Disruption of laboratory activities during the COVID-19 pandemic: results of an EFLM Task Force Preparation of Labs for Emergencies (TF-PLE) survey

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Keywords

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Abstract

Background: The EFLM Task Force Preparation of Labs for Emergencies (TF-PLE) created a survey that has been distributed to its members for gathering information on the key hazards experienced by European medical laboratories during the COVID-19 pandemic.
Methods: The survey was distributed to over 12,000 potential contacts (laboratory workers) via an EFLM newsletter, with responses collected between May 8 and June 8, 2023.
Results: Two hundred replies were collected and examined from European laboratories. 69.7% and 78.1% of all responders said they were short on non-COVID and COVID reagents, respectively. Exactly half of respondents (50.0%) said that they could not complete all laboratory tests required for a specific period, but this figure climbed to 61.2% for COVID tests. Finally, 72.3% of respondents expressed exhaustion during the pandemic, and 61.2% reported increasing patient hostility.
Conclusions: The COVID-19 pandemic had a significant impact on laboratory medicine in Europe. Cultural change, proactive planning, and even re-engineering in some parts of the laboratory industry may thus be necessary to prepare for future challenges.

Introduction

More than three years after the World Health Organization (WHO) declared coronavirus disease 2019 (COVID-19) a pandemic, the international emergency status has ended, but the organization continues to emphasize that COVID-19 remains a global health threat [1]. The fact that most health systems around the world were not prepared for this enormous challenge can certainly be considered one of the most important aspects that have contributed to increasing the morbidity, mortality, and resulting chronic disability caused by SARS-CoV-2 infections [2]. This refers specifically to the enormous burden placed on healthcare facilities by the pandemic, which exponentially increased shortages of beds, staff, and equipment [3], dramatically exacerbated by previous inadequacies in hospital funding. An interesting analysis conducted by Arsenault et al. in 10 different countries [4] shows that significant disruption occurred in almost all countries, characterized by a specific magnitude and duration, with no pattern related to income or pandemic burden. For example, treatment of chronic diseases was disrupted in all regions, while treatment of emergencies such as road traffic accidents was severely affected. The clear evidence that most health systems were woefully unprepared for the dramatic increase in the number of patients seeking diagnosis and treatment for SARS-CoV-2 infection during the initial phase of the pandemic goes hand in hand with evidence that even laboratory medicine was placed under unprecedented and perhaps unimaginable pressure [5,6]. A previous survey was conducted by the American Association for Clinical Chemistry (AACC) in four different periods during the early phase of the COVID-19 pandemic (May 1-24 2020: 100 responses; June 1-5 2020: 33 responses; June 24-July 6 2020: 53 responses; August 3-18 2020: 67 responses; September 17-29 2020: number of responses unavailable; and December 2 2020-January 4 2021: number of responses unavailable) [7]. The percentage of worldwide respondent labs reporting being unable to obtain supplies necessary to run routine laboratory testing ranged between 11-52% for non-COVID-19 tests and between 40-50% for COVID-19 tests, respectively. Contextually, the percentage of laboratories unable to process all requested COVID-19 tests due to supply issues and other challenges ranged between 14-22%. Importantly, up to nearly 80% laboratories responded that they were facing challenges to testing or increasing their testing capacity for COVID-19. Shortage of test kits and reagents affected as many as 60% of all respondent laboratories, whilst staff shortage was also commonplace, involving up to 80-90% of all respondent laboratories. Importantly, during the last surveyed period (December 2, 2020-January 4, 2021), some degree of burnout has also been reported by as many as 70% of all respondents. Nuñez-Argote reviewed 178 surveys completed during the early period of the pandemic by laboratory professionals, engaged in medical laboratories in the United States, and found evidence that the extent of overtime work increased almost every day from 3.4% to 13.5% from before to during the pandemic [8]. Jafri et al. interviewed 64 medical laboratory professionals in Pakistan between June 4th and 14th 2020, and evidenced several important aspects, including the fact that 42% and 78% of the respondents reported fear of employment termination and financial challenges, 96% answered that social life was strongly penalized and nearly 20% that they were largely unsatisfied about the measures taken by the hospital organization during the initial outbreak [9]. Another survey was conducted by the PeriAnalytic and Laboratory Medicine Society (PALMSoc) in Ireland, collecting 45 responses from 38 different medical laboratories [10]. Ac-cording to the results of this survey, nearly 60% of responders affirmed that maintenance of the quality management system was challenged and less than 20% reported as having 100% staffing level before the emergence of COVID-19. To determine the frequency of burnout and depression, along with their contributing factors and the impact of COVID-19, an electronic survey was distributed to a group of Canadian laboratory medicine residents [11]. The authors ultimately collected 79 responses, which revealed a prevalence of burnout and depression of 63% and 47%, respectively. The factors that contributed most to burnout were dissatisfaction with career, impairment of academic performance, lack of availability of sick leave, financial stress, and increased perception of fatigue. Regarding depression, the most important factors were poor availability of wellness resources, reduced free time, and experimentation with reduced sleep duration. In this challenging scenario, with a still unpredictable evolution regarding the risk of future natural and environmental disasters [12], the Task Force Preparation of Labs for Emergencies (TF-PLE) of the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM) has developed a specific survey to be sent to its members. The aim was to collect useful data and important information on the major threats faced by European medical laboratories during the COVID-19 pandemic for developing suggestions on how to avoid the next emergency (besides pandemics) with potentially similar unfavorable consequences.

Materials and methods

To obtain specific information about the extent and nature of the disruption of laboratory activities during the COVID-19 pandemic, a special questionnaire was developed by the EFLM TF-PLE that included general questions about the location and organization of laboratories, as well as a specific request for information about the most important organizational problem encountered, as follows: “Which types of troubles did you encounter (at least at some times) during the COVID-19 pandemic?”, including six possible scenarios with four different answer options each “Yes, for long time”; “Yes, for short time”; “Never”; “N/A (not applicable)”. The detailed questions included in the survey are summarized in table 1. The survey was then sent via an EFLM newsletter to the email addresses of over 12,000 potential contacts (laboratory professionals) from Europe and abroad, with responses collected between May 8 and June 8, 2023 (Figure 1). It had been requested that only one response can be accepted from each laboratory. The complete responses

were downloaded onto an Excel spreadsheet and graphically analyzed with Analyse-it for Microsoft Excel (Analyse-it Software Ltd, Leeds, UK). A single response for each medical laboratory was maintained. The statistics of the responses to the question about the threats encountered by the respondent laboratories during the pandemic was conducted by eliminating the results from participants who selected the "N/A (not applicable)" option (n=?). The survey was officially promoted and supported by the EFLM, and did not involve any medical treatment. Ethics Committee approval or patient's consent is not applicable to these types of studies.

Table 1: Questions and options presented in the questionnaire developed by the EFLM TF-PLE

Question	**Formula %**
Your continent	Asia; Africa; North America; South America; Europe; Oceania
Your country	Free text
Your lab (type of facility)	Private, Public; Other
Number of tests per year of your lab (both inpatients and outpatients)	1 million; 1-4 million; 5-8 million; >8 million
Do you perform stat (urgent) testing in your lab?	Yes; No
Which types of troubles did you encounter (at least at some times) during the COVID-19 pandemic? - Impossibility to run all lab tests requested - Impossibility to run all COVID tests requested - Shortage of some non-COVID reagents and/or supplies - Shortage of COVID reagents and/or supplies - Burnout - Patient aggressiveness	Yes, for long time; Yes, for short time; Never; N/A (not applicable)

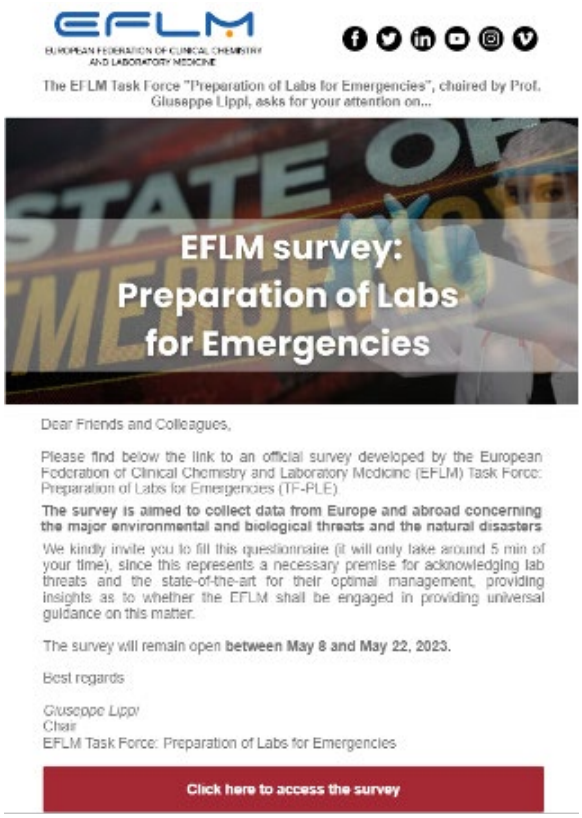

Figure 1: The EFLM Newsletter about the TF-PLE survey that had been delivered to over 12,000 potential contacts among European and non-European laboratory professionals.

Results

During the one-month survey period, a total of 235 responses were received, 200 were from European laboratories (85.1%), which were used for the analysis. Most responses came from Italian laboratories (20.0%), followed by Serbian (9.0%), Turkish (6.5%), Spanish (5%), Croatian, Romanian, and Lithuanian (all 4.0%) institutions; laboratories from other countries accounted for less than 3% of all other responses. Most respondents were from public laboratories (78%), general (rather than specialized) laboratories (74.5%), of which 88.5% also perform urgent and/or emergency laboratory testing. In terms of size, most laboratories reported performing less than 1 million tests per year (42.0%), 32.0% reported performing between 1-4 million tests per year, 10.5% of all laboratories reported performing between 5-8 million tests per year, whilst 15.5% of responding laboratories reported performing more than 8 million tests per year (Figure 2). The responses to the specific question "which types of troubles did you encounter (at least at some times) during the COVID-19 pandemic?" are summarized in figure 3.

The percentage of "N/A (not applicable)" responses was 6.0% for "shortage of some non-COVID reagents and/or supplies", 15.5% for "shortage of COVID reagents and/or supplies", 5.0% for "impossibility to run all lab tests requested", 17.5% for "impossibility to run all COVID tests requested", 8.0% for "burnout" and 17.5% for "patient aggressiveness". Regarding reagents and/or supplies, other than for COVID diagnostics, 69.7% of all laboratories answered that they had some shortage, mostly (63.3%) for a short time, while they answered that some shortage of COVID reagents was more frequent (78.1%), but also mostly temporary (72.8%). Regarding the ability to perform tests, exactly half (50.0%) of all laboratories were unable to complete all tests requested over a certain period (mostly for a short-term, 44.2%), but this number increased to 61.2% for COVID tests ordered (57.0% on the short-term). Importantly, 72.3% of respondents emphasized that they had experienced some level of burnout during the COVID pandemic, 31.5% of them for an extended period. Finally, 61.2% of respondents reported that patient aggressiveness had increased during the COVID pandemic, 22.4% of whom had experienced this phenomenon over a longer period. A partial analysis of the data, stratifying all positive responses to the first four questions (i.e., the sum of "Yes, for long time" and "Yes, for short time" responses) by the amount of testing performed by laboratories, is shown in Figure 4. There are no major differences in the number of tests performed per year. In comparison to all other laboratory size categories, laboratories performing between 5-8 million tests experienced significantly more difficulties "to run all COVID tests requested" (chi-square statistic: 15.497; p=0.001). Apart thereof, no statistical significant difference between answers from different laboratory sizes could be found for "shortage of some non-COVID rea-gents and/or supplies" (chi-square statistic: 1.66; p=0.645), "shortage of COVID reagents and/or supplies " (chi-square statistic: 7.125; p=0.068) or "impossibility to run all lab tests requested" (chi-square statistic: 1.445; p=0.695).

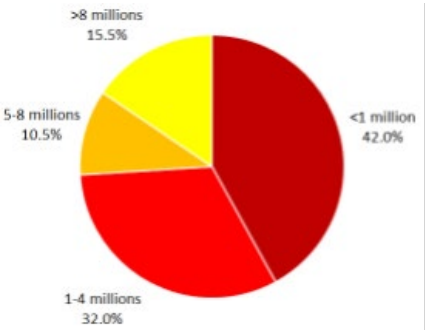

Figure 2: The percentages of the 200 EFLM European medical laboratories which responded to the EFLM survey stratified according to the volume of tests performed per year.

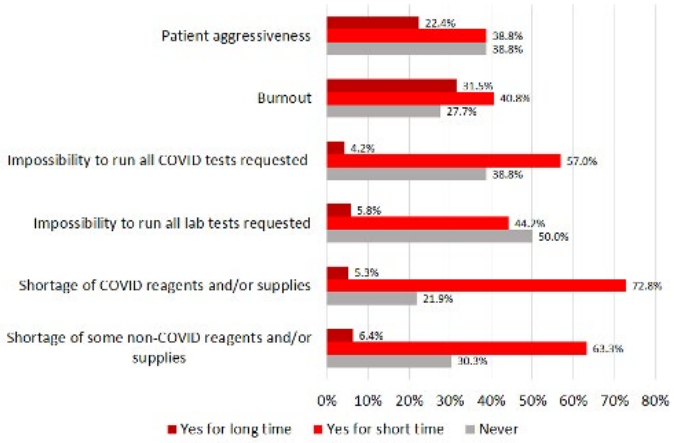

Figure 3: Responses to the question "Which types of troubles did you encounter (at least at some times) during the COVID-19 pandemic?" given by 200 European medical laboratories which responded to the EFLM survey.

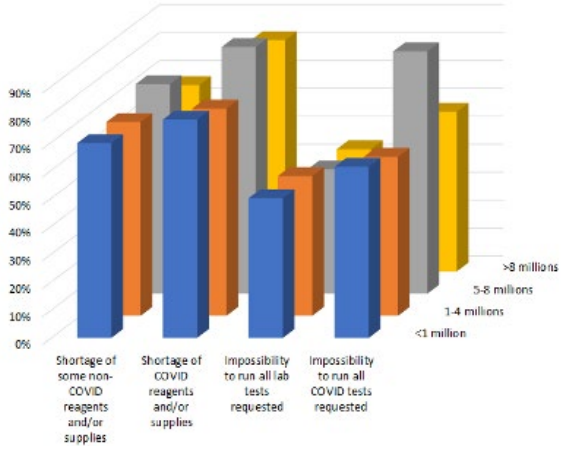

Figure 4: Positive responses to the question "which types of troubles did you encounter (at least at some times) during the COVID-19 pandemic?" given by 200 European medical laboratories which responded to the EFLM survey, stratified according to their testing volume (test per year).

Discussion

Although the Emergency Committee of the WHO made the predictable decision to end the global health emergency for COVID-19, many thousands of people affected by this disease are still in hospitals (some of whom require intensive care unit treatment), and several million others will suffer from the lingering after-effects of SARS-CoV-2 infection [13]. In addition, this (corona) virus is here to stay, and there is a risk that new and more severe lineages will emerge, causing new outbreaks with surging case numbers. The frequency of other natural and environmental disasters posing a public health challenge worldwide has increased significantly over the past few decades [14]. These may also act synergistically to amplify the harm to humans and animals [15]. These threats mainly include tornadoes, thunderstorms, hail, earthquakes and tsunamis, fires, floods, chemical and/or biological emergencies, mass casualties, terrorism and bioterrorism, wars, civil unrest, and so on. Recognizing that laboratory medicine plays a critical role in modern science and medicine [16] and that its contribution is indispensable for the management of frequently foreseeable emergencies (e.g., climate change), the EFLM recently established an ad hoc task force to improve the preparedness of medical laboratories to manage a variety of emergencies (EFLM TF-PLE). The first initiative, which provides an essential basis for planning future training activities, was the development and implementation of a special survey, aimed at collecting information on the extent of disruption of laboratory activities during the last three years of this COVID-19 pandemic. The results of which are presented and discussed in this article. In keeping with the evidence emerged from the previous AACC questionnaire, which was terminated at the beginning of 2021, several critical aspects could be identified from this EFLM initiative. From the responses obtained from over 200 European medical laboratories, the first fact that strongly emerges is that the capacity of both conventional and COVID-19 related diagnostics has been overwhelmed in over 50% of cases for at least some periods. This aspect underlines that around half of medical laboratories which responded to this EFLM survey were already running at their capacity limits, and this precarious stability was disrupted by an "exceptional" event like a pandemic. This inherently means that other similar (natural or environmental) disasters might generate a similar dramatic impact on laboratory medicine, causing important delays or even prolonged interruptions of the diagnostic activity, together with all ensuing patient safety risks. A second finding from our survey is that most European laboratories have suffered a temporary lack of reagents and supplies, which was not restricted to COVID-19 diagnostics but involved also many other testing areas. Intriguingly, nearly two-thirds of all European medical laboratories that responded to this EFLM survey stated that a lack of reagents or supplies for performing non-COVID tests was a tangible issue during the pandemic, thus emphasizing that the entire diagnostic industry was seemingly unprepared to face an exceptional event like this pandemic, and may remain so also in the unfortunate likelihood of future disasters. The third significant conclusion from the 200 replies collected in this EFLM survey is that more than 70% of European laboratory workers admitted to having experienced at least some degree of burnout during the pandemic. This statistic is consistent with prior research, which found that burnout was frequent among healthcare workers, especially in the early phases of the pandemic [17]. Macaron et al. conducted a systematic literature review and meta-analysis to determine the cumulative prevalence of burnout among physicians during the COVID-19 pandemic [18], reporting a peak burnout prevalence of up to 60% in the early stages of the pandemic, which is comparable to the prevalence found in our survey of European laboratory professionals (i.e., around 70%). Last but not least, almost 60% of respondents indicated that patient hostility increased during the pandemic, thus contributing to further aggravation of an already difficult working condition caused by environmental pressure and shortage of personnel. We acknowledge that only a minority of all potentially contacted laboratories responded to this survey, with a preponderance of Italians. This imbalance must be taken into account when interpreting our conclusions.

Conclusions

We live in a modern world where other major challenges such as the current COVID-19 pandemic are very likely to occur in the coming years. If we have learned anything from the recent pandemic, it is that proactivity and preparedness to respond in a much more expedient manner are critical. The findings of this first EFLM TF-PLE survey clearly reveal that the COVID-19 pandemic had a significant impact on laboratory medicine in Europe, both in terms of availability of material resources and professional well-being. Cultural change, proactive planning, and even reengineering in some parts of the laboratory industry may thus be required to prepare for future challenges.

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Conflicts of Interest

The authors declare no conflict of interest

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