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# Determinants of Sickness Absence Duration After Mild COVID-19 in a Prospective Cohort of Canadian Healthcare Workers

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**Objective:** The aim of the study is to identify modifiable factors associated with sickness absence duration after a COVID-19 infection. **Methods:** Participants in a prospective cohort of 4964 Canadian healthcare workers were asked how many working days they had missed after a positive COVID-19 test. Only completed episodes with absence ≤31 working day and no hospital admission were included. Cox regression estimated the contribution of administrative guidelines, vaccinations, work factors, personal characteristics, and symptom severity. **Results:** A total of 1520 episodes of COVID-19 were reported by 1454 participants. Days off work reduced as the pandemic progressed and were fewer with increasing numbers of vaccines received. Time-off was longer with greater symptom severity and shorter where there was a provision for callback with clinical necessity. **Conclusions:** Vaccination, an important modifiable factor, related to shorter sickness absence. Provision to recall workers at time of clinical need reduced absence duration.

**Keywords:** COVID-19, sickness absence, health care workers, vaccination, callback

## LEARNING OUTCOMES

Evaluate the contribution of administrative guidelines and vaccination on the duration of healthcare worker sickness absence for COVID-19 infection.
Assess the importance of the perceptions of symptom severity in mild COVID-19.
Support the importance of vaccination to reduce severity of COVID-19 symptoms.

Healthcare workers contracting COVID-19 were required to take time off work, not simply to preserve their own health but to limit transmission to coworkers and patients. Such absence was challenging for health care organizations providing care during the heat of a pandemic. Knowledge of administrative, work, and personal factors associated with days off work during the COVID-19 pandemic may help with planning for future epidemics.

Studies published on sickness absence associated with COVID-19 have largely used administrative datasets to examine changes in overall sickness absence, comparing pre–COVID-19 patterns with those early in the pandemic[1,2] or to study correlates of sickness absence among those with COVID-19 in the general population of workers.[3–7] Few studies have looked at factors associated with duration of sickness absence specifically in healthcare workers (HCWs) who have tested positive for COVID-19. Van der Plaat and colleagues[8] used sickness absence ascribed to COVID-19 to compare infection rates in UK health service occupations. Reme et al[9] obtained sickness absence records before and during the pandemic for all healthcare workers in Norway but did not distinguish between those who had been infected with SARS-CoV-2 and those who were simply isolating. Kisiel et al[10] in Sweden used electronic health records of healthcare and residential care workers positive for COVID-19 and extracted pre–COVID-19 and post–COVID-19 length of absence, together with sociodemographic data. Aben and colleagues,[7] using longitudinal register-based information, found a decrease in duration of sickness absence from COVID-19 as the pandemic progressed but was unable to account for vaccination.

In Canada, policies and practices for time off work after a positive test for COVID-19 infection differed across jurisdictions and institutions employing HCWs. At the start of the pandemic, a 14-day absence with return only when symptom-free was standard. Later in the pandemic, and particularly in late 2021 and early 2022, when the healthcare system was under great pressure from the Omicron variant, recommendations were less stringent, reflecting increased understanding of infectiousness, and allowed for early return if work demands warranted. Such an approach to mitigate staff shortages was also in use in other jurisdictions from early in the pandemic[11,12] and formalized with a recommendation of 3 days absence in Europe by early in 2022.[13]

In this report, we describe the duration of sickness absence from work in those testing positive for COVID-19 in a Canadian cohort of HCW followed-up since early in 2020. We use data collected

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Funding: This work was supported by seed funding from the College of Physicians and Surgeons of Alberta and by funding from the Canadian Institutes of Health Research (funding reference number 173209). This funding was extended by a grant from the Canadian Immunology Task Force. The funding contained provision for open access publishing.

Conflict of interest: Q.D.-M received honorarium provided by the University of Saskatchewan for grant review.

Ethical approval: Approval for each element of the study was given by the University of Alberta Heath Ethics Board (Pr000099700). The study was also reviewed and approved by Unity Health Toronto Research Ethics Board (REB# 20-298) for those elements coordinated locally for the Ontario participants. All participants gave online written informed consents.

Author contributions: N.C., A.A., Q.D.-M., F.L., and S.R. contributed to the initial design of the study. T.Z. coordinated the ongoing acquisition of data. N.C. analyzed the data and drafted the manuscript. All authors contributed to the interpretation of the data and critically revised the draft. All read and approved the final manuscript.

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Reporting of this study followed the STROBE guidelines for cohort studies.

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Supplemental digital contents are available for this article. Direct URL citation appears in the printed text and is provided in the HTML and PDF versions of this article on the journal's Web site (www.joem.org).



DOI: 10.1097/JOM.0000000000002945

over repeated contacts with the cohort to assess the impact of administrative guidelines and vaccination on duration of sickness absence, taking account of demographic, work, health prepandemic, and other personal factors. The analysis, concentrating on those without hospitalization and who had missed no more than 31 working days, focused on mild COVID-19.



## METHODS

The cohort used for this report has been described elsewhere.[14] Briefly, it included healthcare workers (physicians, healthcare aides, personal support workers and nurses, licensed, registered, and psychiatric) from four Canadian provinces (Alberta, British Columbia, Ontario, and Quebec). Participants were recruited early in the pandemic and completed the following four online questionnaires: phase 1 in spring/summer of 2020, phase 2 in fall of 2020, phase 3 in spring of 2021, and phase 4 in spring of 2022. Information on positive tests for COVID-19 was collected in the questionnaire completed at each phase and, for a nested case-referent study,[15] by self-reports between questionnaires. From December 2020, when vaccination against COVID-19 became available to Canadian healthcare workers, information on dates and type of vaccine was collected alongside data on infection.

The analysis described here is restricted to those who had one or more positive tests for COVID-19, detected either by a polymerase chain reaction or home, rapid antigen, test kit, and who were in employment as an HCW at the time of infection. To avoid overlap with studies of longer-term sequelae of COVID-19 infection ("long COVID"), only those who reported returning to work having missed 31 or fewer working days were included. Furthermore, inclusion was restricted to those reporting such positive tests in a section of the final, phase 4, questionnaire (Supplemental Digital Content A, http://links.lww.com/JOM/B382), which asked the respondent to report, for up to three infection episodes, whether they were working at the time of the positive test, and, if so, how many days they had been off work. They were also asked if they had been admitted to hospital during this episode, whether they believed they had been infected during the course of their work, and whether the sickness absence had been reported to the Workers Compensation Board (WCB) of the province as work related.

Other information used in this report was collected in the baseline questionnaire. This included self-reported gender, age in years, marital status, the presence of a child younger than 18 years in the home, and medical history in the 12 months before the pandemic, including treatment for anxiety, depression or asthma, a history of chronic obstructive lung disease, and a history of tobacco smoking. Province and job (medical doctor [MD], registered nurse or psychiatric nurse [RN], licensed practical nurse [LPN], personal support worker [PSW], or healthcare aide [HCA]) were known from recruitment.

Severity of symptoms during the episode was estimated from responses to a symptom questionnaire designed to assess community-acquired pneumonia[16] completed at each of the four questionnaires (phase 1 to phase 4) in which the participant was asked whether, since their previous questionnaire, they had experienced an episode when they had been unwell for two or more consecutive days. If they reported such an episode, they rated 19 symptoms from 1 to 5, with 5 being the most severe. Where someone had tested positive for COVID-19 in the appropriate time window, the reported symptoms were assumed to relate to the COVID-19 episode. The first principal component (with a mean of 0 and standard deviation of 1) extracted from these responses was taken as a measure of severity (Supplemental Digital Content B, http://links.lww.com/JOM/B382). When a participant had experienced more than one COVID-19 episode between consecutive questionnaires, the symptom severity score was assigned only to the most recent episode and the score marked "unassigned" for previous episodes.

The questionnaire at each phase also included ratings, on visual analog scales, of items reflecting worries and support (questions J1–J4 in Supplemental Digital Content A, http://links.lww.com/JOM/B382). For the current analysis, four items were considered, one reflecting the participant's worry that they shall be infected with COVID-19 (on a scale from not at all worried to very worried) and three reflecting sources of perceived support from work "during this time": support from colleagues or coworkers; from a senior colleague or mentor; from the immediate organization. These were each rated on a 0–100 scale from "no support at all" to "very strong support." To avoid contamination of the rating by experiences during the COVID-19 episode, ratings were taken from the questionnaire immediately before the episode of interest. Similarly, scores of anxiety and depression from the Hospital Anxiety and Depressions Scale (HADS),[17] included in each questionnaire, were taken from the questionnaire immediately before the infection. Both rating scores and HADS scores were absent for infections before the first questionnaire.

The number of vaccinations received before the positive test was computed from reported dates of vaccines and the positive test date. Months between the start of the pandemic and infection were calculated from March 6, 2020.

The return-to-work guidelines for healthcare workers differed between provinces, both in the required number of days and the point in the pandemic when these changed. These were ascertained as accurately as possible for each province, from published documents where available or from informed respondents within the province's public health system. Furthermore, we determined if, and from which date, there was provision for an earlier return if the clinical requirements warranted. Each infection episode reported by a cohort participant was allocated to the relevant period in their province's guidelines. The recommended time off work and possibility of early callback were recorded, reflecting the guidelines in the province of work at the date of infection.

The outcome variable, time off work, was recorded in the phase 4 questionnaire for those in work at the start of the episode and who had returned to work. The question asked was "How many days in total were you away from work because of this episode." Answers, which will have excluded weekends and rest days, would not coincide exactly with guidelines as adopted by the provinces.

The phase 4 questionnaire also included a question, use here only in a supplementary analysis, on post–COVID-19 sequelae (G6 in Supplemental Digital Content A, http://links.lww.com/JOM/B382), which asked participants who reported an episode of COVID-19 whether they had a "condition that they believed was a result of, or made worse by, their COVID-19 infection."

### Ethical Approval

Approval for each element of the study was given by the University of Alberta Heath Ethics Board (Pr000099700). The study was also reviewed and approved by Unity Health Toronto Research Ethics Board (REB# 20-298) for those elements coordinated locally for the Ontario participants. All participants gave online written informed consent.

### STROBE Guidelines

The reporting of this study followed the Strengthening The Reporting of Observational Studies in Epidemiology (STROBE) guidelines (Supplementary digital content 2, http://links.lww.com/JOM/B383)

### Statistical Methods

Analysis was limited to those who had returned to work within 31 days. A proportional hazards model was adopted for time to return. As each participant could report up to three infection episodes, a multiple failure Cox regression was used to assess the contribution of factors to duration of absence. The model required a date of return to

 

work and could not accommodate zero duration. A date of return to work was calculated as date of infection + reported working days missed +1. Months since the pandemic was entered as the natural logarithm but no important skew was seen in days off work, which was used untransformed. Number of vaccines and mandated days of absence were used as categorical variables descriptively but entered into the final model as continuous variables. Rating of worries and support were divided by 10 to assist presentation of results. After bivariate analysis of each factor with time off work, factors showing a possible relation ( $P < 0.10$) were included in a multivariable analysis. This considered first variables within groups (time-related, episode-related, and personal factors). Variables that retained $P < 0.10$ after adjustment within their group were entered into the final model that included factors from all groups. In the Cox regression presented, a hazard ratio >1 implies a faster return to work and one <1 a factor associated with greater time off work. In a supplementary analysis, a mixed effects logistic regression was used to examine reporting of asymptomatic episodes and COVID-19–related sequelae in those returning to work within 5 days of a positive test, during periods with and without provision for callback during times of pressure from staff shortage. The analysis used STATA-18 (StataCorp, 2023, Stata Statistical Software: Release 18; StataCorp LLC, College Station, TX).



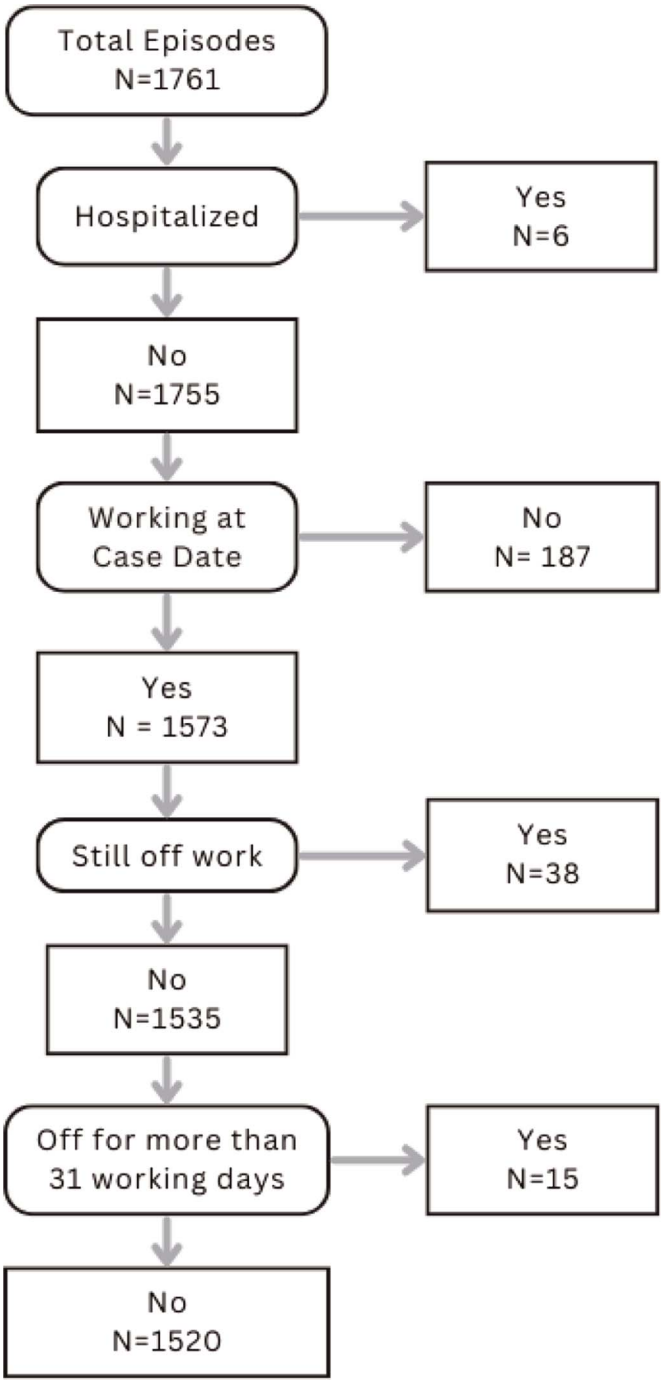


**FIGURE 1.** Flowchart for inclusion of time-off-work episodes in 1668 participants.

 

## RESULTS

In the prospective cohort, 4964 HCW completed the baseline questionnaire and agree to join the follow-up cohort. A total of 3946 completed the "time off work" section of the phase 4 questionnaire with 1668 (42.3%) reporting one or more COVID-19 episodes. Six of these episodes, in five participants, resulted in a hospital admission and were excluded. Overall there were 1520 episodes in 1454 workers in which the participant had been away from work for 31 working days or less and had returned to work after the episode (Fig. 1).

The characteristics of the 1454 participants with one or more included COVID-19 episodes are shown in Table 1. As in the cohort as a whole,[14] the majority were female, with a median age of 43 years (range, 21–73). Registered nurses were the largest group, followed by MDs and HCAs the smallest. The majority were married with about half having a child younger than 18 years in the home. Only 3% had smoked tobacco in the years before the pandemic. Some 22% reported at baseline that they had been treated for anxiety or depression in the 12 months before the pandemic, with lower proportions reporting being treated for asthma (13%) or having chronic obstructive lung conditions (1%).

Features of the 1520 COVID-19 infection episodes are also shown in Table 1. The large majority of cases (83%) were in participants who had, at the time of the positive test, had at least two shots of vaccination against COVID-19. Most cases (77%) occurred in 2022. No case in 2020 was in an HCW vaccinated before infection and only 13 in 2022 were in unvaccinated HCW. Only 17% believed that at this episode, they had contracted the virus at work. Few (5%) reported that the episode had been reported to the WCB.

Median ratings of worry about infection and perceived support from work, recorded on the questionnaire before the infection episode, are given in Table 1. Ratings of support from coworkers were somewhat higher than senior colleagues/mentors and much higher than support from the organization. Severity was present only for those who had reported, on the questionnaire after the infection, that they had experienced an episode when they had been unwell. Of those with a test-positive COVID-19 episode in the relevant period, 20% (308/1520) reported no such episode of ill-health and may be assumed to have had, at most, mild symptoms.

The distribution of days off work is shown in Figure 2. The peaks evident at days 5, 10 and 14 reflect, in part, the administrative

**TABLE 1.** Characteristics of Participants and COVID-19 Episodes

**Participants**

| Factor | | *n* | % |
|---|---|---|---|
| Gender | Female | 1,230 | 84.6 |
| | Other | 224 | 15.4 |
| Age, yr | <40 | 632 | 43.5 |
| | 40 < 55 | 583 | 40.1 |
| | 55 or older | 239 | 16.4 |
| Job | Medical doctor | 388 | 26.7 |
| | Registered nurse | 971 | 66.8 |
| | Licensed practical nurse | 30 | 2.1 |
| | Personal support worker | 44 | 3.0 |
| | Healthcare aid | 21 | 1.4 |
| Married or living as married | Yes | 1,119 | 77.0 |
| | No | 288 | 19.8 |
| | Unknown | 47 | 3.2 |
| Child <18 yr in the home | Yes | 791 | 54.4 |
| | No | 655 | 45.0 |
| | Unknown | 8 | 0.6 |
| Chronic lung condition | Yes | 15 | 1.0 |
| | No | 1,278 | 87.9 |
| | Unknown | 161 | 11.1 |
| In the 12 mo before the pandemic | | | |
| Smoked cigarettes | Yes | 48 | 3.3 |
| | No | 1,245 | 85.6 |
| | Unknown | 161 | 11.1 |
| Treated for anxiety or depression | Yes | 314 | 21.6 |
| | No | 979 | 67.3 |
| | Unknown | 161 | 11.1 |
| Treated for asthma | Yes | 193 | 13.3 |
| | No | 1,101 | 75.7 |
| | Unknown | 160 | 11.0 |
| Total | | 1,454 | 100.0 |

**Episodes**

| Factor | | *n* | % |
|---|---|---|---|
| Episode | First | 1,448 | 95.3 |
| | Second | 68 | 4.5 |
| | Third | 4 | 0.3 |
| Vaccinations before infection | None | 170 | 11.2 |
| | One | 83 | 5.5 |
| | Two | 355 | 23.4 |
| | Three | 893 | 58.8 |
| | Four | 19 | 1.3 |
| Year of infection | 2020 | 105 | 6.9 |
| | 2021 | 243 | 16.0 |
| | 2022 | 1,172 | 77.1 |
| Believe to be infected at work | No | 961 | 63.2 |
| | Yes | 261 | 17.2 |
| | Unsure | 298 | 19.6 |
| Reported to workers compensation board | No | 1,415 | 93.1 |
| | Yes | 71 | 4.7 |
| | Unsure | 34 | 2.2 |
| Total | | 1,520 | 100.0 |
| Ratings and scores on previous questionnaire | | | |
| | Median | Range | *n* |
| Worry will get Infected | 39.0 | 0–100 | 1,489 |
| Support from | | | |
| Colleagues | 77.0 | 0–100 | 1,489 |
| Mentor | 57.0 | 0–100 | 1,489 |
| Organization | 45.0 | 0–100 | 1,489 |
| HADS scores | | | |
| Anxiety | 8.0 | 0–21 | 1,489 |
| Depression | 5.0 | 0–20 | 1,489 |
| Unwell on subsequent questionnaire | | | |
| | | *n* | % |
| No sickness | | 308 | 20.3 |
| Sickness | | 1,177 | 77.4 |
| Not available | | 27 | 1.8 |
| Unknown | | 8 | 0.1 |
| Severity score from subsequent questionnaire | | | |
| | Median | Range | *n* |
| Severity score | −0.115 | −1.63 to 3.44 | 1,177 |

CI, confidence interval; HADS, Hospitals Anxiety and Depression Scale.

 

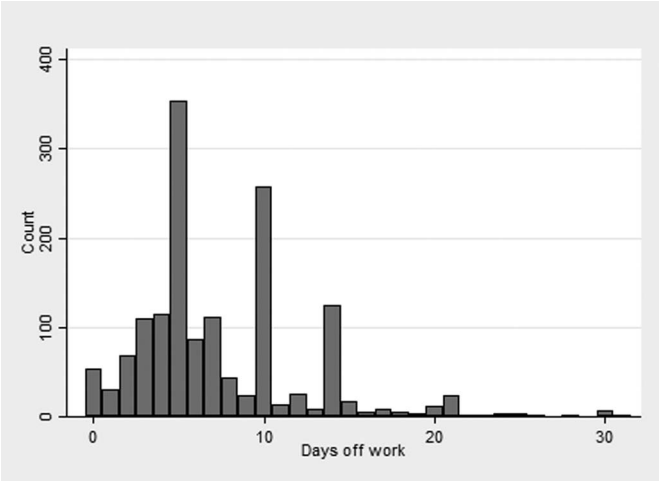


**FIGURE 2.** Distribution of days off work in 1520 post–COVID-19 episodes.

(public health) guidelines for time off work at different phases of the pandemic. Time off by mandated minimum days off and callback provision is shown in Table SDC 1 Supplemental Digital Content C, http://links.lww.com/JOM/B382.

The relation of median and mean days off work to participant characteristics are shown in Table 2, together with estimated coefficients from a bivariate Cox proportional hazards model, allowing for repeated time-off episodes within the same participant. Time off work was not related to sex, age, marital status, or having a child in the home. Participants treated for asthma or for anxiety or depression in the 12 months before the pandemic did not have longer time away from work. Small increases in time off work were associated with having smoked cigarettes in the year before the pandemic and with chronic obstructive lung disease. Personal support workers and HCAs had the longest time off work for a COVID-19 infection.

Table 3 includes the same parameters (median, mean, and hazard ratio) for characteristics of each episode. Second episodes were associated with fewer days away from work. There was a marked

**TABLE 2.** Relation of Participant Characteristics to Days off Work With Estimated Hazard Ratio ($N$ = 1,520)

| | | | | | | | 95% CI | | |
|---|---|---|---|---|---|---|---|---|---|
| **Factor** | | **to** | **Median, d** | **Mean, d** | **SD** | **Hazard Ratio** | **Lower** | **Upper** | ***P*** |
| Gender | Female | 1,287 | 6.0 | 7.61 | 5.12 | 0.92 | 0.81 | 1.05 | 0.205 |
| | Other | 233 | 6.0 | 6.92 | 3.89 | — | — | — | — |
| Age, yr | <40 | 671 | 6.0 | 7.39 | 4.85 | — | — | — | — |
| | 40 < 55 | 607 | 6.0 | 7.49 | 4.96 | 1.00 | 0.91 | 1.11 | 0.929 |
| | 55 yr and older | 242 | 6.0 | 7.82 | 5.27 | 1.02 | 0.90 | 1.16 | 0.731 |
| Job | MD | 403 | 6.0 | 7.10 | 4.12 | — | — | — | — |
| | RN | 1,016 | 5.0 | 7.47 | 5.22 | 0.97 | 0.87 | 1.08 | 0.599 |
| | LPN | 31 | 5.0 | 7.23 | 5.14 | 1.07 | 0.76 | 1.49 | 0.710 |
| | PSW | 47 | 10.0 | 11.13 | 4.03 | 0.60 | 0.51 | 0.69 | <0.001 |
| | HCA | 23 | 9.0 | 9.09 | 5.18 | 0.63 | 0.47 | 0.84 | 0.002 |
| Married or living as married | Yes | 1,169 | 6.0 | 7.46 | 4.87 | 1.02 | 0.91 | 1.15 | 0.678 |
| | No | 303 | 5.0 | 7.68 | 5.22 | — | — | — | — |
| | Unknown | 48 | 7.0 | 7.44 | 5.53 | 1.11 | 0.84 | 1.46 | 0.456 |
| Child <18 yr in the home | Yes | 823 | 6.0 | 7.51 | 4.97 | 1.03 | 0.94 | 1.13 | 0.528 |
| | No | 689 | 6.0 | 7.51 | 4.97 | — | — | — | — |
| | Unknown | 8 | 5.0 | 6.13 | 4.16 | 1.42 | 0.77 | 2.63 | 0.266 |
| Chronic lung condition | Yes | 18 | 8.5 | 9.17 | 5.88 | 0.73 | 0.52 | 1.02 | 0.067 |
| | No | 1,337 | 6.0 | 7.45 | 4.98 | — | — | — | — |
| | Unknown | 165 | 7.0 | 7.71 | 4.65 | 1.03 | 0.91 | 1.18 | 0.613 |
| In the 12 mo to March 2020 | | | | | | | | | |
| Smoked cigarettes | Yes | 53 | 7.0 | 8.49 | 4.86 | 0.76 | 0.62 | 0.94 | 0.010 |
| | No | 1,302 | 6.0 | 7.43 | 5.00 | — | — | — | — |
| | Unknown | 165 | 7.0 | 7.71 | 4.65 | 1.03 | 0.90 | 1.17 | 0.692 |
| Treated for anxiety or depression | Yes | 328 | 6.0 | 7.86 | 5.10 | 0.96 | 0.86 | 1.08 | 0.497 |
| | No | 1,027 | 6.0 | 7.35 | 4.96 | — | — | — | — |
| | Unknown | 165 | 7.0 | 7.71 | 4.65 | 1.03 | 0.90 | 1.18 | 0.675 |
| Treated for asthma | Yes | 203 | 7.0 | 7.84 | 4.84 | 0.94 | 0.83 | 1.06 | 0.314 |
| | No | 1,153 | 6.0 | 7.41 | 5.02 | — | — | — | — |
| | Unknown | 164 | 7.0 | 7.73 | 4.66 | 1.02 | 0.90 | 1.17 | 0.717 |
| Total | | 1,520 | 6.0 | 7.50 | 4.96 | — | — | — | — |

CI, confidence interval; HCA, healthcare aide; LPN, licensed practical nurse; MD, medical doctor; PSW, personal support worker; RN, registered nurse.

 

decrease in duration with increasing numbers of vaccines and with cases occurring later in the pandemic, as indicated by year of infection or by log months since the start of the pandemic, taken as a continuous variable. The mean days off work are shown by year and vaccines received in Table SDC 2 (Supplementary Digital Content C, http://links.lww.com/JOM/B382). Healthcare workers who believed that work was the source of their infection or whose illness had been reported to the WCB as possibly work related were off work for a longer period. The effect of mandated time off work and the provision for earlier callback to work are also shown, with days off work increasing with longer mandated absence and reduced where there was a callback provision. Those who did not report "two consecutive days of ill-health" on the questionnaire following the episode, possibly a marker of low severity, had fewer days off work than those who reported this. The severity measure derived for those who did report ill-health was strongly related to length of time off work: only two of the individual symptoms (chest pain and loss of sense of taste and smell) added to the model after adjustment for severity (data not shown). In this bivariate analysis, those with greater anxiety about becoming infected at work were slower to return to work but the weight that the participant placed on support from coworkers or from the organization itself was unrelated to time off work. Those who rated highly support from senior colleagues or mentors had slightly more time off. Among those who had completed a HADS questionnaire before infection, higher scores on anxiety and depression were positively related to time off work, in this bivariate analysis.

Table 4 shows multivariable models, including factors reflecting personal characteristics, work related factors, and administrative guidelines. The variables included were simplified for this multivariable analysis by using mandated days and number of vaccines as continuous factors and regrouping the variables reflecting the belief of infection at work and reporting to the WCB as "yes" against "no" and "unsure." The first four variables in Table 4 are highly time related, and a model with these four suggests that the number of mandated days off contributed less, having allowed, particularly, for the callback provision. In the next group, of episode-related variables, job type continued to be important with additional effects associated with work-related infection and a report to the WCB. Among the factors reflecting personal characteristics, those who smoked tobacco in the year before the pandemic still had longer off work, after adjustment for other personal factors but chronic lung disease and anxiety and depression, measured by questionnaire before infection, did not. Fear of infection was still a predictor of time-off work at this stage.

The final model, in the right-hand columns of Table 4, included only factors showing a clear relation to time off work in the analysis of grouped factors. In this model, including the time-related factors,

**TABLE 3.** Relation of Episode Characteristics to Days Off Work With Estimated Hazard Ratio ($N$ = 1,520)

| Factor | | *n* | Median, d | Mean, d | SD | Hazard Ratio | 95% CI Lower | 95% CI Upper | *P* |
|---|---|---|---|---|---|---|---|---|---|
| Episode | First | 1,448 | 6.0 | 7.57 | 5.03 | — | — | — | — |
| | Second | 68 | 5.0 | 5.99 | 2.90 | 0.01 | 0.00 | 0.03 | <0.001 |
| | Third | 4 | 6.0 | 6.50 | 5.80 | 0.02 | 0.01 | 0.05 | <0.001 |
| Vaccinations before case date | None | 170 | 14.0 | 12.67 | 6.21 | — | — | — | — |
| | One | 83 | 7.0 | 8.18 | 4.81 | 1.54 | 1.26 | 1.87 | <0.001 |
| | Two | 355 | 7.0 | 8.09 | 5.15 | 1.70 | 1.50 | 1.92 | <0.001 |
| | Three | 893 | 5.0 | 6.26 | 3.86 | 2.38 | 2.12 | 2.66 | <0.001 |
| | Four | 19 | 5.0 | 5.68 | 2.69 | 3.03 | 2.22 | 4.15 | <0.001 |
| Year of case | 2020 | 105 | 14.0 | 14.71 | 5.91 | — | — | — | — |
| | 2021 | 243 | 10.0 | 9.44 | 5.22 | 1.68 | 1.49 | 1.89 | <0.001 |
| | 2022 | 1,172 | 5.0 | 6.45 | 4.08 | 2.64 | 2.38 | 2.94 | <0.001 |
| Believe to be infected at work | No | 961 | 5.0 | 7.02 | 4.63 | — | — | — | — |
| | Yes | 298 | 5.0 | 7.28 | 4.95 | 0.92 | 0.81 | 1.04 | 0.164 |
| | Unsure | 261 | 10.0 | 9.52 | 5.64 | 0.67 | 0.60 | 0.74 | <0.001 |
| Reported to workers compensation board | No | 1,415 | 6.0 | 7.31 | 4.89 | — | — | — | — |
| | Yes | 71 | 10.0 | 10.56 | 5.13 | 0.62 | 0.53 | 0.73 | <0.001 |
| | Unsure | 34 | 9.5 | 9.18 | 5.17 | 0.79 | 0.61 | 1.01 | 0.062 |
| Report unwell on next questionnaire | No | 308 | 5.0 | 6.68 | 4.44 | — | — | — | — |
| | Yes | 1,177 | 6.0 | 7.68 | 5.09 | 0.83 | 0.74 | 0.94 | 0.002 |
| | Not assigned | 27 | 10.0 | 9.22 | 4.41 | 0.60 | 0.48 | 0.76 | <0.001 |
| | Not completed | 8 | 6.0 | 6.38 | 2.62 | 1.22 | 0.80 | 1.90 | 0.349 |
| Mandated days off | 0 | 25 | 8.0 | 7.64 | 2.81 | — | — | — | — |
| | 5 | 965 | 5.0 | 6.45 | 4.10 | 1.82 | 1.61 | 2.06 | <0.001 |
| | 7 | 31 | 8.0 | 8.55 | 3.88 | 1.70 | 1.24 | 2.33 | 0.001 |
| | 10 | 454 | 8.0 | 8.90 | 5.68 | 2.70 | 2.39 | 3.05 | <0.001 |
| | 14 | 45 | 14.0 | 15.04 | 5.66 | 2.11 | 1.53 | 2.90 | <0.001 |
| Callback provision | No | 459 | 10.0 | 10.06 | 5.81 | — | — | — | — |
| | Yes | 1,061 | 5.0 | 6.39 | 4.07 | 1.75 | 1.59 | 1.91 | <0.001 |
| Entered as continuous variables | | | | | | | | | |
| Log months since March 2020 | | 1,520 | — | — | — | 1.87 | 1.65 | 2.11 | <0.001 |
| Severity | | 1,177 | — | — | — | 0.84 | 0.80 | 0.89 | <0.001 |
| Worry will get Infected | | 1,489 | — | — | — | 0.96 | 0.95 | 0.98 | <0.001 |
| Support from | Colleagues | 1,489 | — | — | — | 0.99 | 0.97 | 1.00 | 0.160 |
| | Mentors | 1,489 | — | — | — | 0.99 | 0.97 | 1.00 | 0.081 |
| | Organization | 1,489 | — | — | — | 1.00 | 0.98 | 1.01 | 0.818 |
| HADS | Anxiety | 1,489 | — | — | — | 0.98 | 0.97 | 0.99 | 0.003 |
| | Depression | 1,489 | — | — | — | 0.98 | 0.97 | 0.99 | 0.002 |
| Total | | 1,520 | 6.0 | 7.50 | 4.96 | — | — | — | — |

CI, confidence interval; HADS, Hospitals Anxiety and Depression Scale.

 

smoking and fear of infection were found to be less strongly related to time off work, as was a report to the WCB. Overall, time lost from work was lower with increasing vaccinations and when a callback provision was in place. Return to work was faster as the pandemic progressed. With the time off work taken by MDs as the comparison group, PSWs had the longest time off, and LPNs the shortest. Time off work after COVID-19 infection was longer in those reporting, at their subsequent questionnaire, that they had been unwell and, among those who did, time off increased importantly with the severity of self-reported symptoms. Chest pain and loss of sense of test and smell did not add to this final model. All variables in the model met the proportional hazards assumption.

A supplementary analysis considered symptom reporting in the subgroup of 718 episodes in which the HCW returned to work in 5 days or less and to whom symptoms (including no symptoms) could be ascribed. Of these, 593 had returned at a time when there was a provision for early recall. Among those returning under recall, 79% (468/593) reported symptoms compared with 68% (85/125) returning within 5 days during a period with no recall (OR = 3.81, 95% CI: 1.32 to 11.00; $P = 0.014$). Response to the question on post–COVID-19 sequelae showed little difference between the groups in reporting a "condition that they believed was a result of, or made worse by, their COVID-19 infection." Among those returning in 5 days or less under recall, 21% (125/593) reported such a condition, compared with 18% (23/125) who returned within 5 days without recall provision (odds ratio = 1.57, 95% CI: −0.35 to 7.01; $P = 0.554$).

## DISCUSSION

The analysis reported here was designed to assess the importance of personal factors, administrative guidelines, and vaccination on return to work in Canadian HCW who had tested positive for COVID-19. Those off work for more than 31 working days or who were hospitalized were excluded. Having taken account of time since the start of the pandemic, the changing guidelines, with decreasing demands for extended isolation, had little effect on time off work. Provision for callback, in the face of clinical need, markedly reduced the duration of absence (from a median of 10 days to a median of 5). The number of COVID-19 vaccinations received by the time of the positive test was also clearly related to duration, with a shorter absence associated with each successive vaccination. The strongest additional predictor was the severity of symptoms experienced during the episode. Inclusion of the measure summarizing the extent to which the participant was bothered by 19 symptoms removed any independent effects of worries about infection and scores on the anxiety and depression scales.

Strengths of the study include the collection of information on health and psychosocial factors before infection, avoiding confusion between causes and effects of COVID-19–related ill-health.

**TABLE 4.** Multivariate, Multiple Failure Cox Regression of Days to Return to Work Within Variable Groups and Overall

| Factor Group | | Models With Group | | | | Final Model | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 95% CI | | | | 95% CI | | |
| | | Hazard Ratio | Lower | Upper | *P* | Hazard Ratio | Lower | Upper | *P* |
| A) Time related | | | | | | | | | |
| Mandated days off | Continuous (0 to 14) | 1.02 | 0.99 | 1.05 | 0.133 | | | | |
| Call back provision | No | 1.00 | | | | 1.00 | | | |
| | Yes | 1.36 | 1.19 | 1.55 | <0.001 | 1.33 | 1.19 | 1.50 | <0.001 |
| No. vaccines to case | Continuous (0 to 4) | 1.19 | 1.12 | 1.26 | <0.001 | 1.15 | 1.08 | 1.21 | <0.001 |
| Log months since March 2020 | Continuous (−0.98 to 3.48) | 1.21 | 1.08 | 1.37 | 0.002 | 1.14 | 1.00 | 1.29 | 0.043 |
| B) Episode | | | | | | | | | |
| Job | MD | 1.00 | | | | 1.00 | | | |
| | RN | 0.98 | 0.88 | 1.09 | 0.649 | 1.09 | 0.98 | 1.21 | 0.135 |
| | LPN | 1.15 | 0.81 | 1.64 | 0.437 | 1.51 | 1.15 | 1.99 | 0.003 |
| | PSW | 0.67 | 0.58 | 0.79 | <0.001 | 0.74 | 0.62 | 0.89 | 0.002 |
| | HCA | 0.76 | 0.57 | 1.01 | 0.055 | 0.85 | 0.62 | 1.17 | 0.316 |
| Believe to be infected at work | No | 1.00 | | | | 1.00 | | | |
| | Yes | 0.75 | 0.67 | 0.84 | <0.001 | 0.90 | 0.80 | 1.00 | 0.059 |
| Reported to WCB | No | 1.00 | | | | | | | |
| | Yes | 0.79 | 0.66 | 0.95 | 0.012 | 0.89 | 0.71 | 1.10 | 0.277 |
| C) Personal factors | | | | | | | | | |
| Chronic lung disease | No | 1.00 | | | | | | | |
| | Yes | 0.82 | 0.55 | 1.22 | 0.323 | | | | |
| | Unknown | 1.11 | 0.97 | 1.26 | 0.123 | | | | |
| Smoke before pandemic | No | 1.00 | | | | 1.00 | | | |
| | Yes | 0.78 | 0.61 | 0.98 | 0.036 | 0.82 | 0.63 | 1.06 | 0.134 |
| | Unknown | | | | | 1.06 | 0.93 | 1.21 | 0.402 |
| Reported unwell on next questionnaire | No | 1.00 | | | | 1.00 | | | |
| | Yes | 0.83 | 0.73 | 0.93 | 0.001 | 0.81 | 0.72 | 0.92 | 0.001 |
| | Other | 0.65 | 0.50 | 0.83 | 0.001 | 0.70 | 0.52 | 0.94 | 0.019 |
| Severity | Continuous (−1.64 to 3.64) | 0.85 | 0.81 | 0.89 | <0.001 | 0.83 | 0.79 | 0.88 | <0.001 |
| HADS: anxiety | Continuous (0 to 21) | 1.00 | 0.99 | 1.02 | 0.598 | | | | |
| HADS: depression | Continuous (0 to 21) | 0.99 | 0.98 | 1.01 | 0.372 | | | | |
| Ratings before available | No | 1.00 | | | | 1.00 | | | |
| | Yes | 1.56 | 1.15 | 2.13 | 0.005 | 1.23 | 0.95 | 1.60 | 0.117 |
| Worry will be infected | Continuous (0 to 10) | 0.97 | 0.95 | 0.99 | <0.001 | 0.99 | 0.97 | 1.00 | 0.101 |
| Mentor support | Continuous (0–10) | 0.99 | 0.97 | 1.00 | 0.056 | 0.99 | 0.97 | 1.00 | 0.058 |

CI, confidence interval; HCA, healthcare aide; LPN, licensed practical nurse; MD, medical doctor; PSW, personal support worker; RN, registered nurse; WCB, Workers Compensation Board.

 

Furthermore, the collection of cases and associated sickness absence over the first 30 months of the pandemic allowed us to chart the clear decrease in time off work as the pandemic progressed, also reported by Aben and colleagues[7] in the Netherlands. Limitations include the strong collinearity between months into the pandemic and other time dependent measures such as vaccination, which may have reduced certainty about the size of effects. The reliance on self-reported symptoms to determine severity and the uncertainty about whether the symptoms reported did indeed relate to a COVID-19 episode were further limitations. Although we considered rating of the importance HCWs gave to supports from those at work (before their COVID-19 episode), the choice of these ratings was somewhat arbitrary and cannot be used to conclude that duration of sickness absence is necessarily independent of a supportive work environment. The increase of time off with the perception that infection was from the workplace is only weakly preserved in the final model but may be of practical importance. With the short absences considered here and with provincial or employer undertakings to pay wages for those absent with COVID-19, fewer than one in four of those believing they were infected at work submitted a claim to the workers compensation boards.

We relied on self-report of work days missed. Because we do not know the work schedule of each HCW, it is difficult to extrapolate from total work days to total days between a positive test and return to work: 6 days missed from work would be 10 days, if it included four weekend days, for example. Anecdotally we know of participants being infected on their last day of work before a vacation or during scheduled breaks from work. Nevertheless, it is noted that for 10% of episodes, participants reported fewer than 3 days lost from work. In some jurisdictions, lack of sick pay could be a reason for skirting guidelines, but there was little evidence that this was a factor in this cohort of Canadian healthcare workers. We are not conscious either of widespread "presenteeism"[18,19] in this cohort, but it does at least seem possible that some with largely asymptomatic infections felt ready to return soon after a positive test. As the pandemic progressed, there was increasing acceptance that with massive service needs, the risk of transmission of infection was low and, with appropriate respiratory protection, could be tolerated.[13,20–22]

The finding that demographic factors (other than type of work) were unrelated to length of absence is out of line with reports of sickness absence from COVID-19 in the general population where women[5,7] and older workers[4,5,7,23] were found to have a longer time to return to work. Others have found that preexisting depression and anxiety increased sickness absence duration,[6,10] which (after accounting for severity) was not seen here. The longer absence in personal support workers in this cohort supports that seen in Swedish residential care workers.[10] Comparison with other studies are limited by the difference in definition used for the period of sickness absence; Kisiel et al,[10] for example, compared absence greater and less than 3 weeks and the inclusion, by Jacobsen et al[5] or exclusion (as here), of those admitted to hospital. Moreover, determinants of return to work in healthcare workers may differ importantly from those in the general population.

This study was not designed to evaluate the impact of policy decisions on staff shortages. Others have attempted to do so by modeling.[24,25] Here, we simply report that those who returned to work at a time when there was a callback provision in their province, did so after fewer days than when there was no such provision. The early return may indeed reflect exactly those factors that brought in the provision and it is possible (but perhaps unlikely) that there is no direct causal link between the policy and the outcome. Equally, the mechanism by which vaccination reduces length of sickness absence is likely to be multifactorial. Vaccines attenuate symptom severity,[26] but the faster return to work may also reflect guidelines, in some provinces, that required longer isolation for unvaccinated HCWs. If a province's guidelines specified negative testing before return, this may be achieved earlier postvaccination.[27] Moreover, a HCW may feel more ready to face the work environment after vaccination, and perhaps to do so sooner, if the need is there. Within these data, it may not be possible to determine how much of the effect of vaccination on length of sickness absence reflects biological rather than administrative or other perceptions.

This study of cohort participants, whose ill-health due to COVID-19 infection was mild enough for return to the workplace after a median of six working days, has implications for manpower planning in future pandemics or the resurgence of this one. The role of vaccination in shortening return to work is supported by these data. Moreover, it seems that a policy of recall without extended isolation helped mitigate staff shortages during the pandemic. While the risk of transmission to other HCW and patients from such early return has been assessed as low, any impact on worker health of early resumption of work has yet to be fully determined. Provisional analysis reported here suggests that early recall was not importantly associated with sequalae of COVID-19 infection.

## REFERENCES


1. Van der Plaat DA, Edge R, Coggon D, et al. Impact of COVID-19 pandemic on sickness absence for mental ill health in National Health Service staff. *BMJ Open* 2021;11:e054533.
2. de Paiva LG, Dos Santos WM, de Lima Dalmolin G. The impact of the SARS-CoV-2 pandemic on sickness absenteeism among hospital workers. *Rev Bras Med Trab* 2022;20:65–71.
3. Skyrud K, Telle K, Magnusson K. Impacts of mild and severe COVID-19 on sick leave. *Int J Epidemiol* 2021;50:1745–1747.
4. Westerlind E, Palstam A, Sunnerhagen KS, Persson HC. Patterns and predictors of sick leave after COVID-19 and long COVID in a national Swedish cohort. *BMC Public Health* 2021;21:1023.
5. Jacobsen PA, Andersen MP, Gislason G, et al. Return to work after COVID-19 infection—a Danish nationwide registry study. *Public Health* 2022;203:116–122.
6. Hajek A, König HH. Personality-related and psychosocial correlates of sick leave days in Germany during the COVID-19 pandemic: findings of a representative survey. *Arch Public Health* 2022;80:227.
7. Aben B, Kok RN, de Wind A. Return-to-work rates and predictors of absence duration after COVID-19 over the course of the pandemic. *Scand J Work Environ Health* 2023;49:182–192. doi:10.5271/sjweh.4077.
8. van der Plaat DA, Madan I, Coggon D, et al. Risks of COVID-19 by occupation in NHS workers in England. *Occup Environ Med* 2022;79:176–183.
9. Reme BA, Grøsland M, Gjefsen H, Magnusson K. Impact of the COVID-19 pandemic on sick leave among healthcare workers: a register-based observational study. *Occup Environ Med* 2023;80:319–325.
10. Kisiel MA, Nordqvist T, Westman G, Svartengren M, Malinovschi A, Janols H. Patterns and predictors of sick leave among Swedish non-hospitalized healthcare and residential care workers with COVID-19 during the early phase of the pandemic. *PloS One* 2021;16:e0260652.
11. Silberner J. COVID-19: North Dakota and Belgium have let infected health staff work on wards. *BMJ* 2020;371:m4455.
12. United States Centers for Disease Control and Prevention. Strategies to mitigate healthcare personnel staffing shortages. Available at: https://stacks.cdc.gov/view/cdc/88616/cdc_88616_DS1.pdf. Accessed April 26, 2023.
13. European Centre for Disease Prevention and Control. Available at: https://www.ecdc.europa.eu/sites/default/files/documents/Guidance-for-discharge-and-ending-of-isolation-of-people-with-COVID-19-third-update.pdf. Accessed April 25 2023.
14. Cherry N, Adisesh A, Burstyn I, Durand-Moreau Q, Galarneau J-M, Labrèche F, Ruzycki S, Zadunayski T Cohort profile: recruitment and retention in a prospective cohort of Canadian health care workers during the COVID-19 pandemic Under review *BMJ Open* doi: 10.1101/2023.04.14.23288575. Accessed April 26, 2023.
15. Cherry N, Mhonde T, Adisesh A, et al. The evolution of workplace risk for COVID-19 in Canadian healthcare workers and its relation to vaccination: a nested case-referent study. *Am J Ind Med* 2023;66:297–306.
16. Lamping DL, Schroter S, Marquis P, Marrel A, Duprat-Lomon I, Sagnier PP. The community-acquired pneumonia symptom questionnaire: a new, patient-based outcome measure to evaluate symptoms in patients with community-acquired pneumonia. *Chest* 2002;122:920–929.
17. Bjelland I, Dahl AA, Haug TT, Neckelmann D. The validity of the Hospital Anxiety and Depression Scale. An updated literature review. *J Psychosom Res* 2002;52:69–77.
18. Eisen D. Employee presenteeism and occupational acquisition of COVID-19. *Med J Aust* 2020;213:140–140.e1.


 

19. Webster RK, Liu R, Karimullina K, Hall I, Amlôt R, Rubin GJ. A systematic review of infectious illness presenteeism: prevalence, reasons and risk factors. *BMC Public Health* 2019;19:799.
20. Jung J, Kang SW, Lee S, et al. Risk of transmission of COVID-19 from healthcare workers returning to work after a 5-day isolation, and kinetics of shedding of viable SARS-CoV-2 variant B.1.1.529 (Omicron). *J Hosp Infect* 2023;131:228–233.
21. Raza M, Giri P, Basu S. Surveillance and return to work of healthcare workers following SARS-CoV-2 Omicron variant infection, Sheffield, England, 17 January to 7 February 2022. *Euro Surveill* 2022;27:2200164.
22. Kolodziej LM, Hordijk S, Koopsen J, et al. Risk of SARS-CoV-2 transmission upon return to work in RNA-positive healthcare workers. *J Hosp Infect* 2022;124:72–78.
23. Sakr CJ, Fakih L, Melhem NM, et al. COVID-19 infections and predictors of sickness related absences among healthcare workers: the experience of a tertiary care center with the COVID-19 pandemic. *J Occup Environ Med* 2023;65:590–594.
24. Davies NG, Kucharski AJ, Eggo RM, Gimma A, Edmunds WJ, Centre for the Mathematical Modelling of Infectious Diseases COVID-19 Working Group. Effects of non-pharmaceutical interventions on COVID-19 cases, deaths, and demand for hospital services in the UK: a modelling study. *Lancet Public Health* 2020;5:e375–e385.
25. Aguilar E, Roberts NJ, Uluturk I, et al. Adaptive staffing can mitigate essential worker disease and absenteeism in an emerging epidemic. *Proc Natl Acad Sci U S A* 2021;118:e2105337118.
26. Thompson MG, Burgess JL, Naleway AL, et al. Prevention and attenuation of COVID-19 with the BNT162b2 and mRNA-1273 vaccines. *N Engl J Med* 2021;385:320–329.
27. Prato' S, Paladino ME, Riva MA, Belingheri M. COVID-19 vaccination and asymptomatic infection: effect of BNT162b2 mRNA vaccine on the incidence of COVID-19 and duration of sick leave among healthcare workers. *J Occup Environ Med* 2021;63:e868–e870.



 