punto di riferimento o optimum) del settore no profit, come appresso schematizzato.



Per l'anno 2015, le percentuali di spesa nelle diverse aree si sono considerevolmente avvicinate al benchmark di settore a dimostrazione della corretta taratura delle modalità operative adottate. L'incidenza della spesa in marketing (attività strategica per una Onlus) risulta purtroppo minima ma, come avviene anche nelle aziende industriali, è la prima, o una delle prime, voci di spesa a essere ridimensionata.

In merito allo scostamento delle spese effettive rispetto a quelle preventivate nel Budget 2015, è possibile meglio dettagliare l'andamento delle stesse mediante la successiva rappresentazione schematica:

Aggregato di costo	Budget 2015	Consuntivo 2015	Scostamento (%)
Spese per servizi	327.800	398.140	21,46
Spese per personale	327.000	345.275	5,59
Ammortamenti	10.871	10.827	-0,40
Oneri diversi di gestione	107.300	47.925	-55,34
Imposte correnti	27.000	24.476	-9,35
Altre voci residuali	18.000	44.224	145,69
Totale Spese	817.971	870.867	6,47

Il totale delle spese è rappresentato dal totale delle spese previste nel budget e dal totale delle spese effettivamente sostenute, considerando anche gli aggregati di spesa ulteriormente presenti (e non specificatamente indicati nel prospetto) ma di valori poco significativi tanto da ricomprenderli all'interno del macro aggregato "Altre voci residuali" ed esclusi gli oneri straordinari non prevedibili.

Premesso che lo scostamento in termini aggregati tra preventivo e consuntivo risulta essere minimo, occorre analizzare nel dettaglio la composizione delle singole poste evidenziate.

Le voci relative alle spese per servizi, agli oneri diversi di gestione e alle altre voci residuali presentano un notevole scostamento in termini percentuali (sia positivi che negativi) rispetto al preventivo; a causa di tale scostamento, come prima cosa, si provvederà ad effettuare una verifica della corretta allocazione delle componenti di costo nel documento budget previsionale e la corretta corrispondenza degli aggregati tra i due documenti.

Rispetto normativa D.L. 78/2010 E D.L. 112/2008.

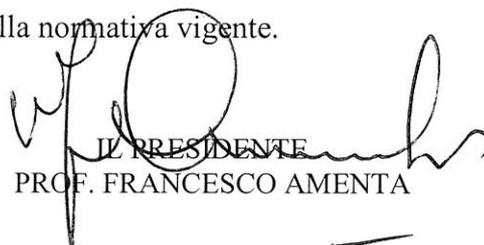
Si da atto che in applicazione della normativa che ha rimodulato compensi e composizione degli organi collegiali (articolo 6, comma 21, del decreto legge n. 78/2010 e articolo 61, comma 17, del decreto legge n. 112/2008) di organismi che ricevono a qualsiasi titolo contributi statali, l'Ente

ha ottemperato alle prescrizioni modificando la norma statutaria e portando a cinque il numero dei consiglieri previsti. Gli stessi, andando oltre la norma medesima, hanno rinunciato al riconoscimento del gettone legato alla presenza alle riunioni del Consiglio di Amministrazione.

La quota da decurtare dai compensi dei revisori e dal gettone di presenza dei Consiglieri di Amministrazione e riversare a favore del bilancio dello Stato, relativamente ai compensi erogati nell'anno 2015, è stata versata sull'apposito capitolo dedicato del bilancio dello Stato in data 26 aprile 2016.

Disposizioni di attuazione dell'articolo 2 della legge 31 dicembre 2009, n. 196 in materia di adeguamento ed armonizzazione dei sistemi contabili"

Allegati al presente documento i prospetti previsti dalla normativa vigente.


IL PRESIDENTE
PROF. FRANCESCO AMENTA

Elenco degli allegati:

Allegato 1: Syed Sarosh Mahdil and Francesco Amenta. 80 Years of CIRM . A Journey of commitment and dedication in providing Maritime Medical Assistance. Int Marit Health in corso di stampa

Allegato 2: Mahdi Ss, Sibilio F, Amenta F. Dental Hygiene Habits And Oral Health Status Of Seafarers. Int Marit Health. 2016;67(1):9-13

Allegato 3: Carletti G, Giuliadori 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(1):14-20.

Allegato 4: Nittari G, Peretti A, Sibilio F, Ioannidis N, Amenta F. Development Of Software For Handling Ship's Pharmacy. Int Marit Health. 2016;67(2):72-8.

ALLEGATO 1

80 Years of CIRM . A Journey of commitment and dedication in providing Maritime Medical Assistance.

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Paper presented at the Meeting The Way Forward of Maritime Telemedicine held in Rome on October 30-31 2015 as an activity in the occasion of celebrations for the 80th anniversary of Centro Internazionale Radio Medico (CIRM)

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Abstract

Objective: A review of activities of Centro Internazionale Radio Medico (International Radio Medical Centre, CIRM) from its foundation in 1935 till its 80th anniversary in 2015 was accomplished. CIRM was founded in 1935, to provide medical assistance via radio to ships with no doctor on board and others who cannot be reached by a doctor. In 1950 CIRM was established as a non-profit-making foundation and has benefited since 1957 from an annual contribution from the Italian government.

Methods : Review of CIRM case histories and other published material from 1935-2015 and presenting them in a scientific yet simplified manner through the use of basic mathematical analysis. All the data were collected from CIRM 's official archives in Rome .

Results and Conclusions: The results achieved by the Centre over 80 years include medical assistance to 81,016 patients on board ships (as well as on small islands and aircraft), with more than 500,000 medical messages received and transmitted. CIRM from the beginning of his activity was organized into a medical service, a telecommunications service and a studies section. In 2002 the Centre was recognized as the Italian Telemedical Maritime Assistance Service (TMAS). In the 2010 the Centre was reorganized as a structure articulated in 4 departments, namely maritime telemedicine, telecommunication, research and occupational medicine. This to cover the different activities related to the global protection of the health of seafarers. The 24-h continuous medical service is provided by doctors at the CIRM headquarters. The doctor on duty gives instructions for managing the case and continues to follow the patient with subsequent appointments until recovery or landing. If need arises CIRM co-ordinates the transfer of patients assisted on board ships to a hospital ashore. In the last few months CIRM has developed innovative approaches for the treatment of diseases and accidents on board of seagoing vessels by introducing as a standard telemedicine corners allowing the transmission of biomedical data from sailing ships to the Centre. These new solutions will bring to a significant improvement of medical care in favour of seafarers.

Keywords: CIRM , Maritime health, Telemedicine, Occupational health, Assistance ,TMAS , History

Introduction

History

The International Radiomedical Centre (Centro Internazionale Radio Medico, CIRM) was established in 1935 with the aim of giving free radio medical advice to ships of all nationalities navigating on international waters. The Centre has its headquarters in Rome and its basic medical services are free of charge. Requests for medical advice reaching CIRM are handled by doctors who are on 24 hour duty (1,2).

The first license for radio medical service to ships was issued on November 18, 1920 to the Seamen's Church Institute on New York. From 1920s to 1930s several maritime countries developed radio medical facilities for their own fleets, with Sweden starting its centre activity in 1922, Netherlands in 1930 and Germany in 1931 (3). The first experience of enlargement of radio medical assistance from a domestic into a really international scenario occurred in Italy in 1935, with the constitution of the Centro Internazionale Radio Medico (International Radio Medical Centre, CIRM). The Centre was chaired by Guglielmo Marconi and developed in terms of medical organization by a physician, Prof Guido Guida. CIRM was established with the mission of providing via radio free medical assistance available to ill or injured seafarers of any nationality, navigating in all seas of the world (1,2,4,5). Over the years, CIRM has pursued its work, interrupted only during the war years 1941-1945, and has enlarged its activity to include patients aboard planes in flight and on small Italian islands. CIRM , a private association until 1950, and from that date established as a non-profit Foundation, has benefited since 1957 of from an annual contribution from the Italian government (1,2,4).

The Centre initially played an outpatient radio service, at certain times of day, in which a doctor was available to respond to requests for assistance, both for new cases, and for patients under treatment. Today CIRM is housed in a functional building in the EUR district of Rome (Figure 1), designed to accommodate the Centre and adapted in order to be more responsive to the needs of the virtual hospital of CIRM . The activities of CIRM are coordinated by a President and a Board of Directors, which provide, among other things, the appointment of the

President. The Operational structures of CIRM until 2010 consisted of three specialized departments (telemedicine, telecommunications, studies and research, the coordination of the activities of which, in the absence of an employee who is responsible for it, is delegated to a member of the Board of Trustees. An Executive Committee and a Scientific-Ethical Committee collaborate with the President and the Board of Directors in promoting initiatives in the relevant fields of the Centre (1,2,4).

In 2002 the CIRM, by joint decree of the Italian Ministry of Infrastructure and Transport and the Minister of Health, CIRM was formally designated as the Italian Telemedical Maritime Assistance Service (TMAS), in accordance with Circular no. 960 dated June 20, 2000 of the International Maritime Organization (IMO) (6). Regulations establish that these activities should be done in close coordination and collaboration with the Research Coordination Center and the National Sea rescue (IMRCC) identified in Italy in the General Command of the Coast Guard. This designation recognized for the efficiency of CIRM service in the field of medical care, and the role of the Centre in ensuring safety and protection of human life at sea.



Figure 1: Current Establishment of CIRM in EUR District of Rome

Current structure and activities

In the 2010 the Centre was reorganized as a structure articulated in 4 departments, namely maritime telemedicine, telecommunication, research and occupational medicine. This to cover the different activities related to the global protection of the health of seafarers.

As part of the departmental organization CIRM , the Department of Maritime Telemedicine is appointed to ensure the medical assistance activities of the Centre. In particular, the Department:

1. Provides advice and medical care. Medical advice includes the diagnosis and treatment of a disease on board;
2. Suggests the transfer of sick or traumatized sailors to the nearest port (MEDEVAC);
3. Liaising with medical organizations on the ground in the case of transshipment or hijacking.

The medical service, of which is responsible a medical director, is attended to by a variable number of doctors who are placed in an on call 24 hours continuous service. The doctor on duty receives the request message from the ship and provides appropriate instructions, making appointments, more or less close together, depending on the severity of the disease to treat. The request for assistance can be sent by e-mail, phone, or other telecommunication systems, in Italian or English. If necessary, the doctor on duty may benefit from the advice of consultants, specialists in various branches of medicine, which are addressed in the case of highly complex illnesses or requiring a particular specialization (1,2,4,5,7). Depending on the severity of the case and the position of the vessel, which is periodically updated by the route, it can be recommended to the ship captain to make diversions of the route to land or to see the patient in the nearest port with medical facilities. In an emergency on board in relation to the ship's position, patient transfer is coordinated through naval or air rescue missions. These missions are organized, in the case of seriously ill, near the Italian coast, with the collaboration of the Italian Maritime Rescue Coordination Centre (MRCC), while in foreign waters, they are organized in collaboration with the MRCC of the various countries of the world (1,2,4,5,7).

The patient is followed up with subsequent radio contact until the healing or on landing. The on-board controls are urged to transmit to CIRM the diagnosis of the doctors who examined the patient. This diagnosis, in most cases, corresponds to that formulated at a distance from CIRM. In giving medical care, the medical team of CIRM takes into account the different provisions of medicines and medical devices available on board (the so-called medicine chests), which vary according to the nationality of the ship and the shipping company.

Unfortunately, the lack of uniformity of the laws of the various countries can create problems for patients embarked on ships with limited availability of drugs or other medical devices.

Every day the medical team updates the statistics on health care. The diseases are divided into assisted nosological groups using the International Statistical Classification of Diseases and Related Health Problems (10th Revision) of the World Health Organization (8). This can be helpful in conducting retrospective studies on of specific diseases that are easily comparable with data for the general population.

The Department of Telecommunications is responsible for maintaining contact between the vessel / aircraft and the medical team of CIRM. The service, which works in the headquarter of the Centre uses the most modern information and communication tools and consists of a supervisor and telemedicine operators (called telemedicine assistants) , which alternate in continuous duty to ensure 24-hour coverage. Telemedicine assistants:

- (a) Manage the service of sending and receiving of medical messages from ships at sea, fishing boats, pleasure boats or airplanes;
- (b) With regard to their own share of responsibility, in close collaboration with the attending physicians, of the electronic compilation of medical records of each patient and updating the records after each teleconsultation.

The communication systems used by CIRM are :

- E-mail, via an ADSL connection at high speed. The system most commonly used today as the forwarding rate of the message is much lower compared to Telex. Thanks to e-mail service, ships can send patient photographs as an attachment which is of great help for diagnosis and therapy. The main service providers are represented by Telemar, through the ground station of France Telecom, and with Globe Wireless.
- Telephone for all requests for telephony, which are recorded using an electronic recording system;
- Coastal radio stations.

In the past, the Centre had its own coastal radio station in telegraphy, which has maintained, throughout its existence, the distinction of being the radio station in the world to carry out only medical service. With the technological advancements of recent years most of the old radio communication systems have been replaced by modern information systems that enable fast, reliable telecommunications from all corners of the planet. The improvement of telecommunication systems has also fostered a steady increase, observed in recent years, of requests for assistance also from areas such as the Far East, which for geographical reasons, in the past, could communicate with Rome only with great difficulty (1,2,4,7).

The Research Department is involved in research activities primarily on seafarers pathophysiology. Research activity of the Centre is relevant and CIRM was recognized officially in 2015 as a research Centre. Research activity of CIRM Research Department is performed independently or in collaboration with Italian or international universities or other research institutions. Research of CIRM is directed mainly towards 4 main areas, namely

- Actions for improving medical care of seafarers
- Inspections via telepharmacy the ship's pharmacy and issuing of international compliance certificates.
- Collaboration for maintenance of high hygiene standards on board ships
- Improvement of health-related training of seafarers

The Occupational Medicine Department is involved in the development and practice of the project named Healthy Ship . Healthy Ship is a project for providing global health protection of seafarers on board ships. The project follows the legal obligation relating to the "compulsory health information for workers destined overseas", which is specifically governed by Italian Legislative Decree 271/1999 (9) and subsequent amendments.

Phases of the project Healthy Ship include:

1. Health education
2. Psychological assessment of on board employment and duty assignment
3. Risk communication
4. Risk management

5. Health surveillance

CIRM medical assistance

Since the starting of CIRM activity on 6th April 1935 till 31st December, over a period of over 80 years, the Centre assisted 81,016 patients on ships, with over 500,000 medical messages being received and transmitted. Dozens of people were also assisted on small Italian islands or on board passenger aircraft (Table 1) (1,2,4,5,7,10).

Table 1 Number of patients assisted by CIRM on board ships and medical messages received and transmitted, 1935–95			
YEARS	PATIENTS ASSISTED	AVERAGE PATIENTS PER YEAR	TELECONSULTATIONS (medical messages)
1935–1940	336	56	1,398
1946–1951	1,069	178	6,858
1952–1956	3,055	611	14,495
1957–1961	5,116	1,023	40,360
1962–1966	5,527	1,105	39,805
1967–1971	7,096	1,419	55,375
1972–1976	6,147	1,229	57,790
1977–1981	4,681	936	47,185
1982–1986	3,717	743	45,880
1987–1991	3,498	700	36,850
1992–1995	2,693	673	36,590
1995-2004	10,608	1,060	52,278
2005-2015	27,473	2,747	125,878
TOTAL	81,016		560,742

From the period of 2005-2015, CIRM received a total of 27,473 calls for medical assistance , the number of assistance calls are going up each year, the majority of those are for common health problems that could be anything from viral respiratory infection to tooth pain (7). There are also several life threatening conditions for which CIRM regularly receives calls of assistance

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.

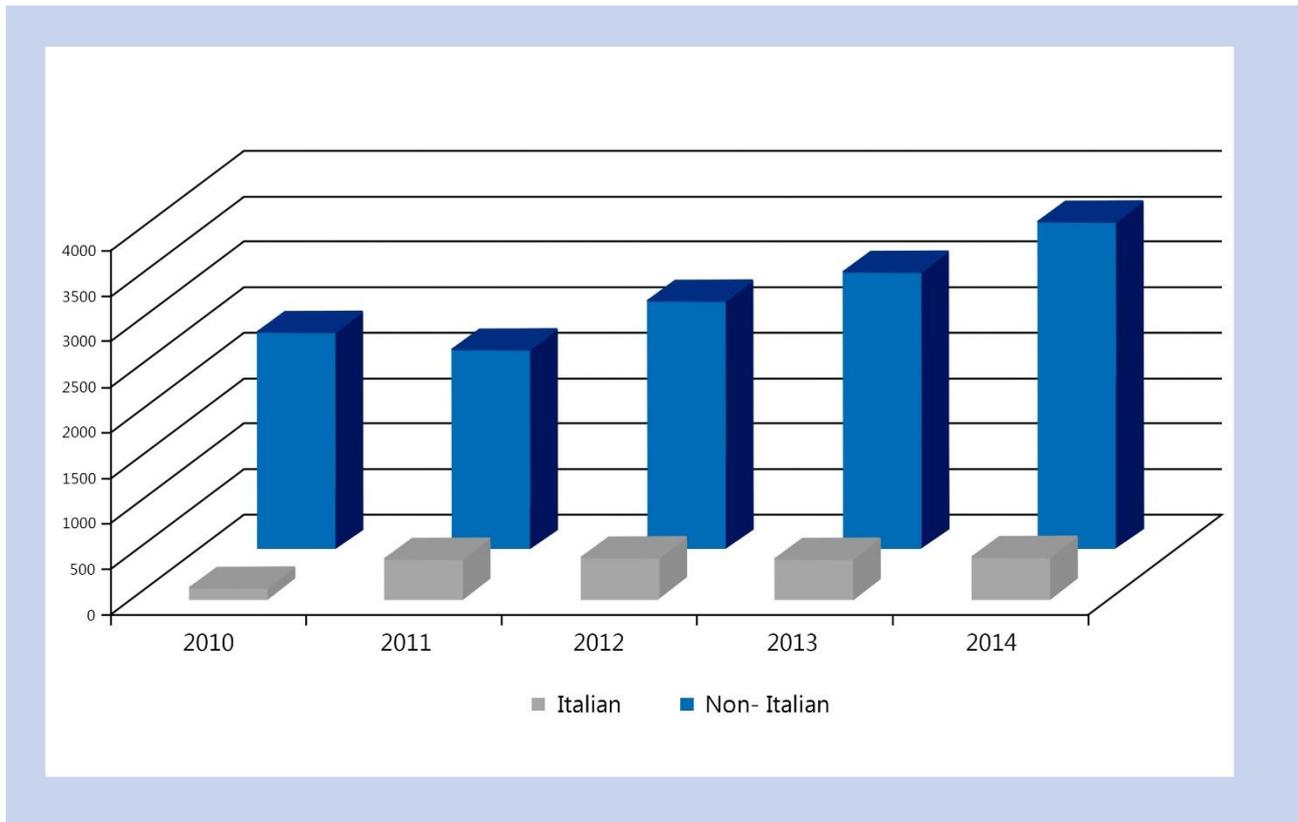


Figure 2: Requests of medical advice received by CIRM from Italian and non-Italian flag ships from 2010 to 2014

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 last few years. In 2012-2014, 3.9% of the diseases managed were due to infections (Figure 3).

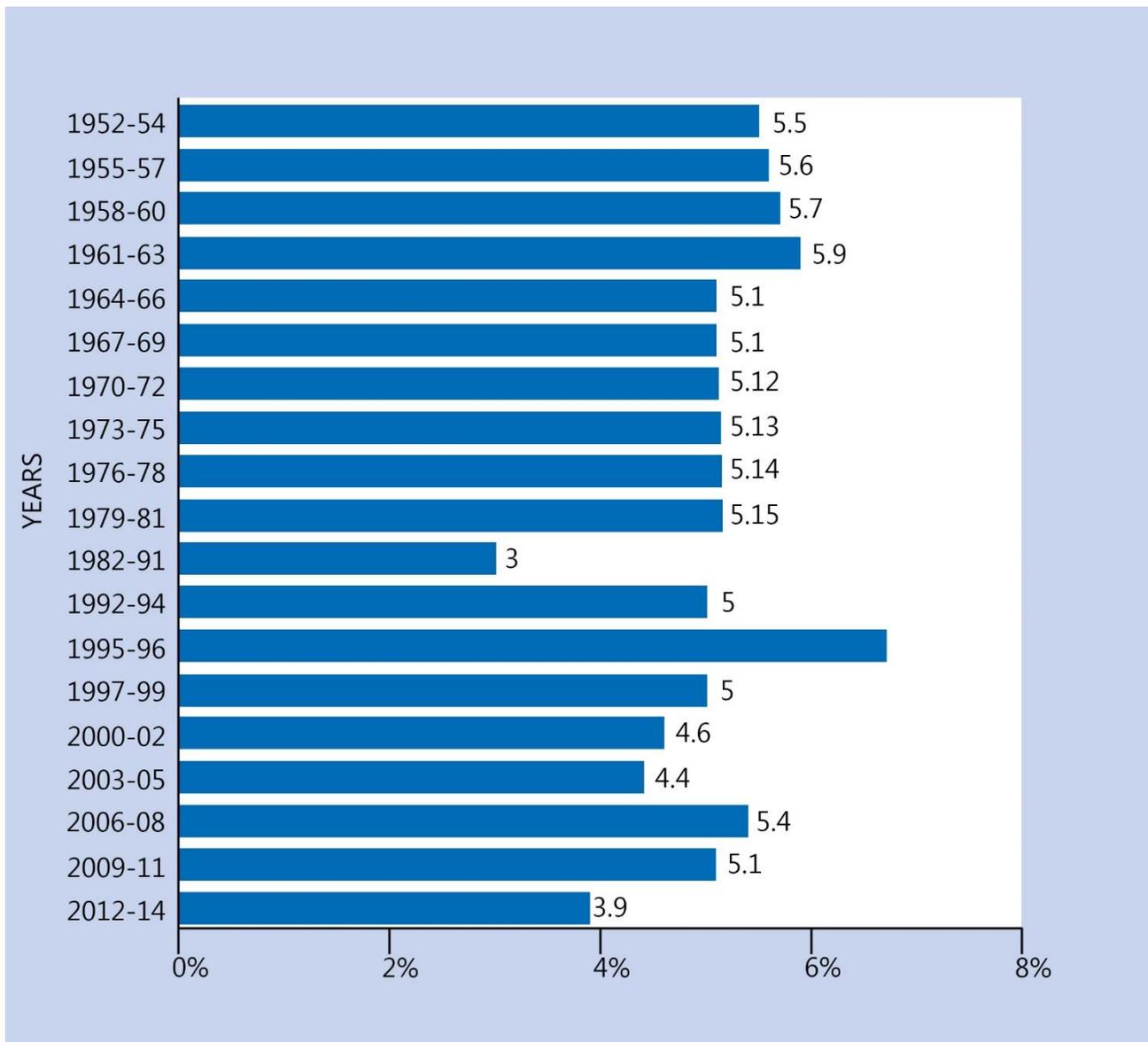


Figure 3: Infectious and parasitic diseases assisted by CIRM from 1952 to 2014. Data are expressed as the percentage of the total cases assisted by the Centre in the years of observation

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).

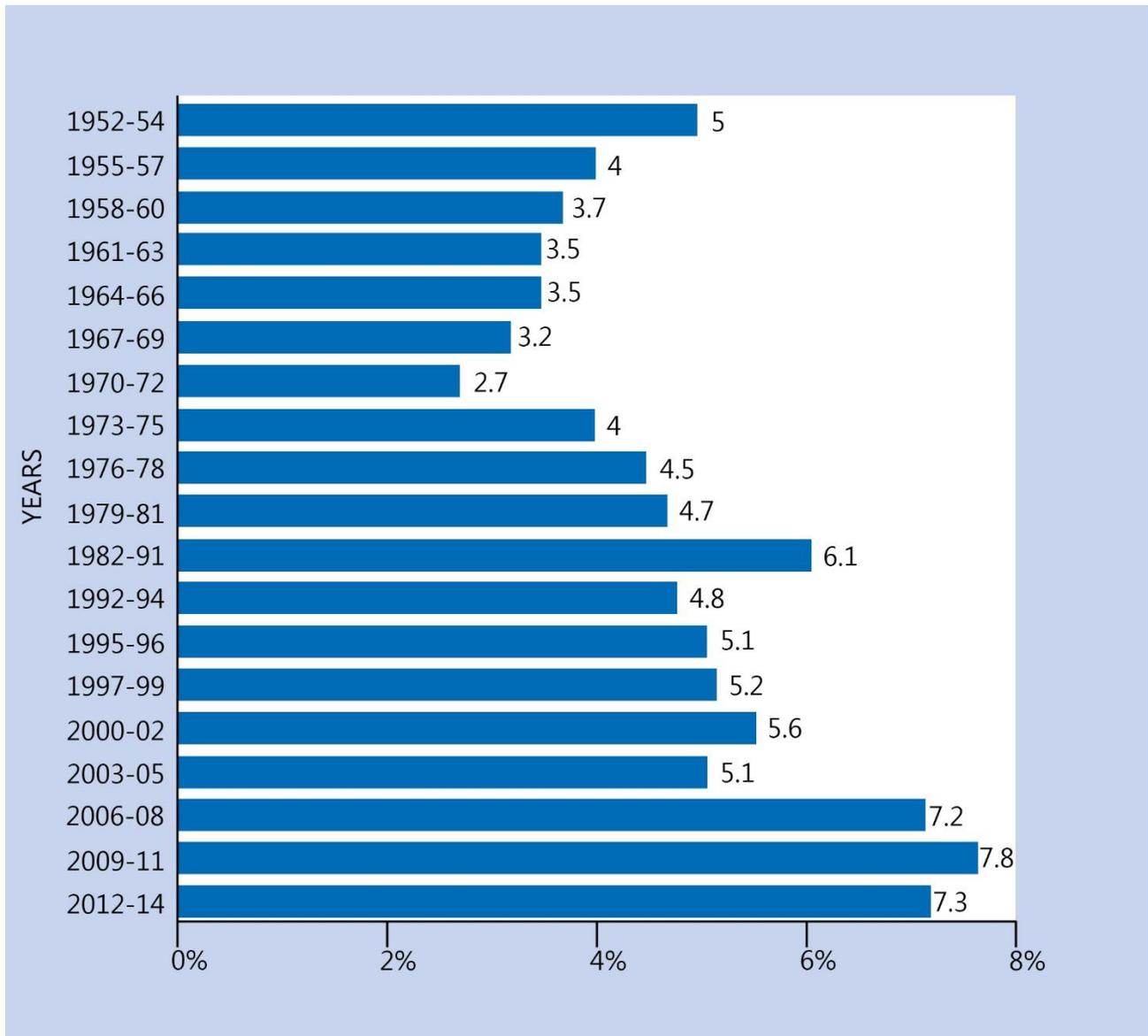


Figure 4: Diseases of the nervous system and organs of sense assisted by CIRM from 1952 to 2014. Data are expressed as the percentage of the total cases assisted by the Centre in the years of observation

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).

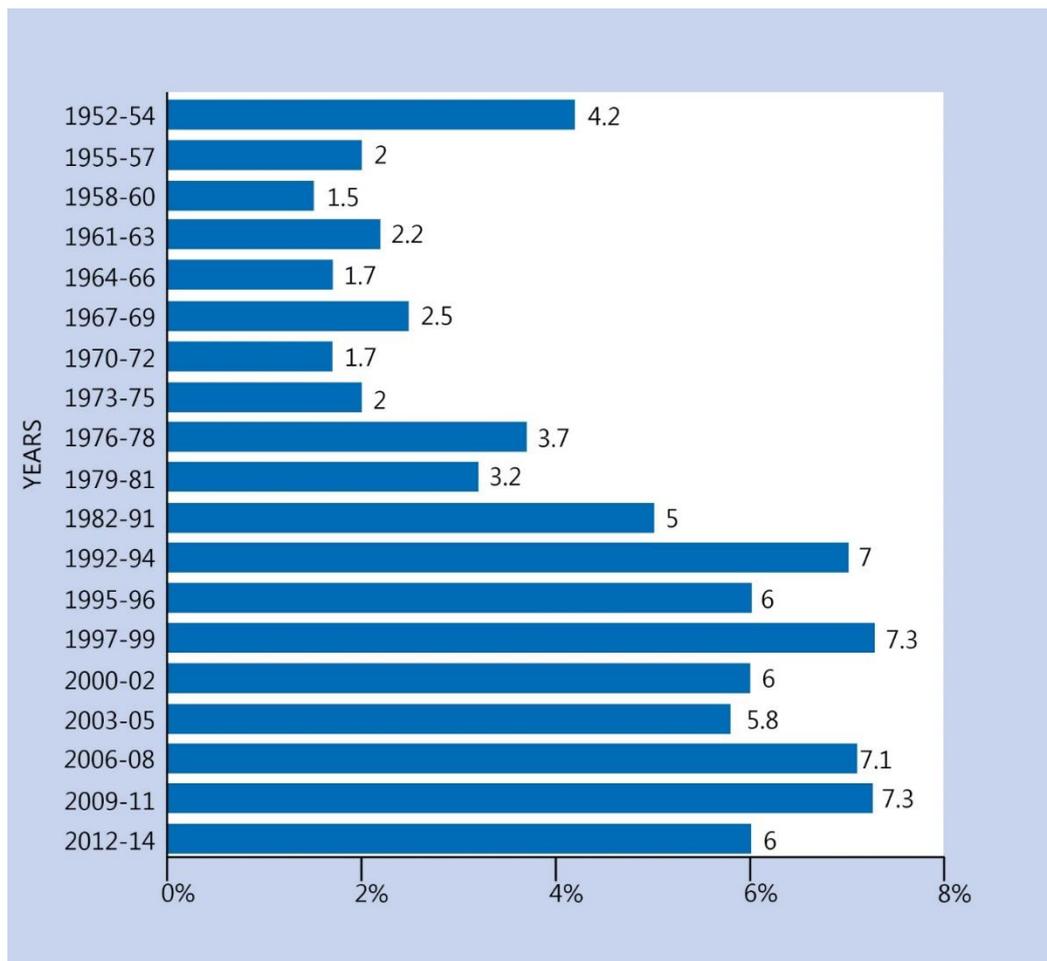


Figure 5: Diseases of the cardiovascular system assisted by CIRM from 1952 to 2014. Data are expressed as the percentage of the total cases assisted by the Centre in the years of observation

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).

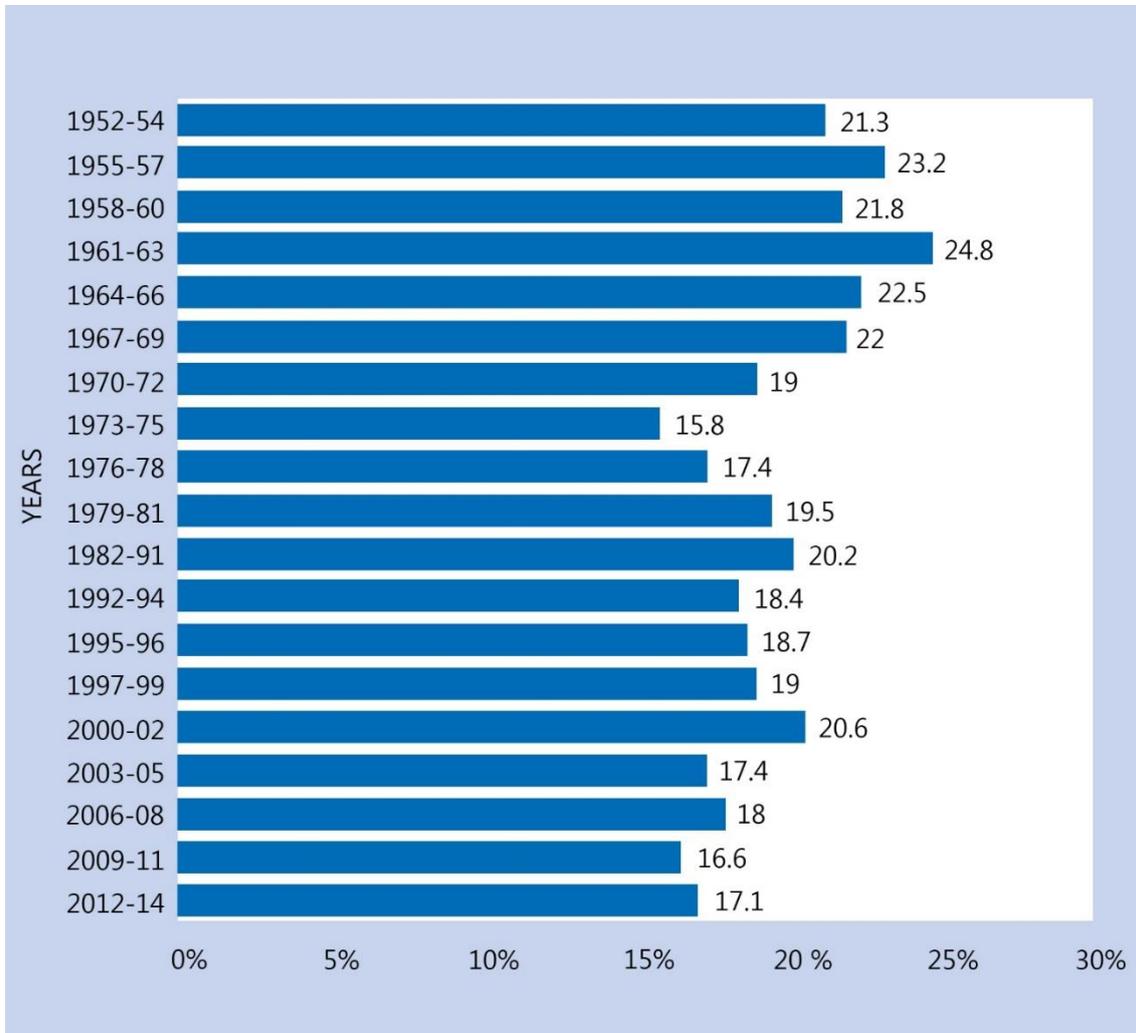


Figure 6: Diseases of the digestive system assisted by CIRM from 1952 to 2014. Data are expressed as the percentage of the total cases assisted by the Centre in the years of observation

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 factors 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.

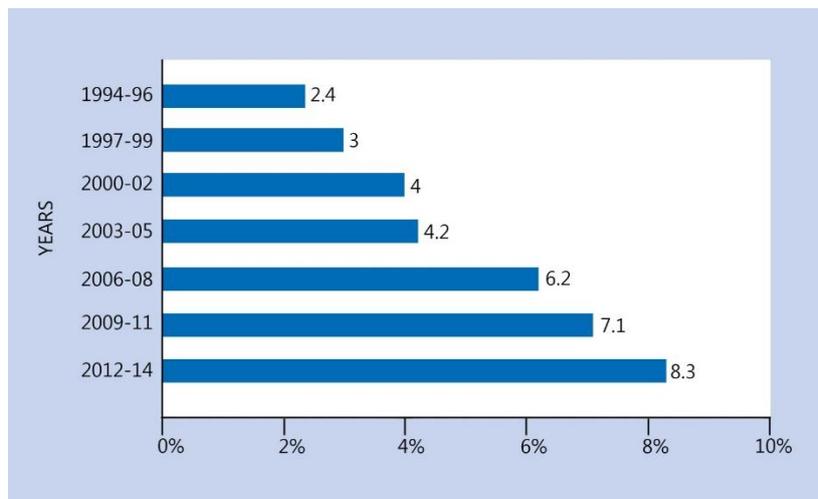


Figure 7: Diseases of the skin assisted by CIRM from 1994 to 2014. Data are expressed as the percentage of the total cases assisted by the Centre in the years of observation

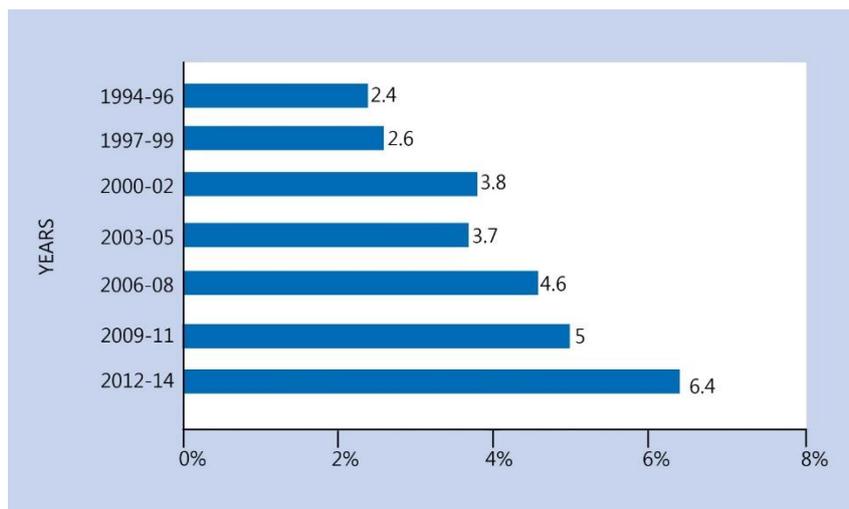


Figure 8: Diseases of the musculo-skeletal system assisted by CIRM from 1994 to 2014. Data are expressed as the percentage of the total cases assisted by the Centre in the years of observation

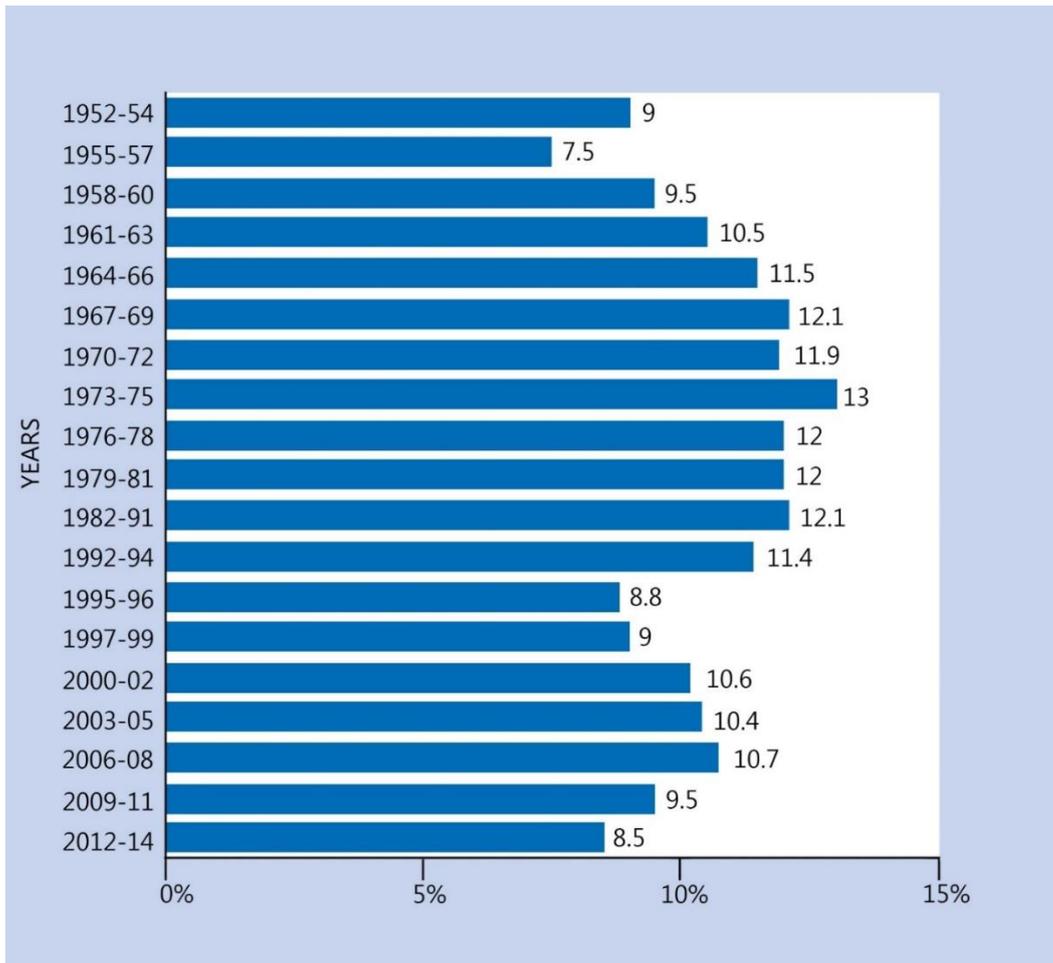


Figure 9: Diseases of the genitourinary system assisted by CIRM from 1952 to 2014. Data are expressed as the percentage of the total cases assisted by the Centre in the years of observation

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.

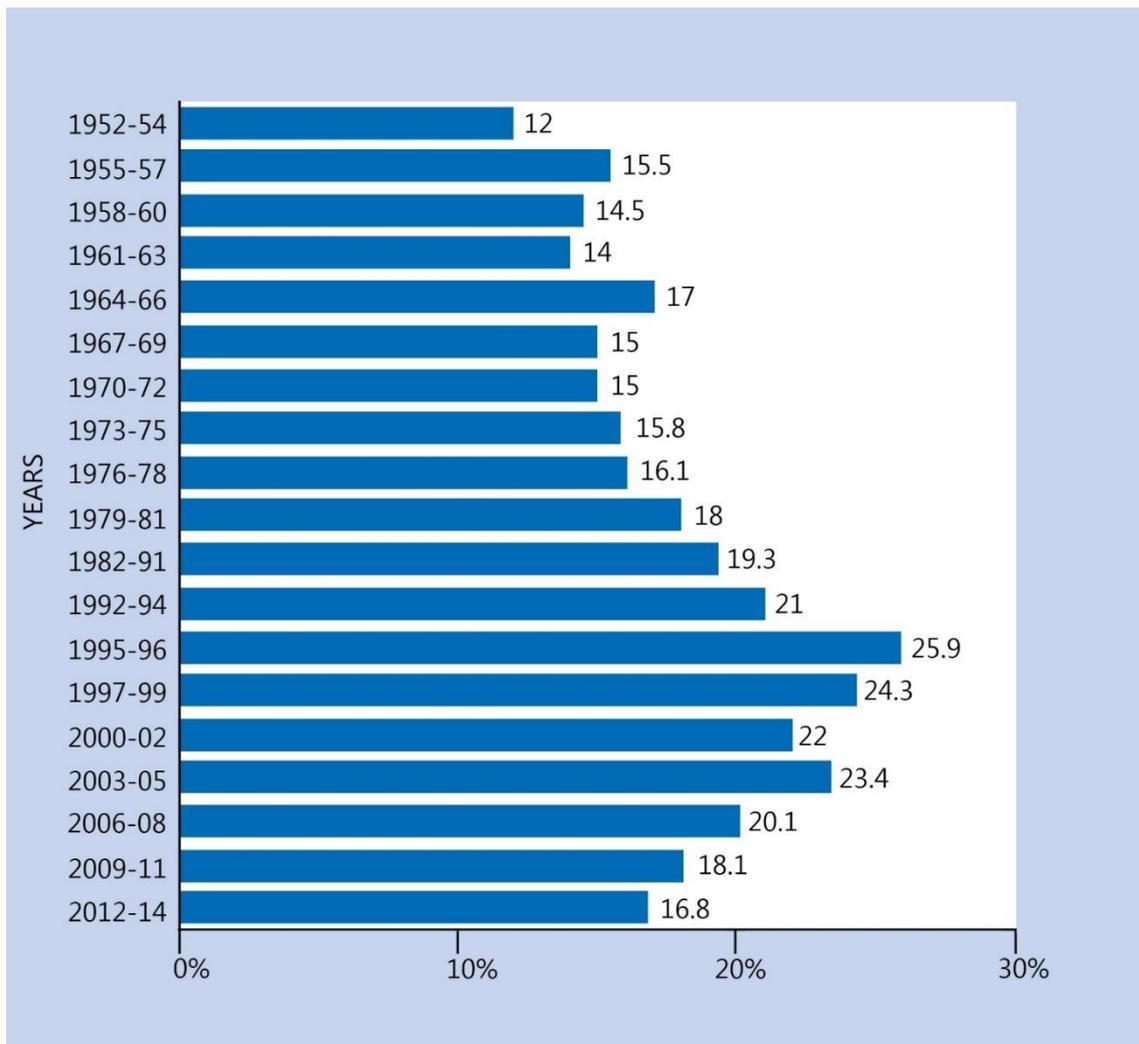


Figure 10: Cases of injury, poisoning and certain other consequences of external causes assisted by CIRM from 1952 to 2014. Data are expressed as the percentage of the total cases assisted by the Centre in the years of observation

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 TMS 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

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Dental hygiene habits and oral health status of seafarers

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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

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topic of oral health of seafarers has been recently reviewed [1]. This paper has reported the lack of extensive information excluding some basic epidemiological studies among merchant ship crews. This review has also demonstrated that people working on board of navy units in general receive better and articulated dental care [1].

Based on the above consideration Centro Internazionale Radio Medico (CIRM), the Italian Telemedical Maritime Assistance Service (TMAS), developed and distributed a questionnaire on oral health habits of seafarers [6].

MATERIALS AND METHODS

An anonymous research questionnaire on oral hygiene was prepared [7]. It was proposed that all ships asking for medical advice from CIRM between 1st July 2014 and 31st October 2014 from CIRM should be requested to fill in the questionnaire. The questionnaire was prepared in English and Italian. A summary of all the questions on the questionnaire was also prepared for the captain of each ship to save time and paper work. Informed consent was taken from all sailors who wanted to be part of the research. Those interested in contributing to the initiative were required to send an e-mail in response, after which questionnaires and instructions were sent to the participating ships. In the 4 months CIRM conducted this survey, 1,198 ships required medical assistance to the Centre, but only 65 ships replied to CIRM's request and took part in the study by returning the summary of the filled questionnaires. The demographics of the sample taking part in the survey are shown in Table 1.

The captain of each ship was informed that he can fill the summarised chart after getting responses of all the seamen on board. In case the captain had any queries he was asked to contact via e-mail the CIRM dental specialists in charge of the project. To appreciate the efforts of the captain being part in this survey, CIRM also awarded certificates and appreciation letters. Ships collaborating with the initiative also received a complimentary copy of the book "Oral Hygiene and its Maintenance", specifically developed for increasing the awareness of seafarers to the problem [2].

The data analysis of the questionnaire was done as an active and interactive process. Researchers carefully sifted the results and analysed the data recorded through the questionnaire. Data was analysed after organising the questionnaire results systematically [8, 9]. Data analysis is the "Process of fitting data together, of making the invisible obvious, of linking and attributing consequences to anteced-

ents. This is the process of conjecture and verification, of correction and modification, of suggestion and defence" [10]. At the outset the data were coded to form categories and subcategories emerging from the data. Codes were developed based on the list of themes. Coding as method of conceptualising research data and classifying them into meaningful and relevant categories for the participations in the study [11].

Charts were created and the results were pasted on these charts into different sections and categories and finally typed into Excel files. After the whole process was completed, a list of themes of categories and subcategories were identified and data was compiled and discussed under the identified categories.

RESULTS

Figure 1 shows the research questionnaire [7]. The results of the survey are summarised in Table 2. A large percentage of seafarers consumed alcohol and nicotine during the voyages. 56.11% of sailors surveyed (n = 1,156) stated that they regularly smoked, out of that population, almost 45% of the smokers said they smoked more than 10 cigarettes a day. 11.45% of the total survey population (n = 236) responded that they consumed alcohol on a regular basis. In recent decades shipping companies have made an effort to restrict alcohol use on cargo ships but policies and implementation of the policies varies [12]. Cross tabulation between the population that consumed alcohol and smoked tobacco showed that 15.39% of smokers (n = 178) also consumed alcohol. Sailors who consumed alcohol were more likely to smoke (80.93%, n = 191), sample population that consumed alcohol admitted that they also smoked tobacco.

55.67% of the participants (n = 1,147) acknowledged use of dairy products or candies which contain fermentable carbohydrates. Only the 61.11% of sailors (n = 1,259) had a complete set of natural tooth. 82% (n = 656) of the total 801 sailors without a complete set of teeth, lost their tooth due to extraction. The remaining people lost their tooth as a result of tooth mobility.

Cross tabulation of the data set showed that older sailors (50–60 years) had higher frequency of tooth loss. 6.6% of the total sample population (n = 137) was from this age group (50–60 years), 63.5% of them (n = 87) had missing tooth or several missing teeth. Around 30.48% of the sailors (n = 628) reported suffering from diseases of the supporting structure of teeth including gingivitis or periodontitis at some

Table 1. Demographics of study sample

Ships contacted	Took part in survey	No. of seafarers filling in the questionnaire	Rate of return
1,198	65	2,060	5.4%

1.	Your age is between	20-30	30-40	40-50	50-60
2.	Are you satisfied with your smile?		Yes		No
3.	Do you have a complete set of natural teeth?		Yes		No
4.	If you answered 'No', could you specify how many teeth you have lost?	Specify the number of missing teeth	Total loss upper teeth	Total loss lower teeth	all teeth missing
5.	Of teeth that were lost, were they extracted for trauma?		Yes		No
6.	Of teeth that were lost, were they extracted because they were mobile?		Yes		No
7.	If you answered 'Yes', do you know that you suffer from periodontal disease?		Yes		No
8.	Do you often suffer from abscesses?		Yes		No
9.	If 'Yes', in which side of your mouth?	Upper right	Upper left	Lower right	Lower left
10.	Are you a smoker?		Yes		No
11.	If "Yes", how many cigarettes a day?	Less than 10	10-20	20-30	More than 30
12.	Do you drink hard liquor?		Yes		No
13.	Do you often eat pastries or candy?		Yes		No
14.	Do you brush your teeth regularly?		Yes		No
15.	If you answered 'No', the reason is because you have pain if you try to brush them?		Yes		No
16.	If you answered 'Yes', how many time a day?	1	2	3	
17.	When you brush your teeth, do you notice bleeding from the gums?		Yes		No
18.	Do you know if you suffer from halitosis (bad breath)?		Yes		No
19.	Do you have the sensation of dry mouth?	Yes	No	Sometimes	
20.	If 'Yes', could you specify whether you seem to have little salivation?		Yes		No
21.	Do you have the sensation of having a burning mouth?		Yes		No
22.	If you look at your tongue in the mirror, could you specify how it seems?	Pink	White	Dark	Speckled pink and white
23.	When you chew, do you have the perception that the tongue is being scratched with some sharp tooth root or fractured tooth?		Yes		No
24.	If you look at your lips in the mirror, could you specify how they seem?	Pinky	Dry	Dry and chapped	They have darker patches
25.	If there are some darker patches, can you specify when they appeared?	1 month	2 months	6 months	1 year
26.	Do you happen to bite your cheeks while you chew?		Yes		No

Figure 1. Questionnaire proposed to seafarers on board ships taking part to this survey

Table 2. Summary of key findings

Synthesis of the key results of the survey questionnaire	
Variable	No. (%) of seafarers
Tobacco use	1,156 (56.11%)
Alcohol use	236 (11.45%)
Smokers who also consumed alcohol	178 (15.39%)
Alcohol consumers who also smoked	191 (80.93%)
Regular use of fermentable carbohydrates	1,147 (55.67%)
Twice a day tooth brushing	834 (40.48%)
Sailors with complete teeth set of teeth	1,259 (61.11%)

point of their life. 27.03% of the sample (n = 557) reported bleeding gums during brushing. Over 75% of the sample were satisfied with their smile.

74.07% of the total sample population (n = 1,526) were regularly brushing their teeth, but interestingly only 40.48% seafarers (n = 834) questioned brushed their teeth twice, which is recommended by dental professionals around the world, whereas the majority of them only brushed once a day. 5% of the sailors surveyed reported that pain was a reason for not brushing their teeth regularly. 4.02% of the total sample (n = 83) reported bad breath or halitosis, whereas only 1.31% (n = 27) sample population indicated feeling the sensation of burning mouth. Whereas 2% of the sailors also referred occasional cheek biting while chewing or eating.

DISCUSSION

Dental fitness of seafarers is considered critical by International Labour Organisation (ILO) and World Health Organisation (WHO) [13]. Seafarers are known to disregard oral hygiene during long voyages and also tend to consume high quantity of nicotine, which is probably done to relieve occupational stress due to odd duty hours and isolation [14]. Nicotine is considered the most important preventable risk factor associated with periodontal and lung disease [15]. The Danish Radiomedical service in its annual report 2010, which analysed 1,300 consultations, stated that dental problems (8.1%) were among the four most reported health issues of seafarers [16]. A study reported that on commercial cargo vessels, the causes of consultations for oral health problems at foreign ports can be as high as 67% [17]. A survey conducted in 1995 found that only 19 countries provide comprehensive oral health services for seafarers [18]. That is why more research is required to investigate the oral hygiene status of seafarers and to assess their awareness and concerns regarding oral health.

The results of the survey are reflective of poor oral hygiene of seafarers. Seafarers were also found to be smoking more than the general population. Global modelled age-standardised prevalence of daily tobacco smoking in the population older than 15 years was found to be 31% in 2012 [19], while 48% of the world population consumes alcohol [20]. In our sample of seafarers, 56% of them smoked and the 11% of them consumed alcohol (Table 2). Alcohol consumption on board vessels is a tricky subject as many shipping companies have banned or restricted alcohol consumption altogether, but implementation of these policies remains a subject of debate, hence it is entirely possible that seafarers are hesitant to openly talk about the subject [12]. The higher consumption of tobacco compared to the general population can be attributed to various factors including isolation, boredom and stress. The intake of dairy products and sweets were also deemed to be very high, which is clearly associated with high dental caries risk. Although a majority of the sailors surveyed were brushing their teeth, most of them were only brushing once, perhaps due to inadequate knowledge of oral hygiene protocols. Brushing the teeth twice a day with a fluoridated tooth paste is the recommended practice for maintaining good oral hygiene [21].

Over a quarter of the survey population suffered from bleeding gums which is troubling, and it could also signify underlying systemic diseases. Over half of the population didn't have complete natural teeth set which suggests that seafarers are more likely to lose tooth than the general population, perhaps due to ambivalent attitude towards oral hygiene.

The combination of high intake of alcohol, tobacco, refined carbohydrates (sweets/dairy products) and insufficient knowledge regarding oral hygiene creates a synergistic effect which is evident from the poor oral hygiene status exhibited by a majority of the seafarers. The fact that most seafarers only brushed teeth once daily is also proof enough that oral hygiene knowledge and motivation remains low in this group. There is a dire need to improve the motivation and knowledge level of seafarers regarding oral hygiene practices. Seafarers must also be made aware of the extreme dangers associated with the use of excessive amounts of alcohol, nicotine and refined carbohydrates. Alcohol and smoking are independent risk factors of many diseases, not just limited to diseases of the mouth, including oral cancer and submucous fibrosis [22].

In view of the oral status of seafarers, of the isolation of the ship and of the difficult access to health and dental care of seafarers, telemedicine based applications for dentistry (teledentistry) could represent a way for providing a reasonable level of oral assistance to seafarers. The emergence of teledentistry as a branch of telemedicine can be

traced back to 1994 when a United States Military project demonstrated that teledentistry reduced dental treatment costs and proved to be effective in providing dental care to distant communities living in rural areas [2]. Teledentistry has the potential to improve access to oral health care and decrease treatment costs [23] and could be integrated with electronic health records, digital imaging as a support of teleconsultations with dental specialists [24]. Teledentistry has been successfully implemented as models to improve dental education and access to care [25] and is effective in the management of oral health issues in remote and rural areas, where access to dentists and oral health specialists is limited [26, 27]. Teledentistry may become a new instrument for tending to the poor oral/dental conditions of people on board of seagoing vessels.

CONCLUSIONS

The results of this survey have shed light on important dental hygiene issues of seafarers. From the above discussion, it is clear that seafarers need better oral hygiene education and care to enable them to take care of 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. Shipping companies should make sure that seafarers are exposed to regular health examinations including dental checkups, which should be made part of the health fitness test that are conducted before the sailor goes on board. Shipping companies should also develop comprehensive dental hygiene programs for seafarers which have shown to make a profound effect on overall dental health of any community [28]. Seafarers due to their unique lifestyle, represent a vulnerable community as far as oral health is considered, that is why more research is required on dental hygiene habits of sailors to expand our current understanding of the problems this community faces in maintaining its oral health, which has direct implications on overall health.

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An ontology-based consultation system to support medical care on board seagoing vessels

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ABSTRACT

Background: A realistic possibility to obtain medical care for patients located in remote sites such as seagoing vessels, in which health professionals are not available, is to contact a doctor via telecommunication systems. In general, the medical knowledge of who on board ships is in charge of medical care is quite limited and therefore, in a first level telemedical consultation, the flow of information should be correct and its efficiency should be maximised. This paper describes an application conceived to improve requests of medical assistance from sailing ships. The ultimate objective of this system is a) to standardise as much as possible the requests of medical advice at a distance, b) to overcome language barriers and jammed-related troubles that could make difficult or not understandable a telephone conversation.

Materials and methods: The application is based on a software engine extracting data from an ontological knowledgebase built ad hoc using Protégé.

Results: Compared to the conventional consultation systems based on telephone and e-mail, the proposed device is more accurate and complete in terms of information contained in the request of assistance. Moreover, data received by the medical centre can be more easily managed, as they can be standardised.

Conclusions: The system described here allows people responsible of medical care on board ships to forward detailed requests of assistance containing symptom-guided information on patient clinical conditions. This may represent an innovative tool for medical consultations at distance allowing the remote centre to provide more precise and quicker medical advice.

(Int Marit Health 2016; 67, 1: 14–20)

Key words: teleconsultation, remote medical advice, ontology, Protégé, medical assistance on board ships

INTRODUCTION

Telemedicine, consisting in the application of information and communication technology (ICT) to the solution of medical problems and in the exchange of medical information, is changing our approach in the delivery of several health services. Telemedicine includes a growing variety of applications and services the use of which will increase in the near future.

Teleconsultation (e.g. the medical visit made via ICT) can be divided into different levels based on the players

involved and the complexity of the information exchanged. A basic (first level) teleconsultation is the electronic/telephonic communication between a client (patient) and a physician. A second level teleconsultation involves a physician or another health professional and a specialist delivering health care services and information over small and large distances. In the second level teleconsultation, data, information, images and/or voice are exchanged. A higher level of teleconsultation (third level) involves a medical team of a hospital addressing specific questions to the team of

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a specialised centre. In primary care, generally, teleconsultation takes place between a patient/caregiver and health care professionals for diagnostic or therapeutic advice or for educational purposes.

Medical assistance of good quality is a right of all citizens, but it is not always easily deliverable in remote areas, such as seagoing vessels as well as small islands, rural regions, or in developing countries. Remote teleconsultation therefore represents the only realistic way to deliver health care to patients not able to obtain direct medical assistance such as seafarers on board ships without medical facilities. Seagoing vessels represent a prototype of isolated place, and could remain at sea for days or weeks before reaching a port. The largest majority of merchant ships do not carry doctors or expert paramedic personnel and an officer with medical duties (the captain or the first mate) is the person in charge of the patient in case of accidents or diseases. For more than 80 years, several radio medical services have been operational, starting by using radio signals and Morse code [1], evolving through telephones to full blown telemedicine solutions. Today specialised ashore centres called Telemedical Maritime Assistance Service (TMAS) offer medical assistance to ships with no doctor on board [2]. Telemedical consultations, however, have some innate limitations. One consists in the fact that the great majority of people asking for medical advice by means of ICT resources do not have proper medical training. The communication of symptoms or specific clinical situations can therefore be difficult or misleading in case of absence of objective information such as biomedical data and/or video support [3].

This paper presents a system conceived to improve the first level teleconsultation by allowing the correct flow of the relevant information on the status of a patient, avoiding problems related to verbal communication or jammed transmission. This system guides the ship captain in the medical examination, increasing the preciseness of the information transmitted with the consequent possibility to obtain more accurate and quicker diagnosis.

Potential users of the system besides seafarers could be also other isolated populations such as personnel on board of commercial aircrafts or oil-rig workers or people living in rural areas. Hence, a potential high number of users can benefit from the system that will allow, starting from a given sign, the identification of the cohort of other signs and symptoms present.

MATERIALS AND METHODS

THE KNOWLEDGE BASE

A knowledgebase was built in the shape of an ontology. The ontology represents concepts and their logical relations and has a hierarchical structure. It is a suitable

solution for data managing and sharing, allowing a universal codification of concepts. In this sense, the effort of the Open Biological Ontologies (OBO) Foundry to create a set of interoperable ontologies enabling scientists and their instruments to communicate with minimum ambiguity should be mentioned [4]. An ontology also permits the reuse of knowledge and the inference of new knowledge, through automatic reasoning [5, 6].

In the present work this ontology has been developed using the existing software Protégé 3.4.1 [7], aggregating free-text data from the relevant literature [8]. When possible, our terms for clinical signs were associated as synonyms with the ones from SYMP (the OBO Foundry Symptom Ontology) [6] exploiting the “Bioportal” function of Protégé that allows linking to external resources.

Two main classes were created: “Sign” and “Detailed info”. A series of instances for the class “Sign” has been created to represent the main signs a patient could manifest, in example “Fever”, “Cough”, “Breathing difficulties”, “Diarrhea”, etc. Each main sign has relations (object property “hasDetailedInfo” in the ontology) with a series (1,n) of detailed information to be communicated to the medical centre. These information are represented in the ontology as instances of the class “Detailed info”, or better, of its subclasses.

Each main sign has relations (object property “hasAdditionalSign” in the ontology) with a series (1,n) of other signs (other instances of the class “Sign”). For instance, “Fever” has relations with “Cough”, “Breathing difficulties”, “Diarrhea”, etc., that represent possible associated clinical signs requested in the final application to the patient to be considered selecting “Fever” as main sign (Figs. 1, 2).

In the same way, to each detailed information has been assigned an answer that finally would represent the option the user should select or fill in the final application. A SPARQL query has been then created to retrieve data from the ontology. The following represents the general syntax to retrieve the detailed information and their relevant superclasses for the main sign “Fever” i.e.:

```
“SELECT ?detail ?answer ?superclass
WHERE { :Fever :hasDetailedInfo ?detail.
?detail rdf:type ?superclass }”.
```

THE APPLICATION

A software application was then built as the engine to interact with the “.owl” generated Protégé file.

Basic software technology and JSP

The system is based on a web service implemented in JSP. JSP seemed to be the most suitable solution, providing a Java library capable of interacting with the OWL standard. Java methods and classes can easily be called in a JSP page. The following are the main JSP pages (Fig. 3).

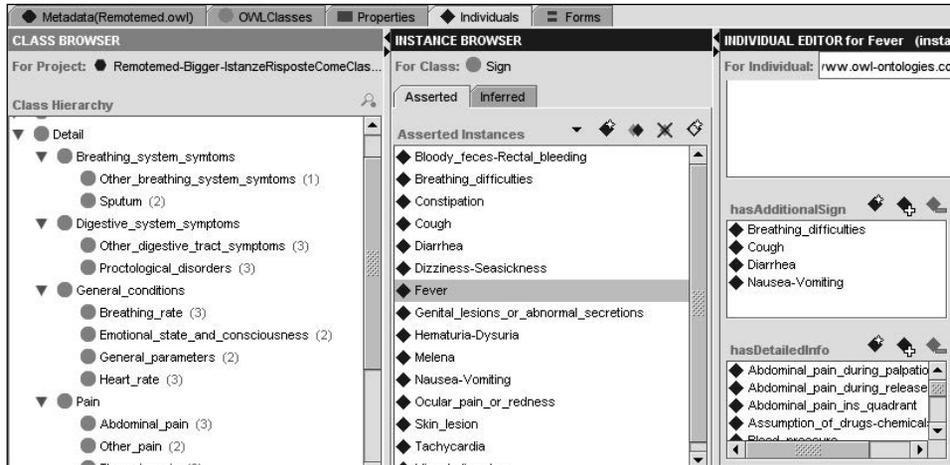


Figure 1. Protégé – some of the detailed information and additional signs (in the right) for the instance “Fever”. Some of the super-classes in the left

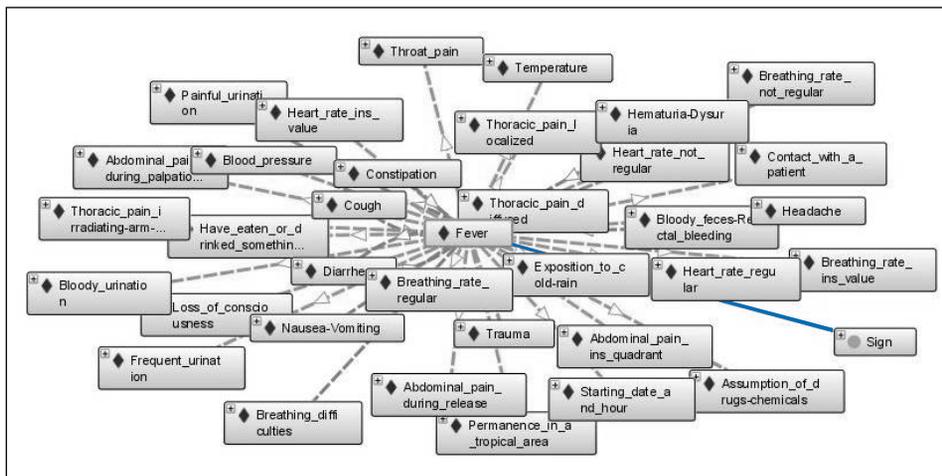


Figure 2. OntoGraph showing Additional Signs (blue line) and Detailed Info for the sign “Fever”

- The system allows for saving data in an XML database:
- main.jsp, main page that allows the user to select the principal sign and answer the detailed information and the additional signs; it contains all the JavaScript functions related to the web service, such as the “Yes/No” functionality (Fig. 4);
 - save.jsp, process page that saves the information inserted by the user in the XML database;
 - menu.jsp, a navigation page;
 - style.css, defines the CSS style of the elements.

The system even allows the doctors of the medical centre to answer the requests inserting a diagnosis and the admin to edit saved data. These are the relevant JSP pages:

- save_diagnosis.jsp, process page that saves the diagnosis inserted by the doctors in the XML database;
- view_data.jsp, allows doctors and admin to see and edit all the records. Admin could then, for instance, decide

to delete one or more users’ records and doctors to add or modify a diagnosis;

- delete_users.jsp, process page that permits to delete users’ records from the XML file.

The two principal pages concerning the final user (patient, doctor or admin) are “main.jsp” and “view_data.jsp”, the first to insert, the second to view data. The other pages, excluding “menu.jsp”, are processing pages and have the task to interact with the XML database and to modify it.

The Java classes

The Java classes work as interface between the application, the ontology and the XML database (Fig. 3). The main Java classes used were:

- **OWLAPI**, it acquires all the information contained in the ontology. For instance, when the page “main.jsp” is loaded, this Java class gets all the principal signs or when a user selects a principal sign, a method of the OWLAPI acquires

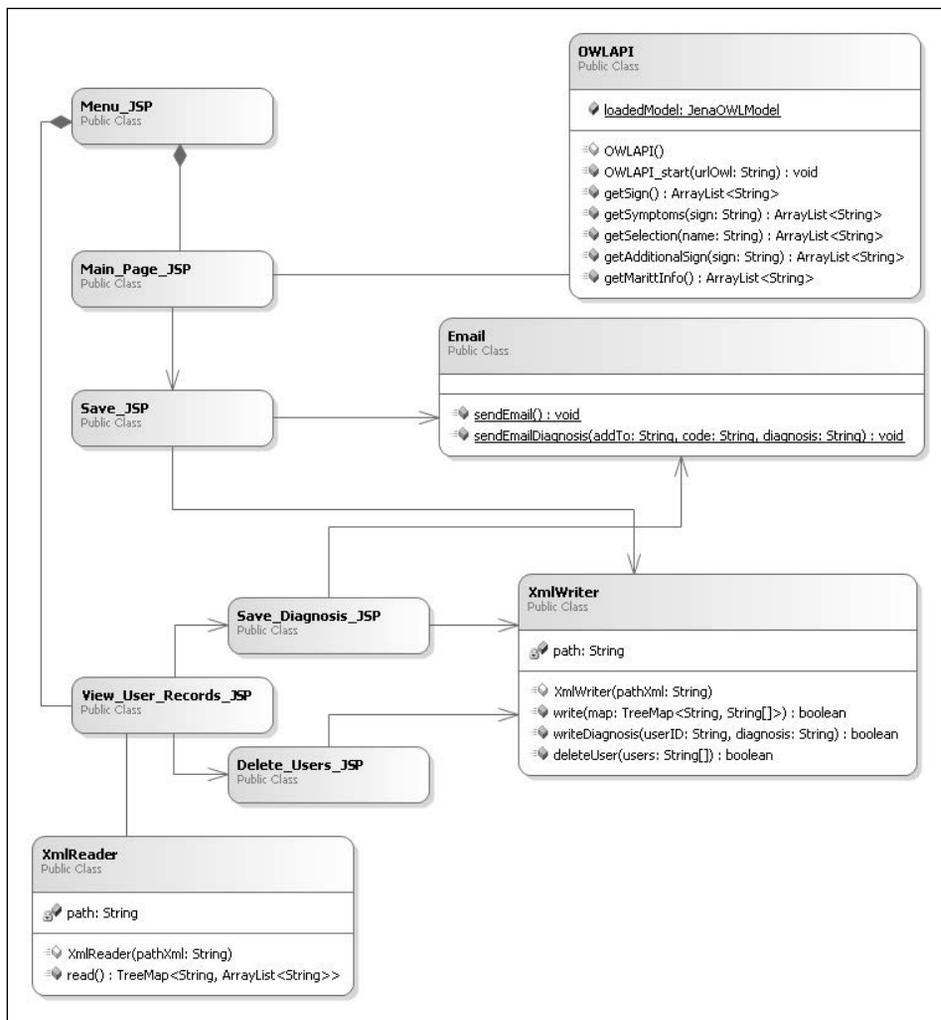


Figure 3. The main JSP pages and Java classes

(Fill out all fields and then click on submit.)

Principal sign: Fever

Abdominal pain Yes/No

Breathing rate Yes/No

Emotional state and consciousness Yes/No

General parameters Yes/No

Heart rate Yes/No

Named Individual Yes/No

Other pain Yes/No

Presuntive causes Yes/No

Starting information Yes/No

Thoracic pain Yes/No

Urinary functions Yes/No

Additional Sign:

Breathing difficulties	<input type="checkbox"/> Yes
Cough	<input type="checkbox"/> Yes
Diarrhea	<input type="checkbox"/> Yes

Figure 4. Groups of detailed information (ontological superclasses) to be explored/opened for the main sign “Fever”

from the ontology all the related detailed information and additional signs. This class takes advantage of the Protégé Java Library that permits to interact with an RDF/XML model that in fact is the structure of the ontology;

- **Email**, the task of this class is to send email to the medical centre with the list of information inserted by the user and to the user if a doctor has inserted or modified a diagnosis;
- **XmlReader**, this class is called when the page “view_data.jsp” is loaded. It takes all the records contained in the XML database;
- **XmlWriter**, as XmlReader it interacts with the XML database and inserts users’ records and doctors’ diagnosis.

THE PATIENT’S USER INTERFACE

Detailed info navigation and answering

The hierarchical organisation of concepts and the super-classes make easier and less time-consuming for the user to navigate the information. Selecting the main sign, the system asks to consider a series of additional signs and detailed infor-

Abdominal pain Yes/No	
Abdominal pain during palpation	<input type="checkbox"/> Yes
Abdominal pain during release	<input type="checkbox"/> Yes
Abdominal pain ins quadrant	lower_sx lower_sx upper_sx lower_dx upper_dx
Breathing rate Yes/No	
Breathing rate ins value	(Ins_intBreaths_per_minute)
Breathing rate not regular	<input type="checkbox"/> Yes
Breathing rate regular	<input type="checkbox"/> Yes
Emotional state and consciousness Yes/No	
General parameters Yes/No	
Blood pressure	(Ins_int_max_and_min)
Temperature	(Ins_float_35.0_to_40.0)

Urinary functions Yes/No	
Bloody urination	<input type="checkbox"/> Yes
Frequent urination	<input checked="" type="checkbox"/> Yes
Painful urination	<input type="checkbox"/> Yes

Additional Sign:

Breathing difficulties	<input checked="" type="checkbox"/> Yes
Cough	<input checked="" type="checkbox"/> Yes
Diarrhea	<input type="checkbox"/> Yes
Nausea-Vomiting	<input type="checkbox"/> Yes



Figure 5. Left part shows a detailed information referring to each superclass with the relevant answer options to select or fill in. The right part of the figure shows the procedure ends with the submission of the compiled form

mation. These are organised in big groups (superclasses). If the patient doesn't manifest the sign to which the group is referring or doesn't want to consider that superclass, he can simply answer "No" (or don't click) to the relevant superclass (Fig. 4).

By clicking on a superclass, the series of detailed info about that clinical status appears. They can be answered in the following three main ways (Fig. 5):

- boolean selection (Yes/No);
- multiple selection;
- typing (generally a string or a number).

Other information

Patient's general info. Some basic details on the patient needing medical assistance and simple information on his personal history should be provided:

- age;
- name;
- birthdate;
- sex;
- nationality;
- rank.

Patient's clinical history and drugs administered. Basic medical history and drug history of the patient should be included in the following order:

- previous most significant diseases;
- chronically administered drugs;
- drugs administered for the actual condition.

Submission of data

Once answered all the detailed information referring to all the superclasses as described above, the user can submit them, sending the data package to the maritime telemedical centre (TMAS) (Fig. 5).

The system has been adapted in particular for naval communication. Then, a series of information about the ship is required to be inserted, such as:

- ship name;
- ship type;
- ship owner;
- call sign;
- master;
- ship nationality;
- port of departure;
- port of arrival;
- speed;
- position;
- telephone/fax/e-mail.

SYSTEM TESTING

Tests of the system are ongoing in collaboration with Centro Internazionale Radio Medico (CIRM), the Italian TMAS [9] using seagoing vessels as a prototype of isolated places. CIRM medical assistance is given to ships of any nationality sailing worldwide. The service is provided 24 h a day and 365/366 days per year by doctors on duty. The centre receives the request of assistance and gives instructions for the case. For assessing the quality of the system, 150 teleconsultations between seagoing participating voluntarily to the experiments (users) and CIRM medical team (experts), were evaluated. Evaluation of the system involved both the user's and the expert's side and both user's satisfaction and technical aspects. The parameters listed below were considered compared to standard communication systems:

- accuracy of the request (number of non-ambiguous signs communicated per request);

Table 1. Evaluation of the system effectiveness using 150 teleconsultations from seagoing vessels (user) and Centro Internazionale Radio Medico (CIRM) headquarters in Rome (expert)

Parameter	Tester	Score
Accuracy of the request	Expert	High
Accuracy of the possible diagnosis	Expert	High
Speed – overall	User-Expert	Medium
Speed – diagnosis	Expert	High
Usability	User	High
Willingness to use	User	Medium
Completeness of the info	User-Expert	High
Easiness of data managing	Expert	High
Reliability of the system	Expert	High

"High", "Medium" and "Low" indicate respectively for better, same as, and worse compared to standard (telephone or e-mail) previous communication systems.

- accuracy of the diagnosis made by the centre (number of correct verified diagnosis/total cases);
- speed of a complete round: time to make the request/ /time to provide the answer;
- speed of the diagnosis;
- usability (easiness of use, even by an inexperienced user);
- willingness to use;
- completeness of the information;
- overall reliability of the system.

A score from "High" to "Medium" to "Low" was assigned by the testers (users and experts) for each of the above parameters.

RESULTS

The system described here has shown the capability to forward accurate remote requests of assistance with no technical problems in terms of software functionality and integrity of data transmission.

Differently to other tools that are diagnosis-oriented [10], the proposed system does not provide diagnostic solutions, but results efficient in guiding the user towards the collection of appropriate signs, already codified according to the guidelines provided by the maritime telemedical centre, with no possibility for self-ambiguity and ensuring the information transmitted to be as complete as required.

Table 1 summarises the results reporting the prevalent mark on the total number of evaluations provided by the testers. The system has shown, in respect to the existing consultation tools, a higher completeness and accuracy of the request of assistance in terms of information transmitted, a quicker and more accurate diagnostic possibility and an overall high usability and reliability.

DISCUSSION AND CONCLUSIONS

The system allows the user to prepare telemedical requests of advice with precise and circumstantial informa-

tion. A substantial advantage derived from adopting the application for telemedical consultation consists in the fact that a great number of specific information about the patient (automatically suggested starting from the main symptom) could be transmitted to the physicians in charge of medical assistance, increasing the chance to get a correct and faster advice. Moreover, data transmitted are encoded using a standard vocabulary and a standard formulation. The information transmitted is therefore more easily managed by the centre. The system will also contribute to constitute a patient's historical data repository as a support for further teleconsultations.

Thanks to the ontologies, an easy to obtain multi-language selection is available. This option could reduce communication barriers caused by language troubles, misunderstandings and verbal hesitations mostly due to the unavoidable use of technical clinical terms. Problems of jammed telephonic communication are also eliminated through the direct transmission of data.

As a result, the user is able to get a faster and more accurate answer of assistance from the maritime telemedical centre. Referring to the maritime assistance, a correct and quick diagnosis could avoid unnecessary transfers of the patients, limiting costs for changes of course/evacuations and discomforts for the crew.

In 2013, CIRM reported several problems in providing correct diagnosis due to imprecise information from the ship side. The test of the support communication system described here, showed an improved definition of the medical problems to be treated. The potential advantages of the system appear therefore promising.

FUTURE IMPLEMENTATIONS

As a possible future enhancement of the system, we are considering the possibility of crowdsourcing the requests, through a server, from the mobile terminal of the patient

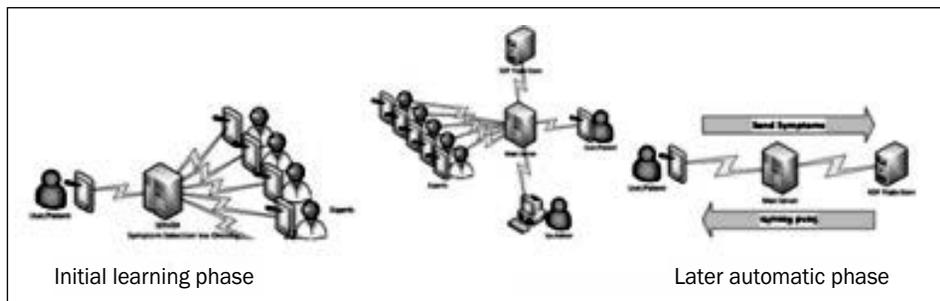


Figure 6. General architecture showing the flow of the information for a future possible distribution system. The users' request dispatched to the server would be redistributed to a set of experts and the answers would be both returned to the user and stored into a knowledgebase creating the basis for automatic diagnosis

(a mobile version should be first developed) to a pool of clinicians. Once the clinicians will answer the requests, these data will be returned back to the patients and stored into a knowledgebase (as actually for the XML database), creating the fundamentals for further automatic processing of medical information (Fig. 6).

This will allow the development of a medically-validated, punctiform, status-diagnosis association. In the second automated phase, the clinicians' work will be significantly reduced, but reliable medical answers could be still obtained since they will be inferred from researches and learning processes on the knowledgebase.

Considering the application, it would be interesting to investigate the possibility to perform automatic reasoning on the main ontology in order to infer new knowledge and to rearrange the existing data structure such as the subclasses hierarchy and the positioning of the instances.

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Development of software for handling ship's pharmacy

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ABSTRACT

Background: Ships are required to carry a given amount of medicinal products and medications depending on the flag and the type of vessel. These medicines are stored in the so called ship's "medicine chest" or more properly – a ship pharmacy. Owing to the progress of medical sciences and to the increase in the mean age of seafarers employed on board ships, the number of pharmaceutical products and medical devices required by regulations to be carried on board ships is increasing. This may make handling of the ship's medicine chest a problem primarily on large ships sailing on intercontinental routes due to the difficulty in identifying the correspondence between medicines obtained abroad with those available at the national market. To minimise these problems a tool named Pharmacy Ship (acronym: PARSI) has been developed.

Materials and methods: The application PARSI is based on a database containing the information about medicines and medical devices required by different countries regulations. In the first application the system was standardised to comply with the Italian regulations issued on the 1st October, 2015 which entered into force on the 18 January 2016.

Results: Thanks to PARSI it was possible to standardize the inventory procedures, facilitate the work of maritime health authorities and make it easier for the crew, not professional in the field, to handle the 'medicine chest' correctly by automating the procedures for medicines management. As far as we know there are no other similar tools available at the moment. The application of the software, as well as the automation of different activities, currently carried out manually, will help manage (qualitatively and quantitatively) the ship's pharmacy.

Conclusions: The system developed in this study has proved to be an effective tool which serves to guarantee the compliance of the ship pharmacy with regulations of the flag state in terms of medicinal products and medications. Sharing the system with the Telemedical Maritime Assistance Service may result in avoiding mistakes in drug administration. Last but not least the availability of PARSI could help reduce/avoid problems with maritime health authorities in case any of the required medicinal products are missing.

(Int Marit Health 2016; 67, 2: 72–78)

Key words: pharmacy ships, software, medicine inventory management, pharmaceutical compound, medical device

INTRODUCTION

Pharmacotherapy is a pillar of modern medicine. This is true also in case of diseases or accidents occurring on board of seagoing vessels [1]. Ships are required to carry given amount of medicines and medical devices which may vary depending

on the flag and on the type of the vessels [1, 2]. Medicinal and medical equipment stores form the so called "Ship Medicine Chest". The "Ship Medicine Chest" is not really a chest anymore, but the name is still there, although it would be more appropriate today to define it as ship's pharmacy [2, 3].

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The types of activities performed on board a ship are entirely different from the ones performed on shore. The situation is complicated by the fact that ships become both a workplace and a living environment for an extended period of time, also, cargo ships do not carry qualified medical or paramedic personnel and sailors have a higher risk of accidents which may result in death or a serious injury [4].

This concern is not completely new, because almost all national law systems – even before the European Union regulations required that medical safety standards are applied and a minimum supply of drugs is carried aboard vessels. A large number of national and international regulations (World Health Organisation [WHO], European Union) [5, 6] makes it difficult for ship officers managing the ship's pharmacy to perform their tasks. Medicinal products considered restricted by some countries are not restricted in others. This could create confusion aggravated by the fact that ship's personnel do not usually have enough knowledge of pharmacology/pharmacy regulations to prepare a cabinet for restricted products before they stop in different countries, e.g. Russia or Nigeria. Another problem may occur as a result of a language barrier; if a given medicine expired or has been used, it would be difficult to replace it with a local product, especially if it is labelled in a rare language.

At the international level, ship pharmacies should follow the regulations/recommendations as listed below:

- An “old” recommendation from WHO/International Labour Office/International Maritime Organisation in the second edition of the International Medical Guide for Ships (IMGS) with the list of types and quantities of medicines to be carried [5].
- This list was updated in the 3rd edition of IMGS [7]. The main problem of the more recent recommendation is that it did not mention the minimum quantities of different active principles to be carried out. In spite of the justifications of the rationale of this choice, this omission apparently has caused more problems than advantages. Problems that were not approached or solved in the so-called “Quantification Addendum: International Medical Guide for Ships 3rd edition” published in September 2010 [7].

Increasingly complex regulations for medical supplies and the maintenance of ship pharmacies as well as the possibility of getting medicinal products in various countries may make difficult to supervise the ship pharmacy especially for ships sailing on intercontinental routes. In general, seafarers may expect support/help from local pharmacies or organizations selling medicinal products. However, the fact that in the majority of cases they limit their intervention to the sale of medicinal products is not enough support.

In view of this in order to help the ship personnel maintain ship pharmacy, the software called Pharma-

cy Ships (acronym: PARSI) was developed. PARSI is a system designed to manage and monitor drug types and quantities available on board ships. It reduces the manual management of the inventory allowing for quick identification of the medicines available on stock which results in their faster administration in case of diseases or injuries on board.

MATERIALS AND METHODS

MICROSOFT WINDOWS ACCESS SOFTWARE

Pharmacy Ships is a pharmacy management system, which helps improve inventory management (the type and amount of medicinal products available on board). It was created using the Windows Access 2007 software and it consists of two sections: medicines and medical devices. Both of them have a storing section, access database, with detailed information about particular items and a mask to edit the database according to national regulations. The decision to divide the database into two main parts was taken after careful evaluation of the available data. The medicinal products database includes more information compared to the medical devices database; also medicinal products have a shorter expiry date and are more often used than medical devices.

RESULTS

SOFTWARE HOMEPAGE

The first page appearing after opening the program is a report showing, if present, medicines that will expire within the next 30 days. Hence, the report notifies the user in advance of the expiry date of medicinal products available on board (Fig. 1).

MEDICINAL PRODUCTS SECTION

A snapshot of the medicinal products database is shown in Figure 2.

Each line lists one medicinal products and the following information:

- pharmaceutical class;
- ATC code;
- active ingredient's name;
- pharmaceutical form;
- dose;
- minimum quantity required according to the ship's flag requirements;
- quantity on board;
- expiration date;
- note;
- amount available; this section will indicate with a green sign if the amount available is that required by regulations and a red sign if not.

ID	PHARMACEUTICAL CLASS	DRUGS NAME	PHARMACEUTICAL FORM	EXPIRATION DATE
21	Antihistamine	Salbutamol	Vial	31/03/2016

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Figure 1. Medicines expiring within the next 30 days

ID	CLASSE_FARMACEUTICA	ATC_CODIC	NOME_FARMACO	FORMA_FARMA	DOSAGGIO	TABELLA_C	QUANTITA_BO
1	Analgesici stupefacenti	N02AA01	Morfina Cloridrato	Fiala	10 mg		10
2	Analgesici stupefacenti	N02AD01	Pentazocina	Fiala	30mg		10
3	Analgesici stupefacenti	N02AD01	Pentazocina	CPR	50 mg		40
4	Antidoti per stupefacenti oppiacei	V03AB15	Nalozone	Fiala	0,4 mg		12
5	Antidoti per benzodiazepine	V03AB25	Flumazenil	Fiala	1 mg		5
6	Antidoti da digitale e altro	S01FA01	Atropina	Fiala	0,5 mg		3
7	Altri antidoti		Carbone vegetale attivato	Flacone	50 mg		2
8	Analgesici, antipiretici antireumatici	N02BE01	Paracetamolo	CPS	1000 mg		36
9	Analgesici, antipiretici antireumatici	N02BA01	Acido acetilsalilico	CPR	500 mg (gastoresi)		70
10	Analgesici, antipiretici antireumatici	N02BB02	Noramidopirina o Metamizolo	Gtt. (flaconi)			10
11	Analgesici, antipiretici antireumatici	M01AE01	Ibuprofene	CPR	200 mg		100
12	Analgesici, antispastici	A03BB01N	Butilbromuro di Joscina	Discoide	10 mg		40
13	Analgesici, antispastici	A03BB01N	Butilbromuro di Joscina	Supposta	10 mg		20
14	Analgesici, antispastici	A03BB01N	Butilbromuro di Joscina	Fiala	20 mg		15
15	Anestetici locali	N01BB02	Lidocaina	Flacone	50 cc		1
16	Antiacidi	A02AD01	Nitrato di alluminio colloidale	CPR	500 mg		100
17	Antiacidi	A02BA01	H2 antagonisti	CPR	150 mg		100
18	Antiacidi	A02BA02	H2 antagonisti	Fiala			20
19	Antistaminici	R03DA05	Aminofillina	Confetto	600 mg		30
20	Antistaminici	R03DA05	Aminofillina	Fiala	2 ml		10
21	Antistaminici	R03AC02	Salbutamolo	Fiala	500 mg		10
22	Antistaminici	R03AC02	Salbutamolo	Aerosol pressurizz			10
23	Antibiotici	J01FA09	Claritromicina	CPR	500 mg		60
24	Antibiotici	J01FA09	Claritromicina	Sosp. Ped.	125/100 ml		3
25	Antibiotici	J01CR01	Ampicillina Sulbactam	Flacone	1 gr + 500 mg		36
26	Antibiotici	J01DD04	Ceftriaxone	Flacone	1 mg		30
27	Antibiotici	D06AX07	Gentamicina	Fiala	40 mg		12
28	Antibiotici	J01AA07	Tetraciclina	CPR	250 mg		80
29	Antibiotici	J01EE01	Cotrimussazolo + Trimetropin	CPR	800 + 160 mg		80
30	Antidiabetici e antagonisti	A10AD01	Insulina	Flacone	400 ml		2
31	Antidiabetici e antagonisti	A10BA02	Metformina	CPR	400 mg		60
32	Antidiabetici e antagonisti		Glucagone	Flacone	1 mg		1

Figure 2. The database containing a list of medicines

The third field appearing in the database is shown in Figure 3. Here, the user can select a specific medicine and instantly obtain the information about the drug chosen. Each user can check the quantity of medicinal products available on board.

The software allows the user to modify some fields such as 'quantity on board'. For instance, if there is an emergency on board and a specific drug is used, an update of the field "quantity on board" must be made/will be stored inside the database. If the amount of a given drug on board is less than required, the software pops up an alert to notify the user that the depot needs to be refilled (Fig. 4).

If the amount of a given medicine on board is less than 50% of the minimum quantity required, the software

pops up another alert. However, in this case, the alert is blocked and the user cannot use the software again before refilling the depot (Fig. 5). There is a field informing the user if the quantity on board is bigger or equal to the minimum quantity required by showing a red "X" or a green "V". In Figure 3 the quantity on board is bigger than the minimum quantity required and thus a green "V" appears on the screen.

The software is capable of monitoring the expiration date of all medicines listed in the database, thus a user can easily see all the medicines expiring within the next 30 days (Fig. 1). The user can print out a copy containing information about the expiry dates of medicinal products at any time.

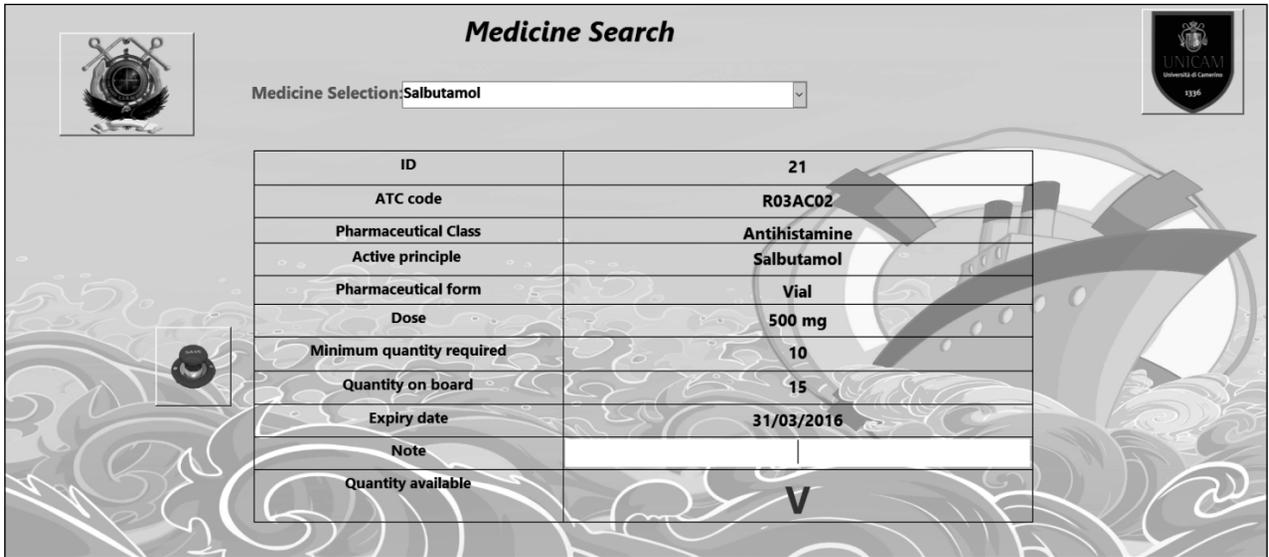


Figure 3. Graphical user interface – a medicine search box



Figure 4. A screenshot of the non-blocking warning created automatically by the software to alert the user that the quantity on board is less than minimum required by regulations

MEDICAL DEVICES SECTION

The medical devices section is quite similar to the medicinal products section. It includes another database with the information on the medical devices and another mask to manage and modify the related information. For each medical device the following data are included:

- ID;
- group;
- medical device name;
- minimum quantity required;
- quantity on board;
- note;
- amount available (Fig. 6).

The medical device mask has the same functions as the medicinal products section mask. There are two warnings related to the quantity on board when it is less of the minimum quantity required, which has been discussed in the previous section of this article (Fig. 7).

As an additional facility, the software has the ability to create an Excel file with the entire contents of the database for a transfer or printing for monitoring the inventory, thus optimising the timing and the quality of service. PARSi does not require the internet connection which is important as nowadays, most of the ships do not have stable internet connection. In the future, along with technological advance of the telecommunication systems on board, a web software

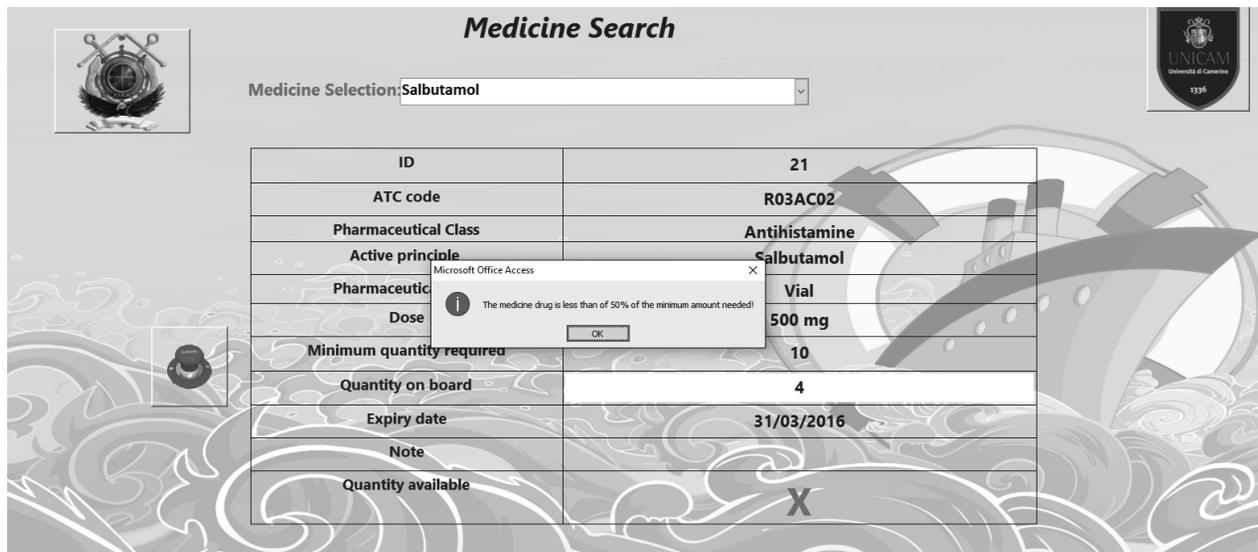


Figure 5. A screenshot of the blocking warning created automatically by the software to alert the user of the quantity on board less than 50% of the minimum quantity required. An immediate refill is mandatory

ID	GRUPPO	NOME MEDICAMENTO	TAB C	QUANTIT	NOTE_MEDICAMENTO	VALUTAZ
1	Kit per medicazione e chirurgia	Pinza standard chirurgica		3		X
2	Kit per medicazione e chirurgia	Forbice mayo		2		X
3	Kit per medicazione e chirurgia	Pinza mosquito		3		X
4	Kit per medicazione e chirurgia	Telino		1		X
5	Kit per medicazione e chirurgia	Pinza adson chirurgica		1		X
6	Kit per medicazione e chirurgia	Filo seta montato su ago		5		X
7	Basic life support	Pallone autoespansibile di ambu adulto		3		X
8	Basic life support	Cannula di guedel adulto mis.4		3		X
9	Basic life support	Cannula di guedel adulto mis.3		3		X
10	Basic life support	Cannula di guedel adulto mis.2		3		X
11	Basic life support	Maschera ambu adulto		3		X
12	Basic life support	Pinza tiralingua		1		X
13	Venopuntura terapie parenteral	Abbassalingua monouso		30		X
14	Venopuntura terapie parenteral	Agocannula 16g		20		X
15	Venopuntura terapie parenteral	Agocannula 18g		20		X
16	Venopuntura terapie parenteral	Agocannula 20g		20		X
17	Venopuntura terapie parenteral	Agocannula 22g		10		V
18	Venopuntura terapie parenteral	Agocannula 24g		10		X
19	Venopuntura terapie parenteral	Siringa sterile 2.5ml 22g		20		X
20	Venopuntura terapie parenteral	Siringa sterile 5ml 22g		30		X
21	Venopuntura terapie parenteral	Siringa sterile 10ml 21g		50		X
22	Venopuntura terapie parenteral	Laccio emostatico		3		X
23	Venopuntura terapie parenteral	Laccio emostatico di esmark		2		X
24	Venopuntura terapie parenteral	Strisce determinazione glicemia conf.		2		X
25	Venopuntura terapie parenteral	Glucometro		1		X
26	Venopuntura terapie parenteral	Lancetta pungidito sterili		30		X
27	Venopuntura terapie parenteral	Strisce reattive multiparametriche urine		50		X
28	Venopuntura terapie parenteral	Siringhe da insulina 100UI/ml		20		X
29	Vari	Aspiratore segreti set cannula		2		X
30	Vari	Assorbenti igienici		10		V
31	Vari	Bacinelle reniformi		5		X
32	Vari	Barilla cucchiaino con cintura di sicurezza		1		V

Figure 6. The database containing a list of medical devices

module can be integrated to enable real-time, and independent sea-to-shore communication.

DISCUSSION

People living ashore usually have an easy access to medical services available. This is not the case with seagoing ships, the majority of which do not have a doctor or any professional medical personnel and may be at sea for days or weeks before they can reach a port. In this situation, the best ways/methods to treat diseases or injuries on board are:

- to provide medical advice via telecommunications systems;
 - to guarantee proper training of personnel responsible for health care on board;
 - to have an adequate supply of drugs and essential medical equipment (the so called ‘ship’s medical chest’).
- The types and quantity of medicinal products and medical devices which need to be stored on board vary greatly depending on the type of ship and the routes the ship follows; the lists of the recommended medicinal products are estab-

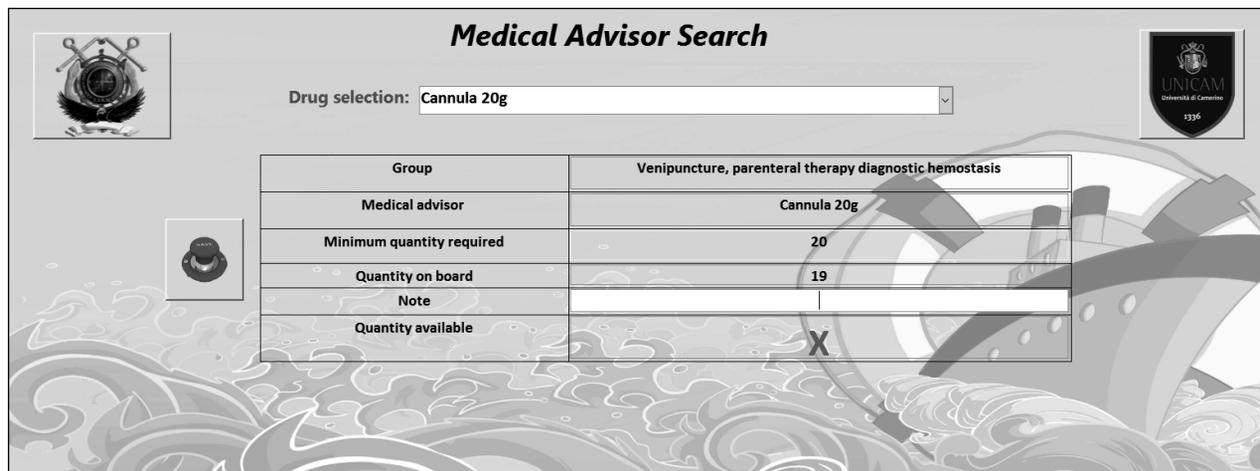


Figure 7. The user interface to handle a medical advisor with a search box

lished by the flag state. International institutions such as the WHO [7] or the European Commission [8] issued specific recommendations on the contents of the ship's medical chest. The WHO guidelines published in 1988 were binding for those states which did not possess their own regulations [7, 8].

The old regulations required the captain to check the medical equipment before departure and gave the maritime health authorities the task to deliver/issue the conformity certificate [9]. The presence of a pharmacist on board ships is not required by law [10]. The World Association of Pharmacists (Federation Internationale Pharmaceutique) at their World Congress of 2003 [11] approved a statement on the policy to be pursued by the category on the issue of supply of drugs to the ships and their proper use [11]. The regulations on the contents of the ship's pharmacy issued by the Italian authorities (Decree 1 October 2015) are the newest of those published by other maritime countries [12]. The main novelty consists in the indication of the ATC code [13] for identifying medicinal products and in the possibility to substitute a medicine with an active principle with a similar one with the same therapeutic activity. This principle represents a real innovation in the field and an opportunity to avoid overlap that from time to time can be seen. This makes possible to limit the contents of the ship's medical chest. A problem which still need to be solved is who can establish the therapeutic equivalence taking into account that inspectors delegated to supervise a ship's pharmacy may not have enough knowledge of pharmacology to fulfil this task. A wider use of the ATC codes on board ships may help establish the therapeutic equivalence between cognate substances. In view of the therapeutic affinity of molecules, varying in the ATC code only in the last 2/3 letters/figures, changes of the ATC code within these limits will certainly result in a simpler

identification of therapeutic equivalence among molecules of a given class [13]. Of course, the only professionals who can perform the task are pharmacists; therefore they should be given a more defined role in controlling, even remotely, the contents of a ship's pharmacy.

CONCLUSIONS

To provide support to the ship personnel responsible for handling/managing the ship's pharmacy we have developed the PARSI programme. The purpose of this was to provide standard operative procedures for handling the ship's pharmacy and to automatize some actions which are still carried out manually. PARSI is easy to use, and it allows the user to manage the inventory of drugs and medicaments on board in a mostly automated way possible, thus reducing the risk for potential errors and oversights. Thanks to this computerised system, periodic monitoring of ship's pharmacy is simpler and less time-consuming. The user can search for a specific drug by typing in its active ingredient and/or its ATC code to find out all the information.

In the future, an improved and more attentive handling of the ship's pharmacy will facilitate the management of diseases and accidents occurring on board. Occasionally it is impossible to fill prescriptions issued by the Telemedical Maritime Assistance Service [13] due to the lack of a given drug on board. Monthly reports on the contents of the ship's pharmacy will help avoid these problems. On the other hand, an easier way of classifying medicinal compounds available on board, identified by numbers could be accompanied to the reduction of possible mistakes in administering pharmaceutical compounds to seafarers. To sum up, PARSI offers a unique opportunity to simplify the management of the ship's pharmacy and consequently, to improve the quality of medical assistance on board ships.

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