

1 **Reduced incidence of Long COVID referrals to the Cambridge University Teaching Hospital**
2 **Long COVID clinic**

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1 **Abstract**

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3 Long COVID (LC) constitutes a potential health emergency as millions of SARS-CoV-2 infections
4 lead to chronic symptoms. We must understand whether vaccines reduce LC as this has major
5 implications for health policy. We report a 79% reduction in LC referrals correlating with
6 reinfections and vaccination in the UK.

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1 **Main text**

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3 Long COVID (also known as post-acute sequelae of SARS-CoV-2 infection (PASC)) poses a serious
4 health burden for society. There is currently no consensus of the exact symptoms, duration or
5 prevalence of Long COVID. It is however evident that some patients experience debilitating
6 multi-systemic symptoms such as fatigue, myalgia, memory problems and shortness of breath,
7 just to mention a few, more than 6 months post-acute COVID-19. Even more concerning is that
8 there are a significant number of patients who have not fully recovered two years since the
9 initial infection. This greatly diminishes Long COVID sufferers' quality of life, as well as exerting
10 a heavy burden on the healthcare system, families of those affected and having a negative
11 impact on the economy ¹.

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13 Given the magnitude and impact of Long COVID, it is vital that we understand whether
14 vaccination reduces the incidence or severity of Long COVID symptoms. Establishing whether
15 vaccines reduce Long COVID risk would provide key information in understanding the
16 mechanistic underpinnings of Long COVID. Additionally, if breakthrough infections are less likely
17 to lead to Long COVID, this affects decisions on policies such as masking to reduce SARS-CoV-2
18 spread, "zero COVID" as a long-term strategy and the use of further booster vaccinations.
19 Indeed, as antibodies wane after booster vaccines, we would expect to see more breakthrough
20 infections and potentially higher rates of Long COVID cases. If that turns out to be the case,
21 then yearly booster vaccines might be cost effective for reducing morbidity from Long COVID.

22

23 Two recent publications suggest that vaccination strongly reduced Long COVID symptoms at 1-3
24 months after infection²⁻⁴ but another study using a cohort of US Army Veterans suggests a more
25 modest effect size at 6 months (15% reduction)⁵. We believe that these differences are likely
26 due to different data collection methods as well as the populations studied. It is conceivable
27 that vaccination may reduce the severity of Long COVID without full resolution of all symptoms.
28 In this scenario, we would expect that vaccinated individuals would be less likely to seek
29 medical treatment for Long COVID but may still report Long COVID symptoms if asked to
30 complete a health questionnaire.

31

32 At the Cambridge University Teaching Hospital the initial long covid clinic was set up in May
33 2020. Patients are referred to the clinic based on a number of criteria, one of which is
34 symptoms duration of at least 5 months. These patients tend to be those on the severe end of
35 the symptom spectrum, having been referred following assessment by a community multi-
36 disciplinary team which includes a general practitioner, mental health practitioners, physio and
37 occupational therapists amongst other specialists.

38

39 We have noticed a 79% drop in the number of patients being referred to the clinic from August
40 2021 – June 2022, compared to August 2020 - July 2021 (Fig 1). This effect has so far been
41 sustained until at least June 2022, despite 4 times more cases per month of acute COVID-19 in
42 England across the same time periods ⁶. This change is notable as the decrease begins in August
43 2021, 5 months after the British population started receiving second doses of COVID-19

1 vaccines in March 2021. Taken in context, this observation points towards vaccination in the
2 UK playing a role in reducing the rates of the most severe Long COVID cases.

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4 Although changes in variant could explain differences in Long COVID rates, we are not aware of
5 any data which suggests a strong enough difference to explain our observations. Our observed
6 reduction in Long COVID rates in August 2021 were from patients experiencing symptoms for 5
7 months which would suggest a change beginning in March 2021. This occurs too early for the
8 delta wave which began in April 2021 but correlates well with the second doses of vaccination
9 in the UK. Our recruitment criteria have not changed over this time period either, leading us to
10 rule this out as a possible explanation. We cannot fully rule out prior infections providing
11 immunity that protects against Long COVID from reinfections, however primary infections were
12 more common than reinfections around March-April 2021⁷.

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14 We also observe no changes in symptoms between those referred for Long COVID before or
15 after vaccination for any of the major symptoms such as fatigue (73% pre-vaccination, 76% post
16 vaccination) and shortness of breath (18% pre-vaccination vs 23% post-vaccination).

17
18 In summary, we have observed a significant reduction in the most severe cases of Long COVID
19 since the introduction of vaccines in the UK. Vaccination has not changed the symptoms of Long
20 COVID but has likely reduced symptom severity. Our data point towards vaccination being an
21 important tool to reduce the burden of Long COVID for society. They also suggest that
22 immunity prior to infection reduces Long COVID risk, although the mechanisms behind this
23 remain to be elucidated. One potential factor to consider is that vaccines reduce the severity of
24 acute COVID-19 symptoms, leading to a reduction in post-COVID sequelae and subsequent
25 reduction in Long COVID severity.

26
27 It is not yet clear if immunity from a prior infection protects against Long COVID, nor whether
28 reinfections with SARS-CoV-2 hold the same risk of Long COVID as a primary infection. Given
29 the possibility that Long COVID is caused by autoimmunity triggered by infection, or by
30 persistent viral infections, it is plausible that each reinfection poses a cumulative risk of Long
31 COVID.

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33 We also do not yet know what level of immunity is required to protect against Long COVID. As
34 immunity wanes over time, booster shots may be necessary to minimise Long COVID risk, and
35 variant specific booster shots may be more efficacious. These questions are paramount to our
36 understanding, treating and preventing Long COVID.

1 **NOTES**

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3 **Acknowledgements**

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5 We would like to thank the staff and patients at CUH NHS Foundation Trust. The views
6 expressed are those of the authors and not necessarily those of the NIHR or the Department of
7 Health and Social Care.

8

9 **Funding**

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11 This work was funded by the Addenbrooke's Charitable Trust (900276 to NS) and an NIHR
12 award (G112259 to NS) and supported by the NIHR Cambridge Biomedical Research Centre.

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14 **Ethics**

15 The Long COVID study patients were recruited and consented under the Cambridge COVID-19
16 NIHR BioResource joint Consent Form (Research Ethics Committee (NRES number (REC)) no.
17 T1gC1) study NBR87. Informed consent was obtained from all participants for the rest of the
18 study.

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20 **Declaration Of Interests**

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22 All authors declare no competing interests

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- 7 <https://coronavirus.data.gov.uk/details/cases?areaType=nation&areaName=England>

1 **FIGURE LEGEND**

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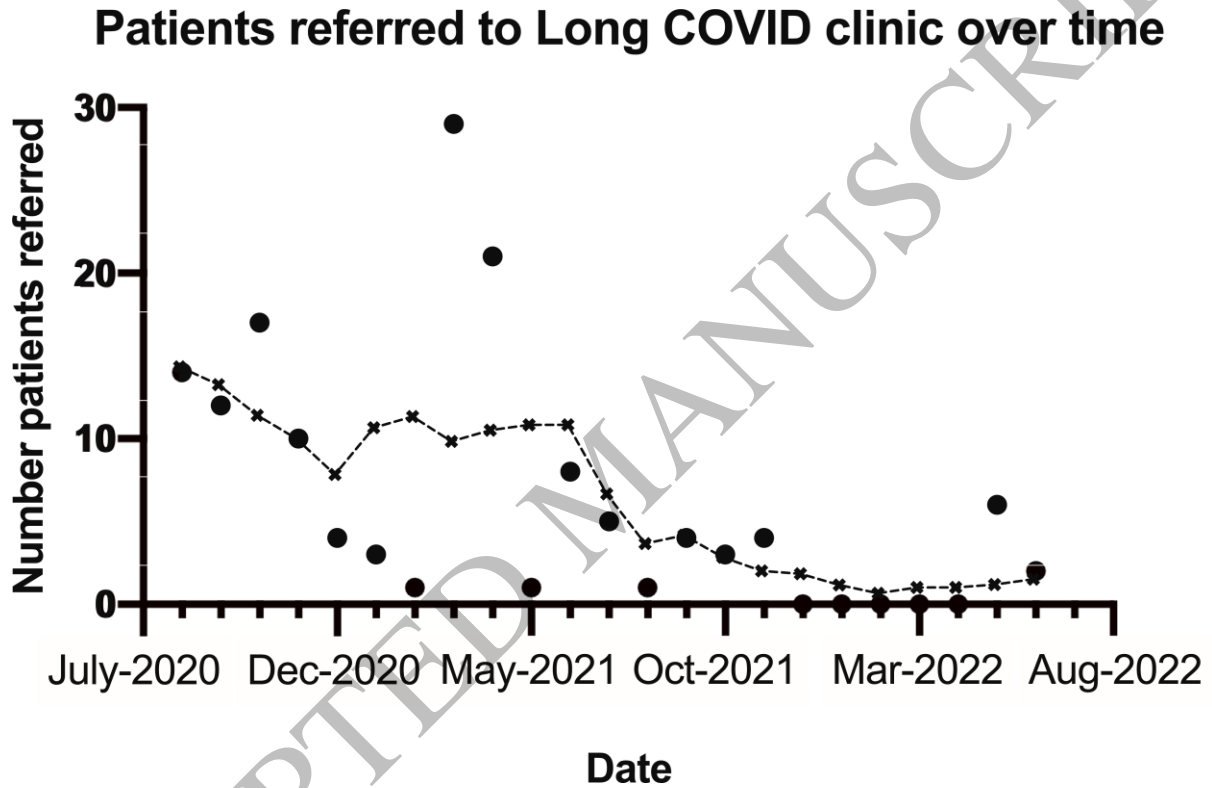
3 **Figure 1:** The number of patients referred to the Cambridge University Teaching Hospital Long
4 COVID clinic has dropped since August 2021. Black circles: number of patients referred that
5 month. Black crosses and dotted line: 6-month moving average.

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Figure 1
159x102 mm (.74 x DPI)