Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Short communication

Teleconsultation in family medicine amid the Covid-19 pandemic: An adequate tool?

H. Verhaeghe a, N. Chellum a, B. Tressières c, R. Ouissa a, P.-M. Roger a,b,*

a Infectiologie, centre hospitalier universitaire de Guadeloupe, Pointe-à-Pitre, France
b Faculté de médecine, université des Antilles
c Centre d’Investigation Clinique Antilles Guyane, Inserm CIC 1424, Pointe-à-Pitre, France

ARTICLE INFO

Article history:
Available online 7 May 2022

Keywords:
Covid-19
Teleconsultation
Family practice
Emergency
Diagnostic accuracy

ABSTRACT

Introduction: Teleconsultation is an emerging tool whose utilization dramatically increased during the Covid-19 pandemic. Our aim was to determine its clinical accuracy.

Methods: This prospective study was carried out during the first wave of Covid-19. Patients were teleconsulted by either general practitioners or emergency doctors reporting clinical exam results to the ID physicians by phone. Five signs were specifically checked: dyspnea, fever, cough, anosmia and flu-like illness. Data collected by remote consultation were compared to face-to-face examination in an ID Department.

Results: From March to April 2020, 149 patients were seen by remote medical care. Dyspnea was found in 14.1% of the teleconsultation patients vs 3.4% in face-to-face consultation; fever in 47.0% vs. 15.4%; cough in 69.1 vs. 16.1%; anosmia in 3.4 vs. 1.3%; flu-like illness in 53.0 vs. 7.4% (all differences significant: P<0.001).

Conclusion: We observed incongruency between remote and face-to-face consultation for the main clinical signs of Covid-19.

© 2022 Elsevier Masson SAS. All rights reserved.

1. Introduction

Coronavirus disease 2019 (COVID-19) is now in its second year of spreading [1]. This novel disease still needs more accurate epidemiological and clinical determination as well as new healthcare organization in daily practice.

During the COVID-19 pandemic, the telemedicine network was rolled out in an effort to adjust the system accordingly. Telemedicine, or “remote medical care”, refers to provision of clinical healthcare through electronic communication technologies instead of in-person meetings between a patient and a doctor.

Telemedicine could prove useful in home management for patients with COVID-19 symptoms by ensuring access to care and by protecting healthcare professionals and their patients from infection. In a French study, the teleconsultation rate soared from 0.2% before the lockdown (January 1st to March 15th, 2020), to 19.5% during the lockdown (i.e., April 2020), and decreased to 8.4% once outpatient facilities had reopened [2]. Telemedicine is now accepted in current practice as it can help the doctor to triage patients and to determine whether a hospital visit for a COVID-19 test is justified [3].

However, up until now the reliability of symptoms reported by teleconsultation has been poorly assessed so far. In this context, we aimed to determine whether telemedicine is suitable for clinical assessment of acute respiratory infections such as COVID-19.

2. Methods

2.1. Study design

We conducted a prospective cohort study using reporting data of the Infectious Diseases (ID) Department of the University Hospital of Guadeloupe (French West Indies), for patients having used audio and audiovisual direct-to-consumer telemedicine service.

2.2. Telemedicine process

The most common form of telemedicine was tele-regulation (or emergency medical dispatch) and teleconsultation by phone call. Tele-regulation involved physicians accustomed to managing urgent calls especially for respiratory problems.
A standard survey was designed during the first wave of COVID-19 in which we proposed early prescription of a supposedly effective treatment [4]. The triage protocol defined by the ID Department at the beginning of the outbreak covered two phases: telephone consultation followed by in-hospital examination.

Having received explanations during a web conference on how to implement teleconsultation, practitioners proceeded to do so.

The general practitioners or emergency service physicians involved in telemedicine used a dedicated phone line to refer the patient the ID Department, describing the clinical signs associated with COVID-19 by means of a story line with checkbox symptoms. Afterwards, the patient was sent to a hospital for examination and COVID-19 testing. A complete examination and interrogation were carried out by the ID physicians in possession of the checklist. Possibility similarity between telemedicine symptoms and those assessed in the ID Department was appraised.

This study was approved by the institutional review board of our institution and registered under the number: A40.2102.08.TELECOVID; all participants gave their informed consent.

2.3. Defining symptoms of acute respiratory episode

Among the symptoms suggestive of COVID-19, five were highlighted: dyspnea on minimal exertion, fever, cough, anosmia and the flu-like illness. For each patient, we reported symptoms detected in teleconsultation and those identified in face-to-face consultation.

Dyspnea is an abnormal and unpleasant perception of breathing; as such, it may be considered as subjective respiratory discomfort about which the subject complains. Answers to the questions put forward during an examination highlight the heterogeneity of the terminology used: shortness of breath, cutoff, blockage, difficulty in breathing. At the ID department, even after clinical examination allowed pulmonary auscultation and respiratory rate measurement, dyspnea was defined by the patient’s perception.

Using an infrared forehead thermometer, the admitted positivity threshold was 37.8 °C in tele and physical medical consultation. As for patients who presented with fever and took paracetamol, they were considered as having fever, even if it disappeared at the hospital.

Cough was recorded on the consultation report if an episode occurred during the examination day.

Anosmia was noted after a targeted interrogation.

An association of two acute symptoms such as nasal congestion, muscle pain, headache or arthralgia was categorized as an influenza-like illness.

2.4. Statistical analysis

A bivariate analysis was carried out to compare the differences in proportions of clinical signs between teleconsultation and face-to-face consultation, using the McNemar test, allowing comparison of paired series (two-tailed test). All the analyses were carried out using R 4.0.2 software.

3. Results

A total of 149 patients from Guadeloupe were included, aged between 21 and 83 years and having used a telemedicine between February 27th and March 26th, 2020. In this population, 96 (64.4%) were females and 53 (35.6%) were males. Seventy-five (50.3%) patients directly called tele-regulation (emergency doctors). All in all, 74 (49.7%) patients were teleconsulted by general practitioners.

The time between teleconsultation and face-to-face consultation in 106 cases (71%) was less than 8 hours (see Table 1).

The most common symptom for which a patient initiated a consultation was cough (n = 103 patients), followed by fever (n = 70), dyspnea (n = 21), and anosmia (n = 5).

PCR Covid-19 test was negative for 132 (88.6%) patients and positive for 17 (11.4%).

3.1. Teleconsultation reliability

Dyspnea was found in 21 (14.1%) patients in a teleconsultation vs. 5 (3.4%) patients during a traditional consultation; fever in 70 (47.0%) vs. 16 (10.7%); data on fever after taking paracetamol up to 6 hours before the consultation were normally distributed. The results were adjusted according to these criteria by postulating that absence of fever after paracetamol intake counted as a positive result for fever; results adjusted for fever were 70 (47.0%) in teleconsultation vs. 23 (15.4%) in a traditional consultation; cough in 103 (69.1%) vs. 24 (16.1%); anosmia in 5 (3.4%) vs. 2 (1.3%); flu-like illness in 79 (53.0%) vs. 11 (7.4%) during a remote consultation vs a traditional consultation respectively (P < 0.001 for all comparisons).

The triad of clinical signs dyspnea + cough + fever (adjusted with the criteria on paracetamol) was found in 10 (6.7%) patients during remote consultation and in 2 (1.3%) patients in the hospital (P = 0.013).

4. Discussion

Our study is the first to evaluate the accuracy of teleconsultation by comparing clinical signs collected by remote consultation with those collected by face-to-face examination on the same patients. The analysis reveals no concordance between the clinical signs found in remote consultation and those found during physical consultation, as all of the five clinical signs studied were markedly overestimated during teleconsultation.

Our study has some limitations. First, the number of included patients seems low, given that during that period the French authorities urged mild COVID-19 patients to stay home. That is why we organized our own pathway after a putative treatment was reported [4]. Second, we did not use the Kappa coefficient to assess the adequacy of the signs observed during a telemedicine consultation as opposed to those observed during a face-to-face consultation. The Kappa coefficient is designed to estimate inter-observer heterogeneity when the same tool is used. However, by doing so we found that the Kappa coefficient was close to 0 (data not shown). Third, we did not investigate the telemedicine knowledge among physicians attending to their patients. To the best of our knowledge, up until now no report has been published describing the benefit of specific telemedicine teaching in acute respiratory infectious disease management.

The lack of connection between telemedicine and face-to-face examination can be explained. Prior studies have highlighted the fact that basic medical care consists in physical exam [5]. And even though a thermometer is easy to use, in this study there was no

---

**Table 1**

Description of the study population (n = 149).

| Sex–ratio (M/F) | n (%) |
|-----------------|-------|
|                 | 0.52  |
| Age             | 39 (25–53) |
| Teleconsultation (TC) | General practitioner 74 (49.7) |
| Emergency doctor | 75 (50.3) |
| Time lapse between TC and face-to-face | Same work day (< 8 hours) 106 (71.1) |
|                | Next morning (12–18 hours) 40 (26.9) |
|                | Two days (18–48 hours) 3 (2.0) |
| Positive PCR Covid-19 | 17 (11.4) |
| Hospitalization | 2 (1.3) |

---
proof that the patient had collected the temperature objectively. Fever findings by remote consultation can at times be explained by a misinterpreted warm or chilly feeling.

Anosmia appears to be a novel symptom suggestive of COVID-19, and while it is the only one studied that shows moderate concordance, it can easily be confused with nasal congestion in a common cold. While a cough could be reported by a patient on a telehealth visit, only when present at the time of examination in the ID Department was it included in the hospital files. As for dyspnea, it may in some cases be related to an anxiety felt by the patient [6].

Another explanation for symptom overestimation is that some patients may have over-expressed their symptoms during the testing shortage so as to be admitted for examination in an ID department. Moreover, a doctor may have focused on some specific symptoms, and tended to dismiss others, a form of anchoring and confirmation bias that is not necessarily caused by remote consultation [7]. But without a physical examination, it would be difficult to reduce the risk of cognitive error.

Nevertheless, telemedicine is now part and parcel of the healthcare system; it facilitates access to care and compensates for a lack of health professionals while enabling the pooling of medical skills. It also simplifies the doctor’s access to people with mobility problems, and during epidemics, it protects patients and doctors from the risk of contamination [2]. Accordingly, in the United States, 48% of general practitioners were using teleconsultation for the first time during the COVID-19 pandemic [8]. Telemedicine is developing rapidly and new medical tools are emerging such as mobile applications to support clinical diagnosis of upper respiratory problems, the objective being to reduce inappropriate use of antibiotics [9,10].

In conclusion, our study showed a lack of congruence between teleconsultation and face-to-face consultation regarding the semiology of COVID-19. It is critical to assess telemedicine as a means of effective continuing care for acute infectious diseases.

Funding

None; this study was carried out as part of our routine work. In conclusion, our study showed a lack of congruence between teleconsultation and face-to-face consultation regarding the semiology of COVID-19. It is critical to assess telemedicine as a means of effective continuing care for acute infectious diseases.

Authors’ contributions

P-M.R, N.C contributed to the study design, P-M.R. and B.T. contributed to the statistical analysis; V.H., P-M.R. contributed to the writing of the article; V.H., N.C., R.O. contributed to the study design and patient inclusion.

Disclosure of interest

The authors declare that they have no competing interest.

Ethics approval

The ethics committee issued a favorable opinion by consensus and the study was registered under the number: A40210208_TELE_COVID.

Consent to participate

The patients provided written consent for computerization of their personal data and clinical research.

Availability of data and material

The data used during the current study are available from the corresponding author on reasonable request.

Consent for publication

All authors have read the paper and consented to its publication.

References

[1] Lipsitch M, Sverdlow DL, Finelli L. Defining the epidemiology of COVID-19 - studies needed. N Eng J Med 2020, http://dx.doi.org/10.1056/NEJMcp2002125.
[2] Cormi C, Ohanessian R, Sanchez S. Motivations of French physicians to perform teleconsultations during COVID-19: a mixed-method Study. Telemed J E-Health Off J Am Telemed Assoc 2021, http://dx.doi.org/10.1089/tmj.2020.0524.
[3] Greenhalgh T, Koh CCH, Car J. COVID-19: a remote assessment in primary care. BMJ 2020 [m1182].
[4] Gautret Ph, Lagier JC, Parola P, et al. Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non-randomized clinical trial. Inter J Antimicrobial Agents 2020, http://dx.doi.org/10.1016/j.ijantimicag.2020.105949.
[5] Ferguson CM. Inspection, auscultation, palpation, and percussion of the abdomen. In: Walker HK, Hall WD, Hurst JW. Clinical methods: the history, physical, and laboratory examinations. 3rd ed. Boston: Butterworths; 1990 [date accessed May, 15th 2021]. http://www.ncbi.nlm.nih.gov/books/NBK420/.
[6] Gelsner EC, Lima JAC, Kawut SM, et al. Noninvasive tests for the diagnostic evaluation of dyspnea among outpatients: the Multi-Ethnic Study of Atherosclerosis lung study. Am J Med 2015;128:171–80.
[7] Triacca M-L, Gachoud D, Monti M. Aspects cognitifs de l’erreur en médecine. Forum Méd Suisse–Swiss Med Forum [Internet]. 28 mars 2018 [accessed 16 mai 2021];18(1314). https://doi.emih.ch/fms.2018.03060.
[8] Abdel-Wahab M, Rosenblatt E, Prajgo B, Zubizarretta E, Mikhail M. Opportunities in telemedicine, lessons learned after COVID-19 and the way into the future. Int J Radiat Oncol 2020;108:438–43.
[9] Moura J, Almeida AMP, Roque F, Figueiras A, Herdeiro MT. A mobile app to support clinical diagnosis of upper respiratory problems (eHealthResp): co-design approach. J Med Internet Res 2021;23 [e19194].
[10] Kim H-S. Lessons from temporary telemedicine initiated owing to outbreak of COVID-19. Healthc Inform Res 2020;26:159–61.