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► **To cite this version:**

Marine Brika, Maëva Bossu, Lilian Fautrelle, France Mourey, Alexandre Kubicki. Geriatric Rehabilitation and COVID-19: a Case Report. *SN Comprehensive Clinical Medicine*, 2020, 2 (12), pp.2890-2898. <10.1007/s42399-020-00613-5>. <hal-04977210>

**HAL Id: hal-04977210**

**<https://hal.science/hal-04977210v1>**

Submitted on 5 Mar 2025

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# Geriatric rehabilitation and Covid-19: A Case Report

Marine Brika <sup>a</sup>, Maëva Bossu <sup>a</sup>, Lilian Fautrelle <sup>b</sup>, France Mourey <sup>c</sup>, Alexandre Kubicki <sup>a d</sup>

<sup>a</sup> IFMS, Hôpital Nord Franche-Comté, Filière Kinésithérapie – Physiothérapie, 25200, Montbéliard, France.

<sup>b</sup> ToNIC, Toulouse NeuroImaging Center, Université de Toulouse, Inserm, UPS, 31000 Toulouse, France

<sup>c</sup> INSERM UMR1093-CAPS, Université Bourgogne Franche-Comté, UFR des Sciences du Sport, F-21000 Dijon, France

<sup>d</sup> Laboratoire de Neurosciences (EA 481), Université de Bourgogne Franche-Comté

(✉) Marine Brika,

IFMS, Hôpital Nord Franche-Comté, Filière Kinésithérapie – Physiothérapie, 25200, Montbéliard, France.  
[Marine.brika@hnfc.fr](mailto:Marine.brika@hnfc.fr)

## Abstract

**Introduction:** The Covid-19 infection has particularly affected older adults. Clinical observations in this population highlight major respiratory impairment associated with the development or aggravation of the patient's frailty state.

**Case Presentation:** Mr P is a 93-year-old frail patient, hospitalised after a COVID-19 infection. The assessment process of this patient has been supported by an innovative multi-systemic tool developed in view of the COVID-19 clinical consequences and a systemic evaluation of motor functions by the Frail BESTest. This process allowed a mixed clinical picture associated with significant respiratory distress (linked with acute respiratory distress syndrome) and an evident motor frailty. The care plan was developed accordingly, and four assessments were done in the same manner until Mr P returned home.

**Conclusion:** This case report allows us to see a holistic COVID-19 clinical picture, showing the different axes of clinical reasoning to enhance the rehabilitation process. Furthermore, this case report illustrates the importance of rehabilitation in the Covid-19 context.

**Key words:** Covid-19 - Geriatric rehabilitation - Frailty - clinical reasoning - screening

## INTRODUCTION

The COVID-19 pandemic targets aged adults, especially when they carry comorbidities [1]. In elderly adults, frailty corresponds to the clinical consequences of physiological function decline, involving pathological aging. Frailty is characterised by a loss of functional supplies, leading to a high risk of falls, institutionalisation and sometimes death [2]. Aged adults who survive COVID-19 could present several frailty criteria following respiratory distress and may sometimes need to spend several days in an intensive care unit. There are multiple clinical pictures associating respiratory and vascular consequences, bed rest effects and medication effects in a psychological context of anxiety [3-4].

## CASE DESCRIPTION

The case report of Mr P aims to underline the mixed clinical picture of Acute Respiratory Distress Syndrome (ARDS) and motor frailty. This case seems highly generalisable in the pandemic context where high age and associated diseases are major causing factors of death.

On 3 March 2020, Mr P is hospitalised for a COVID-19 infection, confirmed by a thoracic scan showing the typical ground-glass opacities (Figure 1). His pulmonary function decreased, entailing oxygen supplementation of 15L/min. His clinical evolution confirms oxygen dependency between 12 and 15L/min with high concentration mask. Mr P is transferred to the rehabilitation unit on 22.04.2020. Mr P lives alone in his house with a bedroom on the first floor. He is able to walk without technical support, both inside and outside. During the examination, Mr P clearly expresses that he wants to go back at home once he regained his previous functional level. A significant fear of falling is observed, measured at 15/28 with the short FES [5]. Mr P also indicates that he fell twice in 2019, when walking in his garden, and explains that he had difficulties getting up from the floor.

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Please insert Figure 1 here  
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About medical treatment, the therapeutic drugs related to the Covid-19 affection were :

- Plaquenil (400 mg) morning and evening on 31 March 2020. Then the plaquenil was prescriber only in the morning for 9 days.
- Methylprednisolone (corticoid) : 20 mg on 6 April 2020 and 100 mg on 7 April 2020.
- Tolicizumab 500 mg on 6 April 2020 and 500 mg on 9 April 2020
- Augmentin 1g : 3 times a day (morning, noon and evening) from 26 April 2020 to 3 May 2020.

Mr P also has an anti-coagulant treatment : Lovenox 7ml (7000UI). This drug is administered subcutaneously every 24 hours starting 31 March 2020. From 8 april 2020, the drug is administered over 12 hours.

Regarding comorbidities, Mr. P's treatment included :

- Furosémide (40 mg) by direct intravenous injection every 24 hours (in the morning) on 7 and 8 april 2020. This drug was introduced due to edema in the lower limbs.
- Kardegic 75
- Perindopril (2 mg) morning and evening then decreased to only in the morning from 20/04 onwards

In addition, two index of comorbidity, the Cumulative Illness Rating Scale (CIRS) (table 1) and Charlson Comorbidity Index (table 2), were carried out.

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Please insert table 1 and 2 here  
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## DIAGNOSTIC ASSESSMENT

We conducted the evaluation using a two-fold analysis. First, we evaluated the deficiencies linked with the COVID-19 infection and the associated ARDS, using a specific COVID-19 aggregation of scales. Next, we targeted the patient's motor function using the Frail'BESTest [6] so as to guide the clinical reasoning.

### Level 1: The specific COVID-19 evaluation

Faced with the heterogeneity of COVID-19 clinical pictures, we tried to propose a global summary that includes several clinical examinations. The available literature [7-8] notes a typical pulmonary deficiency associated with several new clinical scripts (ARDS, Psychomotor disadaptation syndrome, acquired pneumopathy, acquired neuromyopathy, etc.). The scales were aggregated using a transdisciplinary rehabilitation approach to screen all the important aspects resulting from the infection. Tests were retained for their usability, reliability and validity.

- Social and behavioural functions are evaluated with the RAMSAY score [9] and the RASS scale [10].
- Some items from the Hamilton scale (HDRS) are used to measure the psychological and emotional state [11].
- The simplified cardiac and respiratory evaluation allows us to measure the usual parameters with the mMRC dyspnoea scale [12] and the Borg scale [13]. The peak cough flow rate (PCFr) is also measured [14-15].

- In accordance with the loss of mass frequently described [8], the body Mass Index is noted. Swallowing function is evaluated with simple tests.
- Frailty detection is based on several tests showing good sensitivity: the gait speed measure [16], the chair test in one minute [17], the functional reach test [18] and the grip strength test [19].
- Neuromotor functions are evaluated by the PFIT score [20] and the MMRC [21-22]. A few items from the Mini Motor Test [23] and the BESTest [24] allow a global view of the patient.
- A binary analysis of statesthesia and tact are proposed, in addition to the other senses.
- Regarding sensitivity, a double assessment including statesthesia and touch [25] is done.

The evaluation synthesis of Mr P is featured in Figures 2a and 2b.

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Please insert Figures 2a 2b and 2c here  
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## **Level 2: Reasoning with the Frail'BESTest.**

The Frail'BESTest has been developed to make it possible to include frail older adults in systemic evaluations [6]. Therapists can therefore directly manage therapeutic intervention for different types of balance deficiencies. Overall, six sub-systems have been addressed: 1: anticipations, 2: reactions, 3: locomotion, 4: sensorial orientation, 5: biomechanical constraints and 6: asymmetric gait.

## **Diagnosis**

Mr P, a 93-year-old patient, presents with a respiratory dysfunction linked to a Covid-19 infection (saturation at 91% with 7 litres of oxygen supplementation), subsequent effort incapacity and postural-motor deficiencies. Motor automatisms are impaired and several articular and muscular constraints remain. Mr P seems enlisted in a frailty process, leading to increased dependency, an impossibility to return home and relative social isolation.

## **Therapeutic intervention**

The protocol was carried out in accordance with legal and international requirements (Declaration of Helsinki, 1964). Mr P was informed about the published project and gave his written consent before the evaluation.

Mr P followed a rehabilitation programme which primarily included physical therapy and nutritional monitoring. He received one session of physical therapy per day. This session lasted on average 30 minutes. Considering the physiotherapeutic diagnosis of Mr P, as well as the age-specific lung physiology of the patient [26], some cardiopulmonary rehabilitation exercises allowing both the maintenance of ventilator functions and

the improvement of haematosiis can be proposed. During all of these exercises, precautions, red flags and stop criteria indicated in the HAS Quick Response [27] should be followed.

The next paragraph will show the aims and exercise samples that have been proposed to Mr P. We would like to improve both the transverse abdominis and the diaphragm via active, functional and resistive treatment including threshold systems, hypopressive exercise and functional ventilation during movement [28–30]. In order to limit physiological impairment, some exercises including thoracic movement with the arms, chest and spine mobility are introduced during global therapy in both directions: inhale and exhale [31–32]. In order to improve oxygenation and prevent congestion, ventilation should be harmonised throughout the lung territories and mucociliary clearance should be promoted. Thus, treatment involves high-volume ventilation-type work that includes tele-inspiratory holds, while avoiding specific collapses associated with senescence. For example, EDIC, ITLA (Inspiratory Technical for Lifting Atelectasis), Elpr and ACBT-type exercises with open glottis are proposed [33–34]. Concerning rehabilitation with effort, it is necessary to increase the ventilatory threshold in order to improve muscular function and decrease dyspnoea. This will also improve haematosiis and oxidative metabolism. An early and progressive cardiopulmonary rehabilitation programme is established and based on the Borg scale [35–36]. For Mr P, it includes optimal loading, aerobic work measured by paliers as well as endurance. This programme mainly uses functional exercises such as treadmill walking (between 60–80% of the TM6 or the chair-test or top toes test) [37]. It also seems important to prevent dysphagia in the medium term and to optimise the use of the functions of the nose (to warm, filter and humidify the air). So, nasal ventilation and correction of the tongue position is essential. For example, mindless nasal ventilation and the tongue palate position is monitored and lingual resistive exercise and sensitive work are proposed. In a final perspective on the patient's autonomy, throughout the rehabilitation process, education on the perception of effort, use of the Borg scale, the patient's self-assessment of his respiratory capacities and the criteria of alerts are all carried out [38].

On the other hand, in connection with the systemic evaluation of the balance function and motor frailty of Mr P, several sensory-motor exercises are proposed. To improve the efficiency of postural-movement coordination, self-paced perturbations of balance were worked on with speed and variability [39]. For example, Mr P had to reach a coloured target on the ground as quickly as possible once the physiotherapist indicated the colour he has to hit. To reactivate postural adaptations and fall avoidance reactions, Mr P performs exercises that work on extrinsic imbalances (unpredictable balance perturbation) [40]. For example, Mr. P had to react to manual pushes from the physiotherapist. In order to improve muscular power, functional muscular exercises were performed in a closed chain and under a time constraint [41]. For example, Mr P had to go up and down a step to the beat of a metronome. In order to regain physiological ankle mobility and enhance the rolling of feet when walking, active mobilisation exercises were carried out during physiotherapy sessions and also by

the patient independently in his room [42]. To reduce podal dependency, Mr P performed static and dynamic balance exercises on different ground textures (e.g. standing on foam, walking on a mat, walking outside in the grass...). Finally, exercises incorporating the work of spatial and temporal parameters of walking and changes of direction were carried out. These exercises were aimed at improving walking kinetics and would contribute to the evolution of help with technical walking.

### **Follow up and outcomes**

The four assessments performed by the specific COVID-19 evaluation showed an overall improvement of the patient in several functions. In terms of psychological and emotional state, the anxiety with regard to oxygen dependence disappeared. Indeed, during the initial assessment, the patient had 7L of oxygen in the high concentration face mask. During the final evaluation, he had only 1L of oxygen left in the nasal cannula. Pulmonary auscultation, which initially revealed a lack of ventilation associated with congestion of the middle and distal airways, also improved. Final auscultation was evaluated without particularities. The assessment of cognitive and behavioural functions remained unchanged over the course of the four assessments. Initial clinical observations did not show impairment of these functions. The initial preliminary assessment of the vascular and cutaneous system had shown the presence of a stage 1 pressure ulcer (as per the National Pressure Ulcer Advisory Panel Stage Classification) behind the ears due to the oxygen mask. Upon final evaluation, the pressure ulcer was no longer present. No vascular disorders occurred during the hospitalisation. Moreover, there was no significant change in swallowing function, as Mr P did not present any swallowing problems.

Changes to the scores of quantitative outcomes of the different functions are summarised in Table 1.

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The four Frail'BESTest assessments show an improvement in the score of some subsystems. The results are summarised in Table 2.

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## **DISCUSSION AND CONCLUSIONS**

This case allows us to underline the global approach that is necessary in a geriatric rehabilitation context associated with the COVID-19 infection. Although the long-term follow-up is not yet available, it seems important to continue the clinical pictures description associated with this virus in order to better organise rehabilitation strategies. Indeed, the rehabilitation process represents the other challenge of the pandemic situation in several countries characterised by a high proportion of frail patients [43]. In our opinion, it is important to understand that the issue is not only to rescue a patient from their acute respiratory problem, but more so to prevent the functional dependency associated with the infection's consequences, especially in Intensive Care Units where chronic diseases are frequently acquired.

Mr P was probably lucky to return home with a high level of independency. His age and relative frailty were, at the beginning, considered to be bad prognosis factors. As is common in geriatric rehabilitation, age it is not only a question of numbers. In the same manner, frailty should not be questioned as an independence level, but more in terms of functional reserves. Mr P presented sufficient functional reserves, although he was certainly frail upon arriving at the hospital.

Several papers have described the physiotherapy associated with the COVID-19 infection since the pandemic began. A lot of them describe adult patients, often aged up to 65 years, considering respiratory or pulmonary rehabilitation. Strength recommendations are available to manage these COVID-19 patients [8]. However, age and frailty are key factors to consider when targeting the needs of these patients, and all of our health systems should be adapted to the second wave of the pandemic situation: the rehabilitation wave [44].

Although a higher vulnerability of geriatric patients has been observed, the literature on aged COVID-19 patients has remained very scarce. A few studies have already adequately targeted these patients and described interesting clinical pictures and associated medical treatments [45]. However, to our knowledge, this is the first case report highlighting the rehabilitation process with an aged COVID-19 patient who needs to be seen also as a respiratory case and as a frail patient.

#### **ETHICAL STATEMENT:**

- **Funding:** none

- **Conflict of Interest:** The authors state that there are no financial or personal relationships with other people or organisations that could inappropriately influence (bias) their work

- **Ethical approval:** The protocol performed in this case report is in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards

- **Informed consent:** Mr P was informed about the publication of the project and gave his consent

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