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The COVID-19 pandemic and maritime telemedicine: 18-month report

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ABSTRACT

Background: *The onset of the coronavirus disease 2019 (COVID-19) pandemic has greatly impacted maritime telemedicine services. The aim of this study is to describe the impact of the pandemic, both quantitatively and qualitatively, by analysing the teleconsultations by doctors from the French Tele-Medical Assistance Service (TMAS).*

Materials and methods: *We carried out a descriptive observational study of retrospective data from the TMAS files. The main inclusion criterion for the files was a diagnosis of "influenza due to an unidentified virus". We extracted the following data: type of ship, gender, age, nationality, role on board, reason for the call and symptoms, number of calls, navigation zone, severity, medical decision, whether or not a COVID-19 test had been carried out, and treatments prescribed on board.*

Results: *One hundred and ninety-nine files were included of which 39 (20%) were clusters. We were able to analyse data from 384 patients. The study population comprised 376 suspected COVID-19 patients, of whom 334 (87%) were symptomatic and 42 (10.9%) asymptomatic. Eight (2.1%) patients were not thought to have COVID-19 but their call was related to the pandemic. Of the symptoms presented by the patients, fever was the most frequent (n = 196; 59%), while 129 (39%) presented a cough, 60 (18%) a headache, 41 (12%) non-specific ear, nose, throat signs, and 40 (12%) dyspnoea. Two hundred fifty-two (75%) patients stayed on board, 55 (17%) were disembarked, for 14 (4%) a ship diversion was arranged, and 13 were evacuated including 4 medical evacuations.*

Conclusions: *The most important problem encountered related to managing asymptomatic or pauci-symptomatic patients at sea, which was the subject of the majority of calls. The TMAS doctors played an important role in managing the pandemic by emphasising the need for social distancing and quarantine procedures at sea to limit the spread of the virus, while adapting to the sometimes difficult implementation conditions and logistics for medical decision and quarantine.*

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Key words: maritime telemedicine, COVID-19, maritime teleconsultation, maritime health

INTRODUCTION

In France, medical assistance at sea is provided by three partners, the Maritime Rescue Coordination Centre (MRCC), the Tele-Medical Assistance Service (TMAS) based in Toulouse and the Medical Maritime Coordination Service (SCMM) [1].

The seas and oceans of the world are divided into different Search And Rescue (SAR) areas, where the responsibility is either international or attributed to a specific state. The TMAS deals with all the calls they receive regardless of the SAR area called from, the flag state of the vessel or the nationality of the patient.

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When medical assistance is required on board a ship, the call is either received by a French Maritime Rescue Coordination Centre (MRCC) who transfers it to the TMAS, or directly by the TMAS doctor. The teleconsultation can result in the patient being treated on board, disembarked or evacuated. In these last two cases, the MRCC that is coordinating operations, the TMAS and the SCMM coordinate the health-related aspects of the rescue, with or without medically-assisted rescue, by air or by sea, and by making contact with the land-based rescue services.

The onset of the coronavirus disease 2019 (COVID-19) pandemic greatly impacted maritime medical teleconsultation, and thus the calls made to the TMAS. Teleconsultation activities have increased significantly since the start of 2020 (+13% of calls for all types of coding in 2020 compared to the preceding year) [2]. We sought to objectively describe this impact, both qualitatively and quantitatively, by analysing the teleconsultations carried out by the TMAS doctors. Therefore, we undertook a descriptive, retrospective epidemiological study between 1 February 2020 and 31 July 2021.

MATERIALS AND METHODS

We carried out a descriptive study on retrospective data from the teleconsultation report files.

DATA COLLECTION

The calls received by the TMAS are recorded in a specific database known as AppliCCMM®. From this database, we extracted all records with the medical diagnosis coding of "influenza due to an unidentified virus". It was agreed at the start of the epidemic to use this code for all calls related to the COVID-19 pandemic since a "coronavirus" code does not exist. This coding is done by the doctor carrying out the teleconsultation and is obligatory to conclude the file. We extracted all files with this code opened between 1 February 2020, the date set for the start of the pandemic, and 31 July 2021. A file could refer to either one patient or to a cluster. It was possible to describe each patient independently by analysing each file.

The data collected for each patient covered: type of ship, age, gender, nationality, role on board, reason for the call, number of medical follow-up calls, navigation zone, degree of severity (CCMU coding: Clinical Classification of Emergency Patients), the medical decision by the TMAS doctor, whether or not a COVID-19 test had been carried out and the treatments prescribed on board.

The CCMU degrees of severity are the following:

- CCMU 1: Clinical status considered stable. No further diagnostic or therapeutic actions required. Simple clinical examination;
- CCMU 2: Stable lesion status and/or functional prognosis. Complementary diagnostic or therapeutic actions required, to be carried out by the SMUR (mobile emergency and intensive care services) or the emergency services;
- CCMU 3: Lesion status and/or functional prognosis considered to be worsening in emergency department or during an SMUR intervention, but not life-threatening;
- CCMU 4: Potentially life-threatening pathological situation, with no immediate resuscitation required;
- CCMU 5: Life-threatening prognosis emergency care comprising immediate resuscitation required.

ETHICS

During the teleconsultation, the patients were informed that their anonymised data could be used for research purposes. The procedure complied with the Declaration of Helsinki [3]. In compliance with the French public health code, this retrospective study follows the MR-004 regulatory procedure on the processing of personal data for study, assessment and research purposes not involving the human person. It is recorded in the internal MR-004 register of Toulouse University Hospital Centre (CNIL number: 2206723 v 0).

DATA ANALYSIS

The analysis firstly looked at the whole population, and then at three different groups: symptomatic suspected COVID-19 patients, asymptomatic suspected COVID-19 patients, non-COVID-19 patients whose calls for assistance were related to the pandemic.

The data were extracted and anonymised from AppliCCMM®, in Microsoft Excel 2007® format (Microsoft Corporation, Redmond, WA). A TMAS doctor verified and validated the data extracted from the application prior to their inclusion. The statistical analysis was conducted using Microsoft Excel 2007® software (Microsoft Corporation, Redmond, WA).

The categorical data were expressed in frequencies and percentages. The continuous variables were expressed as mean ± standard deviation.

RESULTS

Between February 2020 and July 2021, the TMAS recorded 3455 files for 9092 calls. Of these 3455 files, 211 were coded "influenza due to an unidentified virus" (6%), of which 12 had no link to COVID-19. As such, 199 files were included of which 39 (20%) were clusters. The analysis thus covered 384 patients of whom 334 (87%) were symptomatic and 42 (10.9%) asymptomatic. Eight (2.1%) patients were not thought to have COVID-19 but their call was related to the pandemic.

The patients made between 1 and 29 calls with an average of 3.2 ± 3.4 calls per patient.

SOCIODEMOGRAPHIC DATA

The gender ratio male/female was at 18 (364/20). The median age was 38 ± 11 years. The sociodemographic data are detailed in Table 1. The population comprised 46 nationalities. The majority of the patients were from France (n = 129; 33.6%), followed by the Philippines (n = 82; 21%) and India (n = 39; 10%).

SPECIFIC DESCRIPTION OF THE CALLS FOR SYMPTOMATIC PATIENTS

Fever was the most frequent (n = 196; 59%) symptom presented by the patients. The other symptoms are detailed in Table 2.

The treatments administered were paracetamol for 252 (66%) patients; antibiotics such as amoxicillin and clavulanic acid for 22 (6%) patients and oxygen for 17 (4%) patients. One hundred eight patients received no treatment according to the data entered in the medical files (32%).

COMPARISON BETWEEN THE SYMPTOMATIC SUSPECTED COVID-19 PATIENT GROUP AND THE ASYMPTOMATIC PATIENT GROUP

The asymptomatic suspected COVID-19 patients had either come into contact with a COVID-19 case, or tested positive during systematic screening.

The medical decisions and degrees of severity are detailed in Table 3.

Our analysis of the changes to the decisions made over time shows a decrease in the number of patients cared for on-board as the study progressed (Fig. 1).

The majority of the tests taken came back positive, in both asymptomatic and symptomatic patients. Of the symptomatic patients, 72 (22%) tested positive for COVID-19 (lateral flow or polymerase chain reaction [PCR]). Twenty (6%) patients tested negative. 242 (72%) patients were not tested.

Of the 42 asymptomatic patients, 28 (67%) tested positive for COVID-19 (lateral flow and PCR undifferentiated). Three (7%) patients were contact cases who then tested negative and 11 (26%) patients were not tested.

An analysis of the changes to the testing rates over time shows a linear increase as the study progressed (Fig. 2).

DESCRIPTION OF THE CALLS FOR THE NON-COVID-19 PATIENTS

Of the 8 non-COVID-19 patients whose calls were related to the pandemic, 5 had run out of a chronic treatment because of an extended quarantine at sea or a supply problem, and 2 patients were suffering from psychological distress linked to the health crisis. The last call was to request authorisation to embark due to a hospitalisation 15 days previously following the discovery of an atrial fibrillation in a COVID-19-related context.

Table 1. Sociodemographic data of the patients

Characteristics	Values (n = 384)
Mean age ± standard deviation	38 ± 11
Gender ratio: male/female	18: 364/20
Role on board:	
Officer	77 (21%)
Non-officer professional	286 (74%)
Passenger	11 (3%)
Vacationer	10 (2%)
Type of ship:	
Passenger ship	145 (38%)
Commercial ship	137 (36%)
Fishing vessel	57 (15%)
Pleasure boat	10 (3%)
Service vessel	35 (8%)
Location of the vessel:	
Atlantic Ocean	247 (64%)
Indian Ocean	71 (19%)
Pacific Ocean	34 (9%)
Mediterranean Sea/Black Sea	32 (8%)

Table 2. Symptoms

Symptoms	Values (n = 334)
Fever	196 (59%)
Cough	129 (39%)
Headache	60 (18%)
ENT signs (odynophagia, rhinitis, nasal congestion)	41 (12%)
Dyspnoea	40 (12%)
Asthenia	39 (12%)
Loss of smell	29 (9%)
Loss of taste	25 (7%)
Loss of taste and smell	17 (5%)
Chest pain	14 (4%)
Nausea or vomiting	6 (2%)
Diarrhoea	3 (1%)
Abdominal pain	4 (1%)

DISCUSSION

The pandemic increased the number of calls to the TMAS (+13% of calls for all types of coding in 2020 compared to the preceding year) [2], relating to several types of problem.

Table 3. Medical decision and severity

	Symptomatic patients (n = 334)	Asymptomatic patients (n = 42)
Medical decision		
On-board care	252 (75%)	27 (64%)
Disembarked	55 (17%)	14 (33.5%)
Ship diversion	14 (4%)	1 (2.5%)
Health evacuation	9 (3%)	0 (0%)
Medical evacuation	4 (1%)	0 (0%)
Severity		
CCMU 1	254 (76%)	30 (71%)
CCMU 2	40 (12%)	12 (29%)
CCMU 3	31 (9%)	0 (0%)
CCMU 4	8 (2%)	0 (0%)
CCMU 5	1 (1%)	0 (0%)

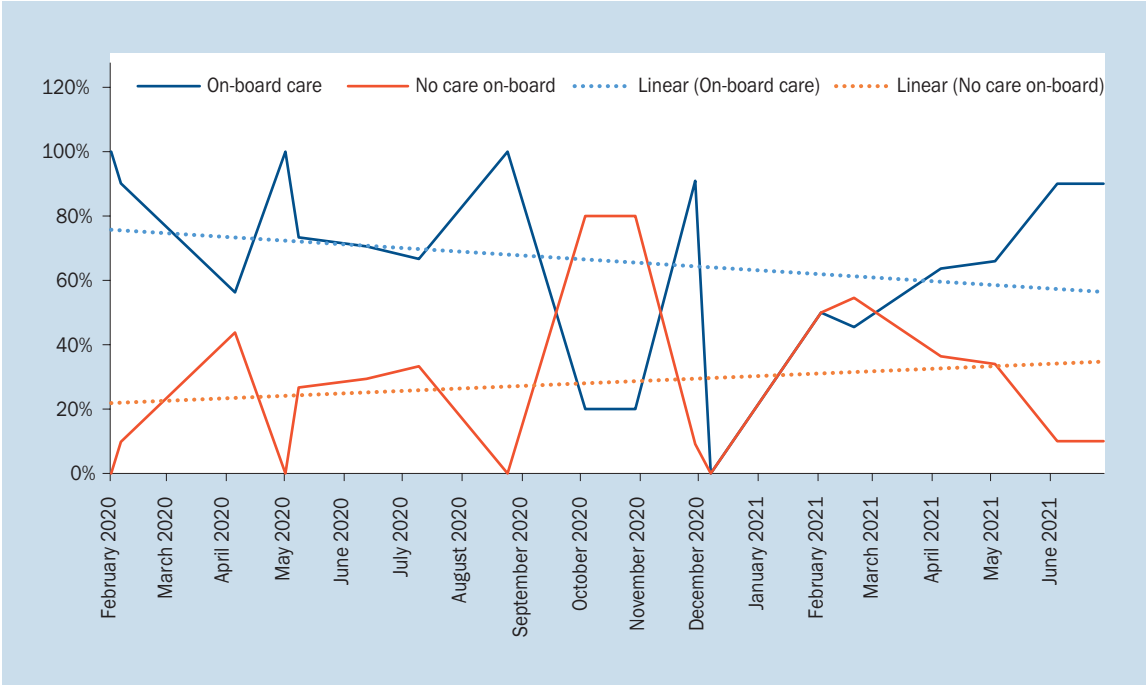

Figure 1. Changes in decisions over time

The most important problem related to managing asymptomatic or pauci-symptomatic patients at sea, which was the subject of the majority of calls. Boats can be significant vectors of transmission, which can clearly be explained by their closed and confined environment, and by the inherently crowded conditions of on-board communal life. It is also a vector of cross-country, or even cross-continental transmission, similarly to air traffic [2]. It is difficult to quarantine on a ship [4–6]. This generates extra costs for the shipowner, and can also be difficult to accept for the seafarers forced to spend even longer periods away from their families, which is effectively more work hours unpaid for the majority of them. This was all the more the case at the start of the epidemic when global propagation was disparate and misunderstood by many seafarers, who thus had difficulty understanding the importance of strict quarantine. However, very few changes to the medical decisions occurred as time went on, despite the arrival of

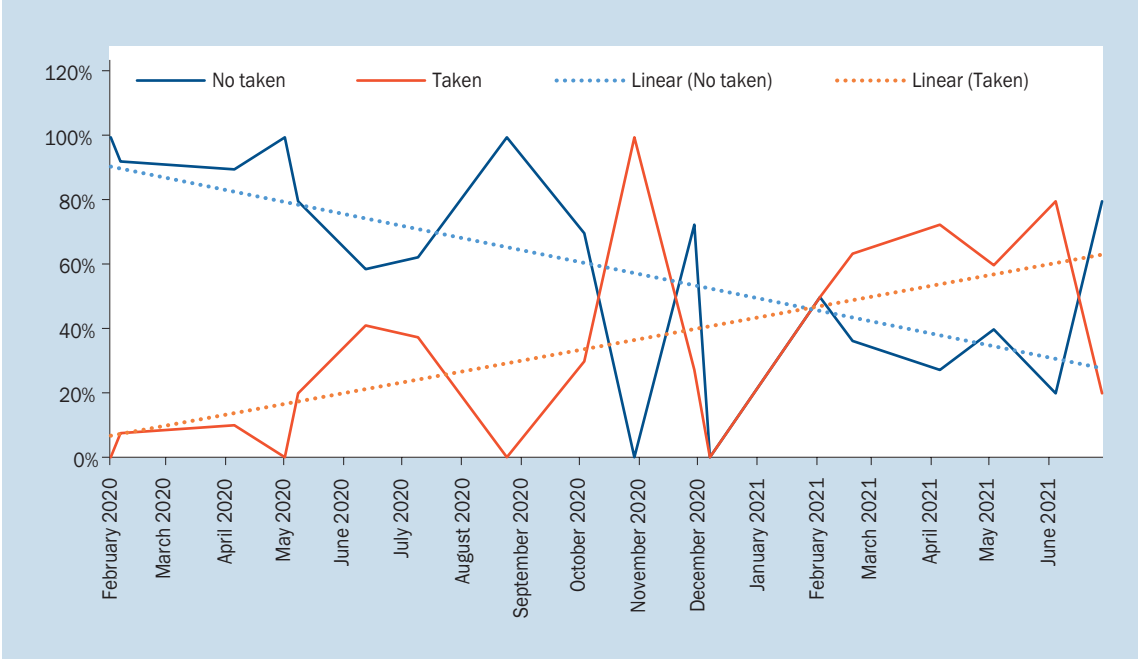

Figure 2. Changes in tests taken or not taken over time

rapid on-board diagnostic tests (available over-the-counter in France since April 2021), the better understanding of the virus by the whole crew, and the increasing experience of the TMAS doctors [7–11].

Another problem evidenced is inherent to all teleconsultations, whether these take place at sea or on land [12, 13]. This relates to the absence of a physical examination, which is a limitation of telemedicine and a certain source of error. This is also often aggravated by language barriers, which are common for seafarers on the open seas [12]. To offset this difficulty, objective examinations such as measuring temperature, pulse oximetry and respiratory rate appear to be effective and particularly useful in the context of COVID-19 [14]. The most frequent symptoms in our study are similar to those found in the literature, i.e. fever and cough. The nationalities also match those found in previous publications [2, 13, 14].

We can note that only 2 patients called with signs of psychological distress over this period. This results should be put in the context of a probable reluctance to seek psychological care in young patients, whose life history and socio-cultural background may not encourage them to consider calling for help for this type of symptom. This aspect probably requires another study in order to confirm the data on the psychological impact of the prolonged missions, difficulties in getting home and in replacing the crew and of financial problems linked to the decrease in maritime transport and embarkments and unpaid wages due to the pandemic [15–17].

CONCLUSIONS

We noted an increase in the number of teleconsultations during the first phases of the SARS-CoV-2 pandemic, with many COVID-19 infections confirmed by tests. The TMAS doctors thus played an important role in managing the pandemic by emphasising the need for social distancing and quarantine procedures at sea to limit the spread of the virus, while adapting to the sometimes difficult implementation conditions and logistics. This specific epidemic-related role was not part of routine practice in teleconsultation before the pandemic [17]. As such, all the doctors and professionals working in at-sea medical care were required to adapt to be able to continue providing care for seafarers across the world, while also attempting to stem viral transmission.

Conflict of interest: None declared

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