

# Pulse oximetry in care homes during the COVID-19 pandemic

## Interpretation of findings

March 2022

**RSET** | rapid  
service  
evaluation  
team

 **BRACE**  
Rapid Evaluation Centre

FUNDED BY  
**NIHR** | National Institute  
for Health Research

**Imperial College  
London**

**INSTITUTE OF  
GLOBAL HEALTH  
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# About these slides

This slide set presents the interpretation of the findings from two independent separate evaluations of the use of pulse oximetry in care homes both in general and as part of the COVID Oximetry @home (CO@h) programme.

All statements in this report are based on a synthesis of the evidence carried out by the evaluators; further insights may be derived from the more detailed results from each of the evaluations.

**Please note that the findings in this report have not yet been peer reviewed.** The findings of the independent evaluations will be submitted for peer review publication separately.

Details of the two evaluation teams and their objectives (both in general and as part of the CO@h programme) are presented below:

- **Study 1:** a collaboration between NIHR RSET (Rapid Service Evaluation Team) and NIHR BRACE (Birmingham, RAND and Cambridge Evaluation)
  - To explore the views of care home staff, and NHS staff they interact with, about the use of pulse oximetry with residents when managing COVID-19 in the care home environment.
- **Study 2:** Institute of Global Health Innovation, NIHR Imperial Patient Safety Translational Research Centre, Imperial College London
  - To describe the number and characteristics of care home residents onboarded to COVID Oximetry at home (CO@h) pathways across England and their rates of mortality and hospital admission.
  - To analyse the characteristics of care home residents with a positive COVID-19 test that are associated with being onboarded to the CO@h pathway.

# About the evaluators

## **Imperial College London**

Institute of Global Health Innovation, NIHR Imperial Patient Safety Translational Research Centre, Imperial College London (ICL). Core team: Thomas Beaney, Jonathan Clarke, Ana Luisa Neves.

## **NIHR RSET / NIHR BRACE**

Two rapid evaluation teams: [NIHR RSET](#) (a collaboration between UCL, Nuffield Trust and Cambridge University) and [NIHR BRACE](#) (a collaboration between University of Birmingham, RAND Europe, the University of Cambridge and National Voices).

Project team for the evaluation and care homes extension: Manbinder Sidhu, Ian Litchfield, Robin Miller, Naomi Fulop, Barbara Janta, Jamie-Rae Tanner, Giulia Maistrello, Jenny Bousfield, Cecilia Vindrola-Padros, Jon Sussex.

This evaluation was funded by the National Institute for Health Research, Health Services & Delivery Research programme (RSET Project no. 16/138/17; BRACE Project no. 16/138/31) and NHSEI.

The views expressed in this publication are those of the authors and not necessarily those of the National Institute for Health Research or the Department of Health and Social Care.

# Study 1: Methods

Online survey sent to registered managers to all 15,362 care homes in England registered with the Care Quality Commission. We obtained 232 survey responses (1.5% response rate).

Interviews with:

- 31 with care home staff and associated NHS staff at 6 care homes across England, with a mix of settings and resident populations
- 3 with individuals with national oversight

Data collection March – June 2021

Learning shared with relevant stakeholders and policy makers at NHS England & Improvement (People Receiving Social Care Workstream COVID Oximetry @home)

Limitations:

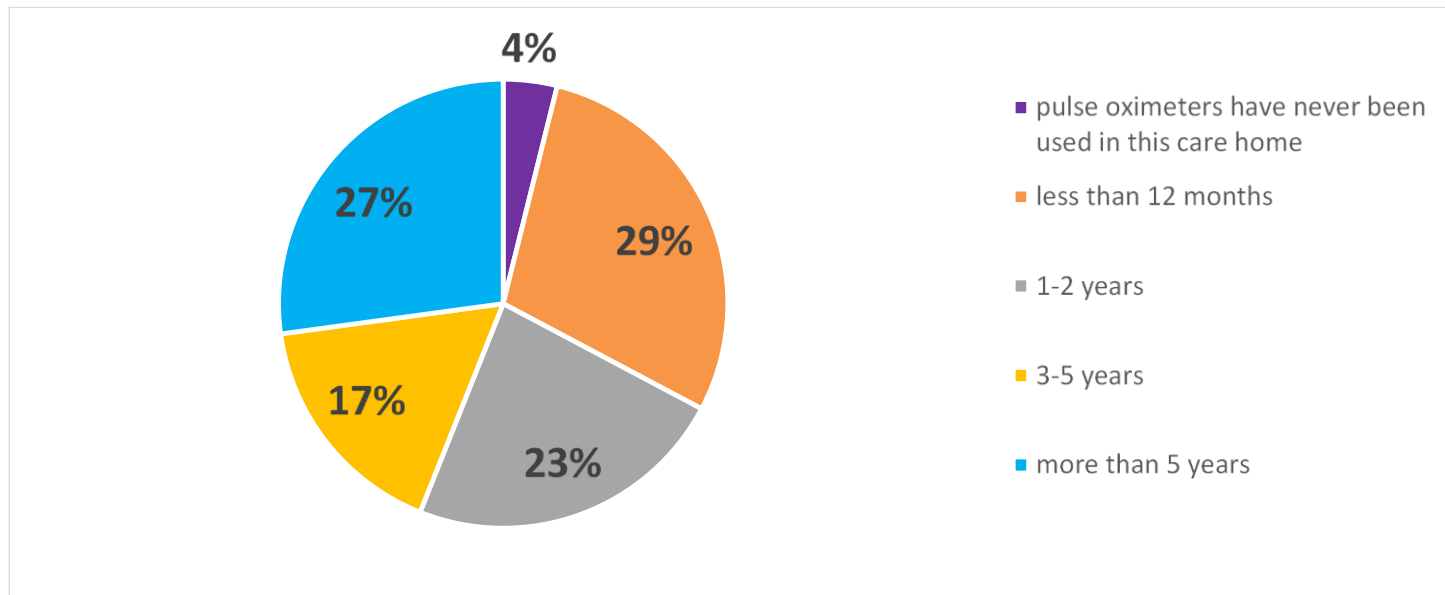
- Fewer than intended interviews completed due to participant unavailability.
- Response rate to the survey was low (1.5%) despite extensive advertising of the survey and repeated reminders. Throughout the pandemic, care homes may have been asked to complete a number of surveys from other research and/or regulatory bodies, which may have contributed to this low response rate. Due to anonymity, the team were unable to determine the range of care homes responding to the survey across variables such as location, financial budget and CQC rating.
- Unable to complete data collection with care home residents and their families.

More information on the care home extension can be found in the protocol [here](#).

# Study 1: Length of time using pulse oximeters (1/6)

Pulse oximeters (along with other diagnostic tools) were in use in many, but not all, responding care homes before the pandemic and that use widened and expanded during the pandemic

Figure 6. Length of time using pulse oximetry in care homes



Note: N= 232

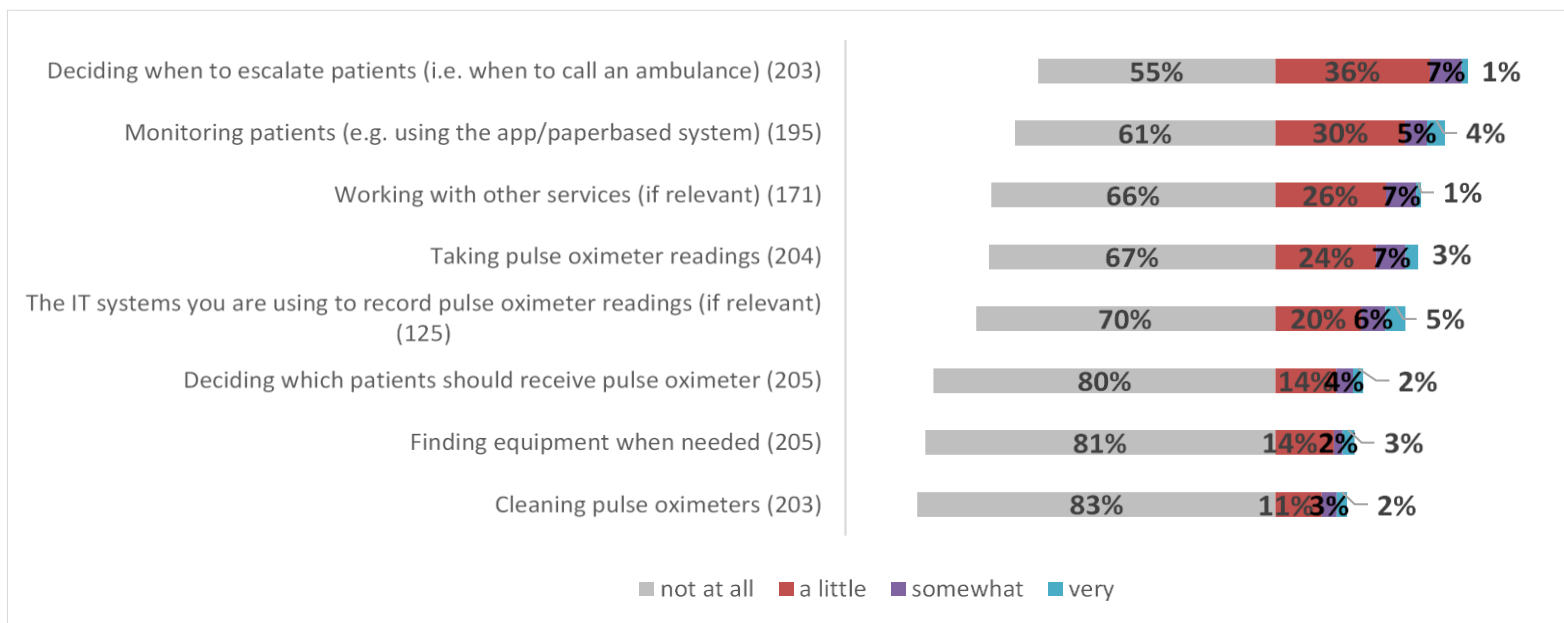
Source: Online survey of care home managers.

“I’ve been here for 9 years and since I’ve started our care manager got us all our own oximeters...so that’s something that they’ve always done here actually. Obviously with COVID they’re more hot on it but yeah, definitely, we’ve always used oximeters.” Qualified Nurse, Nursing Home (Site3)

# Study 1: Level of challenge when using pulse oximeters (2/6)

Pulse oximeters were reported by managers as easy for staff to use and could be readily accommodated alongside the recording of other routine clinical measurements such as temperature and blood pressure

Figure 9. Level of challenge for staff to carry out activities related to pulse oximetry



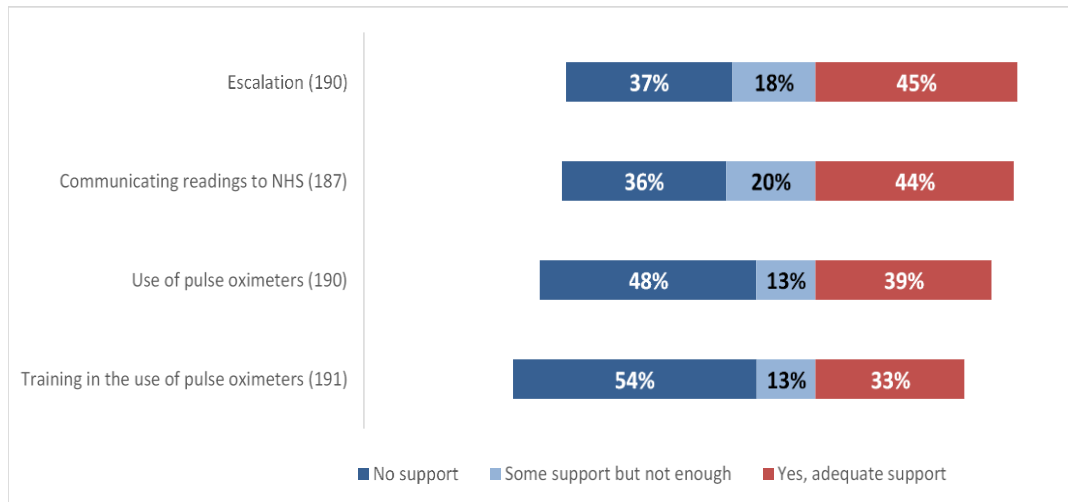
Note: The number of answers differed per option, as indicated in the figure.

Source: Online survey of care home managers.

# Study 1: Nature of support received (3/6)

In some cases support from the NHS, including training, was sought but was not always available to the full extent desired

Figure 14. Perceived level of support from the NHS



Note: The number of answers differed per option, as indicated in the figure.

Source: Online survey of care home managers.

A varied picture:

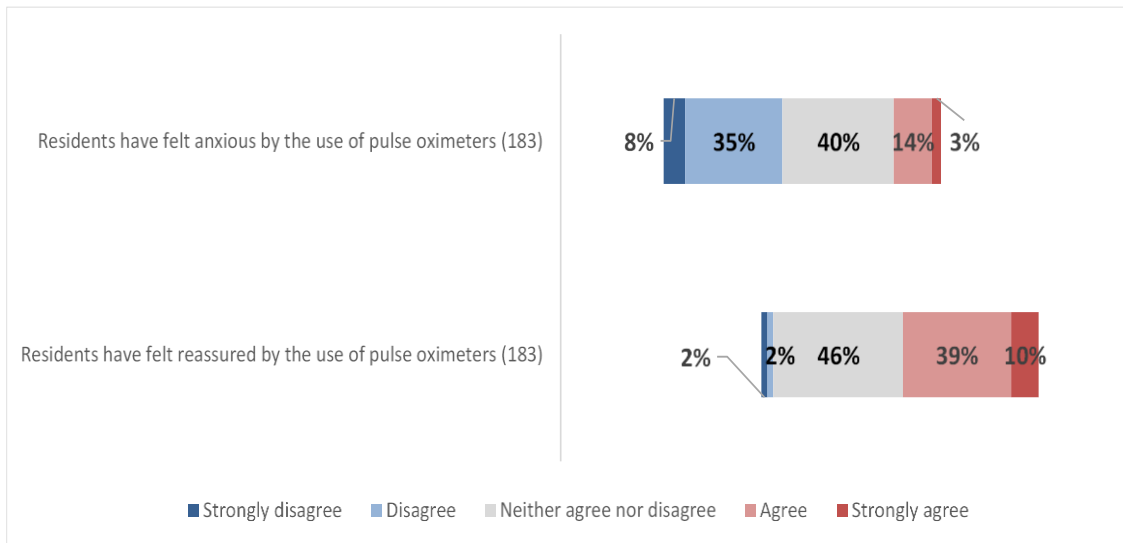
“Myself and the GP, we’re in constant email communication, so if someone’s poorly outside of a Tuesday we can still be requesting things and we get sorted within that day,” Care Manager, Nursing Home (Site 2)

“Personally, I think care homes have been overlooked through the whole thing with regards to training, the support we have,” Senior Carer, Residential Home, (Site 6)

# Study 1: Views of care home managers (4/6)

In the view of care home managers, residents generally benefited from the use of pulse oximeters and were more often reassured than made anxious

Figure 11. Care home managers' perceptions of residents' feelings towards pulse oximetry



Note: N=177.

Source: Online survey of care home managers.

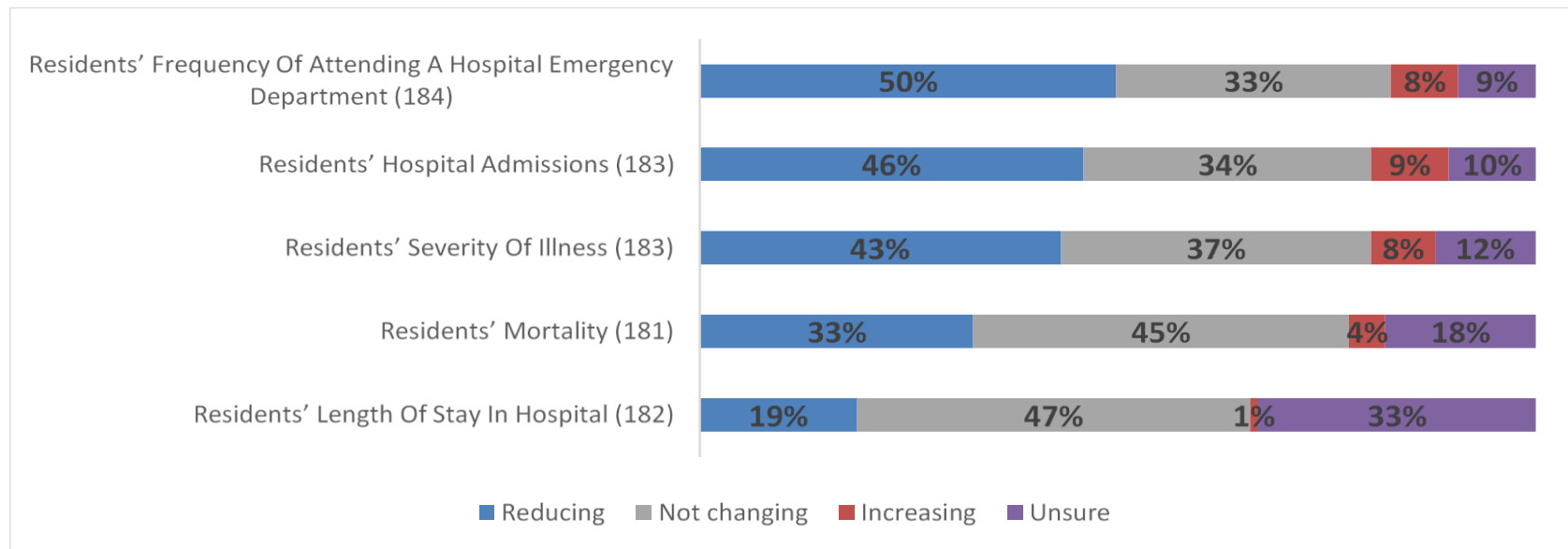
- “the people that have got the capacity, we can speak to them more about it but...there’s quite a lot in our home got dementia and some of it’s quite bad, so trying to explain anything to them is just in one ear and out the other I’m afraid to say...” Care Supervisor, Residential Home (Site 2)
- “So obviously we have a lot of residents with dementia. A lot of them are fine with it on their finger but some of them will try and get it off.” Qualified Nurse 2, Nursing Home, (Site 3)



# Study 1: Views of care home managers (continued) (5/6)

Use of pulse oximetry is thought by care home managers to have, on average, reduced A&E attendances and hospital admissions of care home residents

Figure 13. Impact of pulse oximeters on key health parameters of residents



Note: The number of answers differed per option, as indicated in the figure.

Source: Online survey of care home managers.

# Study 1: Engagement with and awareness of the CO@H programme (6/6)

The NHS COVID oximetry at home (CO@H) programme seems to have been well-received and beneficial at the care home sites in contact with it. But, 60% of care home managers responding to the survey were unaware of the programme:

*“[CCG clinical lead care homes] informed us about...the COVID hub and then the next thing it was either her or someone else delivered a big box of oximeters and all the paperwork and everything like that” Senior Carer 2, Residential Home (Site 4)*

*“It was just the knowing that someone else was going to make – not make a decision for you – but someone else was going to give you advice if you needed it... it’s just that little bit of backup.” Senior Carer, Residential Home (Site 4)*

*“They were really supportive, I couldn’t fault them at all. Any questions we had we would call them up and they’d kind of give us the correct information on how to read the oximeter machines properly and what result we should be looking at. We didn’t even know you had to kind of remove nail varnish and things like that for it to work properly. So they supported us through all of that.” Registered Manager, Residential Home (Site 6)*

# Study 2: Methods

## Methods

### Inclusion criteria:

- Patients identified as a resident of a care home based on postcode matching by NHS Digital.
  - Limited to Clinical Commissioning Groups (CCGs) where one or more care home residents were onboarded onto a CO@h programme.
  - Only positive tests and onboarding events after that implementation date of the programme in each CCG were included.
1. Descriptive analysis of all care home residents with either an onboarding or offboarding event to the CO@h programme.
  2. Two-level hierarchical multivariable logistic regression model of odds of onboarding to a CO@h programme with random intercepts for each CCG.

### Limitations:

- This study had a relatively small sample size and therefore may have insufficient statistical power to detect differences in odds of onboarding between populations.
- There may be variation in how CO@h was implemented between care homes and who was eligible.
- Many patients may have received pulse oximetry monitoring outside of the CO@h programme. In our analyses they are assumed not to have received pulse oximetry monitoring.
- We are unable to control for clinical acuity of patients, and therefore are unable to effectively compare the outcomes of those onboarded onto CO@h with those who were not.

# Study 2: Background and context (1/3)

In 70 CCGs in England, data were received for one or more care home residents onboarded to CO@h programmes within seven days before and 28 days after a positive COVID-19 test and after the local implementation of a CO@h programme.

Within these 70 CCGs, 29,606 care home residents had a positive COVID-19 test after the local implementation date of the CO@h programme. 812 (2.7%) of these were recorded as onboarded onto a CO@h programme within seven days before and 28 days after a positive COVID-19 test.

Outcomes in those onboarded (within 28 days of onboarding):

- 237 (29.2%) attended A&E departments
- 197 (24.3%) patients had a recorded hospital admission
- Of those admitted, none were admitted to level 2 or level 3 care
- 101 recorded deaths (12.4%), of which 99 (98.0%) featured COVID-19 as a cause of death.\*

Of those onboarded, 636 (78.3%) had a recorded offboarding date. Of these:

- 255 (40.1%) were onboarded and offboarded on the same day
- 91 (14.3%) were offboarded on their 14<sup>th</sup> day on the programme
- 62 (9.7%) patients remained on the programme for more than 14 days
- Overall median time on the programme was 4 days, and was 12 days after excluding those onboarded and offboarded on the same day.

\*This study did not aim to quantify differences in mortality or hospitalisation rates between care home residents and non-care home residents. The care home resident population included in the study was significantly older (68.9% aged 80 years or more vs. 5.8% of all those with a positive Covid-19 test) and more likely to be identified as clinically extremely vulnerable than all those with a positive Covid-19 test (62.9% vs. 10.8%) which may result in higher risk of severe or complicated Covid-19 infection in care home residents.

# Study 2: Demographic and clinical characteristics (2/3)

- Demographic and clinical characteristics of included care home residents.

Variable	Onboarded	Total	% Onboarded
<b>Age</b>			
< 50	52	1325	3.92
50-59	39	1101	3.54
60-69	51	1771	2.88
70-79	131	4999	2.62
80+	539	20410	2.64
<b>Sex</b>			
Female	489	18965	2.58
Male	323	10641	3.04
<b>Ethnicity</b>			
White	786	28462	2.76
Asian/Asian British	***	228	< 2
Black/African/Caribbean/Black British	***	300	2.00
Mixed/Multiple ethnic groups	10	199	5.03
Other ethnic group	***	130	< 2
Missing	5	287	1.74
<b>IMD quintile</b>			
1 (most deprived)	189	6086	3.11
2	142	5904	2.41
3	181	6052	2.99
4	215	6025	3.57
5 (least deprived)	85	5539	1.53

Variable	Onboarded	Total	% Onboarded
<b>Body Mass Index</b>			
Underweight	60	2592	2.31
Healthy weight	283	11901	2.38
Overweight	232	7813	2.97
Obese	181	5311	3.41
Missing	56	1989	2.82
<b>Smoking status</b>			
Never smoker	527	18100	2.91
Ex-smoker	205	8449	2.43
Current smoker	80	3053	2.62
Missing	0	4	0.00
<b>Clinically Extremely Vulnerable</b>			
No	254	10985	2.31
Yes	558	18621	3.00
<b>Comorbidities*</b>			
Hypertension	450	16575	2.71
Chronic cardiac disease	267	10657	2.51
Chronic kidney disease	29	1001	2.90
Chronic respiratory disease	204	7516	2.71
Dementia	303	11407	2.66
Diabetes	174	6594	2.64
Chronic neurological disease (including epilepsy)	160	5396	2.97
Learning disability	116	1978	5.86
Malignancy or immunosuppression	154	6151	2.50
Severe mental illness	210	6929	3.03
Peripheral vascular disease	38	1276	2.98
Stroke or TIA	144	6364	2.26

\*Clinical comorbidity data were missing for 4 patients of which none were onboarded.

\*\*\* indicates cells with fewer than 10 patients

# Study 2: Results (3/3)

- Multivariable hierarchical logistic regression model with CCG-level random intercepts for the odds of being onboarded onto a CO@h programme associated with a positive COVID-19 test.
  - Rows coloured red indicate features that have significantly lower odds of onboarding than the reference group
  - Rows coloured blue indicate features that have significantly higher odds of onboarding than the reference group

Variable	Odds ratio	Standard error	p-value	95% confidence interval	
				Lower	Upper
<b>Age (years)</b>					
< 50	Reference				
50-59	1.33	0.35	0.268	0.80	2.21
60-69	1.39	0.35	0.200	0.84	2.29
70-79	1.75	0.43	0.025	1.07	2.84
80+	2.23	0.55	0.001	1.37	3.63
<b>Sex</b>					
Female	Reference				
Male	1.24	0.12	0.019	1.04	1.49
<b>Ethnicity</b>					
White	Reference				
Asian/Asian British	0.61	0.41	0.464	0.16	2.31
Black/African/Caribbean/Black British	0.92	0.48	0.870	0.33	2.55
Mixed/Multiple ethnic groups	1.76	0.70	0.154	0.81	3.86
Other ethnic group	0.49	0.50	0.486	0.07	3.59
<b>IMD quintile</b>					
1 (most deprived)	Reference				
2	0.72	0.10	0.015	0.55	0.94
3	0.91	0.11	0.437	0.71	1.16
4	0.66	0.09	0.003	0.51	0.87
5 (least deprived)	0.38	0.06	<0.001	0.27	0.52
<b>Clinically Extremely Vulnerable</b>					
No	Reference				
Yes	1.40	0.13	<0.001	1.16	1.69

Variable	Odds ratio	Standard error	p-value	95% confidence interval	
				Lower	Upper
<b>Body Mass Index</b>					
Underweight	1.00	0.16	0.990	0.73	1.38
Health weight	Reference				
Overweight	1.28	0.13	0.016	1.05	1.57
Obese	1.38	0.16	0.006	1.10	1.74
<b>Smoking status</b>					
Never smoker	Reference				
Ex-smoker	0.82	0.09	0.064	0.67	1.01
Current smoker	1.04	0.15	0.812	0.77	1.38
<b>Comorbidities</b>					
Hypertension	1.03	0.10	0.731	0.86	1.24
Chronic cardiac disease	0.97	0.09	0.715	0.80	1.17
Chronic kidney disease	0.98	0.23	0.925	0.62	1.55
Chronic respiratory disease	1.02	0.10	0.846	0.84	1.24
Dementia	0.97	0.09	0.758	0.81	1.17
Diabetes	0.88	0.10	0.258	0.72	1.09
Chronic neurological disease	0.90	0.10	0.377	0.72	1.13
Learning disability	2.56	0.46	<0.001	1.80	3.63
Malignancy or immunosuppression	0.94	0.10	0.545	0.76	1.16
Severe mental illness	1.32	0.13	0.005	1.09	1.61
Peripheral vascular disease	1.20	0.26	0.384	0.79	1.83
Stroke or TIA	0.83	0.10	0.101	0.66	1.04

NB: Only includes CCGs where one or more patients were onboarded onto a CO@h programme.

# Study 1: Overall messages

- Care home managers and staff consider that using pulse oximeters in care homes has been beneficial to care home residents and should continue to be encouraged and supported
- Pulse oximetry was not used in isolation but as one of several ways (including taking temperature or measuring blood pressure) in which the staff of care homes monitor the health of residents.
- Pulse oximetry was reported by most care home managers as easy for staff to use and could be readily accommodated alongside the recording of other routine clinical measurements such as temperature and blood pressure.
- There remains a need for training at least some care home staff in the use of pulse oximeters, including when to escalate and seek NHS help, as well as competencies such as taking baseline and further readings to monitor deterioration, preparing participants with respect to why and how they plan to take readings, and checking for any issues that may compromise readings e.g. nail polish and artificial nails.
- There is a need for primary care and other relevant health care services to be clear on the escalation protocols for care home residents, the support care homes can expect to receive, and how this can be accessed.
- There is scope for increasing knowledge of the NHS COVID Oximetry at home (CO@H) care homes programme in the care homes sector. The programme seems to have been well-received. But over half of care home managers responding to the survey were unaware of COVID Oximetry @home and the support it could provide them (albeit there may have been instances of care homes receiving support but not aware of the brand name).

## Study 2: Overall messages

- Data were received for 812 care home residents onboarded onto a CO@h programme across 70 CCGs in England after the local implementation of CO@h programmes and within seven days before and 28 days after a positive COVID-19 test.
- Of the 29,606 care home residents with a positive COVID-19 test in 70 CCGs in England after the local implementation of the CO@h programme, 812 (2.7%) were recorded as onboarded onto a CO@h programme.
- Rates of A&E attendance and inpatient admission were similar to those of the overall onboarded population, while no admitted patients had a critical care admission compared to 9.6% in the overall admitted CO@h population. 12.4% of care home residents had a death recorded within 28 days of onboarding, compared to 2.3% of the overall onboarded population. This difference may result, partly or entirely, from differences in the underlying age and clinical comorbidity profile of care home residents compared to the general population, however this was outside of the scope of this study.
- Male care home residents, those over the age of 70 years, those identified as clinically extremely vulnerable, overweight or obese or with a learning disability or mental health condition were significantly more likely to be enrolled into a CO@h programme, after accounting for other risk factors.
- Compared to the most deprived quintile, patients from less deprived quintiles were significantly less likely to be onboarded onto a CO@h programme.
- These findings suggest that despite low rates of uptake in general, there appears to be preferential enrolment in populations identified to be at greater risk from COVID.



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