Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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"In the Eye of the Storm"—Radiographers' Experience of Working With SARS Covid-19 Patients

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A B S T R A C T

On March 11, 2020, the World Health Organization declared the spread of Covid-19 a pandemic. An overloaded sampling system was not sufficient, while radiography examinations proved to be reliable in the diagnosis of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Radiographers are front line workers whose work has contributed to the fight against Covid-19. The aim of the study is to interview and describe radiographers' experiences in caring for SARS-CoV-2 patients. This is a qualitative interview study with ten radiographers, in which both men and women participated, with various backgrounds in radiography positions. The interview study was conducted with the help of open-ended questions and a predetermined interview guide with carefully evaluated questions that allow the interviewee to speak freely about the research topic. The text obtained from the interviews was analyzed according to the model for content analysis. The results of the analyzed material from the interviews resulted in four main categories: surprise, fear, new guidelines, and the front line. The interviewees have raised the coronavirus pandemic as a challenge that has involved new ways of thinking and working. Radiographers are among the thousands of health-care workers who are at the forefront against the coronavirus pandemic. The work of radiographers is imperative in the diagnosis of patients with symptoms related to SARS-CoV-2. Radiography examinations are fundamental in the continuing care chain for Covid-19 patients.

Severe acute respiratory syndrome coronavirus 2: symptoms and diagnosis

From Wuhan to Pandemic

The epidemic of unknown respiratory infections first broke out in Wuhan, China, in December 2019, with possible links to the Huanan Seafood Wholesale Market (World Health Organization 2020). Research is underway to determine the origin of the coronavirus (Hu et al., 2020). Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causes fever, respiratory problems, and pneumonia. The disease did affect the elderly and those with underlying illnesses the worst in the beginning. The spread of Covid-19 occurs mainly through close contact between humans via droplet infection. This means that when an infected person sneezes, coughs, or speaks, small drops are spread to the environment. SARS-CoV-2 can enter the body via inhalation and by contaminated hands touching the eyes and mucous membranes in the nose and mouth (Lofti et al., 2020).

The incubation period for SARS-CoV-2 from infection until a person shows symptoms is usually estimated to be between two and 14 days. Most are expected to become ill within about 5 days of being infected, although isolated cases may deviate from these patterns (Chakraborty et al., 2020). The most common symptoms of the Covid-19 disease are cough, fever, sore throat, and difficulty breathing. Most people experience mild symptoms that come gradually and go away on their own, while some get seriously ill and experience difficulty breathing and pneumonia (Ye et al., 2020).

The polymerase chain reaction (PCR) test is the most common method for detecting an ongoing Covid-19 infection (Dhama et al., 2020). PCR testing is the method that has been used on a large scale during the Covid-19 pandemic to detect ongoing Covid-19. The virus's nucleic acid can usually be detected early in the course of infection in the sample material from the upper respiratory tract. When testing on a large scale, especially in areas where the

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proportion of a specific population that is ill is low, or when testing asymptomatic people without a clinical issue, there is an increased risk of incorrect results or false positives (Wikramaratna et al., 2020). The first confirmed death linked to Covid-19 in Sweden occurred on the same day that the World Health Organization declared Covid-19 a pandemic (Sohrabi et al., 2020). The person in question, who died in the intensive care unit at Karolinska University Hospital in Huddinge, had an underlying illness but had not been abroad, according to the Stockholm Region (2020).

Radiography examinations came to play a crucial role in the diagnosis of SARS-CoV-2 (Yang et al. 2020). The early reports from China show, among other things, the diagnostic value of the computerized tomography scan (CT scan) (Krassnitzer, M., 2020). Using CT examinations of the thorax, patients with the most common SARS-CoV-2 symptoms can detect an early or ongoing spread of Covid-19 infection in the lungs. According to Ye, Zhang, Wang, Huang, and Song (2020), PCR tests entail the risk of false-negative results, which means that CT scans can serve as a tool in the diagnosis and treatment of Covid-19. Studies have shown that the sensitivity of CT ranges up to 98% (Ye et al., 2020).

The role of radiography

Previous Research

SARS-CoV-2 is a new viral disease that will be researched for many years to come, including its origin, systematics, and disease symptoms. The diagnostic value of radiography examinations proved early on to guide the treatment and follow-up of Covid-19 patients. Research on the work of radiographers during the coronavirus pandemic has been carried out in several countries, but not to the same extent as nurses' and doctors' experiences of the pandemic. In a study on infection control and protective equipment conducted in 2020, Qu, Yang, Yang, Qin, and Yan (2020) outline the safety measures radiographers should apply when dealing with patients with SARS-CoV-2. The authors elaborate on the type of equipment that staff should wear when performing a CT examination on a Covid-19 patient, which includes disposable long-sleeved aprons, goggles, protective masks, disposable gloves, and shoe covers.

Qu et al. (2020) highlight the radiographers' collaboration with colleagues when caring for SARS-CoV-2 patients during radiography examinations and emphasize the importance of reduced contact between patients, the risk of viral transmission, and the management of examination rooms for infection prevention purposes. Stogiannos, Fotopoulos, Woznitza, and Malamateniou (2020) highlight the role of radiographers on the front line, as well as the significant role of imaging examinations and the radiographers in the diagnosis of Covid-19. Stogiannos et al. (2020) also highlight the importance of information about SARS-CoV-2 that arrives daily when more diagnostic tests are performed. This helps ensure that front line radiographers are able to gain a better knowledge and understanding of the care of Covid-19 patients on a daily basis in situations of staff and resource shortages. Finally, the authors highlight the value of front line radiographers being aware of the biggest challenges associated with examining Covid-19 patients to fulfill the professional obligation including patient safety, patient care, and optimization for patients to obtain accurate diagnoses.

Until the publication of this study, three important articles have shed light on radiographers' experiences in the world during the coronavirus pandemic. The authors used the internet and electronic surveys where they compiled questions on experiences. One article was written in Gauteng, South Africa, by Lewis & Mulla (2021), one in Ireland by Foley, O'Loughlin, and Creedon (2020), and another in the Republic of Cyprus by Zervides, Sassi, Kefala-Karli, and Sassis (2021). The authors of the three articles examine radiographers' experiences with SARS-CoV-2 during the first wave of the coronavirus pandemic. South Africa, Ireland, and the Republic of Cyprus are distant from each other, yet there is a common thread in the radiographers' experiences during the coronavirus pandemic.

The South African article interviewed a total of 60 radiographers from both the public and private sectors. South Africa, which also has a history of HIV and AIDS since 1982, which has claimed the lives of three million South Africans, is now undergoing another pandemic. The South African radiographers had to answer a question: “How has your experience been during Covid-19?” These were then coded into three different themes: new workflow, the effect on the well-being of radiographers, and psychological resilience. Under the theme of "the well-being of radiographers," they talk about the importance of not being counted as front line workers. The occupational group is counted as important but not on the front line, which can affect the allocation of resources.

The Irish radiographers that Lewis and Mulla (2021) researched had to complete two electronic questionnaires at 6-week intervals, which analyzed their experience of the coronavirus pandemic in Ireland. The goal for Lewis and Mulla (2021) was to try to reach Ireland's total of 2387 professional radiographers. The authors sought to reach out to Irish radiographers with the help of Twitter, Facebook, and operations managers. A total of 370 respondents responded to the first survey, and 266 to the second survey. A questionnaire was developed, which mainly contained closed questions. The questions were then divided into four categories: demography, infection control, employment, and psychological influence. The radiographers' sincerity about the psychological impact of the coronavirus pandemic and the anxiety of work are manifested in the questionnaires that were sent out, where 40% of respondents in Ireland talked about fatigue syndrome and 30% said that they have considered changing jobs or retiring since the onset of the coronavirus pandemic.

The authors Zervides, Sassi, Kefala-Karli, and Sassis (2021) from the Republic of Cyprus have described the radiographers from the Republic of Cyprus, the impact of the pandemic on their work, and the measures the country took to protect them from the virus. Zervides et al. (2021) draw attention to four questions: How the Covid-19 pandemic affected the work of radiographers? If a specific protocol was implemented, what type of protective equipment was used? And finally, What training and disinfection methodology were used to combat the spread of Covid-19 in the workplace? The survey was sent online to the Republic of Cyprus' 350 professional radiographers. Of the 350, 101 responses were received from 52 women and 49 men in public and private hospitals. The conclusion the authors came to was the importance of immediate training in all radiology departments. Surveys also showed that there was a lack of knowledge about infection-control methods. Zervides et al. (2021) stated in a study that regardless of whether the radiographers worked in a private or public hospital, the staff did not receive sufficient training on remediation methods. The authors propose simple means of achieving the measures needed to be taken during the pandemic by simply following the recommendations of the European Communications Agency (Revel et al. 2020).

Previous research on radiographers' experiences of the coronavirus pandemic has one thing in common that they wish to be considered front line workers and wish to have desired more education about the virus and better conditions to avoid burnout.

Purpose

The study aims to describe radiographers' experiences in meetings with SARS-CoV-2 patients in radiology departments in Stockholm, Sweden.

Method

Design

For the purpose of the study, a qualitative interview study has been applied (Granskär et al. 2008). In qualitative research, the emphasis is on the general method regarding the formulation of the initial questions and the respondents' perceptions and opinions (Bryman, 2018). This method is used to allow radiographers to speak freely and give developing answers (Kvale & Brinkmann, 2014). The study used the method to let the radiographers talk about their experiences during the coronavirus pandemic. With open questions, the Swedish respondents should be allowed to share their experiences to describe the coronavirus pandemic in the radiology department.

Selection

For the purpose of the study, radiographers from both the private and public sectors were asked to participate in the study. The criteria for the study were that the respondents were women and men, that they had 5 years of work experience, and that each participant worked in different modalities. The rationale for at least 5 years in the profession is to try to understand the change that has occurred during the coronavirus pandemic, so that they can reflect on past challenges in the profession and how they differ today with respect to the various work roles which contribute to different perspectives of the problem. Ten candidates were contacted to participate in the interviews, and with the help of clinic lectures and recommendations from colleagues, the request was sent out via email and telephone calls. The interviewees were informed in advance about how the data would be processed, that everything is confidential and anonymized, and that interviewees have the right to refuse to participate in the study retroactively. Five women and five men from general hospitals and a private clinic were interviewed. Of those interviewed, the one who worked the shortest time had worked for 5 years, and the one who worked the longest had worked for 41 years. They were managers in CT, manager in MRI, manager in conventional radiography, one manager in traditional external radiography, one sonographer, and two radiographers without the responsibility for any modality. A script was included for the interview to achieve increased compliance and for the respondents to receive equivalent interviews. The design of the script resulted from a pilot interview conducted with a radiographer who had worked for 2 years with different modalities and experienced the coronavirus pandemic.

The wording of the questions and their purpose were improved after conducting a pilot interview and receiving guidance from the radiographer on what was perceived as interesting or not useful in the future.

Ethical Considerations

The author based this study on the Swedish Research Council's four main requirements for research. These are called the information requirement, the consent requirement, the confidentiality requirement, and the use requirement.

Analysis

An example of a qualitative content analysis that was conducted from the interviews with the radiographer is discussed in the following section. The purpose is to shed light on experiences in the meeting with patients with SARS-CoV-2. Experiences of SARS-CoV-2 patients may vary from respondent to respondent. As a qualitative content analysis is used to identify variations from similarities and differences in a text, the author considered this to be the appropriate method to use. One author conducted the analysis. To get an overall picture, the text that constituted the analysis unit was first read. Then the main content of the text was reflected on. The text was then divided into two domains: events and experiences. Subsequently, units of meaning were identified that were condensed, abstracted, and named with a code. Ten interviews were condensed and coded. The codes were compared for similarities and differences and were sorted into ten preliminary categories. After comparing content within and between the categories, these were combined into four categories. Examples of sentence units, condensed sentence units, codes, and categories are shown in Table 1. Then a theme was formulated based on the text as a whole. The emergence of the theme is a process that takes place throughout the analysis work (Lundman and Graneheim, 2004).

Results

The Surprise

First meeting with Covid-19

The interviewees' experiences in the first meeting with Covid-19 patients vary greatly depending on work experience and individual background. Some respondents experienced the entry of the coronavirus as a way of experiencing health care, while others found it frustrating and unfortunate to work in a workspace with an already high workload. The collective perception among the participants is the lack of preparation in the form of equipment and handling of seriously ill patients. News reports arrived daily in the first weeks of 2020 about a new virus that had caused severe acute respiratory symptoms in Wuhan, China. There were warning signs about the virus's ability to spread around the world. The participants convey thoughts about their first encounter with the coronavirus.

> "Yes, I remember that. Several people were taking care of a patient, no one was wearing a mask, and no one said that the patient had COVID. It happened in this hospital. It turned out that about a hundred employees had to take care of this patient, and no one knew he had COVID. He was then taken to the CT scan, and no one knew what was wrong with him."

> "He had a dry cough, but he felt like something inside needs to be discharged, but nothing came out. In any case, I read the referral with my colleague and didn't know if it was the coronavirus that we were dealing with."

> "Nothing was special about that day, but things started to change in the coming few weeks in March and April. At CT, colleagues had to work more and more because of COVID. In two labs, they were working around the clock. All patients initially tested negative for the samples, which weren't very secure, but they had COVID symptoms shown in the lungs when they got to the CT scan."

Table 1
Themes that emerged during the analysis

The surprise	First meeting with Covid-19
	New challenges
Fear	Fear of being infected with SARS-CoV-2
	Fear of infecting others in their environment
Guidelines	Protective equipment that was missing
	New guidelines
The front line	Radiography as a tool in the diagnosis
	Reliability of radiography

New challenges

The interviewees recalled their first experiences caring for Covid-19 patients in 2020. The participants have several years of experience in the radiographer profession and work on various modalities such as CT, magnetic resonance imaging, and conventional plain radiography. Something with which the participants are familiar is the feeling of being taken by surprise by the Covid-19 virus. SARS-CoV-2 was spreading in China, and no one thought it would reach the hospitals in Sweden, which explains why hospitals did not have set guidelines and protective equipment available for a worst-case scenario. Doctors realized the value of conventional X-rays and DT examinations in the health-care chain when PCR tests have shown false-negative results despite patients showing symptoms of Covid-19. This meant an increased demand for examinations, which contributed to the interviewees experiencing an increased workload in the radiology department.

> "We could take ten or more radiographs every day at the intensive care unit (IVA). Then we would have radiographs for four patients more at the same time. Then we would come back after a few hours and take more patients. But the feeling in the department was that no one has the energy to get up again."

> "It is hard when you stand there as a nurse by yourself because sometimes a patient cannot get up and you need help. You need someone to transfer the patient to the CT table. We may need to call another person and help each other while wearing protective equipment to transfer the patient."

Fear of Being Infected With SARS-CoV-2

There was an immediate fear of becoming infected with the virus among the radiographers after the first meeting with Covid-19 patients. During the first weeks of 2020, the respondents experienced some understanding of a new virus that caused respiratory infections but not much information about which age groups it affects. The reports from abroad turned out to contain sensational headlines where people of various ages and genders, and individuals with unknown underlying diseases, had been hit hard by SARS-CoV-2. The interviewees were in a situation where they had to stay up to date on new studies regarding the virus's ability to spread and how best to prevent infection between staff and patients in the hospital environment. One of the interviewees specifically says that the hospital management and the heads of operations were also surprised by the first known case of the virus at the hospital. The participants felt that there was help available if they wanted to discuss the stress they were under during the first Covid-19 wave. They could turn to the hospital's management and the heads of operations. There was access to help, but the respondents considered the managers' knowledge of the subject to be lacking; there was little help that could incorporate safety into the continued work.

> "I do not think there was much support, I think the disease was so new, and it was the first time we had ever experienced a pandemic, so we did not know if the managers could handle the situation."

> "In the beginning, I was pretty worried. We were all worried about what kind of virus it was. You heard stories about young people who became very ill and about colleagues who died. We did not know that it mainly affects the elderly."

Fear of infecting others in their environment

A contributing factor to this sense of fear was the fact that secondary information from news or social media reached the radiographers. They talk collectively about taking 1 day at a time and about how guidelines were gradually put forward, as well as protective material that could be used when caring for patients. The fear of becoming infected at work and passing the infection on to family members is one thing that all participants point out as something they are aware of and bothered about during the coronavirus pandemic. An interviewee also says that you can count on new diseases, pandemics, and a high work pace when you work in health care. It would help if you did not forget that the virus is also present in society and not only in the hospital environment.

> "I think that this is something one has to expect when applying for this profession. When you go on an internship, you can come into contact with people who have an infection, and you still need to deal with it; otherwise, this profession does not suit you. Yet, I do understand that this is an extreme situation. Thus, you have to do the best you can and follow the experienced nurses. The virus is everywhere, so you don't have to be a nurse to get infected."

> "I do not know if fear is the right word. The only thing I had in mind was not to get infected as my wife is asthmatic and I did not want to risk getting infected and bringing the infection to her. For ten months, you would always feel the pressure of going to work and not getting infected because we never know how one's body would react to the virus."

Guidelines

Protective equipment that was missing

At first, the risks of the virus spreading from Asia to Sweden seemed minimal. It took until March 11, 2020, for Covid-19 to be declared a pandemic, and a shortage of protective equipment occurred. Participants talked about recommendations that arose and changed daily depending on the type of protective equipment available. The delay in receiving protective equipment meant that the radiographers had to create their own visors and aprons while waiting for delivery. The participants also talked about the guidelines that were quickly established for the safety of the employees. The experience of the first wave during the Covid-19 pandemic was a time of learning for the radiographers. Professional working life looked different from day to day, and each radiology department gradually received guidelines that meant more and better protective equipment for the staff.

> "They had not planned for this, but I think it should have been a little better with the planning there, especially with instructions on how we would use this equipment, the protective equipment. I do not think it was so clear; there were different messages."

> "We were not prepared in the least. It was the protective equipment that was most needed; they constantly changed our guidelines. First, you needed to have full uniforms, and then they said, when you were told that there was no protective equipment, the managers came out and said that we do not need to have full attire, and then you become… you question it."

> "Individual patients started coming in, because we have emergency operations as well, so I remember that, and I remember that the first time I would have a patient, we had no routines written down, talked through, finished, so to speak; that is why I remember it."

New guidelines

Radiographers work in an environment where radiation is part of the process of diagnosing patients' pathology. This also meant

new guidelines on protection against radiation. Patients with Covid-19 symptoms are contagious, so the workplaces set up guidelines which stipulated that the radiographer must be inside the room throughout the examination. One respondent talks about how, to reduce the risk of spreading infection, they can stay inside the examination room with protective equipment, a lead apron, and behind lead screens instead of undressing the patient and waiting in the control room. It is not uncommon for one of the most frequent examinations to take 20-30 minutes per patient. Hospital physicists are responsible for placing lead screens in the examination room and for radiation safety in the workplace; there is still some doubt about safety among the respondents.

"We all thought it was not so safe to stand inside without using lead aprons, due to the radiation in the room, so our physicists also came and measured and placed lead screens, which would prevent the radiation from reaching the staff, but I always wear a lead apron because I feel safest with it; then there are others who do not wear it; it is supposedly still safe, it supposedly does not give a high radiation dose at all. I was more worried about the radiation than the corona because we have to stand in there with the patient, so that was, from my point of view, the most stressful."

The Front Line

Radiography as a tool in the diagnosis

During the Covid-19 pandemic, radiography examinations have played an important role in the diagnosis and follow-up of SARS-CoV-2 patients. Even as nasopharyngeal secretion tests repeatedly showed negative results, conventional plain radiography and CT examinations have acted as a complementary tool in the fight against SARS-CoV-2. IVAs and medical IVAs have been given much attention in society because of the high workload with Covid-19 patients. The interviewees find that radiography and radiographers have not been noticed by the media or received the recognition they deserve during the pandemic. The thoughts of all respondents are that Covid-19 patients have passed through the radiology department in the care chain. The interviewed radiographers talk about recurring Covid-19 referrals from doctors who want to diagnose COVID changes or pulmonary embolism in sick patients. They also point out that in principle, they are on the front line as much as the IVA but are not lauded to the same extent because of the fact that society as a whole does not know what a radiology department does. This means that they do not feel appreciated for the work they do during the pandemic. One respondent says that it should not be something to complain about but that it would be appreciated by the employees if society also knew about their struggle on the hospital floor.

"We have not been mentioned in the media. No one thought that radiographers are struggling and should also be praised for their efforts. It is as if we do not exist in this fight against COVID."

"Almost all corona patients go through radiology, so my colleagues and I felt that we did not get the appreciation that we deserve."

"All patients with COVID have ended up with us at some point, but there is not much talk in the media about radiographers."

Reliability of radiography

In the first wave of the Covid-19 pandemic, when PCR tests were scarce, it took time to get a result, and when many suspected cases had to be assessed, DT was sometimes used for diagnostic purposes. Many factors affect the sensitivity of the PCR test, such as the duration of symptoms, the quality of the sample, and the analysis or viral load when the test is performed. Thus, a PCR test may need to be repeated several times, especially when clinical suspicion is high, but the test results are negative. Doctors then considered DT examinations to be fast and reliable in an early diagnosis of Covid-19. DT examinations are widely used in other lung diseases, such as pneumonia. The radiographers talk about how the most common referral issues could be about Covid-19 changes or pulmonary embolism due to confirmed or suspected SARS-CoV-2.

"During the first wave, it seemed that doctors were able to tell the differences in the lungs and to tell which patients were infected or not … Now, it is a standard examination. If the patient has difficulty breathing or the like, then it is either a pulmonary embolism or COVID."

"If there's one thing I want to say, it's that we radiographers are in the middle of everything. When a patient comes in with a cough, feeling sick, or experiencing other symptoms, it is us who find out if the patient is positive. We take a lot of samples and then send the patient for a DT thorax test to rule out COVID symptoms."

A widespread Covid-19 infection is manifested on conventional X-ray and DT examination. The radiographers may look immediately after each examination to see if a suspected or confirmed patient suffers from Covid-19. The respondents work in an emergency hospital and have, during the Covid-19 pandemic, dealt mainly with acute coronavirus cases. Radiography acts as a tool in the diagnosis of SARS-CoV-2, and the radiographers have experienced extensive increases in radiography examinations during the pandemic, which also broadens the way for an overloaded system where time for recovery is scarce. The radiography examination's ability to diagnose and follow up old and new diseases opens up the possibility of further research, and the radiographers' work can be highlighted more in a time of extensive media coverage of the coronavirus. Radiographers and radiography examinations will continue to play an essential role in the future of health care when new pandemics and diseases arise.

Discussion

To achieve maximum credibility, radiographers with long experience in their work were selected to participate in the study, from 5 years up to 41 years. Their knowledge extends in several modalities, and they have been involved in the HIV pandemic, the H1N1 outbreak in 2009, and Middle East respiratory syndrome coronavirus (MERS-CoV) during their professional lives. Respondents have firsthand information about meetings with SARS-CoV-2 patients. Most people remember the feeling in the first meeting with a confirmed Covid-19-infected patient. The first encounter with a patient who was suspected or confirmed to have coronavirus took place in the first months of 2020; the impression of fear and uncertainty is close in mind. At the time of execution of this study, the radiographers are still struggling with the second wave of the pandemic. The author deliberately chose to focus on a broad front, ie, to reach out to radiographers with experience of different modalities and to get various perspectives on the experiences of SARS-CoV-2 patients. The aim was also to investigate whether the pandemic caused an increased workload on all modalities where the radiographers usually work. Deliberate dissemination of experience and background in the respondents has been carried out. The opportunity to interview modality managers within DT, conventional plain radiography, external radiography, sonography, and magnetic resonance imaging has also contributed to a greater understanding of how new guidelines were

implemented and what new changes the radiographers who are responsible for the modality had to make to improve the situation for employees.

The first encounter with a patient infected with SARS-CoV-2 was shocking to the Swedish radiographers. They had read and listened to the news of a new virus spread in Wuhan, China, that caused severe pneumonia in the victims. They could not imagine that the virus would reach Sweden's borders. The radiology department is a place where radiographers can meet patients with several possible diseases. The first meeting with Covid-19 is sudden for all employees, although, in retrospect, not very unexpected as the radiology business handles highly acute cases. Radiography and radiology also came to act as a first or second step in the diagnosis when nasopharyngeal secretory test results were delayed, and the doctors needed a quick and safe diagnostic method. In an article from London, England, the authors Stogiannos, Fotopoulos, Woznitza, and Malamateniou (2020) talk about the limitations of antigen tests in getting fast results, especially in the beginning, and the relatively high number of false negative and false positive results, as well as the limited availability of antigen tests during the Covid-19 outbreak. Furthermore, the authors talk about the imaging methodological significance for possibilities in diagnosing, managing, and treating Covid-19. Imaging methods may also be helpful for differential diagnoses of Covid-19 and similar viral respiratory diseases. Conventional plain radiography, CT, ultrasound, and MRI are the most commonly used modalities, with both pros and cons that the authors emphasize.

An article by Foley, O'Loughlin, and Creedon (2020) examines the experiences of Irish radiologists with the coronavirus pandemic. In an online survey, 75% of 370 respondents describe the fear of passing Covid-19 on to the family after each work shift. The Swedish radiographers surveyed experienced similar feelings after working with Covid-19 patients during the first wave in Sweden. The respondents with families in Sweden talk about the fear of transmitting the infection to partners and children. People can be asymptomatic and, at the same time, contagious, which they found frustrating. Fear was evident in all the interviewees, as they initially did not know about the disease's impact on the body and its spread.

Similar interview studies have been conducted globally, but nothing similar in Sweden based on the experiences of radiographers. In Ireland, South Africa, and the Republic of Cyprus, interview studies have been conducted which draw attention to X-rays and the role of X-ray nurses in the fight against Covid-19 pandemics. Foley et al. (2020) talk about similar experiences that Swedish radiographers had during the Covid-19 pandemic. Irish radiographers have at one time or another been exposed to SARS-CoV-2 in the absence of protective equipment, due to poor communication between staff, or in the absence of suspected patients.

The radiographers talk about the lack of preparation in health care. The first announcement from the public health authority regarding the coronavirus was published on January 16, 2020, approximately 2 weeks before the first confirmed case in Sweden on January 31. The respondents talk about the lack of face masks, visors, and aprons. The respondents' answers regarding Sweden's delayed response to the coronavirus can be linked to the Swedish Public Health Agency (2020), which assessed the risk of cases in Sweden to be very low. One respondent states that at the first meeting with a suspected Covid-19 patient, well-functioning face shields would be developed that were not available in the current modality. The respondents show that protective equipment was deficient and, in most cases, was not available, which could be linked to the fact that it had not been needed before. However, cases such as tuberculosis, winter vomiting, and pneumonia are common in the radiology department.

According to Kooraki et al. (2020), the authors' recommendations on protective equipment can be linked to what the radiographers need to wear not to become infected with the coronavirus. With the help of the WHO (World Health Organization) and CDC (Centers for Disease Control and Prevention), the authors ascertain what type of protective equipment health-care professionals are expected to wear for the best possible protection. This includes the use of N95 masks when radiographers are in close contact with a confirmed or suspected Covid-19 patient. In addition, long-sleeved disposable aprons should be used if there is a risk of drip infection, along with disposable gloves, eye protection, and a visor that covers the eye protection. This is something that all respondents describe as nonexistent.

The results of the interviews show that radiographers have had a tough and transformative year with the Covid-19 pandemic. Much has changed during the past year, where there is reflection and optimism for the future among those surveyed. A pandemic is something that not everyone expects to experience during their working lives. The transition from the first Covid-19 patient to implementing new guidelines and working methods took place overnight. Fatigue and anxiety are emotions that all the radiographers dealt with during this period. All respondents agree that more could have been done to ensure staff health had better guidelines been prepared for similar situations. However, most agree that such a thing is difficult to predict, as Sweden had not experienced anything like it before.

Lewis & Mulla (2021) describe the situation for the radiographers in Gauteng, South Africa, similar to the one in Sweden where they experienced a feeling of not belonging to the front line in the same way as other professions in health care. This has led to them not receiving proper protective equipment in some cases. Furthermore, the results of this study show that radiographers in Sweden have had similar experiences as radiographers abroad in the form of a higher workload and a feeling of not belonging to the front line. One possible explanation, which a respondent mentioned during the interview session, is that radiographers have not been allowed to be heard in the media or social media to the same extent as the staff at an IVA. This has led to radiography being overshadowed, but almost every patient admitted to an IVA has had a CT examination or mobile radiography examination performed in the IVA. The radiographers believe that their efforts during the Covid-19 pandemic have been as extensive as other health-care staff.

Limitations of the Study

Owing to the qualitative design of the study, ten radiographers were interviewed, and it was conducted in three radiology departments in Stockholm. Stockholm was the first most hit area in Sweden with Covid-19, and the three included acute hospitals met this patient at first in line.

Conclusion

Radiographers are allowed to see patients with various diseases, from neonatal to elderly in the final stages of life. The radiographer's work is to perform an optimal examination that is as painless as possible for the patients. The coronavirus pandemic put the health-care system in a difficult situation where protective equipment was lacking, and acutely ill patients with cough, fever, and respiratory problems arrived at the hospitals. The radiographers were among the thousands of front line workers in the fight against the pandemic. Their work in the care of SARS-CoV-2 patients has contributed to thousands of patients getting fast and safe results in the first or second stage of the health-care chain.

CRediT authorship contribution statement

Avalos Jorge: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization. **Kent Fridell:** Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration, Funding acquisition.

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