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## DENTAL PRACTICE DURING A WORLD CRUISE: TREATMENT NEEDS AND DEMANDS OF CREW

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### ABSTRACT

**Aims:** To describe dental treatment needs and demands of crew on a cruise ship during a world cruise.

**Methods:** The routine dental documentation of a two months period at sea on a cruise ship carrying 999 crew was analysed. Age, gender, diagnosis, treatment performed, percentage of emergency and routine procedures, number of appointments, duration of appointment and time since last visit to the dentist were recorded. Oral health-related quality of life (OHRQoL) was measured using the 14-item Oral Health Impact Profile.

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**Results:** Subjects were n = 56 crew with a mean age of 37 ( $\pm$  12.0) years. Out of 114 patient contacts n = 29 (25 %) were for emergency treatment. Caries and its sequelae accounted for 85 % of time spent treating emergencies and 50 % of routine treatment time. The two most frequent treatment options during emergency appointments were extractions and endodontics. In routine cases fillings and periodontal treatment were dominating. Per 1000 persons per month crew required 14.5 emergency plus 42.5 routine appointments. 80 % of crew had seen a dentist within 12 months before their shipboard dental appointment. Oral health-related quality of life was most impaired in case of emergency patients with a particular emphasis on the diagnosis of pulpal disease.

**Conclusion:** High numbers of dental emergencies largely due to caries indicated that International Labour Organisation (ILO) recommendations requiring seafarers to be dentally fit were not adhered to. It is suggested that some doctors performing pre-sea medical examinations may not adequately diagnose caries. A pre-sea examination by a dental professional has the potential to reduce the number of emergency port referrals to dentists. Treatment costs and attitude to preventive dental care were identified as barriers impeding the access of low-wage crew to the ship's dental clinic. Cosmetic dentistry and prophylaxis attracted those crew with an interest in prevention and the ability to pay the fees. In large cruise ships there is a substantial demand for both emergency and routine dental care among crew.

**Key words:** Oral health, Maritime medicine, OHIP, Emergency oral care, Caries

## INTRODUCTION

While individual cargo vessels only carry a small number of the estimated <sup>1,2</sup> million seafarers world-wide<sup>1</sup>, large cruise ships regularly employ more than 1,0<sup>00</sup> people. Personnel in hotel departments plus marine crew have rapidly increased in numbers in parallel with the growth of the cruise market. Previous studies have pointed at an increased risk for the oral health of seagoing crew<sup>2,3</sup>. Up to 6<sup>7</sup> % of referrals by ship's doctors to shoreside specialists are related to oral disease<sup>3</sup>. Current recommendations to cut the referral rate for out-patient port services encourage doctors to ensure, that dental problems are solved before sign-on<sup>4</sup>. The regulations governing medical fitness at sea also include the criterion of dental fitness<sup>5</sup>. However, medical doctors are probably neither trained nor equipped to perform thorough dental examinations and a check-up by a dental professional is not part of the medical fitness requirements for seagoing crew. Therefore it is probable, that a significant number of

dental conditions leading to treatment need during the voyage remain undetected at the medical check-up. In view of the large numbers of seafarers a substantial need for dental treatment is apparent. A previous study has been published describing basic indicators of oral health of crew and passengers on a cruise ship<sup>6</sup>. However, no data have been reported in the literature on dental treatment provided to the crew of merchant ships while at sea.

Therefore, it was the aim of this study to describe treatment needs and demands of crew attending the dental service on board of a cruise ship.

## MATERIAL AND METHODS

### **Subjects and setting**

Records were analysed, pertaining to all dental treatment provided to crew who attended the dental clinic aboard a cruise ship during a world cruise between 15 February and 15 April 2006 sailing from Sydney to Athens. Longest time at sea was 5 days and longest time in port three days. At midpoint of the observation period the vessel carried 999 crew from 57 nations. Some crew changed in every major port. The data regarding all crew would have been influenced by such changes. However, these changes did not affect the general composition of the ship's company and thus a single survey was felt to be sufficient. The vessel was equipped with a standard single-chair dental surgery integrated into the ship's medical facility with chairside intra-oral radiographic facilities. Regular daily office hours coinciding with the medical officer's crew consultation time were offered in the morning and in the afternoon. All tasks related to dental treatment (documentation, clinical procedures, instrument preparation and sterilisation etc) were performed by one dental officer. For occasional complex surgical procedures chairside assistance was available upon request from the ship's medical centre. The ship's nurses assisted in making appointments.

Patients seeking treatment were either classified as emergencies, in case of any acute event, that forced the crew member to seek dental care aboard, or as routine cases. The second category comprised all crew attending without being aware of an acute condition. The costs of the first appointment of an emergency patient were covered by the employer. In most cases this would have been sufficient to control any pain. Any subsequent treatment was at the crew member's expense. For all patients the number of natural teeth and prosthetic status including the presence of implants, fixed and removable prosthesis were recorded. Detailed findings have been published elsewhere<sup>6</sup>.

### **Dental conditions diagnosed and treatment provided**

Oral conditions diagnosed were classed as follows: Pulpal disease, periodontal disease, caries, defective restoration and others. The last category comprised rare conditions and was also applied to crew, who, while presenting for routine examination, expressed an unhappiness with the shade of their teeth.

Procedures performed included extraction, endodontics (root canal treatment), definitive fillings and dental bleaching. Number of appointments, time taken and time since last dental visit before the voyage were recorded. Finally the number of emergency and routine treatment sessions per 1000 persons per month at sea was calculated.

#### **Perceived oral health**

How patients perceived their oral health status was characterised by oral health-related quality of life (OHRQoL). This was measured using the 14-item Oral Health Impact Profile<sup>7</sup>. For each OHIP question, subjects were asked how frequently they had experienced the impact in the last month. Responses were made on a scale 0-never, 1-hardly ever, 2-occasionally, 3-fairly often, and 4-very often. OHRQoL impairment was characterised by the OHIP summary score (OHIP-14) – the sum of all 14 item frequencies. The score ranges from 0-56 (0-4\*14) OHIP units. “0” indicates the absence of any problem, higher OHIP scores represents more impaired OHRQoL, i.e., the total instrument score is a “problem index”.

#### **Data analyses**

For each diagnosis, the accumulated treatment time and OHIP sum score ( $\pm$  standard deviation) were calculated. In addition, the number of appointments per dental procedure and the mean time needed per appointment ( $\pm$  standard deviation) quantified the manpower required for dental treatment. All analyses were performed using the statistical software package STATA, Release 9 (StataCorp. 2005. Stata Statistical Software, College Station, TX), with the probability of a type I error set at the 0.05 level.

## **RESULTS**

### **Dental treatment rendered and treatment time required**

The ship’s dental clinic was attended by 56 crew (mean age  $37 \pm 12.0$  years). The total number of patient contacts during the observation period of two months was 114. Among these contacts, the majority (n=85, 75 %) of treatment sessions rendered to crew was for routine work. Emergency treatment was provided on 29 appointments. These

figures resulted in 14.5 emergency plus 42.5 routine appointments per 1000 crew per month.

Median time since the last visit to the dentist was 12 (P25,75 6, 12) months with one crew member last having had a dental consultation 10 years ago.

Emergency treatment frequently involved endodontics and extractions whereas routine treatment was typically concerned with periodontal treatment, bleaching and a substantial number of fillings. Further details together with the mean duration of appointments by procedure are presented in Table 1.

**Table 1 Emergency and routine dental procedures performed by number of appointments (n) and mean duration in minutes**

Treatment	Emergency treatment	Routine treatment	Duration
	n	N	min (sd)
Bleaching	-	34	28.5 (31.4)
Extraction	8	1	28.9 (13.6)
Osteotomy	1	-	60 (-)
Temporary endodontics	6	1	63.6 (28.1)
Definitive endodontics	1	1	60 (0)
Periodontal treatment	2	23	41.4 (22.6)
Temporary filling	1	-	40 (-)
Definitive filling	7	20	52.4 (23.6)
Others	3	5	25.6 (11.5)
Total	29	85	36.6 (25.1)

#### ORAL DISEASE DIAGNOSED AND ORAL HEALTH-RELATED QUALITY OF LIFE

Most of the treatment time, in both, emergency and routine cases, was related to the diagnosis of caries. In emergency patients, this was followed by pulpal disease as the second most frequent diagnosis whereas routine patients presented with periodontal disease in second place. All OHIP-14 sum scores were higher for emergency than for

routine treatment. This was most notable in the case of emergency and routine treatment of pulpal disease. Trauma related to dental injuries caused by accidents did not occur (Table 2).

**Table 2 Accumulated total treatment time and impairment of oral health-related quality of life by diagnosis and type of treatment**

Diagnosis	Total	Emergency treatment		Routine treatment	
	Time min (%)	Time Min	OHIP mean (sd)	Time min	OHIP mean (sd)
Pericoronitis <sup>2</sup>	80 (2.2)	80	5.0 (-) <sup>3</sup>	-	-
Pulpal disease	405 (11.0)	285	22.3 (4.8)	120	0.0 (0)
Periodontal disease	785 (21.2)	60	8.0 (5.3)	725	3.3 (6.2)
Caries	1345 (36.4)	440	20.9 (19.5)	905	3.0 (5.9)
Defective restoration	505 (13.7)	250	3.4 (5.5)	255	3.0 (2.5)
Others	575 (15.5)	30	8.0 (-)	545	1.1 (1.5)
<b>Total</b>	<b>3695 (100)</b>	<b>1145</b>	<b>12.3 (11.1)</b>	<b>2550</b>	<b>3.3 (5.9)</b>

## DISCUSSION

The present study is the first survey describing both, oral diagnostics and treatment provided to crew onboard a cruise ship. Previous studies of dental health at sea were based on the analysis of general medical records maintained by ship's medical staff. Such records generally did not provide sufficiently detailed information to allow a precise description of diagnostics of dental conditions. They did however indicate a high rate of dental emergencies with a recent study reporting one crew-member per week<sup>4</sup> in need of an emergency dental port referral. As treatment records documenting dental therapeutic interventions in foreign ports are generally not available for analysis, it can only be assumed that the actual treatment need beyond the emergency care may

<sup>2</sup> Gum infection around erupting teeth

<sup>3</sup> Only one treatment session.

be considerably higher. Several studies which contributed to the development of recommendations and standards of general health care, have been published describing medical practice onboard cruise ships, while only scant attention has been paid to dental aspects. Due to the presence of a dental officer, maintaining a regular emergency and routine dental service aboard one ship, treatment records containing in-depth information have been generated. The analysis of these records presented here provides valuable information which may contribute to the development of standards for dental care aboard<sup>8</sup>.

### **Dental emergencies**

Dental caries is the diagnosis of overriding importance letting crew seek dental care. Considering that dental caries is also the root cause behind most pulpal disease, and one of its sequelae are failing restorations, the significance of this disease cannot be overestimated. Combining these three diagnoses, 85 % of emergency treatments and 50 % of routine treatment time was dedicated to dealing with caries.

Caries is found to be polarised in the general population with a small proportion of individuals carrying a large percentage of lesions<sup>9</sup>. Therefore, prevention strategies have been developed to identify subjects at greater risk. A similar approach to reducing dental emergencies at sea could be applied and efforts could concentrate on identifying high risk individuals during the seafarer medical examinations. Currently WHO/ILO recommendations for conditions to be considered by medical examiners when issuing health certificates under the heading of oral health do list "Infections of the mouth cavity or gums. Severe dental defects that interfere with mastication. Seafarers must be dentally fit"<sup>5</sup>. Masticatory function is highly adaptable so that dental defects severe enough as to interfere with mastication are exceedingly rare. This is particularly true for the population of young and middle aged adults which represents the majority of personnel onboard ships. The prevalence of caries as an infection of the hard tissues in turn is extremely high and, as long as it remains untreated, would preclude dental fitness and may lead to more severe problems such as abscesses and general blood infection. In addition to the pain and suffering experienced by the individual such serious conditions potentially reduce the ability of crew members at sea to operate the ship safely.

Any cursory examination, without adequate lighting, without a dental mirror and a dental explorer, as is customary in medical examinations for sea going crew, would only reveal gross problems. Even a trained examiner under ideal conditions cannot by visual examination alone diagnose all caries. Lesions on proximal contact surfaces of teeth, that have not yet progressed to involve any of the adjacent directly visible tooth surfaces, can only be diagnosed on radiographs. In order to reduce the number of dental emergencies at sea by identifying those patients with a particularly high incidence of caries, it is suggested to include an examination by a dental professional in the medical

fitness examination. Incidentally the number of seafarers from the Philippines attending the dental service was very low<sup>6</sup>. Seafarer examination centres in this country generally employ dentists to assess dental fitness. In case of dental pathology diagnosed during the initial examination a certificate of health in accordance with WHO recommendations is only issued after the seafarer has been re-examined following dental treatment. It is suggested that the low attendance of Filipino seafarers may be a corollary of the dental component of the pre-sea examinations in their home country.

Due to the complex nature of the treatment, the duration of sessions involving endodontics (root canal treatment) was longer than for any other procedure. The alternative, a dental extraction, was performed in less than half the time. It has been reported, that the costs associated with root canal treatment can be prohibitive when performed in high-cost ports for low-wage crew with inadequate health insurance who instead request extractions<sup>4</sup>. Teeth that could be restored are thus lost; the oral functions of mastication, speech and aesthetics in the long term are unnecessarily impaired. It is probable, that the support of the shipping company for emergency treatment performed aboard has contributed to an increased rate of teeth being saved by making the first step of a root canal treatment, which controls any pain, available to all crew.

Accidents causing dental trauma to crew did not occur during the observation period. No data on the incidence of accidents requiring dental assistance have been reported in the literature. However, when such accidents occur, the need for an onboard dental service may indeed be critical. Dahl<sup>4</sup> reported figures about dental emergencies on a specific cruise ship requiring crew referrals to port facilities from which a rate of 7.6 emergencies per 1000 crew per month can be calculated. This is half of the figure calculated in this study and underreporting would appear to be the main factor explaining the difference. The well known difficulties in obtaining adequate dental care in developing countries<sup>10</sup> may discourage many crew from seeking dental treatment during a voyage preferring to rather wait until they are able to see their familiar dentist at home, possibly suppressing symptoms with analgesics and antibiotics in the meantime.

#### **Routine dental treatment**

The ship normally carries a dentist once a year for the duration of the world cruise. Regular crew are aware of the facility and a proportion of them make use of it for an annual dental examination. The fact that 80 % of patients had seen a dentist within the past 12 months illustrates a preventive approach of a majority of the routine patients seen. The costs for a dental examination on board were partly sponsored by the shipping company in an attempt to encourage preventive healthcare. It could be argued, that the sponsorship is cost effective for the company as it would potentially reduce the number of costly out-patient referrals of crew in port at times when there is no dentist on board.



What did attract crew to the ship's dental clinic was the offer of tooth whitening (dental bleaching). This supports the commonly held opinion in the dental profession that cosmetic aspects of dental care are increasingly relevant. Adorning teeth with sparkling pieces of glass and whitening are attractive to patients and are widely used as practice builders in private practice. This effect was also observed in the ship's dental clinic.

Maintaining a healthy parodontium requires regular prophylaxis, both by observing oral hygiene at home and by professional maintenance. The majority of patients attending for routine examinations were diagnosed with gingivitis as the mildest form of periodontal disease and had their teeth scaled and polished. The aesthetic improvements achieved by removal of stains due to nicotine, tea and other substances are a welcome side-effect which again acted as a practice builder within the group of patients who value a preventive approach and who are on a wage level that allows them to afford dental care.

#### **Overcoming barriers**

Only 3.5 % of the ship's complement attended for routine dental care. Considering the ease of access to the service onboard this figure appears rather low. A possible explanation lies in the level of dental fees. A large number of low-wage crew may even find a reduced fee of 15 USD prohibitive when a dental examination in their home country is available at even lower rates. The knowledge of the value of preventive examinations and treatment before the patient suffers any pain is not firmly established in the cultural context of developing countries from where low-wage crew often originate.

To overcome these barriers, simple educational material in the form of posters could be used on notice boards around the ship. A more individual approach could involve a personal letter ideally in the crew members preferred language, handed over at sign-on and informing about the availability of an oral health service. The dentist might present illustrated talks on oral health to the crew. In addition, the shipping company could consider offering a free dental examination while the dentist is onboard. Manufacturers of tooth paste and toothbrushes often make samples available to dentists at no cost which could act as an incentive for crew to attend for prophylactics. Patients in need of treatment could either have their teeth rehabilitated on the ship at a reduced rate or, in case they prefer treatment at home, be requested to produce a certificate from their dentist confirming conclusion of their course of treatment before the beginning of a new contract. Such an approach would almost certainly reduce the number of dental emergencies onboard and could be cost effective.

### **Oral Health-Related Quality of Life**

We also assessed how oral disease, in particular caries, affected the individual. Oral health-related quality of life is a concept which described the perceived impact from oral disease. Once a carious lesion has progressed to a state where the pulp is affected, severe pain can occur. Dental and orofacial pain is considered an important dimensions of OHRQoL<sup>11</sup>. Consequently highest OHIP sum scores, signifying a substantial amount of human suffering, were seen in emergency patients with a diagnosis of pulpal disease. It is noteworthy, that those patients in this study who suffered from pulpal disease which was asymptomatic and only diagnosed during routine examinations, had an OHIP sum score of zero. This is not unexpected because oral health-related quality of life questionnaires measure only the impact from oral disease which is perceived by the subject. Although such instruments cannot be used to detect oral disease in its early asymptomatic stages and, therefore, are only of limited values as a screening device, they complement the assessment of physical oral health indicators such as number of (missing) teeth, periodontal pocket depth by providing patient-based information about the impact of oral health. Therefore, brief questionnaires such as the 14-item Oral Health Impact Profile may be useful to implement a bio-psycho-social approach to diagnosis and treatment of oral disease at sea where resources are usually more limited than ashore.

### **CONCLUSIONS**

In large cruise ships there is a substantial demand for both emergency and routine dental care among crew, especially when the journey is longer. The emergency dental treatment needs may be reduced by employing dental expertise in pre-sea medical examinations. Cultural and financial barriers which impede access to routine care for low-wage crew could be addressed in various ways in order to improve oral health of seafarers. It is postulated that a dental service on a large cruise ship staffed with one dentist attracts sufficient numbers of crew patients together with passenger cases to be viable. A broadly trained and experienced dentist can substantially contribute to the wellbeing of crew at sea.

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