

6. Weill FX, Domman D, Njamkepo E, Almesbahi AA, Naji M, Nasher SS, et al. Genomic insights into the 2016–2017 cholera epidemic in Yemen. *Nature*. 2019;565:230–3. <https://doi.org/10.1038/s41586-018-0818-3>
7. Benamrouche N, Belkader C, Njamkepo E, Zemam SS, Sadat S, Saighi K, et al. Outbreak of imported seventh pandemic *Vibrio cholerae* O1 El Tor, Algeria, 2018. *Emerg Infect Dis*. 2022;28:1241–5. <https://doi.org/10.3201/eid2806.212451>
8. Sim EM, Martinez E, Blackwell GA, Pham D, Millan G, Graham RMA, et al. Genomes of *Vibrio cholerae* O1 serotype Ogawa associated with current cholera activity in Pakistan. *Microbiol Resour Announc*. 2023;12:e0088722. <https://doi.org/10.1128/mra.00887-22>

Address for correspondence: Anthony Smith, Centre for Enteric Diseases, National Institute for Communicable Diseases, Private Bag X4, Sandringham, 2131, Johannesburg, South Africa; email: anthony@nicd.ac.za

Asymptomatic Healthcare Worker PCR Screening during SARS-CoV-2 Omicron Surge, Germany, 2022

Ralph Bertram, Wolfgang Hitzl, Eike Steinmann, Joerg Steinmann

Author affiliations: Paracelsus Medical University, Nuremberg, Germany (R. Bertram, J. Steinmann); Paracelsus Medical University, Salzburg, Austria (W. Hitzl); Ruhr University Bochum, Bochum, Germany (E. Steinmann)

DOI: <https://doi.org/10.3201/eid2908.230156>

During 2022, a total of 9,515 asymptomatic healthcare workers of a large hospital in Germany underwent SARS-CoV-2 PCR screening twice weekly. Of 398,784 saliva samples, 3,555 (0.89%) were PCR positive (median cycle threshold value 30). Early identification of infected healthcare workers can help reduce SARS-CoV-2 transmission in the hospital environment.

COVID-19, caused by the SARS-CoV-2 virus, results in acute pulmonary and extrapulmonary manifestations and frequently causes long-term sequelae (1). In Germany, ≈38.5 million SARS-CoV-2

Table. Characteristics and key indicators for a surveillance study among asymptomatic healthcare workers during SARS-CoV-2 Omicron surge, Germany, 2022*

Characteristic	Value
Total no. PCR tests	398,784
Median no. tests/wk (IQR)	7,559 (6,834–8,139)
Total no. PCR-positive tests	3,555
Median positivity rate, % (IQR)	0.9 (0.45–1.17)
Minimum, January 3–9	0.25
Maximum, March 14–20	1.89
Total no. HCWs tested	9,515
No. (%) infected	2,782 (29.2)
No. (%) HCWs with ≥2 infections	463 (4.87)
Sex, no. (%)	
M	705 (25.3)
F	2,077 (74.7)
Median age, y (IQR)	42 (30–53)
Median Ct value (IQR)	30 (27–32)
No. (%) completing immunization regiment†	8,926 (93.8)

*Ct, cycle threshold; HCW, healthcare worker.

†As of March 2022 (Appendix Table 2,

<https://wwwnc.cdc.gov/EID/article/29/8/23-0156-App1.pdf>).

infections and ≈174,000 COVID-19 deaths had been reported through May 2023 (2). Among those, ≈30.2 million infections and ≈47,000 deaths occurred during 2022, when SARS-CoV-2 Omicron variant dominance was accompanied by a mean hospitalization incidence of 5.87 (2). SARS-CoV-2 infection rates among hospitalized patients were reported to be ≈10%–15% (3). Healthcare workers (HCWs) also were exposed to an elevated risk of acquiring and shedding SARS-CoV-2 infections (4). Regular SARS-CoV-2 testing of asymptomatic HCWs has been found to reduced viral transmission to patients and coworkers (5). We report data from a systematic SARS-CoV-2 PCR screening program comprising >9,500 HCWs in a large hospital in Germany during 2022.

Klinikum Nürnberg is a tertiary care hospital with 2,233 beds at 2 sites in Nuremberg, Germany, and cares for ≈100,000 inpatients and ≈170,000 outpatients per year. During January–November 2022, all 9,515 hospital staff were instructed to participate in a government-mandated regular SARS-CoV-2 PCR screening program. According to federal law in Germany, participation was mandatory irrespective of the level of working exposure risk or vaccination status (Table; Appendix Table 1, <https://wwwnc.cdc.gov/EID/article/29/8/23-0156-App1.pdf>).

Asymptomatic HCWs collected saliva samples twice weekly via self-sampling using a reliable gargling method (6); part-time workers collected samples less frequently. Samples were subjected to PCR testing by an external provider, and turnaround time between sampling and electronic reporting was ≈24–38 h. However, staff with acute COVID-19 symptoms were immediately PCR tested in house. Persons with PCR-verified

infection were quarantined for 5–7 days and excluded from the testing program for the next 10 weeks. In November 2022, hospital staff who had no direct patient contact discontinued the screening program.

A total of 398,784 PCR tests were performed, among which 3,555 (0.89%) were positive; 2,782 persons tested positive ≥ 1 . The cumulative infection rate of all tested asymptomatic HCWs was 29.2%. We observed a minimum positivity rate (0.25%) during January 2022 and the highest numbers of positive tests in March (1.89%) and October (1.69%) 2022 (Figure, panel A). The median cycle threshold (Ct) value of all positive PCR tests was 30 (interquartile range [IQR] 27–32), suggesting that SARS-CoV-2-positive staff were detected at an early phase of infection. Asymptomatic HCWs who tested SARS-CoV-2-positive frequently had symptoms develop a few days after detection, accompanied by lower Ct values (data not shown).

We categorized hospital staff into 5 groups: physicians, nurses, facility services, administration, and miscellaneous. Physicians constituted 13.4% of hospital staff and showed an infection rate of 13.6%. Ac-

cording to contingency table analysis, that rate results in a relative risk (RR) for infection of 1.02 (95% CI 0.91–1.14; $p = 0.77$ by Fisher exact test). Nurses accounted for 37.2% of hospital staff and exhibited an infection rate of 37.4% resulting in an RR for infection of 1.01 (95% CI 0.95–1.07; $p = 0.81$ by Fisher exact test). Thus, despite having the most intense contact with patients, neither of the 2 groups was significantly overrepresented in infection events (Figure, panel B; Appendix Table 1).

This 12-month SARS-CoV-2 PCR screening surveillance program of asymptomatic HCWs resulted in an average positivity rate of 0.89%. A meta-analysis of data from January–August 2020 collected by hospitals worldwide reported an average of 1.9% of asymptomatic HCWs tested PCR-positive for SARS-CoV-2 (7). We detected 3,555 COVID-19 cases among 2,782 (29.2%) HCWs infected ≥ 1 time. That number corresponds to results from another 12-month study in South Africa encompassing medical laboratory staff that had an overall cumulative infection rate of 25.7% (8). Comparisons warrant caution because of

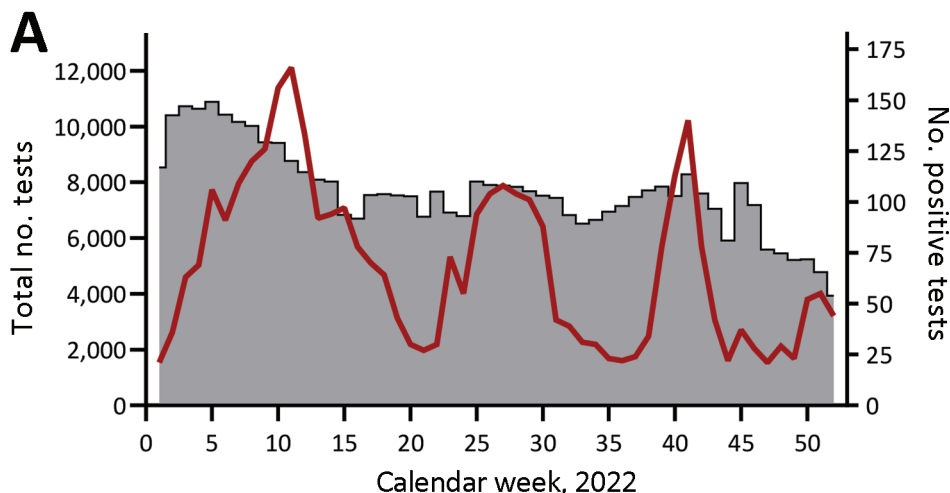
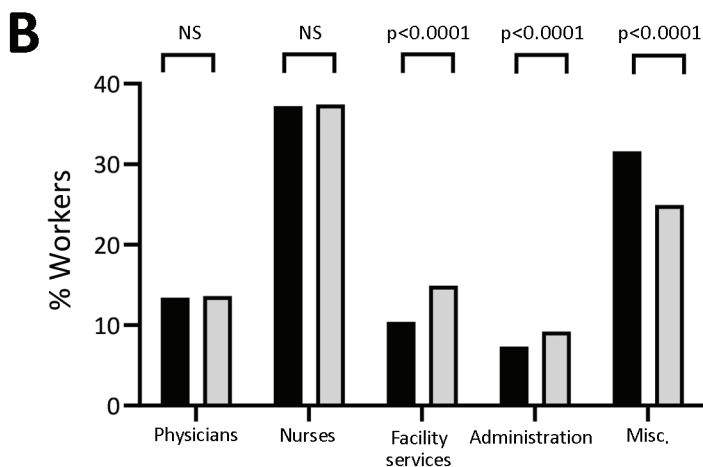


Figure. Number of tests performed and positivity rates for healthcare worker screening during SARS-CoV-2 Omicron surge, Germany, 2022. A) Total number of tests (gray bars) and number of positive tests (red line) per calendar week in 2022. B) Percentage positivity of each healthcare worker group in relation to total staff. Black bars indicate all staff; gray bars indicate the HCW groups. Misc., miscellaneous; NS, not statistically significant.



different spatiotemporal dominance of SARS-CoV-2 variants; vaccination status of HCWs, considering lower efficacy of vaccines against Omicron (9); and different infection control measures applied among hospitals (10). Furthermore, the surveillance study we report was not a randomized controlled trial, does not provide data on asymptomatic courses or rates of false positive PCR results, nor does it provide detailed information regarding seroprevalence or symptoms that developed.

The finding that physicians and nurses who were at the frontline of the COVID-19 outbreak response at Klinikum Nürnberg were not overrepresented in infection numbers speaks in favor of an efficient hygiene regimen. Besides measures such as compulsory patient screening, high-quality protective equipment, or regular ventilation, we believe that effective identification of asymptomatic HCWs in a preinfectious status might be one cornerstone of SARS-CoV-2 infection prevention in hospitals.

Acknowledgments

We thank Johanna Zeller and Florian Engelhardt for their support with data acquisition, Sabine Davison for proofreading and editing English, and the Paracelsus Medical University for their support.

About the Author

Dr. Ralph Bertram is a microbiologist and a researcher and lecturer in the Institute of Clinical Hygiene, Medical Microbiology and Infectiology, Klinikum Nürnberg, Paracelsus Medical University, Nuremberg, Germany. His research interests focus on infectious diseases, drug insensitivity of nosocomial pathogens and gene regulation.

References

1. Nalbandian A, Sehgal K, Gupta A, Madhavan MV, McGroder C, Stevens JS, et al. Post-acute COVID-19 syndrome. *Nat Med*. 2021;27:601–15. <https://doi.org/10.1038/s41591-021-01283-z>
2. Robert Koch-Institut. COVID-19: case numbers in Germany and worldwide [in German]. 2022 [cited 2023 May 29]. https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/nCoV.html
3. Barranco R, Vallega Bernucci Du Tremoul L, Ventura F. Hospital-acquired SARS-Cov-2 infections in patients: inevitable conditions or medical malpractice? *Int J Environ Res Public Health*. 2021;18:489. <https://doi.org/10.3390/ijerph18020489>
4. World Health Organization. Health workers exposure risk assessment and management in the context of COVID-19 virus: interim guidance, 4 March 2020 [cited 2023 Jan 30]. <https://apps.who.int/iris/handle/10665/331340>
5. Viswanathan M, Kahwati L, Jahn B, Giger K, Dobrescu AI, Hill C, et al. Universal screening for SARS-CoV-2 infection: a rapid review. *Cochrane Database Syst Rev*. 2020;9:CD013718.
6. Butler-Laporte G, Lawandi A, Schiller I, Yao M, Dendukuri N, McDonald EG, et al. Comparison of saliva and nasopharyngeal swab nucleic acid amplification testing for detection of SARS-CoV-2: a systematic review and meta-analysis. *JAMA Intern Med*. 2021;181:353–60. <https://doi.org/10.1001/jamainternmed.2020.8876>
7. Jabs JM, Schwabe A, Wollkopf AD, Gebel B, Stadelmaier J, Erdmann S, et al. The role of routine SARS-CoV-2 screening of healthcare-workers in acute care hospitals in 2020: a systematic review and meta-analysis. *BMC Infect Dis*. 2022;22:587. <https://doi.org/10.1186/s12879-022-07554-5>
8. Wilson KS, Ntlebi V, Made F, Sanabria N, Vetten M, Joseph J, et al. COVID-19 cases among medical laboratory services staff in South Africa, 2020–2021: a cohort study. *PLoS One*. 2022;17:e0268998. <https://doi.org/10.1371/journal.pone.0268998>
9. Ren SY, Wang WB, Gao RD, Zhou AM. Omicron variant (B.1.1.529) of SARS-CoV-2: mutation, infectivity, transmission, and vaccine resistance. *World J Clin Cases*. 2022;10:1–11. <https://doi.org/10.12998/wjcc.v10.i1.1>
10. Jin H, Chen Y, Fu Q, Qu Q. Occupational risk factors of contracting COVID-19 among health workers: a systematic review. *Work*. 2021;69:721–34. <https://doi.org/10.3233/WOR-210477>

Address for correspondence: Joerg Steinmann, Paracelsus Medical University, Prof.-Ernst-Nathan-Str. 1, Nuremberg 90419, Germany; email: joerg.steinmann@klinikum-nuernberg.de

Six Extensively Drug-Resistant Bacteria in an Injured Soldier, Ukraine

Patrick T. Mc Gann, Francois Lebreton, Brendan T. Jones, Henry D. Dao, Melissa J. Martin, Messiah J. Nelson, Ting Luo, Andrew C. Wyatt, Jason R. Smedberg, Joanna M. Kettlewell, Brain M. Cohee, Joshua S. Hawley-Molloy, Jason W. Bennett

Author affiliations: Multidrug-Resistant Organism Repository and Surveillance Network, Walter Reed Army Institute of Research, Silver Spring, Maryland, USA (P.T. Mc Gann, F. LeBreton, B.T. Jones, H.D. Dao, M.J. Martin, M.J. Nelson, T. Luo, J.W. Bennett); Landstuhl Regional Medical Center, Landstuhl, Germany (A.C. Wyatt, J.R. Smedberg, J.M. Kettlewell, J.S. Hawley-Molloy); 512th Field Hospital, Rhine Ordnance Barracks, Germany (B.M. Cohee)

DOI: <http://doi.org/10.3201/eid2908.230567>

EID cannot ensure accessibility for supplementary materials supplied by authors. Readers who have difficulty accessing supplementary content should contact the authors for assistance.

Asymptomatic Healthcare Worker PCR Screening during SARS-CoV-2 Omicron Surge, Germany, 2022

Appendix

Relation between Incidence Rates at Klinikum Nürnberg Hospital and in the Community

Positivity rates of the screening program were converted to the hospital healthcare worker (HCW) incidence and its trajectory was compared to that of the local incidence rates in Nuremberg and neighboring cities and counties. In the first half of 2022, the community's and the HCWs' incidences were not significantly different by independent bootstrap *t* test ($p = 0.61$), but in the second half of 2022, the incidences overall diverged significantly ($p < 0.00001$), and HCWs had constantly higher rates compared with the community (Appendix Figure). Decoupling from the HCWs' and the community's incidences particularly in the second half of 2022 may be rationalized by a bona fide constant hospital-risk effect or by an increasing inaccuracy in the local incidence due to less stringent testing in the community.

Appendix Table 1. Vaccination status of among asymptomatic healthcare workers PCR screened during SARS-CoV-2 Omicron surge, Germany, 2022*

Status	No. (%)
3-Fold vaccination†	5,294 (55.6)
2-Fold vaccination†	3,002 (31.6)
1-Fold vaccination, Johnson & Johnson†	131 (1.4)
1-Fold vaccination + recovery status†	159 (1.7)
Otherwise proven sufficient immunity‡	340 (3.6)
1-Fold vaccination	33 (0.35)
Recovered without vaccination	62 (0.65)
Not vaccinated, expired recovery status, or status unknown	494 (5.2)

*As of March 22, 2022.

†Statuses considered as complete immunization.

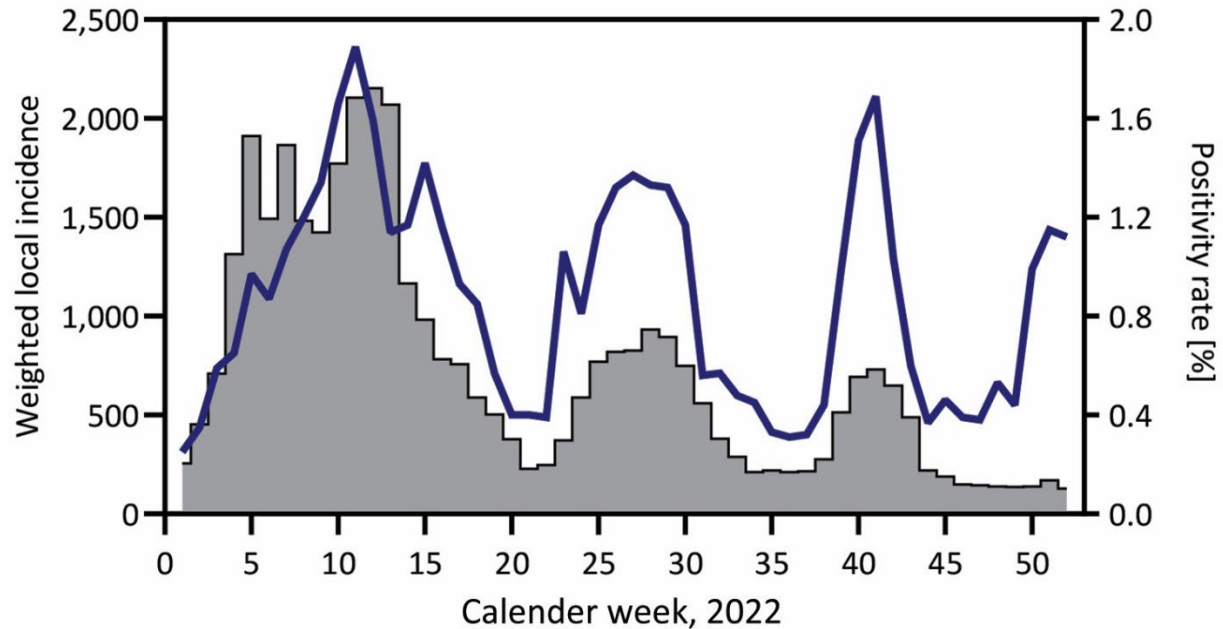
‡Proven immunity according to German Federal Infection Protection Act (IfSG §20a).

Appendix Table 2. Statistics of infection risks for 5 healthcare worker groups screened during SARS-CoV-2 Omicron surge, Germany, 2022*

Group of HCW	% Staff	% Infections	Relative risk (95% CI)	p value
Physicians	13.4	13.6	1.02 (0.91–1.14)	0.77
Nurses	37.2	37.4	1.01 (0.95–1.07)	0.81
Facility services	10.4	14.9	1.79 (1.59–2.02)	<0.0001
Administration	7.3	9.2	1.43 (1.24–1.66)	<0.0001
Miscellaneous†	31.6	24.9	0.72 (0.67–0.77)	<0.0001

*Calculated by using Prism Version 9.5.1 (GraphPad Software Inc., <https://www.graphpad.com>) as contingency table analyses with χ^2 and Fisher exact test.

†Miscellaneous group includes, but is not restricted to, physiotherapists, technical assistants, teachers, and computer and natural scientists.



Appendix Figure. Weighted local SARS-CoV-2 incidence per calendar week of asymptomatic healthcare worker screening during SARS-CoV-2 Omicron surge, Germany, 2022. Gray indicates incidence; blue line indicates positivity rate. The weighted local incidence includes that of Nuremberg (weighted by 50%) and the incidences of the 7 surrounding cities and counties (weighted by 7.14% each) to account for different residences of healthcare workers of Klinikum Nürnberg.