

# ► User satisfaction with maritime telemedicine

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## Summary

We assessed the satisfaction of onboard caregivers with the maritime telehealth service provided by the Centre de Consultations Médicales Maritimes (CCMM). We conducted a survey of captains and caregivers by email. Of the 385 surveys sent out, 165 (43%) were completed. Eighty four percent of responders ( $n = 110$ ) thought that waiting time was satisfactory or very satisfactory, and 97% ( $n = 128$ ) were satisfied or very satisfied with their relationship with the remote physician. Thirty eight per cent of participants ( $n = 50$ ) considered that the physician understood the medical problem very well; understanding was good in 58% of cases ( $n = 76$ ) and bad in only 4% of cases ( $n = 5$ ). Sixty two per cent of participants ( $n = 83$ ) sent pictures before consultation. The respondents were also satisfied with the telephone advice overall, the competence of the physicians providing the advice, the length of time spent waiting, the verbal prescription and the medical advice given. Onboard caregivers were generally well satisfied with the maritime teleconsultations and the advice provided by the CCMM physicians.

## Introduction

Patient satisfaction is an important outcome of health care services and can affect compliance with medical advice, service utilization and the clinician-patient relationship.<sup>1,2</sup> The French organization for Medical Assistance at Sea<sup>3</sup> involves the Centre de Consultations Médicales Maritimes (CCMM), which is in charge of teleconsultations and assistance services. The management of a patient on board – whatever the location of the ship – relies on a teleconsultation with CCMM physicians. Although many satisfaction studies concerning telemedicine have been performed in different settings throughout the world, to our knowledge, none have been done for maritime consultations. We have therefore examined on-board caregivers' satisfaction with the CCMM telehealth services.

offers a 24-hour emergency physician consultation service, and is part of a teaching hospital (Toulouse Purpan Hospital) affiliated with Toulouse University. The service delivered by telephone and email.

A "medical observation prefilled sheet" which was developed by the CCMM is used as a preliminary aid prior to the consultation. In most cases, the patient will be supported, treated and watched over on board, according to repeated teleconsultations. If at the end of a consultation, it is not possible to maintain the patient on board, then the patient will be evacuated with the help of other rescue services. These are provided through the Maritime Rescue Coordination Centre (MRCC) which coordinates emergency resources for search and rescue at sea, including patient evacuation to a suitable hospital.

## Methods

The French Telemedical Assistance Service (TMAS) is operated by the CCMM. The CCMM is a telemedicine centre for French ships worldwide, and provided 3312 teleconsultations for 1633 patients in 2010. The CCMM

## Data collection

In April 2011, we conducted an email survey of the use of and satisfaction with CCMM telehealth services for ships in the previous year. The survey was aimed at captains and caregivers on board, who are authorized to call the TMAS when a medical problem is suspected. We included only people with a known valid email address, because a mailed or telephone survey was not feasible. The survey included 24 items (see Appendix 1) and was developed after several meetings of the TMAS medical team in cooperation with the quality and surveys working group of the emergency medicine department. The questionnaire was tested with administrative staff and with several caregivers from the

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emergency department to check for clarity and validity of the questions, after which minor modifications were made.

The questionnaire was sent by email with an Internet link redirecting the recipient to an online form (Google docs, Google Inc, Mountain View, USA). The questions were about:

- (1) Epidemiological data (age, gender, function, type of ship);
- (2) User satisfaction concerning the conduct of the consultation (scale from 1 = very disappointing to 5 = very satisfactory);
- (3) User satisfaction concerning sending; electrocardiograms (ECGs) by email, interpretation and response;
- (4) User satisfaction concerning sending photographs by email, interpretation and response;
- (5) User satisfaction (scale from 1 = very uncomfortable to 4 = very comfortable) concerning telemedical help for technical procedures (e.g. injections, sutures, splinting);
- (6) User satisfaction concerning initial and continuing annual training by the CCMM physicians (scale from 1 = very dissatisfied to 10 = very satisfied).

Two open-ended questions were included about overall satisfaction with the TMAS consultations.

A cover letter was sent in advance of the survey stating the purpose of the study. One month after the first contact, a second reminder was sent to all potential respondents. Ethics approval for the study was not required.

## Results

Of the 385 surveys that were sent out, 165 (43%) were completed, see Figure 1. The majority of responders were male (93%). The mean age was 40 years (SD 10). The respondents' characteristics are summarised in Table 1.

### Measures of satisfaction

Most respondents ( $n = 110$ , 84%) thought that waiting time was satisfactory or very satisfactory, see Table 2. Most respondents ( $n = 128$ , 97%) were satisfied or very satisfied with their relationship with the TMAS physicians, see Table 3. The mean satisfaction with initial training (level 1, 2) and continuing training were high (7.0 SD 1.7, 7.2 SD 1.8 and 7.3 SD 1.7, respectively).

### Chief complaints

Of the 132 calls concerning one emergency consultation, most callers (70%,  $n = 92$ ) completed the medical observation sheet before the teleconsultation, as an aid to teleconsultation.

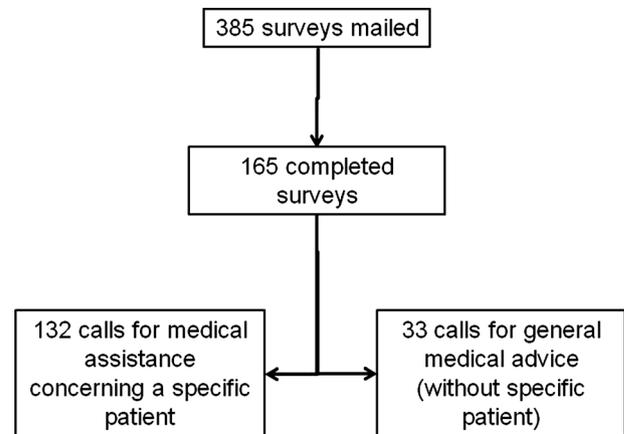


Figure 1 On-board caregivers' responses

The callers recorded electrocardiograms (ECGs) with Survcard equipment ( $n = 61$ , 71%), Telecardia equipment ( $n = 13$ , 15%) or other equipment ( $n = 12$ , 14%). There were problems with ECG recording in 23% of cases ( $n = 30$ ) and transmission was difficult in 17% of cases ( $n = 22$ ).

Sixty two per cent of participants ( $n = 83$ ) sent pictures before consultation. Transmission was difficult in 3% of cases ( $n = 4$ ). A videoconference with Skype (Microsoft Corporation, Richmond, USA) was used by one caller.

### Medical response

Forty four per cent of verbal prescriptions ( $n = 58$ ) were considered very clear, 54% clear ( $n = 72$ ) and 2% unclear ( $n = 2$ ). Thirty per cent of participants ( $n = 17$ ) stated that they would like written confirmation of the prescription by email. Forty nine per cent ( $n = 65$ ) of responders felt uncomfortable concerning medical procedures, see Table 4. In 8% of consultations, medical procedures were not performed ( $n = 12$ ).

Table 1 Respondent demographics ( $n = 165$ )

Characteristics	Value
Mean age, years (SD)	43 (10)
Gender	
Male, $n$ (%)	154 (93)
Function	
Captain, $n$ (%)	104 (63)
Second captain, $n$ (%)	30 (18)
Lieutenant, $n$ (%)	13 (8)
Nurse, $n$ (%)	7 (4)
Physician, $n$ (%)	2 (1)
Other, $n$ (%)	9 (6)
Type of ship	
Merchant ships, $n$ (%)	92 (56)
Pleasure craft, $n$ (%)	25 (15)
Offshore, $n$ (%)	11 (7)
Oceanographic research vessels, $n$ (%)	7 (4)
Lifeboat, $n$ (%)	3 (2)
Cruise ships, $n$ (%)	4 (2)
Fishing vessels, $n$ (%)	3 (2)
Service vessels, $n$ (%)	2 (1)
Other vessels, $n$ (%)	18 (11)

**Table 2** Responses to the question about waiting time ( $n = 133$ )

	No	%
Very long	1	1
Long	2	1
Reasonable	19	14
Satisfactory	55	42
Very satisfactory	56	42

Participants considered that management of the medical problem was easy in 17% of cases ( $n = 22$ ), difficult in 49% of cases ( $n = 65$ ) and stressful in 32% of cases ( $n = 42$ ). Three responders did not answer this question.

Thirty eight per cent of participants ( $n = 50$ ) considered that the TMAS physicians understood the medical problem very well, and provided useful support (e.g. with sutures, plaster or incision of abscess). Understanding was good in 58% of cases ( $n = 76$ ) and bad in 4% of cases ( $n = 5$ ). One responder did not answer this question.

### Free comments

Participants were enthusiastic about the possibility of videoconferences for future TMAS consultations, especially for medical procedures. They asked for more initial and ongoing training, more focused on isolated environments. They also asked for an update of the medical observation sheet (e.g. a translation into English), for prescription of drugs by their International Nonproprietary Names (INN) and for increased availability of common drugs on board (mainly acetaminophen and amoxicillin).

### Discussion

To our knowledge, the present study is the first to evaluate the satisfaction of users with a maritime teleconsultation service. Overall, we found that on-board caregivers had high satisfaction. Callers were satisfied with the telephone advice provided by the CCMM physicians. They were also satisfied with the telephone advice overall, the competence of the physicians providing the advice, the length of time spent waiting, the oral prescription and the medical advice given.

Some ship-owners have equipped their ships with ECG recorders in order to rule out myocardial infarction in seafarers with chest pain. An ECG is an important tool in

**Table 3** Responses to the question about relationship with TMAS physicians ( $n = 132$ )

	No	%
Very disappointing	1	1
Disappointing	0	0
Medium	3	2
Satisfactory	55	42
Very satisfactory	73	55

**Table 4** Responses to the question about comfort concerning medical procedures ( $n = 121$ )

	No	%
Very uncomfortable	9	7
Uncomfortable	65	49
Comfortable	36	27
Very comfortable	11	8

shore-based health care, mainly in hospitals, but also in primary health care.<sup>4</sup> It is not difficult to convince lay people that such an instrument can increase safety on board by improving the processes of medical diagnosis and treatment. Indeed, carrying out an ECG during a call for chest pain can lead to the diagnosis of ST-segment elevation myocardial infarction (STEMI), to the start of anti-platelet therapy and heparin once the diagnosis is established, and to subsequent medical evacuation. The benefits of recording an ECG on board must be balanced with the difficulties of constructing ECG equipment which is technically suitable for sea conditions, the training of callers to ensure correct ECG recording, and the process of calibration and maintenance of the equipment.<sup>5</sup>

The use of real time video pictures in onshore telemedicine is well established as a useful tool. At sea, the lack of sufficient bandwidth has restricted the use of the technique. Still pictures have been used for a long time, and are regarded as a valuable tool in injuries and dermatological conditions. There are some situations where real time motion pictures would probably add valuable information to the assessment of the situation, but the benefits have not been demonstrated in studies so far in maritime health. Early work showed the potential for improved decision support on oil rigs.<sup>6</sup> Video could also be useful in guiding the seafarer in certain procedures, e.g. replacing a dislocated joint or complex suturing.<sup>5</sup> A Norwegian team studied maritime telemedicine and its potential for improvement.<sup>7</sup> Voice and fax systems were available in all cases. However, the emergency medical dispatch centres did not offer an email service and did not use faxes in a maritime setting. The people interviewed suggested a number of areas for improvement, which included having a single emergency telephone number to call for help, email systems with the possibility of digital picture attachments, wireless communication systems on board and a standard CD-ROM reference work for medical guidance/education.

### Limitations

A limitation of the present study was the low response rate to the survey (43%). In the literature, survey response rates have been very variable, between 13%<sup>8</sup> and 77%<sup>9</sup> although these were not maritime surveys. Perhaps maritime surveys are more difficult. Another limitation was that 5% of the respondents were caregivers (7 nurses and 2 physicians) whose understanding of the service value and expectations

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were different. This may explain some of the diversity in the responses. Also, the study results may not be generalizable to other teleconsultation services.

## Conclusion

The present study suggests that on-board healthcare delivery via telemedicine is acceptable to patients in a variety of circumstances. On-board caregivers reported satisfaction with maritime teleconsultation and were satisfied with the telephone advice provided by the CCMM physicians. Further work is needed to understand the possibilities offered by new telemedicine modalities, such as satellite-delivered Internet access, including their feasibility and cost effectiveness.

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