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Impact of the Covid-19 crisis on the hospital work environment and organization: A mixed-methods study

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ABSTRACT

To date, it is still largely unclear how the changes, as a result of Covid-19, affect the work environment and the perceived organizational and managerial context (OMC). Through a mixed methods design, this study aims, (1) to identify changes in the hospital OMC before and during the first wave of the Covid-19 crisis; (2) to further analyze and compare the impact of the crisis on the perceptions of the staff. For the quantitative phase, questionnaire measuring the OMC was used in Covid and Non-Covid wards. For the qualitative phase, we performed semi-structured interviews to identify positive and negative elements from the crisis management. Results from linear mixed models highlighted multiple tendencies following the Covid crisis. Differences appeared between Covid and Non-Covid units, with the latter showing greater difficulties following the crisis. A significant increase in participants' scores on interprofessional relationships was reported ($P < 0.05$). We found a significant decrease in job satisfaction ($P < 0.001$), absence of burnout ($P = 0.001$) and perceived efficiency of the service ($P < 0.001$). These findings suggest that hospital management strategies should aim at providing transformational leadership and information flow, as well as equal support for all working units, so that healthcare professionals feel motivated and work towards a shared meaning.

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Teamwork; hospital management; leadership; job satisfaction; crisis management



Introduction

Major public health crises, such as epidemics or natural disasters, can have significant impact on social, economic, and political aspects at local, national and even international scales. With regard to work environment, during a public health crisis, such as the SARS pandemic, shortages of hospital staff, mostly because of the contamination risks, were documented [1]. It is challenging to compare the consequences caused by different public health crises in terms of infection rate, mortalities, and socio-economic impact due to highly context-specific factors such as medical knowledge and public health responses [2, 3]. Understanding the abrupt changes and the accompanied organizational and managerial strategies implemented to respond to such a crisis is critical in terms of public health management, notwithstanding.

Announced as a Public Health Emergency of International Concern, the Covid-19 pandemic has caused significant disruptions, even in some of the most advanced healthcare systems [4]. Efficient systems under normal conditions may lose some of its

efficiency in adjusting to the crisis [5]. Increased workload has been observed during the Covid-19 pandemic due to the specific conditions, requiring extensive monitoring and early detection of clinical deterioration with rapid responses in an unprecedented stressful situation; staff are also required to wear uncomfortable personal protective equipment (PPE) and are often given poor training [6]. The crisis also revealed issues in allocating sufficient resources, including qualified and adequate staff, along with the need for hospitals to benefit from strong crisis management competencies, adaptability, rapid decision-making processes, communication and collaboration skills [7,8]. Correspondingly, many organizational and managerial changes were made, such as the implementation of debriefings or the daily updating of procedures [9].

From a change management perspective, the implementation of measures aimed to reduce the pressure on hospitals and mitigate the risk of nosocomial spread while maintaining patient safety and high-quality care disrupts the equilibrium and work routines of healthcare professionals [10]. On top of that,

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measures such as physical distancing, limited social contacts and closing down of schools and childcare were other challenges that healthcare professionals encountered. As a consequence, adherence and adaptation to the changes at the workplace are not always evident. Indeed, psychological distress, anxiety and burnout have been reported [11,12], particularly among healthcare professionals in Covid-19 departments [13].

To date, it is still largely unclear how the changes, as a result of Covid-19 management strategies, affect the work environment and the perceived organizational and managerial context (OMC). Studies have largely focused on the psychological impact of the Covid-19 pandemic such as the well-being and burnout among healthcare professionals [14]. While cross-sectional studies and narratives reflecting on the changing working environment during the Covid-19 pandemic have been conducted, the data were collected at a single time point or the method limits itself to either a quantitative or qualitative approach. Therefore, a legitimate comparison or conclusion on the perceptions of changes on the work environment cannot be fully substantiated. Given the relationship between work environment, more specifically, the hierarchical management and support, and the well-being of healthcare professionals [15], it is justified to investigate the impact of the Covid-19 on hospital OMC. To address the aforementioned methodological limitations, we conduct a longitudinal study with a mixed methods approach in data collection. More specifically, the following research objectives are put forward.

- (1) to identify changes in the OMC in the hospital environment before and during the first wave of the Covid-19 crisis;
- (2) to further analyse and compare the impact of the crisis on the perceptions of the staff working in Covid and Non-Covid dedicated units.

Background

The eye opener report ‘To Err is Human’ gave an important wake-up call to address patient safety issues more seriously [16]. Two decades later, although improvements have been made, there remains a notable chiasm [17,18]. These unsatisfactory results are largely due, not to a lack of methodologies or tools, but to a poor OMC in which they are implemented [15,19–21]. Although there is no consensus on the definition of the OMC, it is generally recognized as a combination of two concepts [22–24]: *organizational culture*, including the norms, values, and basic assumptions of a given organization and *organizational climate*, defined as the shared

perception of the organization’s culture and its impact on individual well-being and functioning [25]. Applied to the hospital sphere, the OMC could be defined as ‘the collective and shared perception of values and beliefs, individual attitudes, and organizational and managerial attributes among healthcare professionals’ [24].

Creating a positive OMC is the foundation of the Magnet Hospital concept. Magnet Hospitals are defined as ‘establishments that meet a set of criteria that assesses human resources and organizational and managerial practices identified to optimise the professional practice of caregivers’ [26]. McClure’s study on Magnet Hospitals focused on institutions having relatively easy recruitment and retention of staff by creating a positive OMC, rather than focusing on institutions in difficulties. This allowed the identification of key features, then modelled into five components regrouping 14 forces of Magnetism [27] (Table 1).

The beneficial impact of a positive OMC has been related not only to staff retention, but also to quality of care, patient safety, hospital performance and well-being at work [28]. With this in mind, the Covid-19 crisis, and by extension any crisis, could directly threaten the OMC [29]. In contrast, the pandemic could also lead to unprecedented positive OMC initiatives. Understanding changes in the hospital OMC due to the Covid-19 crisis is therefore key to build on successes and prevent issues identified. Equally important is the question of how to best take these learnings forward.

Methods

Study design

We adopted a mixed methods approach to allow for a comprehensive understanding of the studied topic. A convergent design was used, which allowed for greater precision as both methods were conducted in parallel to complement data collection and analysis [30].

Table 1. Magnet components and their forces of magnetism.

Magnet component	Forces of magnetism represented
Transformational leadership	Quality of nursing leadership management style
Structural empowerment	Organizational structure Personnel policies and programs Community and the healthcare organization Image of nursing professional development
Exemplary professional practice	Professional models of care Consultation and resources Autonomy nurses as teachers Interdisciplinary relationships
New knowledge, innovation and improvements	Quality improvement
Empirical quality results	Quality of care

Integration was performed through data transformation model. This means that qualitative data were coded to be transformed into variable data, which could then be analysed using descriptive or inferential statistics. Discourses and verbatims were used to enrich the discussion and provide insightful examples.

Study settings

Data were collected from two Belgian hospitals: one was a tertiary care hospital located in a suburb, and the other was a secondary care hospital in a more urban zone. The study was conducted concurrently in two phases with nurses, residents and physicians from oncology, pulmonary, the recovery room, the intensive care unit (ICU) and emergency department (ED) of the two hospitals. The hospital units were categorized into Covid (including ED, ICU and Pneumology) and Non-Covid (Oncology and Recovery Room) for the purpose of hypothesis testing.

Quantitative phase

Population

Nurses, residents and physicians working for at least one month before the onset of the Covid-19 crisis in Belgium were included. Caregivers not originally attached to the unit but fulfilling the above-mentioned condition and working at least one day per week in the care unit were also included. Managers as well as all staff on long-term leave or absent during the data collection period were excluded from this phase. Participation was on a voluntary basis.

Data collection and tool

Questionnaires for measuring the OMC (COMET) were distributed and collected in the care units between September 1 and 20, 2020, with the help of the head nurses. We used a validated, French-language version of the 'COMET' questionnaire [31]. This 83-item questionnaire explored healthcare professionals' perceptions about the operational aspects of their units through 6 dimensions and 21 sub-dimensions, with one section for socio-demographic data (age, professional experience, and full-time equivalent). Participants were asked to answer the 83 items using a Likert-scale from 1 'strongly disagree' to 5 'strongly agree'. The dimensions, sub-dimensions and items are presented in Table 2. This tool was used to measure the OMC before the Covid-19 crisis (before March 2020, T0) and during the Covid-19 crisis (in March and April 2020, T1).

The unit head nurses and department head physicians were met beforehand to explain the data collection process, promote the study to the teams and help with the distribution and collection of the questionnaires.

Table 2. Descriptive statistics of the socio-demographics and employment for the quantitative phase (COMET questionnaire).

Categories	Number (%)
Gender	
Male	30 (30.61)
Female	67 (68.37)
Missing	1 (1.02)
Function	
Physician	10 (10.2)
Resident	7 (7.14)
Nurse	81 (82.65)
Service	
<i>University Hospital</i>	
Emergency department	33 (33.67)
ICU	9 (9.18)
Recovery room	6 (6.12)
Oncology department	5 (5.1)
Pneumology department	9 (9.18)
<i>Regional hospital</i>	
ICU	7 (7.14)
Recovery	8 (8.16)
Oncology department	12 (12.24)
Pneumology department	9 (9.18)
Unit	
Covid	67 (68.37)
Non-Covid	31 (31.63)
Work length (in %)	100 [80; 100]
Length at hospital (in months)	118.5 [45.75; 213]
Length at unit (in months)	92.5 [38.25; 189]

Data analysis

For the quantitative phase, descriptive statistics were conducted to examine the rates and percentages of qualitative variables. Quantitative variables were described either by means \pm standard deviations if the data were normally distributed, whereas median and interquartile ranges were reported if this assumption of normal distribution was violated. Cronbach's alpha was calculated to examine the internal consistencies of the items within one sub-dimension, with values from 0.6 indicating an acceptable level of reliability. Linear mixed models were applied to assess the significant effects of time and unit (Covid vs. Non-Covid) and of the interaction between time and unit on the perceptions regarding the 21 dimensions of the COMET. Assumptions of homogeneity of variance and normality of residuals by means of Levene's and Shapiro-Wilk tests, respectively, were examined before applying the linear mixed models. If these assumptions were not satisfied, robust standard errors or Huber-White estimations were employed to account for heteroscedasticity. Confounding variables including gender, work length, length at hospital and length at unit were examined by independent sample t-tests and Pearson's correlations at baseline measurement. If a significant association was found, the variables were added as covariates into the linear mixed models. Partial eta squared (η_p^2) was calculated as a measure of effect size for the main effects of time and unit. According to Cohen's classification, effect sizes were considered to be small (0.01), medium (0.06) and large (0.14). Results were considered to be significant at $P < 0.05$. For the categorical sub-

dimensions including professional aspirations (patient concern, good management of the service, relationships with colleagues, effective care, protection the professional status), conflict management mode (denial of this issue, consensus building, authoritarian regime, collective agreement strategy, pursuit of personal benefit) and type of behaviors encouraged in the unit (normative (standard compliance), creative (taking initiatives), productive (efficiency), collaborative (teamwork)), a summary of frequencies and percentages of positive answers (merging ratings 4 and 5) were provided. Chi-square or Fisher's exact tests were performed to discern the association between the ratings and the units, whereas a McNemar test was employed to examine the trend of ratings between two time points.

The analyses were conducted in the R Statistical Software [32].

Qualitative phase

Population

Nurses, residents, physicians and unit managers (nursing and medical staff) working in the Covid and Non-Covid units of interest were included. No restrictions were set about professional experience for this phase.

Data collection and tool

Semi-structured interviews were conducted between September 1 and 20, 2020 by a single researcher. The length of the interviews was approximately 15 minutes. The interviews were based on the Clinical Debriefing method [33], which led to an analysis of what was positive ('Plus') and what could be improved ('Delta').

Data analysis

Two researchers (MP and ZK) started the analysis by reading the transcripts several times to become familiar with the data and to collectively agree on how to sort the transcripts into items (statements from interviews). After reaching a reasonable collective understanding of the sorting process on a subset of the data, the researchers worked independently to classify each item as 'plus' or 'delta' and placed the items into the COMET dimensions. The individual analyses were then compared and discussed by the research team until a consensus was reached for every item. For that purpose, the two researchers exposed for each item and its classification. If a classification was not the same between the two researchers, they reanalysed the item and collectively reached 100% agreement with a third researcher (AG).

Ethics

Anonymity was ensured in both phases of the study, and all personal data were anonymized. Participation in the questionnaire and/or interviews was on a voluntary basis. In both cases, a summary of the purpose of the study was provided (written for the questionnaires and in written and oral form for the interviews), and a consent form was requested. This study was validated by the Ethics Committee of CHU Liège, reference number 2020/252.

Results

Quantitative phase

Study population characteristics

A total of 98 nurses and physicians participated in the study. Table 2 details the socio-demographics and professional information collected among the population.

COMET analysis

Data relating to the OMC before the Covid-19 crisis (T0) revealed a mean percentage of positive answers equal to 55.10/100.0. Most of the scores were above the mid-point of 3, except that for 'Absence of work overload', which scored a median = 2.5 [2.00; 3.00]). The highest score was found for the sub-dimensions 'Weak discriminative practices' (median = 4.5 [4.00; 5.00]) and 'Professional aspirations' (median = 4.20 [4.00; 4.60]).

After 8 months into the pandemic (T1), the mean percentage of positive scores was 53.54. Regarding the reliability measures as presented in Tables 3 and 5, most sub-dimensions reached a Cronbach's alpha higher than 0.6, except the intention to stay (two items) and the relationships between paramedics (three items).

Comparison T0-T1

Data revealed a decreasing trend for most dimensions, except that of 'Hierarchical support', which showed a slight increase (Table 3).

An examination of the confounders revealed that only work length was significantly correlated with 'Task and objective assignment' ($r = 0.330$, $P < 0.01$), 'Relationships with and between physicians' ($r = 0.260$, $P < 0.05$) and 'Information dissemination' ($r = 0.224$, $P < 0.05$). Therefore, the variable was included in the linear mixed model as a covariate. Only for the dimension 'Absence of burnout', the assumptions for linear mixed models were satisfied. Thus, robust standard error estimations were applied for the remaining COMET dimensions.

The result showed a significant decrease in the perception of the results of 'Unit performance' at T1. More particularly, the participants indicated

Table 3. Descriptive statistics (median and interquartile range) of the sub-dimensions of the COMET over two time points.

Dimensions	Time 0		Time 1		Both group		N	Cronbach's alpha
	Non-Covid	Covid	Non-Covid	Covid	Time 0	Time 1		
<i>Professional involvement</i>								
Unit engagement	4.00 [3.50; 4.40]	3.60 [3.40; 4.20]	4.00 [3.60; 4.45]	3.60 [3.40; 4.00]	3.80 [3.40; 4.20]	3.70 [3.40; 4.40]	96	0.680
Standards reception	3.00 [2.00; 3.50]	3.00 [2.50; 4.00]	3.00 [2.00; 3.50]	3.00 [2.50; 3.50]	3.00 [2.50; 3.50]	3.00 [2.50; 3.50]	96	0.637
<i>Perceived results of unit performance</i>								
Job satisfaction	3.67 [3.25; 4.00]	3.00 [2.75; 3.50]	3.50 [2.50; 4.00]	3.00 [2.25; 3.50]	3.25 [2.75; 3.75]	3.00 [2.50; 3.50]	98	0.696
Intention to stay	4.50 [4.00; 5.00]	4.00 [3.00; 4.50]	4.50 [4.0; 5.00]	3.50 [3.00; 4.50]	4.00 [3.38; 4.50]	4.00 [3.00; 4.50]	98	0.238
Absence of work overload	2.50 [2.00; 3.50]	2.00 [2.00; 3.00]	2.50 [1.50; 3.50]	2.00 [2.00; 3.00]	2.50 [2.00; 3.00]	2.00 [1.50; 3.00]	98	0.616
Absence of burnout	3.20 [2.60; 4.00]	3.40 [3.00; 3.80]	2.60 [2.20; 3.20]	3.20 [2.60; 3.60]	3.40 [2.80; 4.00]	3.00 [2.40; 3.40]	98	0.695
Perceived effectiveness of the unit	3.50 [3.25; 4.00]	3.25 [2.75; 3.50]	3.25 [2.50; 3.75]	3.00 [2.50; 3.25]	3.25 [2.94; 3.75]	3.00 [2.50; 3.38]	98	0.670
<i>Unit management</i>								
Consideration of the individual in the collective	3.50 [2.75; 4.00]	3.00 [2.25; 3.50]	3.25 [2.25; 4.00]	3.00 [2.25; 3.50]	3.00 [2.50; 3.75]	3.00 [2.25; 3.75]	96	0.830
Weak discriminatory practices	5.00 [4.00; 5.00]	4.00 [4.00; 5.00]	5.00 [4.00; 5.00]	4.00 [4.00; 5.00]	4.50 [4.00; 5.00]	4.50 [4.00; 5.00]	96	0.858
Task and objective assignment	3.67 [2.67; 4.00]	3.67 [3.00; 4.00]	3.33 [2.67; 4.00]	3.33 [3.00; 4.00]	3.67 [3.00; 4.00]	3.33 [2.75; 4.00]	96	0.706
Organizational learning	3.50 [2.75; 3.81]	3.25 [3.00; 3.75]	3.38 [2.75; 3.75]	3.50 [3.00; 4.00]	3.50 [3.00; 3.75]	3.50 [2.89; 4.00]	97	0.699
Low conflict incidence	3.38 [3.00; 4.00]	3.25 [2.75; 3.75]	3.38 [3.00; 4.00]	3.25 [2.75; 3.75]	3.25 [2.75; 3.75]	3.25 [2.75; 3.75]	97	0.724
<i>Relationship and communication</i>								
Relationships between paramedics	4.00 [3.67; 4.00]	4.00 [3.67; 4.00]	4.00 [3.59; 4.33]	4.00 [3.67; 4.33]	4.00 [3.67; 4.00]	4.00 [3.67; 4.33]	96	0.553
Relationships with and between physicians	3.50 [3.17; 3.87]	3.33 [3.00; 3.67]	3.67 [3.17; 4.05]	3.50 [3.00; 4.00]	3.50 [3.00; 3.83]	3.50 [3.00; 4.00]	97	0.779
Unit coordination	3.25 [2.50; 4.00]	3.00 [2.50; 3.50]	3.00 [2.50; 4.00]	3.00 [2.50; 4.00]	3.00 [2.50; 4.00]	3.00 [2.5; 4.00]	97	0.621
Information dissemination	3.42 [2.67; 4.00]	3.33 [2.67; 3.67]	3.42 [2.67; 4.00]	3.33 [2.67; 4.00]	3.33 [2.67; 4.00]	3.33 [2.67; 4.00]	97	0.804
Relationship with the patient and family	3.80 [3.15; 4.20]	3.40 [3.00; 3.80]	3.70 [3.00; 4.20]	3.60 [3.20; 3.80]	3.60 [3.00; 4.00]	3.60 [3.20; 3.80]	97	0.709
Hierarchical support	3.67 [3.11; 4.00]	3.67 [3.44; 4.00]	3.73 [3.11; 4.06]	3.78 [3.55; 4.03]	3.67 [3.44; 4.00]	3.78 [3.44; 4.00]	96	0.895

significantly lower scores for 'Job satisfaction' ($\beta = -0.270$, $P < 0.001$, $\eta_p^2 = 0.092$), 'Absence of burnout' ($\beta = -0.361$, $P = 0.001$, $\eta_p^2 = 0.056$) and 'Perceived effectiveness of the unit' ($\beta = -0.273$, $P < 0.001$, $\eta_p^2 = 0.175$).

Regarding the perception of 'Unit management', the participants displayed a significantly lower score in terms of 'Task and objective assignment' at T1 ($\beta = -0.114$, $P = 0.006$, $\eta_p^2 = 0.045$).

Interestingly, in the dimension 'Relationship and communication', participants scored significantly higher at T1 with respect to 'Relationships between paramedics' ($\beta = 0.091$, $P = 0.010$, $\eta_p^2 = 0.035$) and 'Relationships with and between physicians' ($\beta = 0.062$, $P = 0.042$, $\eta_p^2 = 0.025$).

Comparison between Covid vs non-Covid units

When the unit was taken into account, participants from the Covid units scored significantly lower than their colleagues from the Non-Covid units in terms of 'Unit engagement' ($\beta = -0.253$, $P = 0.040$, $\eta_p^2 = 0.043$), 'Job satisfaction' ($\beta = -0.420$, $P = 0.004$, $\eta_p^2 = 0.043$), 'Intention to stay' ($\beta = -0.530$, $P = 0.001$, $\eta_p^2 = 0.056$), and 'Perceived effectiveness of the unit' ($\beta = -0.323$, $P = 0.015$, $\eta_p^2 = 0.030$).

With respect to 'Absence of burnout', participants from the Covid-unit scored significantly higher than those from the Non-Covid unit ($\beta = 0.305$, $P = 0.009$, $\eta_p^2 = 0.035$).

There was only an interaction effect between time and unit, such that colleagues in the Non-Covid units scored significantly lower in the sub-dimension 'Absence of burn-out' at T1 than their peers in the Covid-unit ($P = 0.007$). The result can be found in Table 4.

Chi-square and Fisher' tests revealed only a significant difference in the sub-dimension 'Productivity' between the Non-Covid and Covid units. Accordingly, the latter had significantly more positive ratings on productivity at T1 ($P < 0.05$). The numbers and percentages of positive ratings of the categorical sub-dimensions of the COMET over two time points are presented in Table 5.

Qualitative phase

Study population characteristics

The qualitative phase involved 102 participants, two-thirds of whom were females ($n = 70$, 69%) and one

Table 5. Numbers and percentage of positive ratings of the three categorical sub-dimensions of the COMEt over two time points.

Dimensions	Time 0			Time 1			Both group			Cronbach's alpha	
	Non-Covid	Covid	P-value	Non-Covid	Covid	P-value	Time 0	Time 1	P-value		N
<i>Professional aspirations</i>											0.605
Patient concern	28 (96.6)	65 (97.0)	1.000	27 (93.1)	64 (95.5)	0.636	93 (96.9)	91 (94.8)	0.625	96	
<i>Conflict management mode</i>											0.711
Absence of problem denial	14 (48.3)	28 (41.8)	0.609	13 (44.8)	35 (52.2)	0.290	42 (43.8)	48 (50.0)	0.162	96	
<i>Type of behaviors encouraged in the unit</i>											0.741
Productivity	24 (80.0)	59 (89.4)	0.055	22 (73.3)	60 (90.9)	0.017	83 (86.5)	82 (85.4)	0.572	96	
Collaboration	26 (86.7)	57 (86.4)	0.896	25 (83.3)	69 (90.9)	0.387	83 (86.5)	85 (88.5)	0.990	96	

Note. The numbers and percentages in parentheses represent the positive ratings (merging ratings of 4 and 5) of each sub-dimension.

third males ($n = 32$, 31%). Seventy-four participants (72%) were nurses, followed by 18 (18%) physicians and 10 (10%) residents. Two-thirds of the participants ($n = 66$, 65%) worked in Covid units and one-third ($n = 36$, 35%) in Non-Covid units.

We collected 599 verbatims during the study. Of these, 389 (65%) emerged from caregivers working in Covid units and 210 (35%) from caregivers working in Non-Covid units. Second, 407 (68%) verbatims were obtained from nurses' statements, of which 252 were from Covid units and 155 from non-Covid units. Also, 137 (23%) verbatims resulted from physicians, including 92 from Covid units and 45 from Non-Covid units. Lastly, 55 (9%) verbatims were derived from residents' discourse, of which 45 were from Covid units and 10 from non-Covid units.

Thematic analysis

A total of 317 (55.92%) verbatims were rated as 'Plus' as they were perceived as positive, and 282 verbatims (47.07%) were rated as 'Delta' since they were perceived negatively. Table 6 shows the distribution of pluses and deltas between the COMEt dimensions.

Statistical analysis with post-hoc chi-square tests indicated more pluses in the dimensions 'Relationships and communication' ($P < 0.001$) and 'Professional involvement' ($P < 0.001$). More deltas were found in the dimension 'Perceived results of unit performance' ($P < 0.001$), 'Hierarchical support' ($P < 0.01$) and 'Relationship with the patient and family' ($P < 0.001$).

Discussion

We examined the OMC of hospital staff working in Covid and Non-Covid units before and during the first wave of the Covid-19 pandemic in Belgium. The results highlighted significant differences in the perceptions of the hospital staff regarding unit performance, unit management and relationships following the Covid-19 crisis. Additionally, staff working in Covid and Non-Covid units reported different perceptions related to their unit performance and professional involvement.

Overall, a significant increase in participants' scores on interpersonal relationships was reported. Interviewees also reported more positive statements

Table 4. Effects of time and working unit across different dimensions of the COMEt – results from mixed model analysis adjusted for work time.

Dependent variables	Time (1 vs. 0)			Unit (Covid vs. non-Covid)		
	Coefficient (SE)	P-value	η_p^2	Coefficient (SE)	P-value	η_p^2
<i>Professional involvement</i>						
Unit engagement	-0.027 (0.027)	0.334	0.005	-0.253 (0.122)	0.040	0.022
Standards reception	-0.042 (0.037)	0.266	0.007	0.199 (0.185)	0.284	0.006
<i>Perceived results of unit performance</i>						
Job satisfaction	-0.270 (0.061)	<0.001	0.092	-0.420 (0.143)	0.004	0.043
Intention to stay	-0.056 (0.029)	0.052	0.019	-0.530 (0.156)	0.001	0.056
Absence of work overload	-0.051 (0.051)	0.316	0.005	-0.161 (0.211)	0.445	0.003
Absence of burnout	-0.361 (0.107)	0.001	0.056	0.305 (0.115)	0.009	0.035
Perceived effectiveness of the unit	-0.273 (0.043)	<0.001	0.175	-0.323 (0.132)	0.015	0.030
<i>Unit management</i>						
Consideration of the individual in the collective	-0.070 (0.055)	0.206	0.008	-0.340 (0.184)	0.066	0.018
Weak discriminatory practices	-0.016 (0.024)	0.513	0.002	-0.099 (0.158)	0.531	0.002
Task and objective assignment ^a	-0.114 (0.041)	0.006	0.045	0.237 (0.166)	0.157	0.012
Organizational learning	0.072 (0.045)	0.108	0.014	0.088 (0.148)	0.554	0.002
Low conflict incidence	0.004 (0.035)	0.904	0.000	-0.132 (0.158)	0.406	0.004
<i>Relationship and communication</i>						
Relationships between paramedics	0.091 (0.035)	0.010	0.035	-0.006 (0.120)	0.963	0.000
Relationships with and between physicians ^a	0.062 (0.030)	0.042	0.025	-0.198 (0.145)	0.175	0.011
Unit coordination	0.098 (0.069)	0.160	0.010	-0.013 (0.188)	0.945	0.000
Information dissemination	-0.012 (0.062)	0.848	0.000	-0.079 (0.181)	0.663	0.001
Relationship with the patient and family	-0.014 (0.048)	0.771	0.000	-0.254 (0.138)	0.067	0.017
Hierarchical support	0.035 (0.023)	0.125	0.012	0.114 (0.173)	0.509	0.002

^aAdjusted for work time.

Table 6. Number of pluses and deltas across the different COMEt dimensions.

COMEt Dimensions	Plus, n (%)	Delta, n (%)
Perceived results of unit performance	107 (33.75)	131 (46.45)***
Relationship and communication	70 (22.08)***	16 (5.67)
Hierarchical support	56 (17.67)	73 (25.89)**
Unit management	43 (13.56)	39 (13.83)
Professional involvement	38 (11.99)***	7 (2.48)
Relationship with the patient and family	3 (0.95)	16 (5.67)***
Total	317 (100)	282 (100)

*** $P < 0.001$, ** $P < 0.05$.

regarding this point. These results are similar to those from the study of Gonzalez-Gil et al. [34], which also reported an improvement in relationships among health care professionals during the Covid-19 crisis. To date, however, there have been no studies examining specific aspects of these relationships between nurses, doctors or between nurses and doctors after the Covid 19 crisis. The study conducted by Da Costa Belarmino et al. [35], which addressed the issue of collaborative practice among health care teams during a pandemic, concluded that focusing on communication and teamwork could improve team performance and quality of care. Collaborative practice, therefore, seems to be particularly important in emergencies. These results can be explained by the hypothesis that teams spontaneously adopted collaborative practices under the pressure of the Covid crisis. Another hypothesis could be that these greater teamwork and initiatives providing greater interdisciplinary shared time (e.g. team debriefings, unit support groups, strategic meetings, etc.) may have lessened existing tribalism. Healthcare tribalism can be defined as 'loyalty to a tribe or other social group, especially when combined with strong negative feelings for people outside the group' [36]. Previous research has shown that breaking down silos and opting for an interprofessional approach leads to better outcomes for the organization, medical staff and patients [37]. Indeed, healthcare institutions require effective interprofessional teams sharing a common goal, providing high-quality and evidence-based care while managing complex organizational and cultural processes [38]. Yet, it must be admitted that tribalism remains the core rule within healthcare teams [39]. This tribalism is not only found when providing care and managing teams but also in healthcare politics and hospital governance [38]. However, during the pandemic, professional boundaries seemed to be spontaneously reconfigured to promote interprofessional working [40]. Further research should explore the specific contextual processes that occurred during the pandemic as they seemed to positively influence the nature of interprofessional working.

When it comes to leadership, we observed no significant differences in the perception of hierarchical

support before and during the Covid-19 pandemic. However, these results should be balanced by the analysis of the interviews. Integrating the data from the interviews showed that nurses and doctors felt that local management had improved over time. Better communication between local managers and teams was also reported. In contrast, interviewees felt a stronger gap between teams and top management. Teams spoke of a lack of recognition and communication from top management, despite support from local management. This pattern seemed to be more pronounced within the nursing department. Previous studies [34] also highlighted that nurses felt that the top or middle management had not inquired into their needs or opinions. According to Travers et al., the information provided by the top management had a direct impact on importance nurses attached to their work effort and also influenced their sense of competence [41]. In times of uncertainty, such as during the Covid-19 pandemic, the top management, which plays a key role in supporting medical staff, is expected to respond to the sudden imbalance in the work environment and meet the ever-changing and increasing demands of the healthcare system. Such support has been recognized as one of the forces of the Magnet model [42,43]. Perceptions of a lack of support, confidence and shared meaning might have contributed to the decreased job satisfaction, intention to stay and perceived efficiency among staff in the Covid unit. An interesting avenue would be to investigate this managerial fracture and understand the mechanisms underlying this phenomenon.

We found a significant decrease in the perception of unit performance, more particularly a decrease in job satisfaction, an absence of burnout and a perceived efficiency of the service during the Covid-19 pandemic as compared to the pre-pandemic period. The findings were as expected, given the increased demands from the healthcare system, the low controllability, the newly introduced work procedures and/or the structural changes that characterized the work environment during times of crisis [44,45]. When it came to Covid and Non-Covid unit comparison, our findings suggested that burnout was significantly lower in Covid units. Whilst burnout among healthcare professionals was mediated by factors such as age, gender (female), job position [46,47] and individual resilience [48], several authors [41,49–52] have also observed that stress and burnout were greater among caregivers in Non-Covid units. These authors hypothesize that in Non-Covid units, the protocols, which were often less clear, caused greater fear of being exposed to Covid, whereas Covid units had better organization and protocols, which would lead to a better impression of control and thus reduce stress. Wu et al. stated that it was possible that caregivers

working ‘on the front lines’ (i.e. in contact with Covid-positive patients) felt closer to the key decision makers, had access to accurate and timely information and experienced greater recognition and job satisfaction [49]. These results reflect the reported data, with nurses in Non-Covid units indicating that they lacked information. Some found it a pity that there were no post-shift debriefings, like those organized in the Covid units, and that they did not have the opportunity to give feedback, especially from a nursing perspective. Previous research has shown that unit reorganization and initiatives allowing a quick adaptation during the pandemic, such as post-shift debriefings, the creation of an interdisciplinary task group, among others, lead to a better perceived performance of the unit by the teams and the leaders [47,53]. Hence, further research should explore the implementation of this type of strategy in a non-crisis context.

Surprisingly, the perception of job satisfaction, the propensity to stay or the perceived performance of the service were significantly lower in the Covid unit. Caregivers had stayed and returned despite the fear of being contaminated and of contaminating their families. Nothing in the participants’ statements offered an explanation for this apparent paradox and for this difference between the Covid and Non-Covid units both before and during the pandemic. It is plausible that the demanding work environment of the staff in the Covid unit, including Emergency, ICU and Pneumology, was already a fixed factor associated with the lower scores observed, which was further exacerbated under the pandemic situation. In both types of units, caregivers stated that they supported each other and had the same goal, namely to continue to care for the patients. One hypothesis might be that healthcare teams regained work meaningfulness with the Covid situation. Before the pandemic, a certain lassitude was felt among healthcare professionals regarding their work conditions. In their work, Allande-Cussó et al. assessed the commitment among nurses in all types of services [54] and noted that engagement had increased at the beginning of the Covid crisis. Liu et al., meanwhile, compared Covid and Non-Covid units by implementing a management intervention on work meaningfulness [55]. These authors noted that the Covid-unit caregivers had increased their level of engagement more than those working in the Non-Covid unit. This study is also valuable in showing that it seems to be possible to mitigate the impact of the Covid pandemic on caregivers by implementing interventions that can ameliorate the meaningfulness of their work. This consolidates our previous findings on the significance of a comprehensive participating pluridisciplinary strategy that underlines a shared vision

within the teams and alignment with individual motivations and professional aspirations.

Limitations

This study presents certain biases and limitations. A first bias is the use of a single questionnaire to assess caregivers’ perceptions before and during the Covid-19 crisis. The retrospective effort required from the participants inevitably caused a loss of information. To limit this bias, statistical adjustments were applied. This study also contains a selection bias as the participation of caregivers was voluntary. As for the limitations, the collaboration of the head nurses for collecting the questionnaires led to reluctance from the caregivers. Different solutions were proposed to overcome this: questionnaires were given in envelopes, responses were sent by e-mail to the researcher, or the questionnaire was given to the researcher in person during his visit to the care units. Qualitative data analysis creates a limit to interpretation; however, this limit was reduced by two independent researchers analysing the data. Because the culture and climate differ among hospitals, two different types of hospitals (regional and university) were included in the study to limit the institutional effect. Finally, from a quantitative point of view, the sample size is not large and the findings therefore cannot be generalized. However, thanks to the use of a mixed-methods approach, the triangulation of the data reduced the effects of bias and limitations.

Implications for research and practices

Perceived changes in the hospital OMC as a result of enforced changes in the organization and management strategies in different departments of the hospital were captured by both quantitative and qualitative data in the present longitudinal study. In this respect, the study not only corroborated previous findings on the impact of the Covid-19 pandemic but also suggested significant new insights into those aspects deemed vulnerable to change or rather stable.

As shown, the Covid-19 pandemic had a negative impact in only three dimensions related to the unit performance and one dimension of unit management. The non-significant interaction effect between time and departments (Covid and non-Covid) meant that the effects were perceived among all healthcare professionals. On the contrary, aspects related to individual professional involvement and organizational culture like unit engagement, consideration of the individual in the collective, organizational learning, unit coordination and information dissemination remained unchanged. The findings, therefore, allowed us to understand the extent to which the Covid-19 pandemic had an impact to the hospital OMC. Put it

differently, if it was difficult and took a longer time to motivate professionals and cultivate a learning and collaborative workplace culture, once established, these positive aspects would remain unchanged in the long run, even during times of crisis. The findings prompt helpful insights for further research aimed to scrutinize the perseverance of an organizational system when a new and/or forced change is to be introduced. Practically, the results could help healthcare managers and policy makers to address the most vulnerable aspects related to the effectiveness of the hospital working units and departments while capitalizing on the existing empowering factors such as individual motivation and collaborative culture.

Employing a comprehensive questionnaire covering different OMC aspects, ours were among the few studies that brought into light the positive changes. The findings revealed significant improvement in the relationships between the paramedics and the relationships with and between physicians and lowered perception of burn-out among the professionals in the Covid-19 units. These positive perceptions could be plausibly attributed to the effective strategies put in place from the hierarchical and local management. As indicated by our qualitative data, prominent changes, and support in terms of communication, training, and appreciation were more observed in the Covid-19 units. While these findings suggested helpful recommendations for future management of such a crisis, they encouraged a thorough consideration and support for all healthcare professionals, irrespective of their working units. In this way, a major public health crisis like the Covid-19 pandemic can be viewed as a lever to realize major organizational change initiatives. This experience should encourage improved communication within hospitals and units by promoting team spirit. The interdisciplinary approach should also be given more consideration, mainly in terms of training or strategies to improve the work environment and to speak as teams rather than functions.

Conclusions

Using a mixed methods approach, our longitudinal study elaborated the changes in the hospital OMC before and during the first wave of the Covid-19 crisis. The findings indicated that hospital staff experienced a significantly lower scoring of job satisfaction, absence of burnout, unit performance, and task and objective assignment during the pandemic as compared to the pre-pandemic period. Whereas the results confirmed previous findings, the longitudinal design helped to identify unchanged or improved aspects of the hospital OMC even in times of crisis. These included professional involvement, concern for the patient and reinforced interprofessional relationships, which

suggested that key organizational culture and individual motivations were less likely to be affected. These findings, therefore, put forward that hospital management strategies should aim at providing transformational leadership, transparent work procedures and information flow, as well as equal support for all working units, so that each and every healthcare professional feels motivated and works towards a shared meaning, i.e. enhanced patient safety and effective unit performance.

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