



Impact de la prise en charge de patient suspect de COVID sur le stress des soignants pré-hospitaliers

Luc Pigeon

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UNIVERSITÉ CLERMONT AUVERGNE
UFR DE MÉDECINE ET DES PROFESSIONS PARAMÉDICALES

THÈSE D'EXERCICE
pour le
DIPLOME D'ÉTAT DE DOCTEUR EN MÉDECINE
par

PIGEON, Luc

Présentée et soutenue publiquement le 07/10/2021

TITRE DE LA THÈSE

IMPACT DE LA PRISE EN CHARGE DE PATIENT SUSPECT DE COVID SUR LE
STRESS DES SOIGNANTS PRE-HOSPITALIERS

Président du jury : Monsieur SCHMIDT Jeannot, Professeur, UFR de Médecine et des Professions paramédicales - Clermont-Ferrand (Médecine d'urgence)

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Spécialité : médecine d'urgence

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Titre de Thèse : Impact de la prise en charge de patient suspects COVID sur le stress des soignants pré-hospitaliers

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LISTE DES ABBREVIATIONS

COVID-19, COVID: Coronavirus Disease 19

SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus-2

HCW: Health Care Worker

EP: Emergency Physician

BLS: Basic Life Support

MICU: Mobile Intensive Care Unit

VAS: Visual Analog Scale

HRV: Heart Rate Variability

RMSSD: Root Mean Square of the Successive Differences

SDNN: Standard Deviation of NN intervals

PNN50 : Percentage of successive RR intervals that differ by more than 50 ms

Introduction

Since more than 18 months, the Coronavirus Disease 19 (COVID-19), caused by the Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) has changed the face of the world and forced healthcare system to adapt their practice. The local epidemic became fast a global pandemic that forced worldwide government to adapt response.(1) During the first wave of the pandemic, in April 2020, no vaccine was available, and some areas were overload. Emergency HealthCare Workers (HCW) were in frontline to face this new disease.(2) In France, emergency HCWs are working both in and out of hospital for Emergency Physicians (EP), nurses, and ambulances' drivers.(3) Furthermore, EPs works also in the 911 center where they work in a noisy and overcrowded environment.(4) Out of hospital care can be provided by firefighters with Basic Life Support (BLS) abilities or by Mobile Intensive Care Unit (MICU), a team composed of a professional driver, a state certified nurse and an EP. They can provide the same care than in the Emergency Department (ED).(3) Chronic stress at work is a major public health concern increasing both morbidity and mortality (5). Emergency HCWs are a particularly at-risk population for stress and burnout because of the complex interaction between life-threatening emergencies, ED overcrowding, lack of sleep; bad food, and accumulated fatigue.(6)(7) Health care workers are considered as high-risk group for death by suicide. (8)If men have a higher risk of suicide in the general population, female physicians have higher suicide rates. Specialties with a heavy workload, long shifts, and unpredictable hours, stress-related situations, and easy access to a means of committing suicide are particularly at risk of suicide.(9) The best way to assess subjective stress at work is the Karasek Job-demand scale or the Perceived Stress Scale. However, because of its length and its complexity, it is impractical especially due to the limited time. Visual analogue scale (VAS) was initially developed to assess pain. It has been secondly used to assess stress. The use of VAS is attractive because it is simple to implement, easy to understand, and time efficient. Currently, the VAS is the common tool used by occupational physicians to assess stress among workers.(10)(11)(12) But stress can also be assess objectively using biomarkers such as cortisol(13)(14), epinephrine(15), interleukine-8(16), leptin(17), ghrelin(18), DHEA(19), and heart-rate variability (HRV)(20)(21). HRV is painless, easy to use, reproducible and can also study long periods (more than hours). Linked to the autonomous nervous system, it reflects the cardiovascular response to regulatory impulses affecting heart rhythm(22).

Thus, we performed a study on MICU emergency HCWs during the first wave of the pandemic. The main objective is to compare stress level during care of a patient with a suspicion of

COVID-19 with a non-COVID-19 suspicion patient. Secondary objectives are to compare subjective and objective levels, and to find some clinical or sociodemographic characteristics that could impact stress levels.

Methods

Study design

This study was performed between April 9th 2020 and April 15th 2020 in the Mobile Intensive Care Unit of the University Hospital of Clermont-Ferrand, France. At the beginning of the day, one investigator installed a belt to monitor heart rate (HR) and HRV to physician, nurses and drivers of the volunteers MICU workers. They kept this belt during all day with or without interventions. This permit to study each R-R interval. Furthermore, a questionnaire was given for all day. This questionnaire was created by three investigators regarding stress assessment and necessity of studying the impact of COVID on stress among emergency health care workers. Completion of the survey took approximately three minutes. This questionnaire was composed in three parts. The first one was sociodemographic – age, sex, height, weight, profession, experience, physical activity, tobacco. The second one was composed by 21 VAS – stress to care for COVID patient, stress to care for non-COVID patient, stress regarding COVID in general, stress at work, stress at home, tiredness, sleep quality, anxiety, mood, professional exhaustion / burnout, decision latitude, burden, hierarchical support, colleagues support, family support, job satisfaction, personal involvement at work, ethical conflict at work, work addiction, self-appreciation, psychological support. This part was asked twice (at the beginning of the day work and at the end). The third part was the collection of interventions with the following details – time of beginning, time of end, type of intervention (on site, between two hospitals, exercise), suspicion of COVID, TIVEC[®] wearing, life and death intervention, technic intervention, intubation. Exclusion criteria were student, refusal of participation.

Data collection

All data from questionnaires were extracted manually in an Excel[®] sheet. Regarding the data from HR monitoring, all devices were uploaded daily with Bioharness Zephyr[®] software. Analysis from Zephyr was performed with a Kubios[®] software. All 39 HR records available were first sequenced in different part (before intervention 1, during intervention 1, between intervention 1 and 2...). Then, we deleted incorrect data due to artefacts. All questionnaires were linked to an HR monitoring with an anonymized number. All data were anonymized with the last two letters of their first name, the last two letters of their last name and the date of analysis. Following HRV parameters were collected. The root mean square of successive differences between normal heartbeats (RMSSD) is obtained by first calculating each

successive time difference between heartbeats in ms. Then, each of the values is squared and the result is averaged before the square root of the total is obtained (23). The standard deviation of the IBI of normal sinus beats (SDNN) is measured in ms(23). The percentage of adjacent NN intervals that differ from each other by more than 50 ms (pNN50) also requires a 2-min epoch(23).

Data analysis

We performed statistical analysis in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist. The results were descriptive in nature and those for all closed questions were provided in absolute numbers or percentages. All data were analyzed using Stata® software version 16 (StataCorp, College Station, Texas, USA). The categorical variables were expressed as frequencies and associated percentages. Continuous data were expressed as mean $\pm$ standard deviation or median [interquartile range]. To measure the increase in stress between the stress at home and stress at work, paired t-tests were performed. Furthermore, to examine the impact of different parameters such as sociodemographic, the ANOVA and Kruskal–Wallis tests were used. All statistical tests were performed for a two-sided type I error of 5%.

Ethics

A French Ethics committee (Comité de Protection de Personnes Sud-Est VI, CHU Clermont-Ferrand) approved this study protocol on April 2020 (reference 2020/CE15), and the protocol was registered in ClinicalTrials (NCT04954105).

RESULTS

Generalities

Between April 9th 2020 and April 15th 2020, 32 individuals participate to the study for a total of 45 questionnaires, 45 HRV records – including six with no data, eleven with not interpretable data and 28 interpretable. Under the 28 records, we had 41 interventions with full record and 8 with partial record. (figure 1)

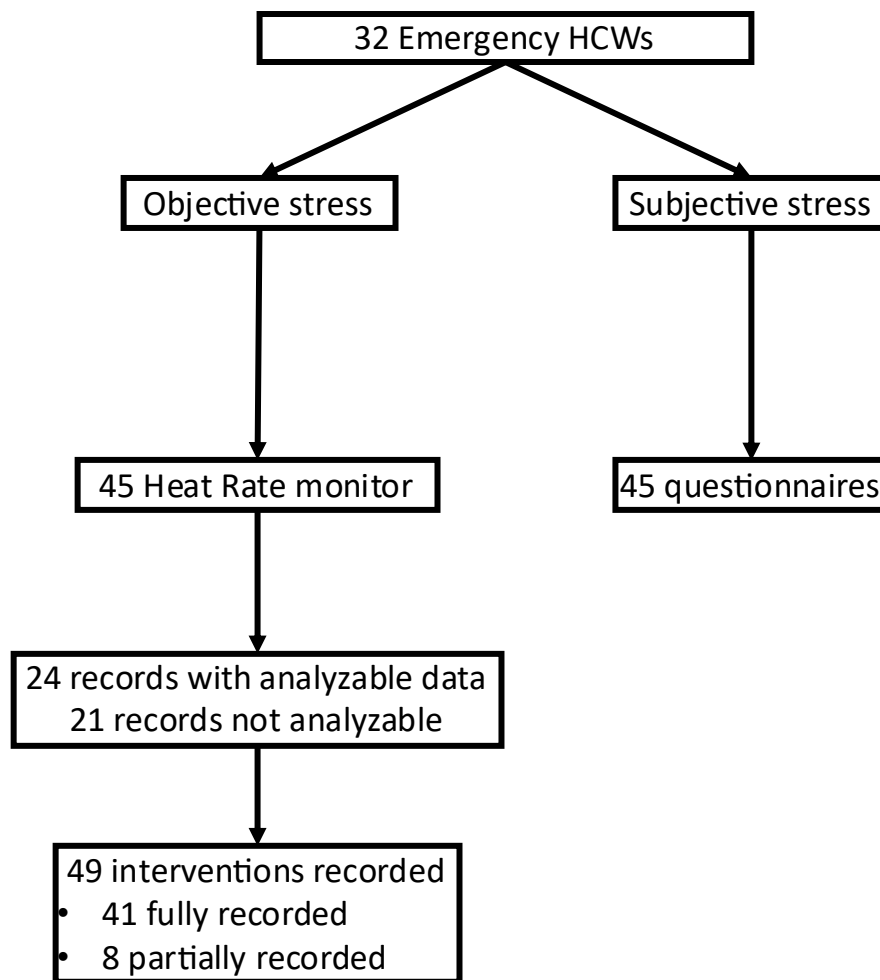


Figure 1: Flow-Chart

Characteristic of population

Over 32 individuals, 15 (46.9%) were female and 17 (53.1%) for a sex ratio=1.13. Seven (21.9%) were drivers, 10 (31.3%) were nurses and 15 (46.9%) were physicians. Five (15.6%) were smokers. Mean age was 35.66 years old (+/- 8.8) with a minimum at 25 and a maximum at 58. Mean body mass index (BMI) was 22.7 kg/m² (+/- 2.6) with a minimum at 19.23 and a maximum at 30.93 kg/m². Median physical activity was four hours per week, median experience in MICU was four years and total experience was six years. Table 1

Characteristics	n (%)	Mean +/-SD	Minimum	Maximum
Age (years)	-	35.66 +/- 8.75	25	58
<u>Sex:</u>	-	-	-	-
Female	15 (46.88)	-	-	-
Male	17 (53.13)	-	-	-
<u>Work:</u>	-	-	-	-
Ambulance's driver	7 (21.88)	-	-	-
Nurses	10 (31.25)	-	-	-
Doctors	15 (46.88)	-	-	-
<u>Tobacco:</u>	-	-	-	-
Smokers	5 (15.63)	-	-	-
Nonsmoker	27 (84.38)	-	-	-
BMI	-	22.70 +/- 2.64	19.23	30.93
Physical activity by week (per hour)	-	4*	1	10
Work Experience in SMUR (in years)	-	4*	0.5	34
Total work experience	-	6*	0.5	34

Table 1: Characteristics of population. n=number of participants; SD=standard deviation: *=median

Subjective stress

Main objective

Among the 30 responders, median stress regarding COVID in general at the beginning of the day was 24.3 and at the end of the day 28.7 (p=0.03). Over these 30 responders, the median of stress they declared for caring for COVID patient was 38.2 at the beginning of the day and 42.6 at the end of the day. Always on these 30 responders the median of stress they declared for caring for non-COVID patient was 17.6 at the beginning of the day and 16.2 at the end of the day. (table 2)

We compared (with a Wilcoxon test) median of stress (declared for caring for COVID and non-COVID patient) at the beginning of the day and at the end of the day. Stress level regarding the care of a patient with a suspicion of COVID infection compared to a non-COVID patient found a statistically significant result 38.2 versus 17.6, p<0.001 at the beginning of the day and at the end of the day 42.6 vs 16.2, p<0.001.

	n	Median	p25	p75
<u><i>Stress regarding COVID in general (p=0.03)</i></u>	-	-	-	-
At the beginning of shift	30	24.3	16.2	45.6
At the end of the shift	30	28.7	16.2	45.6
<u><i>Stress to care for COVID patient (p=0.79)</i></u>	-	-	-	-
At the beginning of shift	29	38.2	25.0	52.9
At the end of the shift	29	42.6	23.5	52.9
<u><i>Stress to care for non-COVID patient (p=0.24)</i></u>	-	-	-	-
At the beginning of shift	30	17.6	11.8	32.3
At the end of the shift	30	16.2	10.3	30.9

Table 2: Subjective stress assessed with VAS. n=number of participants; VAS=visual analog scale

Among thus 30, 29 and 30 responders concerning stress regarding COVID in general, stress to care for COVID patient and stress to care for non-COVID patient, we check to see how many of them have a relevant stress level higher than 50 on VAS for an at-risk population (12)(table 3). Concerning stress regarding COVID in general, over 30 responders, at the beginning of the day, 26 declared to have a stress level less than 50 and four up to 50. At the end of the day, 24 had a stress level less than 50 and six up to 50. Concerning the care of a patient with a suspicion of COVID infection, over 29 responders, at the beginning of the day, 19 had a stress level less than 50 and ten up to 50. At the end of the day, 18 had a stress level less than 50 and eleven up to 50. Concerning the care of non-COVID patient, over 30 responders, at the beginning of the day, 27 had a stress level less than 50 and 3 up to 50. At the end of the day, 26 had a stress level less than 50 and four up to 50. We also Check if there is HCWs with a higher stress level than 82 but there is none among thus responders.

	VAS < 50 ; n (%)	VAS > 50 ; n (%)
<u><i>Stress regarding COVID in general</i></u>	-	-
At the beginning of the shift	26 (87)	4 (13)
At the end of the shift	24 (80)	6 (20)
<u><i>Stress to care for COVID patient</i></u>	-	-
At the beginning of the shift	19 (65)	10 (35)
At the end of the shift	18 (62)	11 (38)
<u><i>Stress to care for non-COVID patient</i></u>	-	-
At the beginning of the shift	27 (90)	3 (10)
At the end of the shift	26 (80)	4 (20)

Table 3 : Relevant subjective stress level ; VAS=visual analog scale ; n=number of participants

Other data

Over 40 questionnaire, median level of stress to care for COVID patient was 33.8 at the beginning of the day and 32.3 at the end ($p=0.45$). Over 41 questionnaire, median level of stress to care for non-COVID patient was 16.2 at the beginning of the day and 14.7 at the end ($p=0.34$). Over 41 questionnaire, median level of stress regarding covid in general was 22.1 at the beginning of the day and 23.5 at the end ($p=0.04$). Over 39 questionnaire, median level of stress at work was 19.1 at the beginning of the day and 19.1 at the end ($p=0.72$). Over 41 questionnaire, median level of stress at home was 7.3 at the beginning of the day and 5.9 at the end ($p=0.41$). Over 40 questionnaire, median level of tiredness was 22.1 at the beginning of the day and 45.6 at the end ($p=0.002$). Over 40 questionnaire, median level of sleep quality was 69.8 at the beginning of the day and 70.6 at the end ($p=0.31$). Over 41 questionnaire, median level of anxiety was 11.8 at the beginning of the day and 16.2 at the end ($p=0.41$). Over 39 questionnaire, median level of happiness was 80.9 at the beginning of the day and 76.5 at the end ($p=0.37$). Over 40 questionnaire, median level of professional exhaustion / burnout was 6.6 at the beginning of the day and 8.8 at the end ($p=0.03$). Over 38 questionnaire, median level of decision latitude was 55.1 at the beginning of the day and 57.3 at the end ($p=0.048$). Over 41 questionnaire, median level of burden was 23.5 at the beginning of the day and 29.4 at the end ($p=0.99$). Over 41 questionnaire, median level of hierarchical support was 51.6 at the beginning of the day and 54.4 at the end ($p=0.84$). Over 41 questionnaire, median level of colleague's support was 75 at the beginning of the day and 76.5 at the end ($p=0.046$). Over 41 questionnaire, median level of family support was 85.3 at the beginning of the day and 85.3 at the end ($p=0.96$). Over 41 questionnaire, median level of job satisfaction was 66.2 at the beginning of the day and 69.1 at the end ($p=0.41$). Over 41 questionnaire, median level of personal involvement at work was 77.9 at the beginning of the day and 77.9 at the end ($p=0.93$). Over 41 questionnaire, median level of ethical conflict at work was 16.2 at the beginning of the day and 16.2 at the end ($p=0.68$). Over 41 questionnaire, median level of work addiction was 47.1 at the beginning of the day and 47.1 at the end ($p=0.45$). Over 41 questionnaire, median level of self-appreciation was 51.5 at the beginning of the day and 55.9 at the end ($p=0.06$). Over 41 questionnaire, median level of psychological support was 8.8 at the beginning of the day and 8.8 at the end ($p=0.81$). (table 4)

	n	Median	p25	p75
<u>Stress regarding COVID in general (p=0.04)</u>	-	-	-	-
At the beginning of shift	41	22.1	14.7	42.6
At the end of the shift	41	23.5	13.2	41.2
<u>Stress to care for COVID patient (p=0.45)</u>	-	-	-	-
At the beginning of shift	40	33.8	15.4	52.9
At the end of the shift	40	32.3	16.9	52.2
<u>Stress to care for non-COVID patient (p=0.34)</u>	-	-	-	-
At the beginning of shift	41	16.2	7.3	30.9
At the end of the shift	41	14.7	10.3	23.5
<u>Stress at work (p=0.72)</u>	-	-	-	-
At the beginning of shift	39	19.1	8.8	45.6
At the end of the shift	39	19.1	10.3	32.3
<u>Stress at home (p=0.41)</u>	-	-	-	-
At the beginning of shift	41	7.3	2.9	10.3
At the end of the shift	41	5.9	4.4	10.3
<u>Tiredness (p=0.002)</u>	-	-	-	-
At the beginning of shift	40	22.1	7.3	50
At the end of the shift	40	45.6	18.4	61.0
<u>Sleep quality (p=0.31)</u>	-	-	-	-
At the beginning of shift	40	69.8	47.8	84.6
At the end of the shift	40	70.6	45.6	85.3
<u>Anxiety (p=0.41)</u>	-	-	-	-
At the beginning of shift	41	11.8	4.4	23.5
At the end of the shift	41	16.2	5.9	23.5
<u>Mood (p=0.37)</u>	-	-	-	-
At the beginning of shift	39	80.9	54.4	86.8
At the end of the shift	39	76.5	48.5	83.8
<u>Professional exhaustion / burnout (p=0.03)</u>	-	-	-	-
At the beginning of shift	40	6.6	1.5	17.6
At the end of the shift	40	8.8	2.9	20.6
<u>Decision latitude (p=0.048)</u>	-	-	-	-
At the beginning of shift	38	55.1	25	75
At the end of the shift	38	57.4	20.6	70.6
<u>Burden (p=0.99)</u>	-	-	-	-
At the beginning of shift	41	23.5	7.3	47.1
At the end of the shift	41	29.4	8.8	48.5
<u>Hierarchical support (p=0.84)</u>	-	-	-	-
At the beginning of shift	41	51.5	32.3	72.1
At the end of the shift	41	54.4	29.4	73.5
<u>Colleagues support (p=0.046)</u>	-	-	-	-
At the beginning of shift	41	75	69.1	88.2
At the end of the shift	41	76.5	67.6	86.8
<u>Family support (p=0.96)</u>	-	-	-	-
At the beginning of shift	41	85.3	77.9	94.1
At the end of the shift	41	85.3	77.9	92.6
<u>Job satisfaction (p=0.41)</u>	-	-	-	-
At the beginning of shift	41	66.2	54.4	76.5
At the end of the shift	41	69.1	58.8	77.9
<u>Personal involvement at work (p=0.93)</u>	-	-	-	-
At the beginning of shift	41	77.9	64.7	85.3
At the end of the shift	41	77.9	64.7	86.8
<u>Ethical conflict at work (p=0.68)</u>	-	-	-	-
At the beginning of shift	41	16.2	8.8	51.5
At the end of the shift	41	16.2	8.8	36.8
<u>Work addiction (p=0.45)</u>	-	-	-	-
At the beginning of shift	41	47.1	16.2	69.1
At the end of the shift	41	47.1	19.1	70.6
<u>Self-appreciation, (p=0.06)</u>	-	-	-	-
At the beginning of shift	41	51.5	36.8	75
At the end of the shift	41	55.9	44.1	79.4
<u>Psychological support (p=0.81)</u>	-	-	-	-
At the beginning of shift	41	8.8	4.4	14.7
At the end of the shift	41	8.8	1.5	17.6

Table 4: Difference between VAS at the beginning and the end of a workday. VAS=visual analog scale; n=number of surveys

Objective stress

Heart Rate

Regarding eight interventions among a COVID patient, mean HR was 81.8 before intervention (+/- 11.3) and 81.7 (+/-10.3) during intervention. Regarding 41 interventions among a non-COVID patient, mean HR was 78.4 (+/-8.7) before intervention and 81.1 (+/-8.2) during intervention. We did not find any impact of COVID suspicion in HR variation ($p=0.38$). We did not find any significant impact of sex ($p=0.16$), work ($p=0.051$), tobacco ($p=0.32$), TIVEC use ($p=0.70$), type of intervention ($p=0.32$), life threatening intervention ($p=0.16$), technical gesture ($p=0.89$) but a significant impact of intubation ($p=0.007$). (Table 5 and table 6) We found the same results after exclusion of non-complete records (Table 13)

	n	Mean HR +/- SD	Min	Max
<u>COVID related intervention</u>				
Before the intervention	8	81.8 +/- 11.3	63.9	98.5
During the intervention	8	81.07 +/- 10.0	61.9	93.4
<u>Non COVID related intervention</u>				
Before the intervention	41	78.3 +/- 8.7	61.8	93.6
During the intervention	41	81.1 +/- 8.2	61.0	101.0

Table 5: Mean Heart Rate before and during intervention. $p=0.38$; n=number of interventions; SD=standard deviation; min=minimum; max=maximum

	n	Median	p25	p75
<u>COVID related intervention ($p=0.47$)</u>				
Yes	8	-0.4	-3.8	8.9
No	41	4.4	-1.8	10.2
<u>Sex ($p=0.16$)</u>				
Men	33	4.9	-1.5	11.9
Women	16	0.0	-6.6	6.9
<u>Category of work ($p=0.051$)</u>				
Driver	16	9.7	1.6	15.4
Nurses	19	2.4	-6.2	10.1
Physicians	14	-0.7	-2.8	4.5
<u>Tobacco ($p=0.32$)</u>				
Nonsmoker	39	4.4	-2.5	11.9
Smokers	10	1.1	-5.1	4.9
<u>TIVEC® ($p=0.70$)</u>				
Yes	6	7.1	-1.9	12.9
No	43	3.5	-2.8	10.2
<u>Type ($p=0.32$)</u>				
Primary	29	3.6	-2.8	10.2
Secondary	18	2.9	-1.8	10.1
Exercise	2	11.2	9.2	13.1
<u>Life-threatening ($p=0.16$)</u>				
Yes	10	6.9	-5.1	16.4
No	39	2.4	-2.5	10.1
<u>Intubation ($p=0.007$)</u>				
Yes	4	-14.3	-20.0	1.0
No	45	4.4	-1.8	10.2
<u>Technical gesture ($p=0.89$)</u>				
Yes	13	4.4	-0.2	8.7
No	36	2.9	-2.6	11.6

Table 6 : Risk factor of heart rate difference between intervention and rest. n=number of intervention

RMSSD

Regarding eight interventions among a COVID patient, mean RMSSD was 60.7 before intervention (+/- 18) and 51 (+/-28.8) during intervention. Regarding 41 interventions among a non-COVID patient, mean RMSSD was 64.1 (+/-30) before intervention and 60 (+/-30.2) during intervention. We did not find any impact of COVID suspicion in RMSSD variation ($p=0.57$). We did not find any significant impact of sex ($p=0.8$), work ($p=0.81$), tobacco ($p=0.8$), TIVEC use ($p=0.36$), type of intervention ($p=0.13$), life threatening intervention ($p=0.49$), technical gesture ($p=0.29$) and intubation ($p=0.78$). (Table 7 and 8) We found the same results after exclusion of non-complete records (Table 14)

	n	Mean RMSSD +/-SD	Min	Max
<u>COVID related intervention</u>	-	-	-	-
Before the intervention	8	60.7 +/- 18.0	29.0	78.4
During the intervention	8	51.0 +/- 28.8	25.7	110.4
<u>Non COVID related intervention</u>	-	-	-	-
Before the intervention	41	64.1 +/- 30.0	17.4	167.2
During the intervention	41	60.0 +/- 30.2	18.3	139.1

Table 7: Mean RMSSD during COVID intervention and non-COVID intervention. $p=0.57$. n=number of interventions

	n	Median	p25	p75
<u>COVID related intervention ($p=0.37$)</u>	-	-	-	-
Yes	8	-13.0	-50.3	11.5
No	41	-5.9	-21.5	9.9
<u>Sex ($p=0.80$)</u>	-	-	-	-
Men	33	-5.9	-20.6	9.9
Women	16	-11.6	-26.9	13.6
<u>Category of work ($p=0.81$)</u>	-	-	-	-
Driver	16	-1.5	-15.9	17.8
Nurses	19	-17.9	-23.2	7.5
Physicians	14	-13.3	-35.9	21.8
<u>Tabacco ($p=0.80$)</u>	-	-	-	-
Nonsmoker	39	-5.9	-23.2	8.8
Smokers	10	-13.0	-28.6	21.8
<u>TIVEC® ($p=0.36$)</u>	-	-	-	-
Yes	6	-16.1	-54.5	-0.8
No	43	-5.9	-23.2	13.4
<u>Type ($p=0.13$)</u>	-	-	-	-
Primary	29	-16.4	-30.5	7.5
Secondary	18	3.6	-11.9	21.8
Exercise	2	-9.1	-17.5	-0.8
<u>Life-threatening ($p=0.49$)</u>	-	-	-	-
Yes	10	-3.9	-11.9	8.8
No	39	-8.2	-30.5	13.4
<u>Intubation ($p=0.78$)</u>	-	-	-	-
Yes	4	12.4	-35.7	35.7
No	45	-9.8	-23.2	8.8
<u>Technical gesture ($p=0.29$)</u>	-	-	-	-
Yes	13	-11.3	-19.9	7.5
No	36	-7.0	-33.2	11.6

Table 8: Risk factor of RMSSD difference between intervention and rest. n=number of intervention. n=number of intervention

SDNN

Regarding eight interventions among a COVID patient, mean SDNN was 57.2 before intervention (+/-16.2) and 53.9 (+/-23.2) during intervention. Regarding 41 interventions among a non-COVID patient, mean SDNN was 58.9 (+/-21.5) before intervention and 56.2 (+/-19.8) during intervention. We did not find any impact of COVID suspicion in SDNN variation ($p=0.77$). We did not find any significant impact of sex ($p=0.67$), work ($p=0.76$), tobacco ($p=0.91$), TIVEC use ($p=0.46$), life threatening intervention ($p=0.93$), technical gesture ($p=0.24$) and intubation ($p=0.44$), but a significant impact of the type of intervention ($p=0.007$). (Table 9 and 10) We found the same results after exclusion of non-complete records (Table 15)

	n	Mean SDNN +/- SD	Min	Max
<u>COVID intervention</u>	-	-	-	-
Before the intervention	8	57.2 +/- 16.2	29.4	74.8
During the intervention	8	53.9 +/- 23/2	33.8	100.3
<u>Non COVID intervention</u>	-	-	-	-
Before the intervention	41	58.9 +/- 21.5	24.2	139.1
During the intervention	41	56.2 +/- 19.8	25.2	108.4

Table 9: mean SDNN before and during intervention. $p=0.38$

	n	Median	p25	p75
<u>COVID related intervention ($p=0.77$)</u>	-	-	-	-
Yes	8	2.0	-34.5	16.8
No	41	-3.6	-19.8	16.6
<u>Sex ($p=0.67$)</u>	-	-	-	-
Men	33	-2.9	-19.8	17.5
Women	16	-2.8	-21.4	15.8
<u>Category of work ($p=0.76$)</u>	-	-	-	-
Driver	16	-5.3	-18.6	13.9
Nurses	19	-0.6	-19.8	19.5
Physicians	14	-1.9	-32.8	17.5
<u>Tobacco ($p=0.91$)</u>	-	-	-	-
Nonsmoker	39	-7.6	-20.2	16.6
Smokers	10	1.8	-32.7	17.5
<u>TIVEC® ($p=0.46$)</u>	-	-	-	-
Yes	6	-10.2	-32.8	-0.4
No	43	-2.9	-20.2	17.5
<u>Type ($p=0.07$)</u>	-	-	-	-
Primary	29	-7.6	-26.5	4.4
Secondary	18	13.6	-10.6	21.5
Exercise	2	-10.2	-19.8	-0.6
<u>Life-threatening ($p=0.93$)</u>	-	-	-	-
Yes	10	-3.4	-14.1	4.0
No	39	-2.9	-26.5	18.8
<u>Intubation ($p=0.44$)</u>	-	-	-	-
Yes	4	24.2	-16.2	31.7
No	45	-3.6	-20.2	13.6
<u>Technical gesture ($p=0.24$)</u>	-	-	-	-
Yes	13	0.9	-10.5	13.6
No	36	-5.6	-28.6	18.1

Table 10: Risk factor of SDNN difference between intervention and rest. n=number of intervention. n=number of intervention

PNN50

Regarding eight interventions among a COVID patient, mean PNN50 was 19.1 before intervention (+/-9.1) and 17.8 (+/-15) during intervention. Regarding 41 interventions among a non-COVID patient, mean PNN50 was 23 (+/-14.5) before intervention and 20.6 (+/-13.3) during intervention. We did not find any impact of COVID suspicion in SDNN variation ($p=0.99$). We did not find any significant impact of sex ($p=0.92$), work ($p=0.86$), tobacco ($p=0.72$), TIVEC use ($p=0.51$), life threatening intervention ($p=0.81$), technical gesture ($p=0.18$) and intubation ($p=0.45$), but a significant impact of the type of intervention ($p<0.004$). (Table 11 and 12) We found the same results after exclusion of non-complete records (Table 16)

	n	Mean pNN50 +/- SD	Min	Max
<u>COVID intervention</u>	-	-	-	-
Before the intervention	8	19.1 +/- 9.1	4.1	27.8
During the intervention	8	17.8 +/- 14.9	5.2	51.1
<u>Non COVID intervention</u>	-	-	-	-
Before the intervention	41	23.0 +/- 14.5	0.9	62.8
During the intervention	41	20.6 +/- 13.3	2.0	57.9

Table 11: pNN50 before and during intervention. $p=0.82$

	n	Median	p25	p75
<u>COVID related intervention ($p=0.99$)</u>	-	-	-	-
Yes	8	-13.0	-53.3	65.2
No	41	-20.5	-42.2	26.3
<u>Sex ($p=0.92$)</u>	-	-	-	-
Men	33	-20.5	-43.1	26.3
Women	16	-14.8	-37.0	70.2
<u>Category of work ($p=0.86$)</u>	-	-	-	-
Driver	16	3.8	-38.4	48.1
Nurses	19	-21.7	-41.3	20.2
Physicians	14	-22.6	-43.7	46.1
<u>Tobacco ($p=0.72$)</u>	-	-	-	-
Nonsmoker	39	-20.5	-42.2	20.2
Smokers	10	1.0	-43.4	48.7
<u>TIVEC ($p=0.51$)</u>	-	-	-	-
Yes	6	-32.5	-43.4	20.2
No	43	-19.6	-43.1	28.6
<u>Type ($p=0.004$)</u>	-	-	-	-
Primary	29	-22.7	-53.5	20.2
Secondary	18	-4.3	-23.4	67.5
Exercise	2	-11.0	-42.2	20.2
<u>Life-threatening ($p=0.81$)</u>	-	-	-	-
Yes	10	-10.1	-22.5	24.6
No	39	-21.0	-43.4	28.6
<u>Intubation ($p=0.45$)</u>	-	-	-	-
Yes	4	40.8	-52.5	110.7
No	45	-20.5	-43.1	24.6
<u>Technical gesture ($p=0.18$)</u>	-	-	-	-
Yes	13	-20.5	-39.7	24.6
No	36	-20.3	-43.5	27.4

Table 12: Risk factor of PNN50 difference between intervention and rest. n =number of intervention. n =number of intervention

DISCUSSION

We found a significant higher subjective stress regarding the care of suspected COVID patients versus non-COVID patients in out of hospital Emergency HCWs. This finding is logic but needs to be discussed. First, participants were assessed during the first wave of the pandemic, in a time that no vaccine was created, no treatment was available(24). Emergency HCWs were sent on the frontline to fight a virus that no one knows anything regarding contagiousness, transmissibility (air, contact, droplet, both), resistance on contact area, or even mortality(25). This situation can be considered as a hazard disaster. During the first wave of the pandemic, the Auvergne land was relatively protected regarding COVID-19 admission. Indeed, the French government declared the lockdown on March 17th 2020 (26). The ED of Clermont-Ferrand has a normal level of admission around 160 patients per day. It showed a huge decrease of admission with a minimum at 60 admissions on March 18th 2020. Furthermore, all non-urgent surgery and medical hospitalization were cancelled. The overcrowding disappeared during the lockdown.(27)(28) Emergency HCWs are more stressed at work to fight a disaster. For example, we showed an increase of 11 points in stress levels assessed with a VAS between work and home regarding nuclear or radiation disaster risks in a low risk area among Emergency HCWs (29). During more than 18 months, COVID-19 and its consequences on Emergency HCWs have been studied. Frontline workers suffer to more burnout, post-traumatic stress disorders and poor sleep quality (30). Furthermore, medical staff reported depression at a level of 31.3%, anxiety at a level of 41.2%, and insomnia at 39.3%. Compared with the citizens, medical staff experienced higher level of anxiety, depression and insomnia, especially the frontline medical staff. Furthermore, male, married medical staff with poorer physical health reported lower mental health (31).At the end of the workday, we found eleven (38%) participants with a stress level up to 50, who can be characterized as “potentially stressed workers” (12) regarding the care of COVID patient. Indeed, stress levels can be classified as low risk of burnout if VAS result is less than 50, and high risk of burnout if VAS is up to 82. Those workers can be confidently considered as workers under pressure, for whom action is urgently required. Indeed, the most stressed workers are known to commit suicide. Very interestingly, we did not have any participant with a VAS up to 82. All eleven were in the “gray zone”, also called “potentially stressed”. If no conclusion regarding there stress can be done, literature recommend performing an extended interview, to begin preventive action, and to propose a closer follow-up. Indeed, 23.0% of workers between 50 and 82 would not have been identified with the use of a single threshold.

Among 48 interventions, we did not find any significant change on all parameters of heart rate and heart rate variability between the care of COVID patient and non-COVID patients. The very low incidence of COVID in Auvergne can explain this result(26)(28). Furthermore, during our period of study, there was a very low level of activity in out-of-hospital teams. This induces a lower risk of stress and tiredness. Secondly, during the first wave of the pandemic, communication was centralized to protect patients at risk of severe disease, i.e. elderly, immunocompromised, obese, diabetes, hypertension, pulmonary disease(32)(33)(34). Lastly, we had only eight interventions of suspected COVID but none was confirmed, inducing a decrease of stress level.

Our study has some limitations. First, we did not ask for a general stress level which induce a bias. Indeed, we are not able to assess the impact of COVID in general stress level and also the impact of other parameters such as sociodemographic on general stress level. Secondly, our period of study was during the first wave of the pandemic which was very low in Auvergne, mainly due to the benefit of the lockdown. It could be interesting to perform new measurement at different period of COVID pandemic (for example, first wave, second wave, when the vaccine was available, after the third wave). Thirdly, we used Biohardness Zephyr® and participants were asked to place the belt themselves, which induced a lot of artefacts and not interpretable data(35). It should be interesting to train participants to use the belt before the beginning of the measurement.

CONCLUSION

We found a significant subjective stress assessed with a visual analog scale in out-of-hospital emergency health care workers in the care of a patient suspect of COVID-19 infection compared to a patient non-suspect of COVID-19 infection during the first wave of the pandemic in April 2020. This result is not confirmed by the study of objective stress with the assessment of heart rate variability. We did not find any risk factor or protective factor of stress. The main explanation is the weak number of interventions recorded with a COVID-19 suspicion (eight over 49) during the study period. Indeed, the city of Clermont-Ferrand was protected with a low number of COVID-19 infections during the first wave because of the lockdown. However, the subjective stress was significantly higher at the beginning of the day work and the end of the day work, showing the stress level of emergency health care workers.

CONCLUSION

Une différence significative de stress subjectif est retrouvée par le biais des échelles visuelles analogiques chez les soignants des équipes du service mobile d'urgences et de réanimation dans la prise en charge des patients suspects d'une infection à la COVID-19 par rapport à la prise en charge des patients non suspect d'une infection à la COVID-19. Ce résultat n'est pas confirmé par l'étude objective du stress mesuré par la variabilité sinusale de la fréquence cardiaque. L'explication principale est le manque d'intervention enregistré avec des patients suspects d'une infection à la COVID-19 (8 sur 49) pendant la durée de l'étude. En effet la ville de Clermont-Ferrand a été protégée avec un faible nombre de contamination durant la première vague grâce au confinement. Cependant le stress subjectif était significativement supérieur au début et à la fin de la journée, mettant ainsi en évidence le niveau de stress des soignants.

Clermont-Ferrand, le

Pierre CLAVELOU
Doyen – Directeur



Clermont-Ferrand, le 22 septembre 2021

Jeanriot SCHMIDT
Le Président du Jury

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ANNEXES :



Figure 2: Zephyr BioHarness 3.0®

COVISTRESS - MICUH

Age: Date : __ / __ / 2020
 Sexe: ☐ Homme ☐ Femme
 Poids: Tabac – nombre de cigarettes par jour:
 Taille: Nombre d'heures d'activité physique par semaine :
 Activité professionnelle: ☐ Médecin ☐ Infirmière ☐ Ambulancier

A la prise de poste – Heure de début de poste : __ h __ min

Quel est votre niveau de ... :

... stress lors de la prise en charge d'un patient COVID+ ou suspect	Aucun	Maximal
... stress lors de la prise en charge d'un patient non COVID	Aucun	Maximal
... stress lié au coronavirus	Aucun	Maximal
... stress au travail	Aucun	Maximal
... stress à la maison	Aucun	Maximal
... fatigue	Aucun	Maximal
... qualité du sommeil	Aucun	Maximal
... anxiété/ peur	Aucun	Maximal
... humeur / moral	Aucun	Maximal
... burn-out / épuisement professionnel	Aucun	Maximal
... latitude décisionnelle / autonomie au travail	Aucun	Maximal
... demande psychologique au travail (charge de travail)	Aucun	Maximal
... soutien de votre hiérarchie dans le cadre du travail	Aucun	Maximal
... soutien de vos collègues dans le cadre du travail	Aucun	Maximal
... soutien de votre famille	Aucun	Maximal
... satisfaction obtenue de votre travail au regard des efforts fournis	Aucun	Maximal
... d'investissement dans votre travail	Aucun	Maximal
... conflit éthique au travail	Aucun	Maximal
... addiction au travail	Aucun	Maximal
... estime de soi	Aucun	Maximal
... besoin d'un soutien psychologique	Aucun	Maximal

Intervention 1:

Heure de début: __ h __ min

Heure de fin: __ h __ min

Suspicion COVID: ☐ Oui cas + connu ☐ Oui, cas + possible ☐ Non ☐ Habillage NRBC

Sortie: ☐ Primaire ☐ Secondaire

Patient: : ☐ Urgence vitale ☐ Intubation ☐ Gestes techniques

Intervention 2:

Heure de début: __ h __ min

Heure de fin: __ h __ min

Suspicion COVID: ☐ Oui cas + connu ☐ Oui, cas + possible ☐ Non ☐ Habillage NRBC

Sortie: ☐ Primaire ☐ Secondaire

Patient: : ☐ Urgence vitale ☐ Intubation ☐ Gestes techniques

Intervention 3:

Heure de début: __ h __ min

Heure de fin: __ h __ min

Suspicion COVID: ☐ Oui cas + connu ☐ Oui, cas + possible ☐ Non ☐ Habillage NRBC

Sortie: ☐ Primaire ☐ Secondaire

Patient: : ☐ Urgence vitale ☐ Intubation ☐ Gestes techniques

Intervention 4:

Heure de début: __ h __ min

Heure de fin: __ h __ min

Suspicion COVID: ☐ Oui cas + connu ☐ Oui, cas + possible ☐ Non ☐ Habillage NRBC

Sortie: ☐ Primaire ☐ Secondaire

Patient: : ☐ Urgence vitale ☐ Intubation ☐ Gestes techniques

Intervention 5:

Heure de début: __ h __ min

Heure de fin: __ h __ min

Suspicion COVID: ☐ Oui cas + connu ☐ Oui, cas + possible ☐ Non ☐ Habillage NRBC

Sortie: ☐ Primaire ☐ Secondaire

Patient: : ☐ Urgence vitale ☐ Intubation ☐ Gestes techniques

Intervention 6:

Heure de début: __ h __ min

Heure de fin: __ h __ min

Suspicion COVID: ☐ Oui cas + connu ☐ Oui, cas + possible ☐ Non ☐ Habillage NRBC

Sortie: ☐ Primaire ☐ Secondaire

Patient: : ☐ Urgence vitale ☐ Intubation ☐ Gestes techniques

Intervention 7:

Heure de début: __ h __ min

Heure de fin: __ h __ min

Suspicion COVID: ☐ Oui cas + connu ☐ Oui, cas + possible ☐ Non ☐ Habillage NRBC

Sortie: ☐ Primaire ☐ Secondaire

Patient: : ☐ Urgence vitale ☐ Intubation ☐ Gestes techniques

Intervention 8:

Heure de début: __ h __ min

Heure de fin: __ h __ min

Suspicion COVID: ☐ Oui cas + connu ☐ Oui, cas + possible ☐ Non ☐ Habillage NRBC

Sortie: ☐ Primaire ☐ Secondaire

Patient: : ☐ Urgence vitale ☐ Intubation ☐ Gestes techniques

A la fin de poste – Heure de fin de poste : __ h __ min

Quel est votre niveau de ... :

... stress lors de la prise en charge d'un patient COVID+ ou suspect	Aucun	Maximal
... stress lors de la prise en charge d'un patient non COVID	Aucun	Maximal
... stress lié au coronavirus	Aucun	Maximal
... stress au travail	Aucun	Maximal
... stress à la maison	Aucun	Maximal
... fatigue	Aucun	Maximal
... qualité du sommeil	Aucun	Maximal
... anxiété/ peur	Aucun	Maximal
... humeur / moral	Aucun	Maximal
... burn-out / épuisement professionnel	Aucun	Maximal
... latitude décisionnelle / autonomie au travail	Aucun	Maximal
... demande psychologique au travail (charge de travail)	Aucun	Maximal
... soutien de votre hiérarchie dans le cadre du travail	Aucun	Maximal
... soutien de vos collègues dans le cadre du travail	Aucun	Maximal
... soutien de votre famille	Aucun	Maximal
... satisfaction obtenue de votre travail au regard des efforts fournis	Aucun	Maximal
... d'investissement dans votre travail	Aucun	Maximal
... conflit éthique au travail	Aucun	Maximal
... addiction au travail	Aucun	Maximal
... estime de soi	Aucun	Maximal
... besoin d'un soutien psychologique	Aucun	Maximal

Figure 3: questionnaire

	n		Median		p25		p75
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<u>COVID related intervention (p=0.45)</u>	-	-	-	-
Yes	8	-0.4	-3.8	8.9
No	33	4.5	-2.8	11.4
<u>Sex (p=0.35)</u>	-	-	-	-
Men	26	4.9	-1.9	12.9
Women	15	0.2	-5.1	8.2
<u>Category of work (p=0.08)</u>	-	-	-	-
Driver	14	10.3	5.0	16.4
Nurses	15	1.1	-8.1	9.2
Physicians	12	-0.7	-2.6	4.7
<u>Tabacco (p=0.62)</u>	-	-	-	-
Nonsmoker	33	4.4	-2.8	11.9
Smokers	8	1.6	-3.5	6.5
<u>TIVEC (p=0.69)</u>	-	-	-	-
Yes	6	7.1	-1.9	12.9
No	35	2.4	-3.3	11.4
<u>Type (p=0.36)</u>	-	-	-	-
Primary	27	1.2	-3.3	11.4
Secondary	12	3.4	-5.6	10.0
Exercise	2	11.2	9.2	13.1
<u>Life-threatening (p=0.19)</u>	-	-	-	-
Yes	10	6.9	-5.1	16.4
No	31	1.2	-2.8	9.3
<u>IOT (p=0.008)</u>	-	-	-	-
Yes	4	-14.3	-20.0	1.0
No	37	4.5	-1.9	11.4
<u>Technical gesture (p=0.68)</u>	-	-	-	-
Yes	11	4.4	-5.	8.7
No	30	3.4	-2.8	12.9

Table 13: Risk factor of heart rate difference between intervention and rest on 41 interventions.
n=number of intervention

	n	Median	p25	p75
<u>COVID related intervention (p=0.57)</u>	-	-	-	-
Yes	8	-13.0	-50.3	11.5
No	33	-9.8	-23.2	5.3
<u>Sex (p=0.98)</u>	-	-	-	-
Men	26	-9.0	-28.6	4.7
Women	15	-11.9	-30.5	8.8
<u>Category of work (p=0.98)</u>	-	-	-	-
Driver	14	-1.5	-11.3	18.5
Nurses	15	-19.9	-30.5	-0.8
Physicians	12	-15.5	-41.0	4.3
<u>Tabacco (p=0.23)</u>	-	-	-	-
Nonsmoker	33	-8.2	-23.2	5.3
Smokers	8	-15.5	-41.6	3.6
<u>TIVEC (p=0.50)</u>	-	-	-	-
Yes	6	-16.1	-54.5	-0.8
No	35	-9.8	-28.6	8.5
<u>Type (p=0.74)</u>	-	-	-	-
Primary	27	-16.4	-30.5	8.8
Secondary	12	-5.4	-21.8	6.9
Exercise	2	-9.1	-17.5	-0.8
<u>Life-threatening (p=0.38)</u>	-	-	-	-
Yes	10	-3.9	-11.9	8.8
No	31	-16.4	-35.9	5.3
<u>IOT (p=0.52)</u>	-	-	-	-
Yes	4	12.4	-35.7	35.7
No	37	-11.9	-28.6	35.7
<u>Technical gesture (p=0.86)</u>	-	-	-	-
Yes	11	-11.9	-20.9	0.0
No	30	-9.0	-35.9	8.5

Table 14: Risk factor of RMSSD difference between intervention and rest on 41 interventions.
n=number of intervention. n=number of intervention

	N intervention	Median	p25	p75
<u>COVID related intervention (p=0.88)</u>	-	-	-	-
Yes	8	2.0	-34.5	16.8
No	33	-10.2	-20.2	4.0
<u>Sex (p=0.90)</u>	-	-	-	-
Men	26	-8.9	-23.1	13.0
Women	15	-8.5	-22.5	14.9
<u>Category of work (p=0.72)</u>	-	-	-	-
Driver	14	-5.3	-14.1	14.9
Nurses	15	-10.2	-20.2	2.9
Physicians	12	-7.0	-33.5	10.5
<u>Tabacco (p=0.86)</u>	-	-	-	-
Nonsmoker	33	-10.2	-20.2	13.0
Smokers	8	-1.9	-32.7	9.4
<u>TIVEC (p=0.69)</u>	-	-	-	-
Yes	6	-10.2	-32.8	-0.3
No	35	-8.5	-22.5	14.9
<u>Type (p=0.56)</u>	-	-	-	-
Primary	27	-7.6	-26.5	4.4
Secondary	12	-10.3	-15.9	20.6
Exercise	2	-10.2	-19.8	-0.6
<u>Life-threatening (p=0.64)</u>	-	-	-	-
Yes	10	-3.4	-14.1	4.0
No	31	-10.2	-31.8	16.6
<u>IOT (p=0.23)</u>	-	-	-	-
Yes	4	24.2	-16.2	31.7
No	37	-10.2	-22.5	4.0
<u>Technical gesture (p=0.56)</u>	-	-	-	-
Yes	11	-0.6	-13.8	4.4
No	30	-10.4	-31.8	16.6

Table 15: Risk factor of SDNN difference between intervention and rest on 41 interventions.
n=number of intervention. n=number of intervention

	N intervention	Median	p25	p75
<u>COVID related intervention (p=0.62)</u>	-	-	-	-
Yes	8	-13.0	-53.3	65.2
No	33	-21.7	-42.2	10.2
<u>Sex (p=0.61)</u>	-	-	-	-
Men	26	-21.8	-43.4	11.8
Women	15	-21.7	-41.3	24.6
<u>Category of work (p=0.33)</u>	-	-	-	-
Driver	14	3.8	-23.4	67.5
Nurses	15	-24.0	-41.3	10.2
Physicians	12	-32.9	-52.5	-5.6
<u>Tabacco (p=0.97)</u>	-	-	-	-
Nonsmoker	33	-21.0	-41.3	10.2
Smokers	8	-32.9	-43.5	35.4
<u>TIVEC (p=0.88)</u>	-	-	-	-
Yes	6	-32.5	-43.4	20.2
No	35	-21.0	-43.1	11.8
<u>Type (p=0.86)</u>	-	-	-	-
Primary	27	-22.7	-53.5	11.8
Secondary	12	-20.3	-23.7	33.4
Exercise	2	-11.0	-42.2	20.2
<u>Life-threatening (p=0.36)</u>	-	-	-	-
Yes	10	-10.1	-22.5	24.6
No	31	-23.4	-43.7	11.8
<u>IOT (p=0.22)</u>	-	-	-	-
Yes	4	40.8	-52.5	110.7
No	37	21.7	-43.1	10.2
<u>Technical gesture (p=0.61)</u>	-	-	-	-
Yes	11	-22.5	-41.3	24.6
No	30	-21.3	-43.7	10.2

Table 16: Risk factor of PNN50 difference between intervention and rest on 41 interventions.
n=number of intervention. n=number of intervention

(Conseil national de l'ordre des médecins) SERMENT D'HIPPOCRATE

Au moment d'être admis(e) à exercer la médecine, je promets et je jure d'être fidèle aux lois de l'honneur et de la probité.

Mon premier souci sera de rétablir, de préserver ou de promouvoir la santé dans tous ses éléments, physiques et mentaux, individuels et sociaux.

Je respecterai toutes les personnes, leur autonomie et leur volonté, sans aucune discrimination selon leur état ou leurs convictions. J'interviendrai pour les protéger si elles sont affaiblies, vulnérables ou menacées dans leur intégrité ou leur dignité. Même sous la contrainte, je ne ferai pas usage de mes connaissances contre les lois de l'humanité.

J'informerai les patients des décisions envisagées, de leurs raisons et de leurs conséquences. Je ne tromperai jamais leur confiance et n'exploiterai pas le pouvoir hérité des circonstances pour forcer les consciences.

Je donnerai mes soins à l'indigent et à quiconque me les demandera. Je ne me laisserai pas influencer par la soif du gain ou la recherche de la gloire.

Admis(e) dans l'intimité des personnes, je tairai les secrets qui me seront confiés. Reçu(e) à l'intérieur des maisons, je respecterai les secrets des foyers et ma conduite ne servira pas à corrompre les mœurs.

Je ferai tout pour soulager les souffrances. Je ne prolongerai pas abusivement les agonies. Je ne provoquerai jamais la mort délibérément.

Je préserverai l'indépendance nécessaire à l'accomplissement de ma mission. Je n'entreprendrai rien qui dépasse mes compétences. Je les entretiendrai et les perfectionnerai pour assurer au mieux les services qui me seront demandés.

J'apporterai mon aide à mes confrères ainsi qu'à leurs familles dans l'adversité.

Que les hommes et mes confrères m'accordent leur estime si je suis fidèle à mes promesses ; que je sois déshonoré(e) et méprisé(e) si j'y manque.

Nom, Prénom Signature

SERMENT D'HIPPOCRATE

En présence des Maîtres de cette FACULTE et de mes chers CONDISCIPLES, je promets et je jure d'être fidèle aux lois de l'Honneur et de la Probité dans l'exercice de la Médecine.

Je donnerai mes soins gratuits à l'indigent et je n'exigerai jamais un salaire au-dessus de mon travail. Admis dans l'intérieur des maisons, mes yeux ne verront pas ce qui s'y passe, ma langue taira les secrets qui me seront confiés et mon état ne servira pas à corrompre les mœurs ni à favoriser le crime.

Respectueux et reconnaissant envers mes MAÎTRES, je rendrai à leurs enfants l'instruction que j'ai reçue de leurs pères.

Que les HOMMES m'accordent leur estime si je suis fidèle à mes promesses. Que je sois couvert d'OPPROBRE et méprisé de mes confrères si j'y manque.

Nom, Prénom Signature

Titre de la thèse :
**Impact de la prise en charge de patient suspects COVID sur le stress des
soignants pré-hospitaliers**

CONTEXTE : Depuis fin 2019 le SARS-CoV-2, responsable de la COVID-19 a provoqué une pandémie conduisant les systèmes de santé à s'adapter à commencer par les structures d'urgence. Le service mobile d'urgence et réanimation (SMUR) est en première ligne depuis le début de la crise. Les soignants de l'urgence sont particulièrement exposés au stress notamment à cause des surcharges des services d'urgence, du travail de nuit, des plannings irréguliers. Le stress chronique au travail est un problème majeur de santé publique. L'ensemble des inconnues provoquées par la COVID-19 renforce le risque de stress aigu pour les soignants de l'urgence.

OBJECTIF : L'objectif principal de cette étude est d'évaluer le stress subjectif (par auto-évaluation) et objectif (par mesure de biomarqueurs cliniques : variabilité sinusale de la fréquence cardiaque) lors de la prise en charge des patients suspect d'une atteinte COVID-19 par rapport à la prise en charge des patients non suspects. Les objectifs secondaires sont d'évaluer les facteurs de risque de stress.

METHODE : Étude descriptive observationnelle, par questionnaire et enregistrement du monitoring cardiaque auprès des équipes du SMUR de Clermont-Ferrand, entre le 9 avril 2021 et le 15 avril 2021.

RESULTATS : Parmi les 30 professionnels interrogés, la médiane de stress subjective pour la prise en charge d'un patient suspect de COVID-19 était supérieure à celle d'un patient non suspect de COVID-19 en début de poste (38.2 vs 17.6, $p < 0.001$) et en fin de poste (42.6 vs 16.2, $p < 0.001$). Cette différence n'a pas été retrouvée lors de l'analyse des données de variabilité sinusale de la fréquence cardiaque. Nous n'avons pas retrouvé de facteur de risque ou de facteur protecteur dans les analyses uni variées.

CONCLUSION : Les soignants de l'urgence ont un stress subjectif plus important lors de la prise en charge de patients suspects d'infection COVID-19.

Mots-clés :

- | | |
|------------|--|
| - COVID-19 | - Biomarqueurs |
| - Stress | - Variabilité sinusale de la fréquence cardiaque |
| - Pandémie | - EVA |

Clermont-Ferrand, le

Pierre CLAVELOU
Doyen – Directeur

Clermont-Ferrand, le 22 septembre 2021

Jeannot SCHMIDT
Le Président du Jury