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COVID-19 vaccination strategy for hospital staff in Germany: a cross-sectional study in March–April 2021

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SUMMARY

Background: SARS-CoV-2 vaccination for healthcare workers (HCWs) started in Germany in December 2020. Hospitals had little time to prepare a vaccination strategy.

Aim: To gather information on the initial vaccination strategy for HCWs from the infection control practitioners in Germany.

Methods: A cross-sectional, ethically approved questionnaire was developed, formatted as an online survey and pre-tested. Infection control practitioners responsible for hygiene/infection prevention in 987 randomly selected German hospitals were invited to participate in the survey in March and April 2021. For statistical analysis, the hospitals were categorized into two groups based on bed capacity (<500 beds: small; ≥500 beds: large).

Findings: One hundred out of 987 (10%) infection control practitioners completed the survey. In 80% of the participating hospitals, HCW vaccination prioritization was based on recommendations of the German standing committee on vaccination (STIKO). Even so, only 54% prioritized the vaccination of HCWs with contact to vulnerable patients, thus deviating from STIKO recommendations. HCWs with a high personal health risk were prioritized for vaccination in 24% of the hospitals. Transferring unvaccinated HCWs to an area with less infection risk was considered by 2% of large and 12% of small hospitals.

Conclusion: Vaccination prioritization differed across hospitals and deviated from STIKO recommendations. A pandemic preparedness concept should address the potential impact of divergent strategies compared to a common approach. In addition, further studies analysing the reasons why HCWs remain unvaccinated are needed to adopt effective

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strategies. This is especially important against the background of facility-based compulsory vaccination.

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Introduction

Since March 2020, the coronavirus disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus type 2 (SARS-CoV-2), has been declared a pandemic by the director of the World Health Organization (WHO) [1]. According to the WHO dashboard, there have been more than 380 million confirmed cases including more than 5.7 million death cases around the world by the beginning of February 2022 [2]. In Germany, about 11 million COVID-19 cases have been confirmed and more than 400,000 cases were hospitalized by the beginning of February 2022 [3].

The high number of hospitalized COVID-19 patients has increased the risk for healthcare workers (HCWs) and non-COVID-19 patients to contract nosocomial COVID-19 [4]. Many infected persons are asymptomatic or presymptomatic [5–10]. Currently, transmission of the newest Omicron variant of concern has been observed to be greater than for other variants, even in fully vaccinated persons [11,12]. Persons in hospital (patients, HCWs, visitors) shedding this variant may spread the infection further among staff and patients.

The vaccination campaign in Germany started in late December 2020 [13]. During the first weeks, there were repeated vaccine bottlenecks because demand exceeded supply [14,15].

According to the German Infection Protection Act (IfSG), hospitals are obliged to provide necessary strategies to prevent nosocomial infections. COVID-19 vaccination for hospital staff is one of the organizational infection prevention strategies recommended by both the Commission on Hospital Hygiene and Infection Protection (KRINKO) and the German Standing Committee on Vaccination (STIKO) [16]. HCWs working in an area with high risk of exposure to SARS-CoV-2, especially in COVID-19 areas and emergency departments, were the highest priority for vaccination according to the recommendations. Priority was also given to HCWs who regularly have contact with patients at high risk of severe COVID-19. The next level of priority for vaccination was HCWs working in COVID-19 testing centres. The lowest priority was for other HCWs with low exposure risk, for example laboratory personnel and staff working in non-clinical areas [17]. HCWs at high personal risk were not explicitly prioritized beyond the level for their job role [17].

Vaccination for HCWs in some federal states in Germany started in late December 2020. However, about 17% of hospital staff in Germany, who participated in an online survey on COVID-19 vaccination by the German Public Health authority Robert Koch Institute (RKI) in March–April 2021, had not yet been vaccinated [18]. About 10% of HCWs categorized as highest priority did not have full immunization at this time. Of these unvaccinated HCWs, most reported that they were not offered vaccination (44%). Some were afraid of permanent side-effects (25%) or vaccination reactions (25%). Other reasons for being unvaccinated included lack of adequate vaccine information (7%) and problems making appointments (11%) or finding a vaccination location (1%) [18].

The aim of this study was to gather information from hospitals' perspectives regarding vaccination strategies for hospital staff. These strategies include the distribution of vaccination information, staff prioritization and registration, and dealing with unvaccinated staff.

Methods

This was a multicentre observational cross-sectional study of a sample of German hospitals. Data were collected in March and April 2021.

Sampling process

A random sample of hospitals across Germany, stratified according to size, were invited to participate. Hospital infection control practitioners responsible for implementing infection control strategies for their hospital were surveyed about the strategies of the individual hospitals, but not about their personal attitudes and perceptions. Further details of the sampling process are provided in the Supplementary Appendix.

Questionnaire

An interdisciplinary and interprofessional team of experts in infection control, infectious diseases, hygiene, microbiology and virology, infectious epidemiology, public health, and general medicine developed the questionnaire to collect information regarding characteristics of respondents and vaccination strategy for hospital staff. A preliminary questionnaire was prepared and pre-tested on infection control experts from the Scientific Working Group 'Hospital Hygiene: Prevention of Infection and Antibiotic Resistance' and Standing Committee 'General and Hospital Hygiene' ($N = 5$) of the Deutsche Gesellschaft für Hygiene und Mikrobiologie (DGHM), who have not been selected in the whole sampling process. Adjustments to the questionnaire were made accordingly. The questionnaire is provided in the Supplementary Appendix.

For the survey, we used the online survey tool LimeSurvey (<https://www.limesurvey.org/>). Infection control practitioners in 987 hospitals across Germany were invited to participate by e-mail. Participation was anonymous. This project previously received positive ethical consent by the ethics committee of the University Medical Centre Göttingen under the file no. 5/2/21 An.

Data analysis

Data were analysed using SPSS 26 (IBM Deutschland GmbH, Ehningen, Germany). For statistical analysis, hospitals were defined as small (0–499 beds) or large (≥ 500 beds). Relative frequencies were calculated for each item. To estimate the relevance of statistical differences according to hospital size, Fisher's exact test was performed. Statistical significance was defined as $P < 0.05$.

Results

Respondent characteristics

In all, 151 out of 987 invited infection control practitioners accessed the survey but only 100 (10%) completed it. Forty-nine small hospitals (response rate: 6%) and 51 large hospitals (response rate: 22%) were represented. The survey was performed during the second wave of the pandemic in Germany and the target group was under high pressure to implement infection control strategies and prevent hospital outbreaks at this time. The characteristics of the respondents are shown in Table I. Sixty-one percent were directors or heads of their departments, and around 90% had a clear qualification in hygiene and infection control. The hospitals were mostly located in the west region of Germany (36%) followed by the south (26%) and north (21%) regions. Nineteen percent of the hospitals were university hospitals.

Information to staff

In most (97%) hospitals, staff were informed about vaccination (Table II). The most prevalent mode of information delivery was electronic text format (e.g. e-mail, intranet posts). Some hospitals provided information through other types of digital media (e.g. audio podcasts, short videos). In-house communication platforms were the most prevalent distribution source in all hospitals regardless of size. Relatively

few hospitals (12%) used homepages and social media accounts to communicate vaccine information to their staff.

Vaccination

The majority of clinical staff in both hospital size groups with or without direct contact with COVID-19 patients received a vaccination offer from their employers (Table III). Other HCWs (e.g. cleaning service or laboratory staff) were also offered vaccination in 90% of both large and small hospitals. Vaccination offers to scientific staff and students were more prevalent in large hospitals.

All large hospitals and about 90% of the small hospitals prioritized vaccination of the staff working in COVID-19 areas. However, prioritization of staff treating extremely vulnerable patients, which were supposed to have equal priority, was reported by only 54% of hospitals. Interestingly, only 24% of hospitals prioritized the vaccination of staff with a high personal health risk.

Self-reported prioritization of offers was mostly (80%) based on the recommendation of the STIKO. However, prioritization based on agreements between the local vaccination task forces and ethics committee (20%) or based on the decision of the directors (23%) was also reported. The latter was more prevalent in large (29%) than in small (10%) hospitals.

The option of registering for vaccination by e-mail was reported by 58% of the hospitals; 36% offered registration via telephone vaccination hotline (36%), and 24% offered booking directly through an in-house website (24%). A specific website for this purpose was more frequent in large (28%) than in small (8%) hospitals. Most (87%) hospitals offered vaccination through an on-site centre. However, 6% of hospitals referred their staff to communal vaccination centres.

Table I
Characteristics of participating hospitals/personnel

Characteristic	% (N = 100) ^a
Infection control practitioner's position	
Director/head of department	61
Acting director/head of department	5
Not in the leader position	34
Infection control practitioner's competence area (multiple answer possible)	
(Hospital) Hygiene	93
Microbiology	17
Virology	6
Public health	8
Region	
North (Bremen, Hamburg, Niedersachsen, Mecklenburg-Vorpommern, Schleswig-Holstein)	21
East (Brandenburg, Berlin, Sachsen, Sachsen-Anhalt, Thüringen)	17
South (Bayern, Baden-Württemberg)	26
West (Nordrhein-Westfalen, Hessen, Rheinland-Pfalz, Saarland)	36
Hospital status	
University hospital	19
Non-university hospital	71
Others ^b	10
Hospital size	
Small hospitals	49
Large hospitals	51

^a The relative and absolute frequencies are identical.

^b Outpatients clinic, rehabilitation centre, medical care centre.

Unvaccinated staff

The majority of respondents reported provision of information as their approach to unvaccinated HCWs (Table IV). Transfer of unvaccinated staff working in a high-risk area to lower-risk areas was deployed by 12% of small and 2% of large hospitals. Moving unvaccinated staff with a high personal health risk was done by 10% of hospitals. Around 10% of hospitals had no specific strategy for handling unvaccinated staff.

Discussion

Our data show that hospitals in Germany implemented a vaccination strategy to assure a safe environment for employees and patients during the COVID-19 pandemic. To increase staff awareness and participation in vaccination, hospitals promoted and communicated the latest information through various media, especially digital media. In early 2021, vaccination offers were made based on priority. Besides the main challenge of organizing these vaccinations during a wave and despite the vaccine shortage, there was also the question of how to deal with unvaccinated staff.

A large proportion of hospitals reported providing staff with the most up-to-date information on vaccination, contrasting with the RKI report that some HCWs in Germany felt under-informed [18]. One possible reason for this divergence is that the format for delivery of information was mainly electronic,

Table II
Vaccine information targeted towards staff

Information	Small hospitals, % (N = 49)	Large hospitals, % (N = 51)	Total, % (N = 100)	P-value ^a
Deliver up-to-date vaccine information to staff	95.9	98.0	97.0	0.614
Form of media (multiple answers possible)				
Print text	22.4	11.8	17.0	0.248
Electronic text	46.9	45.1	46.0	1.000
Audio-video podcast	8.2	11.8	10.0	0.792
Audio podcast	2.0	0.0	1.0	0.990
Platform to deliver information (multiple answers possible)				
In-house communication platforms	49.0	45.1	47.0	0.841
Homepage of the hospital	12.2	11.8	12.0	1.000
Social media of the hospital	6.1	7.8	7.0	1.000

^a Fisher's exact test; $P < 0.05$ defined as significant.

and this format may not be readily accessible to all types of HCW, either because they had no time at work during the pandemic, or they had limited access to electronic media at work

[19,20]. Information overload during the COVID-19 pandemic could also be a reason, for example vaccination information may have been overshadowed by other more important information,

Table III
Vaccination strategy for staff

Strategy	Small hospitals, % (N = 49)	Large hospitals, % (N = 51)	Total, % (N = 100)	P-value ^a
Vaccination offer (multiple answers possible)				
Medical staff with direct contact to COVID-19 patient	91.8	98.0	95.0	0.200
Medical staff without direct contact to COVID-19 patient	93.9	98.0	96.0	0.357
Scientific staff ^b	36.7	56.9	47.0	0.048
Administrative staff	71.4	74.5	73.0	0.823
Other (e.g. cleaning service, laboratory staff)	89.8	90.2	90.0	1.000
Students	49.0	74.5	62.0	0.013
Trainees	73.5	76.5	75.0	0.819
Prioritized invitation for vaccination (multiple answers possible)				
Staff in high infection risk area	91.8	100.0	96.0	0.054
Staff with high personal health risk	26.5	21.6	24.0	0.642
Staff contact to vulnerable patient	49.0	58.8	54.0	0.422
Staff in administrative department	26.5	21.6	24.0	0.642
Establish prioritization (multiple answers possible)				
Recommendation of STIKO	79.6	80.4	80.0	1.000
Agreement between Corona-Vaccination task force and ethics committee	10.2	29.4	20.0	0.024
Decision of the hospital directors	18.4	27.5	23.0	0.345
Registration (multiple answers possible)				
In-house internet website	18.4	29.4	24.0	0.244
Specific website	8.2	27.5	18.0	0.018
Telephone vaccination hotline	38.8	33.3	36.0	0.678
E-mail	65.3	51.0	58.0	0.162
In person	6.1	2.0	4.0	0.587
Written registration	6.1	3.9	5.0	0.962
Vaccination location				0.239
Vaccination centre in the hospital	83.7	90.2	87.0	
In the hospital medical service	6.1	7.8	7.0	
In the communal vaccination centre	10.2	2.0	6.0	

^a Fisher's exact test; $P < 0.05$ defined as significant.

^b For example, a research assistant with or without contact to COVID-19 patients.

Table IV
Considerations on the perspective of dealing with the unvaccinated staff

Consideration	Small hospitals, % (N = 49)	Large hospitals, % (N = 51)	Total (N = 100)	P-value ^a
Medical personnel at very high risk of SARS-CoV-2 infection				0.203
No further strategy	6.1	13.7	10.0	
Deliver further vaccination information	71.4	68.6	70.0	
Transfer to another working area	12.2	2.0	7.0	
Staff with a high health risk				0.288
No further strategy	8.2	7.8	8.0	
Deliver further vaccination information	73.5	62.7	68.0	
Transfer to another working area	12.2	7.8	10.0	

^a Fisher's exact test; $P < 0.05$ defined as significant.

such as changes in clinical protocols [21,22]. Third, the information provided may not have been adequately targeted towards different HCWs' background knowledge. Fourthly, employer-produced information may have become lost in the huge amount of divergent and emotional information in everyday media including social media. Therefore, a good communication strategy that allows feedback and adaptation is important.

The RKI study also reported that some employees had problems making appointments and accessing vaccination [18]. Our data showed that although various registration methods had been developed, 60% of hospitals offered only one method for making appointments. Also, in small hospitals especially, HCWs were sometimes expected to attend off-site community vaccination centres, which may have produced a disincentive for many reasons, including access to transport and having to find time to attend an off-site location. However, hospital-based vaccination centres present financial and organizational challenges that are not sustainable for all hospitals. By contrast, community vaccination centres are financed by the states as well as the statutory and private health insurance schemes (§7 Coronavirus-Impfverordnung).

Rather than the STIKO guidelines, some hospitals followed local vaccination prioritization recommendations or the decision of the hospital directors. Unfortunately, we did not ascertain how local practices deviated from the STIKO recommendations. It might be expected that local rules would be tailored to meet local needs but remain true to the principles of the STIKO recommendations. However, we found that HCWs in contact with vulnerable patients were not prioritized in almost half of hospitals. We also found that HCWs with high personal health risk were prioritized in only 24% of hospitals, which is important from the point of view of employee protection and avoidance of time off work. Unfortunately, we did not explore the reasons for this lack of prioritization.

Since this study was performed, vaccination prioritization has been lifted, and every HCW is now offered vaccination. Hospitals in Germany have a high vaccination rate with 91% of the participating hospital staff fully vaccinated, 4% incompletely vaccinated, and 5% unvaccinated (study period June–July 2021) [18]. However, in January 2022, 11% of patient-facing HCWs were unvaccinated, and without official regulation of the documentation of vaccination status among HCW implementation of targeted interventions impossible [23]. At the time of writing the German government decided on a facility-based mandatory vaccination, which, among others, applies to hospitals (§20a IfSG). Employees must provide their

employer with proof of completed vaccination, proof of recovery, or a doctor's certificate that they cannot be vaccinated by March 15th, 2022. One study showed that half of German hospitals expected limitations on patient care because of this requirement [23].

Our study had several limitations. The questionnaire was long, taking at least 15 min to complete. That, and fact that the survey was undertaken during the second wave of the pandemic when infection control practitioners were busy, may have reduced the participation rate. This may have had an impact on participation and dropout rates. The response rate of small hospitals was particularly low, and these results may not therefore be generalizable. A further limitation is that a cross-sectional study performed at a single time-point cannot take into account the rapid and dynamic changes during the pandemic. Like all self-reporting questionnaires, the responses may have been subjective, and they could not be verified. Overall, however, we feel that our study does provide a useful overview of the initial phase of HCW vaccination across in Germany.

In conclusion, the vaccination prioritization in many hospitals was based on, but deviated from, the STIKO recommendation. We found that good communication between employers and HCWs is vital; feedback loops may be useful to ensure that all staff groups are reached. There was widespread use of electronic systems for communication and booking vaccination appointments, but not all staff have ready access to this format. Hospitals should consider offering alternative systems, such as printed and verbal information. HCWs may also benefit from easy access to vaccination centres, which is a particular challenge in smaller hospitals that may not be able to establish an internal centre. Further studies are required to understand why some HCWs remain unvaccinated, and how best to encourage them to accept vaccination.

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Conflict of interest statement

None declared.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jhin.2022.05.012>.

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