



## Research paper

# The impact of SARS-CoV-2 pandemic on medical personnel

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## ABSTRACT

**Introduction:** The development of the SARS-CoV-2 pandemic has been causing changes globally in economic sectors and healthcare systems.

**Aim:** The purpose of the survey we proposed, was to collect information provided directly by medical professionals during the first weeks of the SARS-CoV-2 virus epidemic about how the facilities in which they work.

**Material and methods:** An anonymous survey was addressed to all medical staff and made available on the Internet for a period of 10 days. The research group consisted of 284 people.

**Results and discussion:** Most (97.6%) of health care units have introduced changes in the way they function in connection with a pandemic, and almost every employee was informed about it (94.7%). In most centres, frequent hand disinfection (86.6%) and the wearing of face masks (60.2%) were recommended. Changes in working hours have been introduced in 60.6% cases, and nature of work has changed for 62.0% of respondents. Most respondents are afraid that they may be a source of infection for their relatives (81.3%), whilst almost half are afraid for their personal health (49.3%) and that of their colleagues (54.2%). For the vast majority of respondents, the use of disinfectants has been recommended (94.0%), the wearing of gloves (93.0%), and for 79.9% to wear protective masks.

**Conclusions:** In a survey of medical staff, most people have been experiencing increased stress due to the current coronavirus pandemic. The greatest concern among medics is the possibility of transmitting the SARS-CoV-2 virus to their relatives and colleagues. According to respondents, the current pandemic will have an impact on how the healthcare system will change in Poland.

## 1. INTRODUCTION

The development of the SARS-CoV-2 pandemic has been causing changes globally in economic sectors and health-care systems. The influenza pandemic in 1918–1920 caused a significant decline in gross domestic product, from 6% to 8%, in the countries most affected by the pandemic – this is comparable to the economic recession in 2008–2009.<sup>1</sup> Efforts made by different governments to minimize the economic effects of a pandemic are incomparable on a global scale.<sup>2</sup> The number of new cases and deaths has been increasing day by day. At the time of writing the article, over 2 160 000 cases have been confirmed in the world and over 146 000 deaths. Every day, over 85 000 SARS-CoV-2 new cases are confirmed, and over 6700 people lose their lives.<sup>3</sup>

In Poland the first case of COVID-19 was confirmed on March 4, 2020, and after about six weeks the number of infected people increased to over 7500 and the number of deaths to 286.<sup>4</sup> The growing number of cases, the duration of the pandemic – the timing of which is difficult to estimate – and its progression make it impossible to determine healthcare needs accurately. Some hospitals have already been transformed into so-called uniform infectious hospitals, and patients who were previously under the care of medical staff in a given facility were forced to find help in another centre.

Health care workers belong to a high risk group subjected to the new pathogen. This has already been observed during the SARS-CoV-2 epidemic in China, where as many as 1716 health care workers were infected with the virus, and 6 people died as of February 14, 2020.<sup>5</sup> To provide the best possible care to people with symptoms of infection, medical personnel of many facilities previously not having dealt with infectious diseases have been given special training and included in the shifts of these facilities. In all medical establishments it was necessary to adjust work in light of the epidemiological situation, which meant many changes for patients and medical staff. Different working times of medical professionals, introducing shift work, the need to admit patients with their own personal protective equipment, the necessity of stopping the practice of working at several locations, work moving to another unit, or even to another city are all examples of necessary changes.

## 2. AIM

An effective fight against the spreading SARS-CoV-2 requires the proper management of human resources and other available assets. The purpose of the survey we proposed was to gather information provided directly by medical professionals during the first weeks of the SARS-CoV-2 epidemic about how the facilities in which they work have prepared for the new epidemiological situation, and about changes in their daily work. The collected data is very interesting and can be used for further planning of staff training or setting a new work schedule.

## 3. MATERIAL AND METHODS

From April 2 to April 12, 2020, an online survey called ‘The impact of COVID-19 causing SARS-2 pandemic on medical personnel’ was published on social media. The purpose of the collected data was to analyze the restrictions introduced in medical centers. After 10 days, the research group consisted of 284 medical personnel from all over Poland. The vast majority of respondents were women – 71.8% ( $n = 204$ ), and 28.2% ( $n = 80$ ) were men;  $P < 0.05$ . Out of 284 interviewees 67.6% ( $n = 193$ ) were below 40 years of age and 247 (86.6%) were below 50 years of age. Only 13.0% ( $n = 37$ ) of respondents were between 51 and 65 years of age (mean 38.02; SD 10.109).

### 3.1. Study population

The vast majority (82.7%;  $n = 236$ ) declared work in a public entity, with 16.9% ( $n = 48$ ) working in a private unit ( $P < 0.05$ ). Over two-thirds of respondents (69.3%;  $n = 197$ ) are working in doctor’s surgeries and 30.7% ( $n = 87$ ) in hospitals. From those employed in hospitals, 71.2% ( $n = 202$ ) provide services in hospital wards, 12.0% ( $n = 34$ ) in diagnostic units, 5.3% ( $n = 15$ ) in Accidents and Emergency Units, and 2.4% ( $n = 7$ ) in administration. Medical staff employed in hospitals most often represented university hospitals (25.7%;  $n = 73$ ) and regional (voivodeship) hospitals (20.4%;  $n = 58$ ). Most respondents came from the voivodeship Wielkopolskie ( $n = 76$ ; 26.8%), then from the voivodeship Kujawsko-Pomorskie ( $n = 46$ ; 16.2%) and thereafter voivodeship Mazowieckie ( $n = 39$ ; 13.7%). Medical doctors taking part in the study were represented the best (78.5%;  $n = 223$ ), followed by general practitioners (GPs) (11.6%;  $n = 33$ ), and general and oncological surgeons (9.1%;  $n = 26$ ), as well as pediatricians (7.7%;  $n = 22$ ), and radiologists (7.0%;  $n = 15$ ). Nurses and midwives constituted 9.8% ( $n = 28$ ) of all respondents, laboratory diagnosticians 1.4% ( $n = 4$ ), medical secretaries 1.4% ( $n = 4$ ), paramedics 1.4% ( $n = 4$ ), psychologists 1.4% ( $n = 4$ ), administrative staff 1.1% ( $n = 3$ ), electroradiologists 0.7% ( $n = 2$ ), pharmacists 0.7% ( $n = 2$ ), physiotherapists 0.7% ( $n = 2$ ), radiographers 0.7% ( $n = 2$ ), biotechnologists 0.4% ( $n = 1$ ), dental assistant 0.4 ( $n = 1$ ), IT specialists 0.4% ( $n = 1$ ), nutritionists 0.4% ( $n = 1$ ).

### 3.2. Statistical analysis

The level of statistical significance was adopted at the value of 0.05. For data that is numerical, ordinal, or binary (yes/no). Data dependency used the Spearman correlation coefficient for numerical, ordinal and binary (yes/no answers) data. For the remaining data, the  $\chi^2$  test was used. Regarding the significance of percentage differences, the analysis was performed with a  $z$ -test.

### 3.3. Limitations of the study

The respondents were not verified whether they are performing a medical profession due to the anonymous nature of the survey.

## 4. RESULTS

Having analysed the information collected in the main part of the survey, changes have been introduced in 97.2% ( $n = 276$ ) of health care units due to the prevailing pandemic. Almost every employee was informed about it (94.7%;  $n = 269$ ), either by the supervisor and unit director (64.1%;  $n = 182$ ) or by colleagues (45.8%;  $n = 130$ ). Information was also provided electronically (34.5%;  $n = 98$ ) or by phone (20.8%;  $n = 59$ ) (Table 1).

The analysis of the procedures introduced by health care units was done and the results are as follows. Frequent hand disinfection (86.6%;  $n = 246$ ) and the wearing face of masks (60.2%;  $n = 171$ ) were recommended in most centers. Restrictions on third party access to medical centers (88.4%;  $n = 251$ ) were introduced, as well as the monitoring of body temperature before entering the unit (66.2%;  $n = 188$ ). Approximately half (53.5%;  $n = 152$ ) of all the respondents reported a change in their work schedule (reduction of staff / shift work). In 41.2% ( $n = 117$ ) cases, online medical services have been introduced (Table 2).

Changes in working hours were introduced for 60.6% ( $n = 172$ ) of respondents, and the nature of work changed in 62.0% ( $n = 172$ ) cases,  $P < 0.05$ . The coronavirus pandemic caused almost a quarter of doctors to change their workplace- 24.6% ( $n = 70$ ),  $P < 0.05$ . Nearly half of the respondents ( $n = 126$ ; 44.4%) experienced a feeling of being overwhelmed by responsibilities,  $P < 0.05$ , and almost everyone experienced an increase in stress levels due to pandemics ( $n = 269$ ; 94.7%) (Table 3).

Most respondents are afraid that they may be a source of infection for their relatives (81.3%;  $n = 231$ ) whilst almost half are worried about their own health (49.3%;  $n = 140$ ) and their colleagues (54.2%;  $n = 154$ ). About a third of patients are anxious that hospitals will not be able to admit all infected patients, and less than a quarter are anxious about their workplace closing down and losing income.

Training on the use of anti-coronavirus infection measures introduced in the primary place of employment was organised for half of the interviewees (50.0%;  $n = 142$ ). In the vast majority of cases, the use of disinfectants (94.0%;  $n = 267$ ) and the wearing of gloves (93.0%;  $n = 264$ ) and protective masks (79.9%;  $n = 227$ ) have been recommended. Almost half (49.6%;  $n = 141$ ) of respondents declared the need to wear face shields in their workplace, 40.5% ( $n = 115$ ) use goggles and 25.7% ( $n = 73$ ) wear protective overalls (Table 4).

Over two-thirds of respondents (70.4%;  $n = 200$ ) believe that the health care system in Poland is not prepared to meet all patients needs during an ongoing pandemic; 26.8% ( $n = 76$ ) say that the health care system can cope with the spread of SARS-CoV-2 virus only in a very limited way. Nearly three-quarters of respondents 72.2% ( $n = 205$ ) believe that a pandemic will change the health care system in Poland. However, 83.1% ( $n = 236$ ) think that its funding will not increase.

A significant proportion of medical staff (78.5%;  $n = 223$ ) have experienced a feeling of being understood by

**Table 1. Ways of informing medical staff.**

Way of informing	Frequency <i>n</i> (%)
Directly by the chief/director of the unit	182(64.1)
Directly from the staff	130(45.8)
By e-mail	98(34.5)
By phone contact	59(20.8)
By website/facebook/twitter unit's	82(28.9)
Other	20(7.0)

**Table 2. Procedures introduced by healthcare units to counteract the spread of coronavirus.**

Procedures	Frequency <i>n</i> (%)
Unit closure	15(5.3)
Hand disinfection	246(86.6)
Temperature control of people entering the workplace	188(66.2)
Does not introduce any	3(1.1)
Restricting access to the unit's premises for third parties	251(88.4)
Limitation of unit operation	169(59.5)
Putting on protective masks	171(60.2)
Staff reduction / rotational nature of work	152(53.5)
Telemedicine	117(41.2)
Other	7(2.5)

**Table 3. The biggest concerns of medical staff during the coronavirus outbreak.**

Concerns	Frequency <i>n</i> (%)
I am afraid that my close family may become infected with me when I have no symptoms	231(81.3)
I am afraid that the hospital will not be able to admit all patients with the infection	105(37.0)
I'm afraid of coronavirus infection	140(49.3)
I am afraid that they will close my workplace and lose income	67(23.6)
I'm afraid for the health of my colleagues	154(54.2)
Other	0(0)

**Table 4. Presentation of available clothes and equipment for medical staff in their workplace.**

Equipment	Frequency <i>n</i> (%)
Goggles	115(40.5)
High-visibility clothing	73(25.7)
Protective mask	227(79.9)
Safety helmets	141(49.6)
Gloves	264(93.0)
Disinfectants	267(94.0)
No protective measures	8(2.8)

their patients, and more than half (53.9%;  $n = 153$ ) have felt supported by them during the epidemic.

Having analysed the relations, the results are as follows:

- (1) People working in private units are significantly more often informed by phone about the introduced changes than people working in public units ( $\chi^2 = -0.12$ ;  $P < 0.05$ ).
- (2) Hand disinfection is significantly more common in public units than in private ( $\chi^2 = 6.83$ ;  $P < 0.05$ ).
- (3) The conclusion after the results analysis is that temperature-taking in the workplace is more common for people working in university hospitals than people working in municipal and regional hospitals ( $\chi^2 = 18.19$ ;  $P < 0.05$ ).
- (4) Restrictions to the way the units are functioning are more significant in hospitals than doctor's surgeries ( $\chi^2 = 7.09$ ,  $P < 0.05$ ).
- (5) A reduction in staff and the use of shift work have been more significant in hospitals than in doctor's surgeries ( $\chi^2 = 8.12$ ;  $P < 0.05$ ).
- (6) Telemedicine was significantly more common in private units than in public ones ( $\chi^2 = 9.38$ ;  $P < 0.05$ ).
- (7) Telemedicine is more common in ministerial hospitals than in city, district, and community hospitals. Telemedicine is more common in university hospitals than in community hospitals ( $\chi^2 = 58.16$ ;  $P < 0.05$ ).
- (8) Older people believe that the healthcare system in Poland is prepared for a coronavirus pandemic more than younger people (Spearman  $r = 0.15$ ;  $P < 0.05$ ).
- (9) Stress level in women is significantly higher than in men during the coronavirus epidemic. Women are more anxious about their loved ones than men (women: 85.3%, 174 out of 204; men: 72.2%, 57 men out of 79;  $z = 2.57$ ,  $P < 0.05$ ).

## 5. DISCUSSION

In a conducted survey, healthcare workers confirmed that changes related to the coronavirus pandemic had been introduced to their workplace and that they were informed about them. In 65.5% ( $n = 186$ ) of cases, the supervisor or the director of a given medical facility provided the staff with information on further proceedings (Table 1), in private units more often by phone than in public facilities,  $P < 0.05$ . According to Klompas, healthcare professionals should be very strict about imposing restrictions on patients and other employees in the event of mild symptoms of upper respiratory tract infection. It is particularly important to screen all people entering the medical facility.<sup>6</sup>

The main procedures used in the workplace mentioned by the respondents are (Table 3): hand disinfection (86.6%;  $n = 246$ ), restriction of entry to the facility to third parties (88.4%;  $n = 251$ ), and temperature control of all people entering (66.2%;  $n = 188$ ). Hand disinfection is carried out more often in public than private hospitals ( $P < 0.05$ ). This may be due to the fact that in the beginning of the pandemic, when such funds were lacking in the first place, they were delivered to public hospitals.

To minimize the spread of the coronavirus, medical personnel should have the necessary protective clothing and equipment for their own and patients' safety. The most frequently mentioned examples available in the workplace are: disinfectants (94.0%;  $n = 267$ ), gloves (93.0%;  $n = 264$ ), and protective masks (79.6%;  $n = 227$ ). They are necessary to ensure the best safety of both staff and patients.<sup>7</sup> Most hospitals in Poland have introduced contingency or crisis plans and are recommending the cancellation of any procedures not regarded as emergency.

Training medical staff in new procedures is one key to progress. However, nearly half of the interviewees (49.8%;  $n = 141$ ) haven't undergone any training as yet. The SARS-CoV-2 pandemic is likely to put healthcare professionals around the world in an unprecedented position as they will have to make difficult decisions and work under extreme pressure. Health care workers are especially at risk of trauma and mental health problems as they face the challenges of the COVID-19 pandemic. This is why managers of medical facilities must take proactive actions to protect their mental health.<sup>8,9</sup> Based on recent research the worst clinical course and the poor prognosis associated with old age and male sex could be the consequence of these variables on the ACE2 enzyme.<sup>10</sup> In Poland, many health care workers are in retirement age.

Over 60.0% ( $n = 172$ ) of surveyed respondents have experienced changes in their working hours and in the nature of their work. About 25.0% ( $n = 70$ ) have had to change their workplace. Working longer hours during a pandemic can't be avoided – it has been experienced by as many as 44.0% ( $n = 126$ ) of respondents. The vast majority of interviewees have experienced work-related stress during the pandemic (95.1%;  $n = 269$ ). Health care workers have been feeling very anxious that, as asymptomatic carriers of the virus, they could infect their close family (81.3%;  $n = 231$ ). It is predicted that as the pandemic progresses, many health professionals could risk mental health breakdown.<sup>11,12</sup> Most respondents (78.5%;  $n = 223$ ) have met with patients' appreciation in the current situation, and more than half (53.9%;  $n = 153$ ) have felt supported by them.

Apart from public health actions, hospitals can significantly extend access to testing through private, hospital, and public health laboratories. Rapid tests are needed to ensure that hospitalized patients are accordingly divided into groups, in a similar way to the examination of infected workers, to identify safe behaviors in the workplace.<sup>13</sup>

Summarising the responses of the survey regarding the healthcare system in Poland, 83.1% ( $n = 236$ ) of people believe that government funding for it will not increase, while 72.2% ( $n = 205$ ) think that nature of their work will change as one of the effects of the pandemic. One of the positive effects may be the development of telemedicine as a permanent element of the healthcare system. The survey showed that telemedicine in private units was more common than in public ones  $P < 0.05$ . I suggest that public units in Poland require wider access to telemedicine, which has already been introduced by private sector. The COVID-19 pandem-

ic could see a resulting call for necessary regulatory changes to be adopted to support the widespread use of telemedicine in those countries where it wasn't previously an integral part of the system.<sup>14</sup> The implementation of structural, organizational, and operational changes could optimise telemedicine and prepare health care systems for future epidemics.<sup>15</sup>

## 6. CONCLUSIONS

- (1) Most people have experienced increased stress due to the current pandemic based on self-assessment in the survey. They have significant concerns about infecting their relatives and colleagues with the SARS-CoV-2 before they start showing symptoms of the disease.
- (2) Many medical professionals have faced a change in their working hours and a change in the nature of their work.
- (3) Health care units have introduced many restrictions to minimize the risk of coronavirus infection for staff and patients.
- (4) Basic protective clothing and equipment such as gloves, disinfectants, and protective masks were made available in the units to a large extent.

### Conflict of interest

None declared.

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None declared.

### Ethics

Personal data was not processed, the survey was fully anonymous and voluntary. The anonymous survey does not have to be submitted to the opinion of the institutional review board, which was confirmed by the institutional review board at the Poznan University of Medical Science in Poland.

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