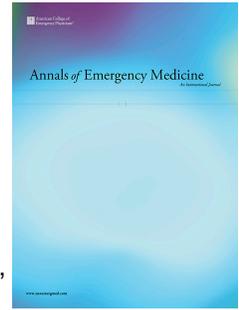


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Preparedness and response to Pediatric CoVID-19 in European Emergency Departments: a survey of the REPEM and PERUKI networks

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**Title:** Preparedness and response to Pediatric CoVID-19 in European Emergency Departments: a survey of the REPEM and PERUKI networks

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Danilo Buonsenso designed the draft of the survey.

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**ABSTRACT**

**Study objective:** We aimed to describe the variability and identify gaps in preparedness and response to the COVID-19 pandemic in European EDs caring for children.

**Methods:** A cross-sectional point prevalence survey, was developed and disseminated through the pediatric emergency medicine research networks for Europe (REPEM) and the United Kingdom and Ireland (PERUKI). We aimed to include ten EDs for countries with > 20 million inhabitants and five EDs for less populated countries, unless the number of eligible EDs was below five. ED directors or their delegates completed the survey between March 20<sup>th</sup> and 21<sup>st</sup> to report practice at that time. We used descriptive statistics to analyse data.

**Results:** Overall 102 centers from 18 countries (86% response rate) completed the survey: 34% did not have an ED contingency plan for pandemics and 36% had never had simulations for such events. Wide variation on PPE items was shown for recommended PPE use at pre-triage and for patient assessment, with 62% of centers experiencing shortage in one or more PPE items, most frequently FFP2/N95 masks. Only 17% of EDs had negative pressure isolation rooms. COVID-19 positive ED staff was reported in 25% of centers.

**Conclusion:** We found variation and identified gaps in preparedness and response to the COVID-19 epidemic across European referral EDs for children. A lack in early availability of a documented contingency plan, provision of simulation training, appropriate use of PPE, and appropriate isolation facilities emerged as gaps that should be optimized to improve preparedness and inform responses to future pandemics.

## INTRODUCTION

### Background

Ever since the first human cases of the novel coronavirus were reported in Wuhan, Hubei Province in China in December 2019, the Coronavirus Disease 2019 (COVID-19) pandemic has spread rapidly across the world.<sup>1</sup> The epidemic in Europe initially centered around Northern Italy where there was a steep rise in the number of cases and case fatalities from February 20<sup>th</sup> 2020 onwards.<sup>2</sup> While European countries were deciding upon or were enacting containment measures of varying degrees, the infection continued to spread across the continent with devastating impact on health systems, the economy and the society at large.

Within healthcare, it is crucial that the emergency department (ED), as the entry point to hospital care, is prepared to manage high risk COVID-19 patients in an efficient and safe way, from triage to final disposition. The ED should respond to the epidemic surge in agreement with hospital contingency plans and guidelines from local and national health authorities,<sup>3</sup> also learning from the experience of other countries.<sup>4</sup>

Even though it has now become apparent that children are affected less frequently and with a much more benign disease spectrum than adults,<sup>5,6</sup> appropriate management in the ED of suspected and confirmed cases and their families is essential.<sup>7,8</sup> Children may present with conditions not linked to COVID-19 but some, when admitted for that condition, are found to have COVID-19 positive swabs as an incidental finding. This may be a feature with the more widespread dissemination of COVID-19 throughout the population. Besides suspected or confirmed COVID-19 patients, EDs should also maintain the quality of care provided to children presenting with serious illnesses or accidents not related to the pandemic.

### Importance

Pathways and protocols need to be in place to ensure that rapid appropriate care is provided to suspected COVID-19 children, while avoiding delay in care of non-COVID-19 patients.<sup>9</sup> In addition, it is paramount to ensure adequate protection and minimize exposure of patients and staff to the infection.<sup>10</sup> However, the dialogue between European pediatric emergency physicians who liaised through their European Society and their research networks (Research

in European Pediatric Emergency Medicine - REPEM and Paediatric Emergency Research in the United Kingdom and Ireland – PERUKI)<sup>11-13</sup> highlighted differences and challenges in ED preparedness and response between countries, as the COVID-19 pandemic unfolded throughout Europe.

### **Goals of this investigation**

Hence, we aimed to describe the preparedness and response to the COVID-19 pandemic in European referral EDs for children within the REPEM and PERUKI networks.

We hypothesised that European referral EDs for children would show variability and gaps in preparedness and response to the COVID-19 pandemic, from which lessons could be learned for the current and future pandemics.

## **METHODS**

### **Survey design and setting**

We conducted a cross-sectional point prevalence survey. The survey was developed in English by the lead author and then underwent several rounds of review by the research team. The survey was distributed through the REPEM network,<sup>12</sup> a research collaborative consisting of Pediatric EDs (PEDs) and EDs of general hospitals with a separate pediatric section, serving as referral centers for children, and also the sites affiliated to the executive committee members of PERUKI. For each country, a country lead was identified on a volunteer basis, through the network, to disseminate the survey to centers meeting the above reported criteria. Country leads were pediatric emergency physicians or paediatricians working in the ED. We also included Israel as a European associated country, as Israel has been part of the REPEM network since its foundation.<sup>14</sup>

To ensure balanced representativeness of participating countries and feasibility of the study, the research team, using a quota sampling method,<sup>15</sup> agreed to include a pre-determined number of centers based on the population of participating countries. For countries with more than 20 million inhabitants (namely Italy, France, Germany, Spain and the United Kingdom)

participation of ten EDs was sought. For countries with *less than* 20 million inhabitants five EDs were expected to participate, unless the number of eligible EDs was less than five (i.e. Estonia: four EDs eligible; Iceland: one ED eligible; Latvia: one ED eligible; and Malta two EDs eligible). The denominator for our survey comprised 103 centers.

Country leads were to decide on the strategy to approach eligible EDs in their country. Some country leads approached more than the pre-established number of centers to ensure a 100% response rate, accounting for the possibility that some contacted centers might not respond. By adopting this approach, some countries actually exceeded the expected number of participating centers per country. For calculation of the survey response rate the number of EDs exceeding the pre-determined expected number of participating EDs per country was not considered.

ED directors or their delegates, staff members appointed by the ED director as most suitable persons to complete the survey, completed one survey for each participating center. The survey was open on March 20<sup>th</sup> and 21<sup>st</sup> 2020. Survey responses were collected in REDCap, a validated online data collection system.<sup>16</sup> Respondents were asked to state their country of residency, but it was not mandatory to give the name of their hospital. Each country lead recorded the name of the invited and participating hospitals. Country leads communicated to the principal investigator the number of centers that completed the survey, without disclosing the hospitals' identities, ensuring the number of completed surveys per country matched the number of centers that actually completed the online survey.

## **Definitions**

Preparedness and response were defined, based on consensus of the research team, as organizational and operational actions taken by EDs to face the pandemic, including contingency plans, training, screening of suspected cases, surge capacity, availability and use of personal protective equipment, ED infection control measure, care pathways and management of suspected cases, health professionals safety and sustainability of care.

## **Survey content**

A first survey was completed by country leads to reflect the national situation of the COVID-19 pandemic as of March 20<sup>th</sup> 2020. The country lead survey included questions on range of

COVID-19 cases (total and pediatric) per country; the date of identification of the first COVID-19 cases in the country; and the type of containment measures enforced in their country. Data on range of confirmed cases per country, as well as deaths, were cross checked with the European Center for Disease Control and worldometers websites on March 21<sup>st</sup>, to ensure complete update of data up to March 20<sup>th</sup> 2020.<sup>17,18</sup> There were no reported pediatric COVID-19 confirmed deaths in participating countries at the time of the survey.

The participating ED survey completed by each participating center focused on organizational and operational aspects of preparedness and response as reported in the above mentioned definition.

We followed STROBE guidelines for reporting of observational studies.<sup>19</sup>

### **Statistical analysis**

Descriptive statistics were used to analyse the data, reporting 95% confidence intervals (CI) around each point estimate. Data were analysed using Stata (version 13, StataCorp, College Station, Texas, USA).

### **Ethics**

This survey accessed clinicians via a research collaborative to assess their departmental practice and therefore did not require formal ethics review, as determined by the ethics board of the University Hospital of Padova, Italy. Consent was implied by participation.

## **RESULTS**

A total of 18 countries participated in the study. Eighty-nine of the expected 103 centers, based on the pre-established number of participating centers per country, completed the survey (response rate 86%). However, some countries exceeded the number of expected participating EDs, leading to a total of 102 EDs participating to the survey (**Table 1** and **Figure 1**). The survey was completed by the ED director in 48% of cases and by their delegate in 52%. The number and characteristics of participating centers and the range of COVID-19 confirmed cases per country is reported in **Table 1**. The majority of participating EDs were tertiary-care PEDs (75%) and most centers had a pediatric yearly census > 10,000

visits per year (89%). Only few confirmed COVID-19 pediatric patients, if any, were seen in participating EDs. Containment measures were variably enforced in participating countries as of March 20<sup>th</sup> 2020 (**Table 1S, Supplementary material**). Measures less often taken were the most restrictive, namely the closure of non-essential commercial activities (67%); the closure of land borders (50%) and the prohibition of any travel not-related to health or food shopping needs (50%). A summary of criteria for suspected COVID-19 cases in use at participating EDs is provided in **Table 2S- Supplementary material**. Definition criteria had changed over time in 90% of centers, reflecting the very dynamic adjustments made to face a rapidly evolving crisis. At the time of the survey, any child with flu-like illness or fever was considered as a suspected COVID-19 infection in 67% of centers.

Approximately one third of centers (34%) did not have an ED contingency plan for pandemics and 36% had never organized simulations for such events. The majority of centers (76%) had not experienced mass casualty disasters or pandemics during the past five years. Nearly all institutions had established a formal ED management plan for suspected/confirmed pediatric COVID-19 cases, with daily updates in 69% of centers. Surge capacity for pediatric suspected COVID-19 cases was variable between centers at an ED, admission ward and intensive care level in terms of number of available rooms/beds (**Table 2**). In one fifth of the institutions there was no intensive care availability for pediatric COVID-19 patients. Only admission ward surge capacity increased according to ED volume (**Supplementary Figure 1**). Adjustments implemented to best manage suspected/confirmed COVID-19 patients included cancellation of planned activity (i.e. outpatient visits, surgery or hospital admissions) in 90% or more of participating centers; reorganization of beds in other pediatric wards in 75%, and telemedicine in nearly 70%.

The distribution of responses showed variation in the timing of pre-triage set-up and training on personal protective equipment (PPE). Variation was also observed in the recommended use of PPE to be worn during pre-triage and during patient assessment. If looking at recommended mask use during pre-triage, surgical masks were used in 52% of centers, FFP2/N95 masks in 27% and FFP3/N100 masks in 8%, while during patient examination, 49% of centers used FFP2/N95 masks, 43% surgical masks and 11% FFP3/N100 masks. Recommended PPE use for patients was more consistent across centers with a surgical mask to be worn by patients in 82% of EDs. Recommended duration of filtering masks use was also variable. A shortage of both basic and aerosol generating protective PPE items was

experienced by nearly two thirds of centers with FFP2/N95 masks being the items most frequently missing (**Table 3**). Contagion of healthcare workers was frequently reported at an institution level (69%), but less so at the ED level (25%). Only 18% of sites endorsed a periodic active surveillance of ED staff. Disposition of healthcare workers who had been in close contact with a confirmed COVID-19 case varied between centers, with approximately one third allowing staff to work while asymptomatic and one third recommending quarantine at home. Overall, ED physicians shift work had been re-arranged in nearly two thirds of centers with variable adjustments including both increase and reduction in staff, as well as different shift schemes to prevent cross-infection among staff (**Table 4**).

EDs limited caregivers/parents presence to only one person in the majority of centers (84%) and reorganized patient flow to accommodate suspected cases in separate dedicated areas. Fewer than 20% of EDs had isolation rooms with negative pressure. Most EDs performed swab testing for SARS-CoV-2 (78%). However, asymptomatic children with a history of close contact, who could be otherwise discharged, were not tested in the ED in the majority of centers (75%). At most sites suspected cases who were tested, but were fit for discharge, were sent home and swab results communicated to the family when they became available. In cases of positive test results for discharged patients, half of the centers could count on specific outpatient services to provide telephone follow-up. Most EDs experienced a substantial reduction in pediatric presentations, by more than 50% in half of the centers (**Table 5**). Centers further into the infection spread wave more frequently reported a larger reduction in the number of pediatric presentations (**Figure 2**). Overall 46% of centers agreed (36%) or strongly agreed (10%) about the statement “My hospital was ready and prepared to handle COVID-19 at the time the outbreak started in our country” and 54% agreed (39%) or strongly agreed (15%) when the statement was referred to ED pediatric care.

## LIMITATIONS

The results of our study should be interpreted in the light of its limitations. Although we included a large number of European countries, our survey does not provide a pan-European perspective. However, this is the first European dataset that provides a detailed snapshot of pediatric emergency care from within the pandemic, at a more granular level than any institutional channel has been able to provide so far. While the pandemic evolves in each country and accompanying adjustments are made, a repeat focused survey will capture the

dynamic progress made from an organizational and operational perspective. We arbitrarily decided, as a research team, the number of centers to be included in each country to ensure a balanced representativeness and to obtain timely completion of the survey. The participating centers represent a subset of EDs caring for children in Europe and include referral centers for children, thus our findings may not be generalisable across different settings. Although some countries exceeded the expected number of recruited centers, we were able to obtain a reasonable balance in terms of country representativeness. In addition, the objective of this survey was to explore common challenges and common learning points and not to compare responses between countries. Lastly, while the authors themselves refined questions via review processes, the survey questions did not undergo a formal content validation procedure. Given that most of the answers required fixed quantitative responses on practice in use/recommended at participating EDs, a formal content validation would have likely had limited impact on the reliability of our findings.

## **DISCUSSION**

Our survey provides a snapshot of preparedness and response of EDs caring for children from 17 European countries and a European associated country at one month after the COVID-19 outbreak started in Northern Italy. Overall, the findings of our study show high variation in time and in level of organisational responses to COVID-19 of EDs caring for children across Europe and identified a few gaps that still need to be optimized to improve preparedness and inform responses to future pandemics. Our data show that a written and documented contingency plan was still missing in approximately one-third of centers one month after the onset of the outbreak in Europe. While the majority had not faced an epidemic or a mass casualty event in the past five years, nearly 40% had never run a simulation on how to manage such a crisis in the ED. A striking finding of our point prevalence survey was the wide variation in reported PPE use at pre-triage and for the assessment of suspected COVID-19 cases, with 62% of centers experiencing shortage in one or more PPE items. In addition, a high percentage of centers reported infection in staff members, which may affect the sustainability of care provided. From a structural perspective, the low percentage of EDs with negative pressure isolation rooms (17%) highlights opportunities for improvement, should renovation work be undertaken or new hospitals are built in the future.

While participating countries were at different stages in the outbreak spread the different pace in the pandemic advancement represents an opportunity for healthcare systems to learn from

each other by sharing experience and identifying areas for improvement. This may ensure a more rapid response in terms of implementation of infection prevention and control measures within healthcare in those countries that lag behind the spread wave. This is important at all levels of care within an integrated health care system, but it is paramount for frontline services such as EDs.<sup>20,21</sup> By March 20<sup>th</sup> nearly all participating centers had received a formal plan for the management of pediatric suspected/confirmed COVID-19 cases in the ED, however, many faced common challenges: the lack of unequivocal definition of pediatric suspected cases and the need of continuous adjustments secondary to the rapid change of definitions and management plan; the late training in PPE use and shortage in PPE supplies; the need for extra-resources to set up a pre-triage; the re-arrangement of staff shift work to minimize infection spread or to cover for sick colleagues; the lack of negative pressure isolation rooms; the lack of outpatient services to follow up discharged children with confirmed COVID-19, with possible avoidable representations to the ED; the possibility to admit adult COVID-19 patients into pediatric beds; the difficult balance of resource use. Although children have shown to be relatively spared from this pandemic,<sup>5,6,22,23</sup> timely preparation and appropriate response are essential to minimize the transmission of the infection to both patients and healthcare professionals. Healthcare facilities have played an unwillingly significant role in increasing viral transmission in this pandemic.<sup>24</sup> For physicians taking care of children in the ED, COVID-19 has rightfully been defined a logistic rather than a clinical emergency, as a much greater effort was necessary to rapidly reorganize care pathways to prevent infection to patients and staff, rather than to actually provide clinical care to sick COVID-19 children. Not only the number of confirmed pediatric cases seen at participating EDs at the time of the survey was very low (approximately 200 overall), but ED presentations substantially reduced, further decreasing the clinical burden.<sup>25</sup> Appropriate PPE use is paramount for staff safety and to reduce the risk of viral transmission.<sup>26,27</sup> Although tracheal intubation, manual ventilation or non-invasive ventilation are rarely needed for pediatric COVID-19 patients,<sup>5,6,22</sup> nearly 80% of participating EDs performed swabbing, which is classified as an aerosol-generating procedure. While our survey question on use of PPE might have been misinterpreted with respect to assessment by the emergency physician, as to whether or not this included aerosol-generating procedures, suboptimal reported practice still emerged from responses. The PPEs recommended by the interim guidance of the European Center for Disease Prevention and Control and the World Health Organization for health care professionals performing aerosol-generating procedures are gown, respirator (N95 or FFP2 standard or equivalent), gloves, eye protection (goggles or

face shield) and apron, while those providing direct care to COVID-19 patients should wear a gown, surgical mask, gloves and eye protection. Healthcare workers at triage should maintain special distance of at least 1 meter and provide the patient with a medical mask (if tolerated); no PPE is required if preliminary screening does not involve direct patient contact.<sup>28,29</sup> Nearly half of the centers reported a shortage of PPE, most often FFP2/N95 masks. PPE use should be maximized to avoid shortage of supplies, which ultimately exposes staff and the broader community to an increased transmission risk. One third of respondents stated that respirators (N95/FFP2 or FFP3/N100) are disposed of after the assessment of each suspected case. This practice may contribute to shortage of supplies, as the same respirator could be used for more than one patient, as long as it is not damaged or soiled.<sup>29</sup>

Approximately 70% of respondents were aware of infected healthcare workers at their institution, while one fourth reported infected staff in the ED. Unfortunately, infection of healthcare workers has been reported as a major threat to the sustainability of healthcare in this pandemic.<sup>26</sup> In fact, the disposition of healthcare professionals who had been in close contact with a confirmed COVID-19 case varied between centers, possibly because of concerns regarding service provisions.

Implementation of appropriate PPE use can be easily done and should occur in a timely manner. This is in contrast to barriers related to structural limitations and constraints affecting the organization of ED patient flow and isolation capacity, which may be difficult to overcome in a short time frame. Infection control measures were more consistently reported in the survey, including re-arrangement of ED patient flow, changing of staff work shift to optimize resource utilization, reduction in the number of care givers allowed with the child and home quarantine for confirmed COVID-19 pediatric cases fit for discharge.

Another interesting finding from our survey is the substantial reduction in pediatric ED presentations during the pandemic. Centers from countries with a longer time since first case experienced higher reductions in the number of ED presentations. Parents' fear of contagion in a healthcare environment, improved hygiene measures, reduced community transmission of communicable diseases, reduced opportunities to sustain injuries owing to the strict containment measures enforced by governments, and reduction in stress-related functional diseases may be the reasons underlying this phenomenon. Reports from previous epidemics also showed an overall decrease in PED attendances.<sup>30,31</sup> The MERS outbreak had resulted in a significantly higher proportion of high acuity ED pediatric presentations and an increase in delayed presentations.<sup>9, 32</sup>

Despite its limitations, the provision of a timely report on preparedness and response in pediatric emergency care during the pandemic is useful to inform practice and policymakers to properly reorganize health systems while the crisis is still evolving. It provides an accurate objective historical dataset from which lessons can be learned for the future, including for adult EDs. The collaboration of the REPEM and PERUKI European networks was instrumental to ensure wide representation of European countries and timely completion of this multinational point prevalence survey. The data provided highlight the importance of European multinational research collaborations to provide the best care to children in the frontline.

In summary, we identified variability and gaps in preparedness and response to the COVID-19 epidemic across European referral EDs for children at one month since the start of the outbreak in Northern Italy. A lack in early availability of a written and documented contingency plan including detailed infection control measures, in the provision of simulation training, appropriate use of PPE, and appropriate isolation facilities emerged as gaps that should be optimized to improve the preparedness and inform responses to future pandemics.

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**Figures legend**

**Figure 1.** Map of participating countries and number of EDs participating to the survey per country.

**Figure 2.** Reported reduction in pediatric ED visits by time since first reported COVID-19 case (based on country of origin).

**Supplementary Figure 1.** Percentage distribution of ED (A), ICU (B) and admission ward (C) surge capacity according to ED volume

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**Table 1.** Characteristics of participating countries and centers

	Belgium	Denmark	Estonia	France	Germany	Iceland	Ireland	Israel	Italy	Latvia	Lithuania	Malta	Netherlands	Portugal	Spain	Sweden	Switzerland	UK
Pre-determined No. of expected centers	5	5	4§	10	10	1§	5	5	10	1§	5	2§	5	5	10	5	5	10
No. centers actually participating	7	5	3	15	13	1	4	6	11	1	2	2	2	5	9	3	6	7
ED Setting																		
- Tertiary care PED of standalone hospital	0	0	1	6	4	1	2	1	5	1	0	0	0	2	3	1	3	1
- Tertiary care PED in a hospital for adults and children	2	3	1	7	8	0	0	5	6	0	1	0	1	1	5	1	1	3
- Referral general ED with pediatric section *	5	2	1	2	1	0	2	0	0	0	1	1	1	0	0	0	2	3
- Other #	0	0	0	0	0	0	0	0	0	0	0	1	0	2	1	1	0	0
Pediatric age limit																		
- up to 14 years of age	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4	0	0	0
- up to 15 years of age	2	0	0	3	0	0	1	0	2	0	0	0	0	0	2	0	0	1
- up to 16 years of age	3	0	0	3	0	0	3	0	1	0	0	1	0	0	1	0	5	6
- up to 18 years of age	2	5	3	9	13	1	0	6	4	1	2	1	2	5	2	3	1	0
ED pediatric yearly census (visits/year)																		
- < 10,000	1	2	2	0	2	0	0	0	0	0	0	1	2	0	0	1	0	0
- 10,000 -15,000	4	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	1
- 15,000 -25,000	2	3	0	0	9	1	1	1	4	0	0	1	0	1	2	1	2	0
- 25,000 -50,000	0	0	0	11	1	0	2	5	5	0	1	0	0	2	1	0	4	4
- > 50,000	0	0	1	4	1	0	1	0	1	1	0	0	0	2	6	0	0	2
Number of pediatric positive COVID-19 cases seen in ED (total for all centers per country)	7**	16	0	34	13**	2	11	4	48	2	0	1	0	12	26	0	14**	2**
Time from first COVID case	3-4 weeks	3-4 weeks	3-4 weeks	≥ 4 weeks	3-4 weeks	3-4 weeks	2-3 weeks	3-4 weeks	≥ 4 weeks	2-3 weeks	3-4 weeks	1-2 weeks	3-4 weeks	2-3 weeks	≥ 4 weeks	≥ 4 weeks	3-4 weeks	≥ 4 weeks
Number of total COVID-19 confirmed cases	≥1,000 <10,000	≥100 <1,000	≥100 <1,000	≥10,000	≥1,000 <10,000	≥100 <1,000	≥100 <1,000	≥100 <1,000	≥10,000	≥10 <100	≥10 <100	≥10 <100	≥1,000 <10,000	≥100 <1,000	≥10,000	≥1,000 <10,000	≥1,000 <10,000	≥1,000 <10,000
N° of total COVID-19 confirmed deaths	≥10 <100	<10	<10	≥100 <1,000	≥10 <100	<10	<10	<10	≥1,000	<10	<10	<10	≥100 <1,000	<10	≥1,000	≥10 <100	≥10 <100	≥100 <1,000
Number of total pediatric COVID-19 confirmed cases	≥10 <100	≥10 <100	≥10 <100	≥1,000 <10,000	≥100 <1,000	≥10 <100	≥10 <100	<10	≥100 <1,000	<10	<10	<10	<10	≥10 <100	Not reported	≥10 <100	≥100 <1,000	Not reported

ED=Emergency Department; PED= Pediatric Emergency Department; UK= United Kingdom

§ number of eligible EDs was less than the pre-determined number of five expected participating centers for countries with a population of less than 20 million inhabitants

\* referral ED for children

# Malta: general referral ED seeing children; Portugal: 2 secondary-care PED in a hospital for adults and children; Spain: secondary-care PED in a hospital for adults and children; Sweden: secondary-care PED for medical conditions. A secondary-care PED provides specialist care upon referral by primary care, pre-hospital emergency services or other smaller hospitals, but does not include highly specialized medical care, which may involve advanced and complex procedures and treatments performed by medical specialists in a tertiary-care state-of-the-art facility.

\*\* Belgium: 3 centers did not know; Germany: 2 centers did not know; Switzerland: 1 center did not know; UK: 1 center did not know

**Table 2.** Contingency plans, guidelines and capacity

Survey question	Response options	Centers (n=102)	%	95%CI
As of March 20 <sup>th</sup> does your hospital have a written and documented contingency plan in the event of a prolonged mass incident event as seen in pandemic infections?	Yes No Don't know	73 23 6	71% 23% 6%	62-79% 15-32% 3-13%
As of March 20 <sup>th</sup> does your ED/PED have a written and documented contingency plan in the event of a prolonged mass incident event as seen in pandemic infections?	Yes No Don't know	64 35 3	63% 34% 3%	53-71% 26-44% 1-8%
When was the last time you did a simulation in your ED/PED on how to manage a mass casualty/epidemic?	Less than a week ago Between a week and a month ago More than a month ago, but less than a year ago More than a year ago Never done	8 4 34 19 37	8% 4% 33% 19% 36%	4-15% 1-9% 25-43% 12-27% 28-46%
Has your ED/PED managed a mass casualty or epidemic in the last 5 years?	Yes No Don't know	23 78 1	23% 76% 1%	15-31% 67-83% 0.1-5%
When did your institution distribute a formal management plan for suspected/confirmed pediatric COVID-19 for your ED?	Between the 15th and 31st of January Between the 1st and 15th of February Between the 15th and 29 <sup>th</sup> of February Between the 1st and 15th of March No formal plan yet I don't remember	7 15 37 39 2 2	7% 15% 36% 38% 2% 2%	3-13% 9-23% 28-64% 29-48% 0.5-7% 0.5-7%
Was the management plan above updated regularly?	No formal plan yet No, only one plan distributed so far Yes on a daily basis Yes on a weekly basis Yes every two weeks Yes, but at a different pace from above Don't know	3 1 70 20 1 5 2	3% 1% 69% 19% 1% 5% 2%	1-8% 0.1-5% 59-77% 13-28% 0.1-5% 2-11% 0.5-7%
What is the surge capacity of your ED/PED to assess suspected/confirmed pediatric COVID-19 cases simultaneously?	1 room 2 rooms 3-5 rooms >5 rooms	7 19 36 40	7% 19% 35% 39%	3-13% 12-27% 27-45% 30-49%
What is the surge capacity at your institution to admit suspected/confirmed pediatric COVID-19 cases who need admission to hospital but not intensive care?	I cannot admit these patients in my institution, they are transferred to another hospital < 5 beds 5-10 beds >10 beds	5 11 28 57	5% 11% 27% 56%	2-11% 6-18% 20-37% 46-65%

	Don't know	1	1%	0.1-5%
What is the surge capacity at your institution to admit suspected/confirmed pediatric COVID-19 cases in (pediatric) intensive care?	No PICU/ICU availability for COVID-19 at my institution	26	26%	18-35%
	< 5 beds	33	32%	24-42%
	5-10 beds	20	20%	13-28%
	>10 beds	20	20%	13-28%
	Don't know	3	3%	1-8%
Does your hospital have a formal plan to increase capacity (bed availability) for suspected/confirmed pediatric COVID-19 patients?	Yes	78	77%	67-83%
	No	22	21%	15-30%
	Don't know	2	2%	0.5-7%
Which of the following adjustments/measures has your hospital taken to be able to best manage pediatric COVID-patients in terms of staff resources/bed availability? <i>[more than one answer possible]</i>	Cancellation of planned outpatient visits	94	92%	85-96%
	Cancellation of planned surgery	97	95%	89-98%
	Cancellation of planned hospital admissions	93	90%	84-95%
	Modification of current accommodation i.e. re-organization of beds in other ped wards	76	75%	65-82%
	Telemetry and/or remote outpatient clinics by phone/teleconferencing	69	68%	58-76%
	Don't know	1	1%	0.1-5%
As part of the hospital wide contingency COVID-19 plan is there the possibility that COVID-19 adult patients will be admitted to pediatric beds?	Other	8	8%	4-15%
	No, we are a standalone children's hospital	7	7%	3-13%
	No, this is not part of the current plan	46	45%	36-55%
	Yes, this is part of the plan if in need to increase capacity for adult COVID-19 patients	43	42%	33-52%
	Don't know	4	4%	1-9%
	Other	2	2%	0.5-7%

ED=Emergency Department; PED= Pediatric Emergency Department

**Table 3.** Personal protective equipment and pre-triage

Survey question	Response options	Centers (n=102)	%	95%CI
When did your institution provide you with training on how to use and remove personal protection equipment (PPE) for suspected or confirmed pediatric COVID-19 cases?	Between the 15th and 31st of January	5	5%	2-11%
	Between the 1st and 15th of February	15	15%	9-23%
	Between the 15th and 29th of February	35	34%	26-44%
	Between the 1st and 15th of March	36	35%	27-45%
	Not provided yet	8	8%	4-15%
	I don't remember	3	3%	1-8%
Type of training <i>[more than one answer possible]</i>	Video tutorial	58	56%	47-66%
	Lecture(s)	30	29%	21-39%
	Small group training	54	52%	43-62%
	One to one face mask testing	18	18%	11-26%
	Written instructions (handouts, posters, flowcharts)	5	5%	2-11%
	Other	2	2%	0.5-7%
When did your Institution recommend setting up a pre-triage (i.e. triage process just before the current ED triage, within the hospital area) for children presenting to your ED?	Between the 15th and 31st of January	2	2%	0.5-7%
	Between the 1st and 15th of February	6	6%	3-12%
	Between the 15th and 29th of February	19	19%	12-27%
	Between the 1st and 15th of March	52	51%	41-60%
	Not recommended yet	22	22%	15-30%
	I don't remember	1	1%	0.1-5%
Which resources did your institution give you to set up the pre-triage?	Tent(s)	25	24%	17-37%
	Extra room in the hospital/department	34	33%	25-43%
	A thermoscan (infra-red thermometer)	11	11%	6-18%
	Extra-staff	38	37%	28-47%
	Other	13	13%	8-20%
	At your ED/PED clinical staff at <u>pre-triage</u> have to wear the following personal protective equipment <i>[more than one answer possible]</i>	Surgical mask	54	52%
One glove per hand		50	49%	39-58%
Protective gown		45	45%	35-54%
Hair cover		27	27%	19-36%
FFP2/N95 mask		22	22%	15-30%
Safety goggles		19	19%	12-27%
Face shield		19	19%	12-27%
Shoes cover		13	13%	8-20%
Double gloves per hand		11	11%	6-18%
FFP3/N100 mask		8	8%	4-15%
Other		7	7%	3-13%
What is the recommended personal protective equipment	Patient should wear a surgical mask	84	82%	74-88%

for patients with suspected COVID-19 in your ED/PED after pre-triage?	Patient should wear a FFP2/N95	7	7%	3-13%
	Patients should wear a FFP3/N100 mask	2	2%	0.5-7%
	Patient should not wear any mask	1	1%	0.1-5%
	None recommended yet	8	8%	4-15%
When the pediatric emergency physician evaluates a child with suspected COVID-19, he/she has to wear [more than one answer possible]	Protective gown	85	83%	75-89%
	One glove per hand	70	68%	59-77%
	Hair cover	52	51%	41-60%
	FFP2/N95 mask	49	49%	38-58%
	Safety goggles	48	48%	38-57%
	Surgical mask	44	43%	34-53%
	Face shield	36	35%	27-45%
	Double gloves per hand	22	22%	15-30%
	Shoes cover	18	18%	11-26%
In your ED/PED, what are the recommendations for the use of FFP2/N95 or FFP3/N100 masks for suspected/confirmed COVID-19 cases?	FFP3/N100 mask	11	11%	6-18%
	Other	5	5%	2-11%
	They can be used for a maximum of 6-8 hours after being worn first	46	45%	36-55%
	They should be used only once and then disposed after every single suspected case	33	32%	24-42%
	They can be used for a maximum of 12-24 hours after being worn first	11	11%	6-18%
	We do not have FFP2/N95 or FFP3/N100 masks	1	1%	0.1-5%
In your Institution, have you experienced at any time shortage of one or more of the following PPE? [more than one answer possible]	Don't know	2	2%	0.5-7%
	Other	9	9%	5-16%
	FFP2/N95 mask	44	43%	34-53%
	FFP3/N100 mask	32	32%	23-41%
	Surgical masks	26	25%	18-35%
	Face shields/goggles	22	21%	15-30%
	Disinfectant gel	21	20%	14-29%
	Protective gown	17	17%	11-25%
	Shoes cover	9	9%	5-16%
In your Institution, have you experienced at any time shortage of one or more of the following PPE? [more than one answer possible]	Hair cover	5	5%	2-11%
	Gloves	5	5%	2-11%
	No supplies shortage so far	39	38%	29-48%

ED=Emergency Department; PED= Pediatric Emergency Department

**Table 4.** ED Staff safety and service sustainability

Survey question	Response options	Centers (n=102)	%	95% CI
Does your institution have an active surveillance plan to test ED staff on a regular basis for COVID-19?	Yes	18	18%	11-26%
	No	82	80%	72-87%
	Don't know	2	2%	0.5-7%
In your Institution, are you aware of any COVID-19 case in a healthcare worker?	Yes	71	69%	60-78%
	No	31	31%	22-40%
In your Institution, if a healthcare worker has been in contact (without personal protection devices) with a confirmed case of COVID-19	He/she must be tested and in the meantime be in quarantine	31	31%	22-40%
	He/she must be tested and in the meantime can work with a surgical mask	16	15%	10-24%
	He/she must be placed in quarantine without being tested	10	10%	5-17%
	If he/she has no symptoms, can continue to work without being tested	36	35%	27-45%
	Other	7	7%	3-13%
Has any of your ED/PED staff tested positive for COVID-19?	Yes	25	25%	17-34%
	No	76	74%	65-82%
	Don't know	1	1%	0.1-5%
Have staff physicians shifts been rearranged to face the COVID-19 emergency for pediatric cases?	Yes	64	63%	53-71%
	No	38	37%	28-47%
How were shifts re-arranged? (data on n=64 positive responses to previous question)	We increased the number of ED consultants for children	14	22%	8-22%
	We reduced the number of ED consultants for children dividing them in teams to have a spare team in case someone gets infected/needs quarantine	16	25%	10-24%
	Staff physicians are organized in groups which rotate in the same way (to prevent infection among staff)	20	31%	13-28%
	Other	14	14%	8-22%

ED=Emergency Department; PED= Pediatric Emergency Department

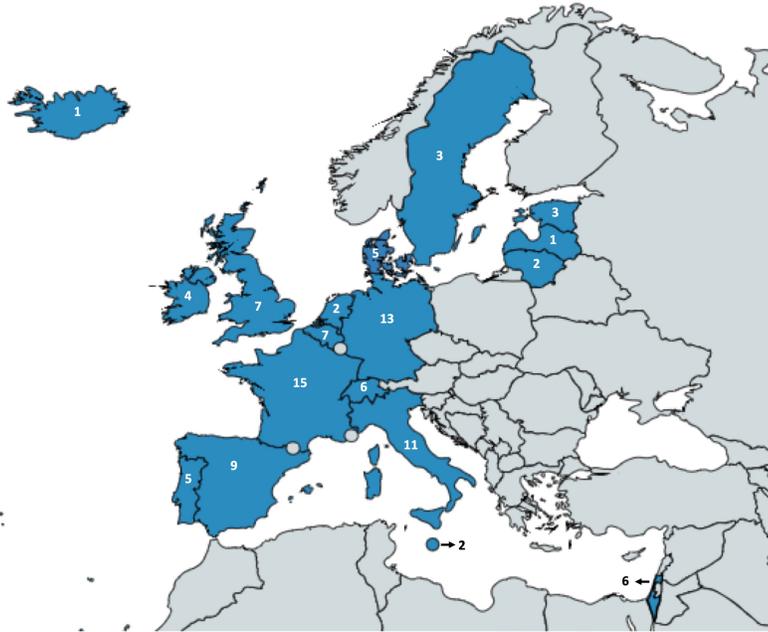
**Table 5.** Logistics and organization of ED management

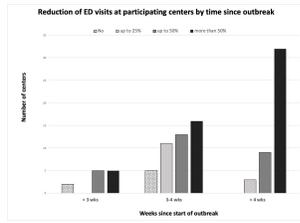
Survey question	Response options	Centers (n=102)	%	95% CI
In your ED/PED what is the policy for parental/caregiver presence of children with suspected COVID-19?	Both parents/caregivers are allowed to be with the child	13	13%	8-20%
	Only one parent/caregiver is allowed to be with the child	86	84%	76-90%
	There are no rules that establish the number of caregivers allowed in the ED	3	3%	1-8%
What is the patient flow for a suspected COVID-19 in your ED/PED after pre-triage?	Patient is taken directly to an isolation room, with negative pressure	14	14%	8-22%
	Patient is taken directly to an isolation room, but with no negative pressure	38	37%	28-47%
	Patient is taken directly in a usual visit room	7	7%	3-13%
	Patient waits in the usual waiting room	1	1%	0.1-5%
	Patient waits in a dedicated waiting room for suspected COVID-19	36	35%	27-45%
	Other	6	6%	3-12%
Where does the Pediatric Emergency physician evaluate a child with suspected COVID-19?	in an isolation room, with negative pressure	18	17%	11-26%
	in an isolation room, but with no negative pressure	63	62%	52-71%
	in a usual visit room	18	18%	11-26%
	Other	3	3%	1-8%
If you evaluate a child with suspected COVID-19, do you perform nasal/pharyngeal swab(s) for SARS-CoV-2 in the ED/PED?	Yes	79	78%	68-84%
	No	22	21%	15-30%
	Don't know	1	1%	0.1-5%
If you perform a nasal/pharyngeal swab for SARS-CoV-2 in the ED/PED to a clinically stable child (who would not otherwise require admission)	I must keep the child in a dedicated isolation room until I receive the swab result	6	6%	3-12%
	I can discharge the child home and I communicate the family the result when available	78	76%	67-83%
	I have to admit the child to a regular pediatric ward until I receive the swab result	2	2%	0.5-7%
	Children who do not need admission are not tested for SARS-CoV-2 in my ED	15	15%	9-23%
	Other	1	1%	0.1-5%
If your only criterion for suspected COVID-19 is close contact with a confirmed COVID-19 case and the child is otherwise asymptomatic and well, do you test/will you test the child in the ED/PED for SARS-CoV-2?	No, they are discharged home for isolation (quarantine)	77	75%	66-83%
	No, they are redirected to a screening clinic where swabs are done on asymptomatic patients	7	7%	3-13%
	Yes always	9	9%	5-16%
	Yes sometimes, depending on other circumstances	9	9%	5-16%
If you have a <u>confirmed</u> pediatric COVID-19 case	I must admit the child for 14 days independently of his/her clinical conditions	5	5%	2-11%
	I can discharge the child based on his/her clinical conditions, as I do for any patient, recommending home quarantine	87	85%	77-91%
	Other	6	6%	3-12%
	Don't know	4	4%	1-9%
In your city, are there specific outpatient services that provide phone follow-up of discharged children with confirmed pediatric COVID-19 cases?	Yes	49	48%	38-58%
	No	45	44%	35-54%
	Don't know	8	8%	4-15%
Are you experiencing a reduction in number of	No	7	7%	3-13%

pediatric visits in your ED/PED since the start of the COVID-19 outbreak in your country?	Yes, up to 25%	14	14%	8-22%
	Yes, up to 50%	27	26%	19-36%
	Yes, by more than 50%	52	51%	41-60%
	Don't know	2	2%	0.5-7%

ED=Emergency Department; PED= Pediatric Emergency Department

Journal Pre-proof

**Countries and number of EDs participating to the survey**



Journal Pre-proof