*Human Error, Reliability, Resilience, and Performance,* Vol. 33, 2022, 52–59
https://doi.org/10.54941/ahfe1001567

# Health Crisis Management and Resilience Factors: A Comparative Study in Two Sectors

**Cecilia De la Garza[1] and Nora Oufi[2]**

[1]EDF Lab Paris-Saclay, PERICLES – FOH 7, Bd. Gaspard Monge, 91120 Palaiseau, France
[2]Conservatoire National des Arts et Métiers, 41, rue Gay Lussac, 75005 Paris, France

## ABSTRACT

This paper presents an empirical study of the human factors influencing management of the first COVID-19 wave in hospitals and in the nuclear sector. The objective is to analyse and compare health crisis management in these two sectors and to characterize the organizational resilience successes and challenges. Similarities have been identified between these sectors in terms of their ability to collectively mobilize and carry out organizational reconfigurations when facing unexpected situations. However, there are also particularities related to their specific socio-technical features, such as the extraordinary allocation of resources in the case of hospitals, or the complete halt to contractor operations in the nuclear sector at the start of the crisis. Similar difficulties have been identified. These aspects are discussed to illustrate the factors underlying the capacity of these two sectors to adapt and recommendations are made to help improve human reliability in crisis organisations.

**Keywords:** Crisis management, Organizational resilience, Human reliability, Design

## INTRODUCTION

### Context

The COVID-19 pandemic hit Europe in the winter of 2020. This new, unknown virus and the difficulties encountered in controlling its spread led to strong measures such as the national lockdown in March 2020 and the implementation of social distancing measures to stop it from being passed on and overwhelming health systems. On the hospital side, an emergency plan (the White Plan) sets out how hospitals should be reconfigured in the event of a health crisis. On the nuclear side, there is a business continuity plan as well as a pandemic emergency plan (support and mobilization plan).But, both the hospital and the nuclear industry (EDF) have had to organize and adapt to continue their activities from the beginning of the crisis in March 2020. Electricité de France (EDF) had anticipated the lockdown, and most staff were equipped to enable them to work from home. However, at nuclear power plants, as in hospitals, it is necessary to ensure the continuity of on-site operations, i.e. the generation of electricity for the country. Operating and maintenance teams were required to attend and provide a service with reduced staff.La Pitié Salpêtrière Hospital, a referral hospital for infectious

 

diseases, recorded the first COVID-19 death. The crisis unit was activated at that time.

## Objective

The objective of this study is to analyse the modalities of health crisis management in two different sectors during the COVID-19 crisis: hospitals and the nuclear industry. The study aims:

- To characterize the specific features of the health crisis;
- To identify the organizational resilience factors and challenges in both sectors;
- To identify areas of similarity between the crisis management approaches used in the two sectors and any particularities related to their specific socio-technical features.
- To make recommendations to enhance the robustness of crisis organizations.

## Organizational Resilience

High-risk organizations face a recurring dilemma: choosing between the technical anticipation of feared situations likely to devolve into crises and optimized management of these crises by staff, whose skills and understanding of the situation will enable them to adapt their strategies and actions to the situation in real time. This paradox was pointed out by Karl Weick (Weick, 1995), who suggested that organizations should not to try to resolve it, but instead accept it. Doing so increases the organization's effectiveness and strikes a balance between rigidity and flexibility, confidence and caution. In agreement with Weick (op.cit.), our approach is based on three fundamental points regarding the reliability and robustness of a Socio-Technical System (STS) that we consider to be the keys to understanding its organizational resilience (Le Bot and Pesme, 2010; De la Garza & al., 2018; Le Bot & al., 2018):

- Recognition of the necessary co-existence of two seemingly opposed rationalities, anticipation of the "technical rationality" and the adaptability of the "flexible rationality" of the human community interacting with its working environment.
- The modelling of working groups, i.e. those who demonstrate the resilience, rather than of an individual (or even a number of individuals), or of the emergency response organization of a STS.
- The dynamic operation of an operational STS where resilience is used to deal with the situation, through a succession of rupture phases, where the system chooses the rules or adapts the operating procedures, and stabilization phases.

## The Specific Case of the Health Crisis

Health crises have a special status because they affect fundamental human values (Dab, 2017). The COVID-19 crisis is particularly notable for its long-term impact, which gives it an "unprecedented" status. The pandemic has so far involved five waves and several twists and turns. With this in mind, we

**Table 1.** Methods used for the HOF's factors study of pandemic management.

| Method | Hospital | NPP |
|---|---|---|
| Anonymous interviews lasting 1–1.5 hours, recorded, transcribed, and analysed thematically | 37 | 31 |
| Daily meetings of the crisis unit listened into by telephone with the participants' consent | 35 | - |
| Analysis of health crisis management documents and business continuity plans | X | X |

concur with Shrivastava (1993) who describes a crisis as referring to "disruptive situations characterized by urgency of decision, large impacts and system restructuring." This restructuring may or may not have been planned, for example as part of the hospital and nuclear sector emergency plans, and also includes other restructuring that will be necessary to meet the demands of situations. In the hospital context, it may also be necessary to approach the crisis as a constructed social process, thereby taking into consideration that a given event is only the trigger for a process already underway within the "normal state" organization (Lagadec and Guilhou 2002). In the nuclear context, the health crisis clearly means transitioning from an "ordinary" situation to an "extraordinary" situation, but the duration will not be the same.

## METHODOLOGY

Data were collected between April and June 2020 at the hospital, and between October and December and then August and September in the nuclear power plant (NPP) sector. Qualitative methods developed in the fields of cognitive psychology, ergonomics, and sociology were used. Table 1 summarizes the methods employed in each of the sectors studied.

## RESULTS

Results of the study will be presented in tables and, in some cases, illustrated using verbatim excerpts from the interviews. The factors common to both sectors are highlighted in green in the tables, while factors specific to one sector are marked in blue. These results are not by any means exhaustive. For each factor one or two examples are given. And, for the success factors some verbatim are exposed to illustrate the activity and the feelings of the workers.

### Innovative Adaptation Processes, Success Factors for Organizational Resilience

Table 2 illustrates and compares four success factors. These are processes for adapting existing mechanisms or innovations in response to the actual requirements of the situation.

**Space reconfiguration.** In both sectors, spaces were reconfigured. In the NPP sector, this was to enable improved control of incoming and outgoing flows of people, and thus avoid contact and infection. At the hospital, these

**Table 2.** Comparison of success factors and adaptation processes.

| Organizational success factors | Hospital | NPP |
|---|---|---|
| Space reconfiguration | - Emergency department: reconfigured to triage COVID patients on arrival<br>- Departments allocated to other activities converted into Intensive Care Units (ICU) | - Reconfigured to manage the arrival of staff and contractors (floor markings, signage, barrier measures) |
| Rescheduling of activities | - All operations scheduled for subsequent weeks were cancelled and patients were transferred to other facilities to free up beds | - A series of maintenance operations were put on hold, tasks were prioritized and training and crisis exercises were postponed |
| Human resources management | - Temporary hires, internal reinforcements, accelerated training, optimization of human resources | - Shift changes to maintain teams, backup operators<br>- Control room treated as sacrosanct, all staff barred from entry |
| | Teleworking | |
| | Adaptation of communication methods: Teams, WhatsApp, etc. | |
| | Increased involvement of local management, a feeling of having to ensure teams' health; listening and trust more important | |
| Administrative management | Allocation of exceptional funding during the 1st wave | |
| | Simplification of all administrative procedures | |

measures were intended firstly to limit contact between patients with COVID (COVID+) and patients with other conditions (COVID-). The second aim was to free up and reconfigure spaces to help accommodate the massive influx of COVID patients.

**Rescheduling of activities.** In response to the pandemic, rescheduling activities was another approach that enabled organizations to manage patient flows and ensure continuity of operations.

**Human resources management.** The sectors implemented measures to address the shortage of hospital staff and to maintain operating teams. The use of teleworking where possible to enable continuity of operations was an approach adopted in both sectors.

Example of verbatim quote from the hospital:

*"I have found the time to engage in a more meaningful relationship with the patient and therefore have the time to provide the patient with proper care. There are some situations that went better as a result of this, because we were not stressed by the number of assessments piling up, because we were not understaffed with things suddenly getting complicated. For me, that was a comfort." (Nurse).*

Example of verbatim quote from the nuclear sector:

*"(...) while guaranteeing that we would protect jobs, we were in this situation where there was a general lockdown, so we had to ensure that there*

**Table 3.** Comparison of individual and collective success factors.

| Success factors | Hospital | NPP |
|---|---|---|
| Collective mobilization at all levels | Between caregivers, caregivers/doctors | Peer support |
| | Strong individual commitment, overtime | |
| Experience of critical situations | Emergency and ICU staff manage complex and/or critical situations on an everyday basis | NPPs are trained and used to dealing with complex situations and hazards |

*weren't too many employees mixing with each other, including the staff that needed to provide the on-call service (...) So we set up a shift system where we had what we called Team A, who could come into work on one particular week, when Team B was not there, and vice versa the following week. This was the kind of shift system that management was asked to put in place to ensure that there was as little mixing as possible (...)" (HR Manager).*

**Management adaptation.** Another feature found in both organizations was a change in the relationship between management and teams, with greater personal involvement on the part of management.

Example of verbatim quote from the hospital:

*"Yeah, so I'm lucky to have a very good manager, who, frankly, trusts me completely. I'm very fortunate to have very, very good management. As I said to you earlier, the doctors see us differently, and that too... is really, really important. They trust me, because they saw how effective my work is, then and after." (Caregiver).*

Example of verbatim quote from the nuclear sector:

*"...in fact, I used to call people at least once a week, to have telephone contact. I called everyone who was not on site individually once a week. Just to give them some information on how things were going, an organizational update, where we were, what measures were taken into account, what the schedule looked like, and what we were doing, etc." (First Line Manager).*

**Administrative management.** In both sectors, measures were introduced to simplify administration. The organizations moved away from some procedures and simplified others, speeding up decision-making processes. The hospital was also allocated exceptional funding during the first wave.

## Individual and Collective Success Factors for Organizational Resilience

In this section, table 3 presents the individual and collective factors that characterize management of the pandemic.

**Collective mobilisation**. In both sectors, mobilization, commitment and mutual assistance were identified as key elements in ensuring a reliable and effective crisis response.

**Experience of critical situations.** A success factor identified in both sectors was experience of critical or complex situations, either on a daily basis, as was

**Table 4.** Comparison of challenges weakening resilience.

| Challenges | Hospital | NPP |
|---|---|---|
| Management of limited resources | - Prioritization of medicines for certain patients, changes to protocols | - Manufacture of hand sanitizer |
| | - Prioritization of mask allocation to COVID teams | - Prioritization of masks for certain staff |
| | - Extended use | - Manufacture of masks |
| Lack of knowledge about COVID-19 | - Constant changes to treatment protocols | |
| | Changes to the global guidelines on barrier measures | |
| | Fear of becoming infected and/or infecting loved ones | |
| Work-related mental health impact | Fear of not being able to provide treatment for everyone | |
| | Fear of not being able to ensure continuity of operations | |
| Duration of the crisis | Staff fatigue and exhaustion | Fatigue |

the case in some hospital departments -emergency and, or through training or complex hazardous situations in the nuclear sector.

## Challenges Weakening Organizational Resilience

This last section will present examples of the challenges that weakened organizational resilience, although they did not interfere with crisis management.

**Management of limited resources**. In both sectors, the lack of resources led to different adaptations being made and impacts: an additional workload when it proved necessary to review protocols and limit the use of equipment. In other cases, innovations were introduced, such as an organization manufacturing its own hand sanitizer.

**Lack of knowledge about COVID-19**. In the early stages of the pandemic, a lack of knowledge about the virus meant that national guidelines were sometimes contradicted within days or weeks. This led to constant changes being made to protocols and rules on barrier measures (mask wearing, social distancing) in both organizations. More specifically, changes to patient treatment protocols were also a factor in the hospital (constant changes to protocols for donning/removing PPE, disinfection, etc.). The fear of transmitting the virus was a sentiment raised in both sectors.

**Work-related mental health impact.** Medical staff experienced mental health burdens, these were linked to the inability to guarantee treatment for patients and not being able to provide care. In NPPs, the mental health burden arose due to the need to provide electricity and to ensure the continuity of operations at power plants.

**Duration of the crisis**. The long-term nature of the crisis is another factor that has affected individuals in both sectors. This long crisis is leading to both physical and emotional fatigue and exhaustion among medical staff. Staff working at NPPs have talked about a general sense of fatigue linked to the various restrictions imposed by this global pandemic.

## CONCLUSION

The pandemic and widespread lockdown due to the COVID-19 virus have had a major impact on activity in both sectors, leading to various adjustments depending on the sector. There were similarities in terms of the emotional impacts and fears resulting in part from the lack of knowledge about the virus and how people could protect themselves at the beginning of the crisis. This was accentuated in both sectors by a lack of resources, that then had to be prioritized and limited to the most at-risk personnel and/or personnel that had to be protected due to their role. In addition, the confrontation with death and families who could not be with their loved ones at the beginning of the crisis was a strong and new emotional factor for medical staff working at the hospital. These emotional aspects are little discussed during crisis and we feel that it is important to consider how to prevent them and how to mitigate them.

Another interesting point is the adaptability in both sectors, resulting from expertise and experience acquired during everyday operations in the hospital (De la Garza et Lot, 2020). In the nuclear sector, this adaptability is the result of managing critical situations coupled with crisis management training (emergency exercises, simulator training) (De la Garza et al., 2018). These situations help to develop "crisis" skills, a form of cognitive and collective flexibility that facilitates decision-making and makes it more reliable in the face of unexpected events. In addition, this adaptability is based on advance planning approaches in terms of organization, technical resources, procedures and various tools. It is the ability to connect the past with the present and the future that makes it possible to establish a new operating procedure and that characterizes organizational resilience. However, this crisis highlights the limits of planning in a long crisis, particularly in the hospital environment. The restructuring of the hospital was done differently in subsequent waves and the hospital continued to learn from the crisis. The crisis was not experienced in the same way by each sector. In the nuclear sector, from the second wave onwards, staff returned to their daily activities by incorporating the extraordinary into the ordinary (barrier measures and maintenance protocols with gauges).

### Acknowledgment

The authors would like to thank the medical staff at La Pitié Salpêtrière hospital and the nuclear power plant staff who contributed to this study.

## REFERENCES

Dab, W. (2017). Gestion des crises sanitaires. Environnement-Sécurité et gestion des risques. Technique de l'ingénieur.

De la Garza, C., & Lot, N. The socio-organizational and human dynamics of resilience in a hospital: the case of the COVID-19 crisis. JCCM. (*accepted on January 2022*).

De la Garza, C., Le Bot, P., Baudard, Q., (2018). The simulation of extreme situations for the analysis of resilience: an original methodology to improve simulation and organizational resilience. Presented at the 20th Congress International Ergonomics Association, Springer, Florence, Italy.

Hermann, C. F. (1963). Some consequences of crisis which limit the viability of organizations. Administrative Science Quarterly, 61–82.

Lagadec, P., & Guilhou, X. (2002). Les conditions de survenue des crises graves. Conditions et mécanismes de production des défaillances, accidents et crises, 157–210.

Bot, P., Baudard, Q., De La Garza, C. (2018). The Model of Resilience in Situation: its contribution to the crisis management analysis and improvement. Proceedings of the Probabilistic Safety Assessment and Management PSAM14. Los Angeles, CA.

The Bot, P., Pesme, H. (2010). The Model of Resilience in Situation (MRS) as an Idealistic Organization of At-risk Systems to be Ultrasafe, in: Proceedings of a Meeting Held 7–11 June 2010. Presented at the PSAM10 - 10th International Conference on Probabilistic Safety Assessment & Management, Seattle, Washington, USA.

Shrivastava, P. (1993), Crisis Theory/Practice: Towards a Sustainable Future, Industrial and Environmental Crisis Quarterly, 7, 23–42.

Weick, K.E. (1995). Sensemaking in Organizations, London, Sage Publications.