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Testing for SARS-CoV-2 Infection in Care Home Residents and Staff in English Care Homes: A Service Evaluation

RESEARCH

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ABSTRACT

Context: COVID-19 is especially dangerous to older adults living in residential care.

Objective: To evaluate the usefulness of a nurse-led Enhanced Care Home Team (ECHT) SARS-CoV-2 testing strategy to identify resident cases early, identify typical illness presentation residents, and correctly attribute cause of death in care home settings in Norfolk, UK.

Method: Residents and staff received nose and throat swab tests (7 April to 29 June 2020). Resident test results were linked with symptoms on days 0–14 after test and mortality to 13 July 2020. The data collected were used to evaluate service performance.

Findings: Residents (n = 521) and staff (estimated n = 340) in 44 care homes were tested in the ECHT service. SARS-CoV-2 positivity was identified in 103 residents in 14 homes and 49 staff in 7 homes. Of 103 SARS-CoV-2+ residents, just 37 had what were understood to be typical COVID-19 symptom(s). Among 51 residents without symptoms when initially tested, 13 (25%) developed symptoms within 14 days. Many SARS-CoV-2+ residents lacked typical symptoms but presented rather as 'generally unwell' (n = 16). Of 39 resident deaths during the monitoring period, 20 (51%) were initially attributed to SARS-CoV-2, all of whom tested SARS-CoV-2+. One deceased person not initially attributed to SARS-CoV-2 tested positive through a different monitoring programme. Of all staff tests, 9% were positive.

Implications: A locally designed and integrated joint nursing and social care team approach successfully identified asymptomatic and pre-symptomatic SARS-CoV-2+ residents and staff. Being 'generally unwell' was common amongst symptomatic residents and indicated SARS-CoV-2 infection in older people in the absence of more 'typical' symptoms. The service supported correct attribution of cause of death.

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INTRODUCTION

Social (long-term) care describes forms of physical interaction and support which are assistance in daily living rather than health care. Social care is, for instance, help with toileting, eating, and getting dressed. *Social care settings* include residential facilities set up as multi-occupancy homes, and *care homes* that provide 24-hour access to social care. Most persons living in care homes have physical or mental frailty and therefore tend to be elderly adults (age 70 years and older). In Britain, the National Health Service (NHS) is intended to primarily provide health care while social care is mainly the responsibility of local government councils and private providers (Hudson & Henwood, 2002). To protect NHS bed-capacity in early 2020 as the COVID-19 pandemic reached the UK, national policy was to discharge patients from hospitals and health care as soon as possible, including into care homes when appropriate to patient needs. However, care homes are particularly high-risk settings for COVID-19 ingress and spread (Brainard et al., 2020; Rajan, Comas-Herrera & Mckee, 2020).

Historically, care homes in the UK have been consistently under-resourced in other respects (The Kings Fund, 2015). Staff are largely unregistered (Cavendish, 2013), while training and support for healthcare support workers is limited (Cavendish, 2013; Sarre et al., 2018). Paid carers often work across settings on casual or agency contracts (Stephenson, 2020). Allocation of SARS-CoV-2-tests and personal protective equipment (PPE) supply was initially focussed on clinical settings in many countries during the COVID-19 pandemic, including in the UK. Hence, NHS-discharged patients were not tested for COVID-19 status before 16 April (Dunn et al., 2020). There was no national policy for screening of care home residents or staff at this time, much less asymptomatic screening and testing. A national strategy to support formal testing of symptomatic residents and care home workers started from 15 April 2020. Whole care home testing in homes with known COVID-19 infection started from 15 May 2020 (Dunn et al., 2020), while voluntary screening (for asymptomatic infection) only began from 11 June 2020. These care home testing programmes had slow roll-out and implementation (Holt, 2020; House of Commons, 2020; Rajan, Comas-Herrera & Mckee, 2020). SARS-CoV-2 also highlighted wider serious gaps in data intelligence surrounding English care homes (Hanratty et al., 2020). Regional test results (surveillance) were typically not available to local authorities until 2 July 2020 (Dunn et al., 2020). As a result of limited availability of tests, lack of surveillance systems and late national policy and guidance, community care home management teams had to make independent and local decisions about how to best identify COVID+ care home residents or staff during the early pandemic period.

Only after the epidemic had reached many care homes did it become apparent that older patients often have atypical presentation (e.g. lack of cough or fever). Equally, early in the pandemic, it was unclear how common pre- or asymptomatic transmission might be, or what the duration of the infectious pre-symptomatic period might be (Gandhi, Yokoe & Havlir, 2020). These early knowledge gaps made recognition and control of infection in care homes difficult (Arons et al., 2020). This article describes how a nursing-led care home testing service was implemented and what information the service was able to collect in an environment with severe information deficits about likely presentation and symptom severity of care home staff or residents infected with COVID-19. The three main service objectives were to support early identification of infected patients, to understand their symptom presentations and to correctly attribute any deaths during this period. This service evaluation (Twycross & Shorten, 2014) describes the service activity, the data collected and service performance with respect to each of these objectives.

SETTING

The county of Norfolk lies in the East of England, UK. North Norfolk is one of seven local authority districts within Norfolk and has a total population of approximately 104,000 (ONS, 2019). The district is relatively rural and is neither especially deprived nor affluent (*https://www.norfolkinsight.org.uk/*). It has devolved administration for many public services including primary care to the North Norfolk Primary Care group (NNPC). North Norfolk has the oldest median age, at 53.8 years, of any local authority area in England and Wales (McCurdy, 2019). This compares with median age of 45 years across the entire county of Norfolk, and 40.2 years for the UK. Of the 89 registered residential homes for the elderly in North Norfolk, 57 receive enhanced nursing care services (as described below) from NNPC.

In the UK approximately 13.7% of people aged 85 and over live in care homes (ONS, 2020). Care home residents typically have high levels of healthcare needs related to chronic progressive disease including dementia, multiple disabilities and high dependency. Older people and staff of care homes in North Norfolk benefit from a series of well-developed integrated care services including an Enhanced Care Home Team (ECHT) service commissioned by Norfolk and Waveney Clinical Commissioning Group (CCG) in December 2018 (NNPC, 2020). The ECHT comprises five nurses (two advanced nurse practitioners [ANP], three nurse practitioners [NP]) and a paramedic. The ECHT was commissioned to provide holistic care through consistent review of the mental and physical health of care home residents. ECHT core objectives are to reduce unplanned hospital admissions or readmissions, undertake medicine reviews, and provide palliative care enabling residents to die with dignity and compassion at 'home.' At the time the pandemic started, the ECHT was already working with care homes to identify at-risk patients through risk stratification.

In early 2020, given limited resources for surveillance, the ECHT had to develop an 'intelligent' SARS-CoV-2 testing strategy that maximised available resources with a focus on detecting SARS-CoV-2 infection in an especially vulnerable cohort. Limited resources included low test capacity, that few staff that were trained in how to administer diagnostic tests, there were no rapid-result tests, and there was incomplete understanding of infection presentation in the relevant cohorts (elderly care home residents and care home staff). Thus the surveillance programme needed to prevent unnecessary use of tests and yet optimise collection of information to support infection control and delivery of high quality residential social care.

METHODS

Individual residents or staff were initially tested usually due to symptom presentation following requests by individual care homes for testing. Whenever SARS-CoV-2 was identified in a home among residents, all residents were offered further screening tests. Staff at homes with SARS-CoV-2 residents were offered testing through the ECHT service if testing for these staff members was unavailable from other test programmes. Broader screening (for pre/asymptomatic infection) in most homes was also introduced starting 11 June 2020. Resident test results were linked with symptoms recorded in care records at day-0 (test date) to day-14, and mortality outcomes. Individual residents receiving at least one SARS-CoV-2 test result and aggregated staff test results are described in the data summary.

RECRUITMENT

All 57 care homes for which North Norfolk Primary Care were responsible were eligible for ECHT COVID-support. Of these, 44 requested that at least one resident SARS-CoV-2-test through ECHT and 10 had staff tested. SARS-CoV-2 testing commenced on 7 April 2020. The results described here cover the monitoring period from 7 April to 29 June 2020.

SARS-COV-2 TESTING

Where SARS-CoV-2-was suspected the resident was isolated and strict protocols were applied with regard to social distancing and use of personal protective equipment (PPE) for both staff and patient (where appropriate) were followed. A bespoke testing procedure was developed (Arkieson & Dunham, 2020). The testing procedure did not have blinded assessment or administration. Duplicate or repeat tests were not undertaken to confirm positive status due to shortage of tests available for most of this period. However, tests for residents were administered again after an initial negative test if symptoms developed or worsened. Nasopharyngeal swabs were taken at the home by ANPs (for residents), else at drive-through sites or self-administered (for staff). The materials collected on swabs were sent to local laboratories (managed by Norfolk and Norwich University Hospital Foundation Trust) for processing based on reverse transcription polymerase chain reaction technology to detect SARS-CoV-2 genetic material. Test results were subsequently available via electronic medical records (EMR). Where SARS-CoV-2-infection was confirmed, isolation and PPE protocols were continued with escalation of care where appropriate.

Staff or residents could receive more than one test. Staff who tested positive were asked to self-isolate for 7-days in accordance with concurrent national policy and guidelines. Retests were conducted for residents for whom SARS-CoV-2 results were negative if they began or continued to exhibit putative symptoms.

CLINICAL PRESENTATION

Residents of UK care homes are registered with local primary care services and clinical conditions recorded in EMRs. For SARS-CoV-2-positive residents, data on typical SARS-CoV-2 symptoms (new cough, temperature, anosmia), and atypical symptoms (anorexia, generally unwell, confused or agitated, fatigue, GI disturbance, rash, falls) or any mention of any other symptom (other) at the time of testing were extracted from medical records by an ANP. In addition, for SARS-CoV-2-positive residents who were asymptomatic at the point of test, data on any symptoms recorded in the 14-day post-test period were extracted. Symptoms for staff were not recorded as the primary focus of the service was limiting SARS-CoV-2 infection among residents not staff. At the time of this emergency service deployment, English care homes were especially stretched for resources and did not have capacity to consider staff symptoms as part of broader infection control understanding (Rajan, Comas-herrera & Mckee, 2020).

MORTALITY

Cause of death data were obtained from residents medical records and death certificates.

DATA ANALYSIS

Data were pseudo-anonymised and provided to the investigators by ECHT. Statistical analyses were undertaken using STATA (v. 16). To consider any possible demographic or other cohort differences between residents who tested negative/positive, between group comparisons are reported using appropriate statistical tests: Mann Whitney U-test for comparing medians in non-parametric data (age), Pearson's chi-square test for between group proportions (counts in categories > 5) or Fisher's Exact Test for proportion differences when data were sparse (category counts ≤5; Kim, 2017). Information for residents and staff tests comprised unique ID, care home ID, date of SARS-CoV-2 test(s) and test outcome(s). Data for residents also included age, sex and symptoms

(SARS-CoV-2-positive residents only). Residents' results were reported for individuals, but staff test results were reported in aggregate by care home ID. Residents who ever had a SARS-CoV-2-positive test were considered SARS-CoV-2-positive.

Estimates of the number of staff tested are indicative because the counts of staff on roster in care homes can fluctuate and could only be approximated. These estimates were based on care home manager report of the proportion of staff tested, the number of staff employed in each home, and number of tests reported for each home.

Cases were asymptomatic if they had no symptoms at the point of test or in the subsequent 14-day period. Cases were pre-symptomatic if they had no symptoms at the point of test but developed symptoms in the subsequent 14-day period. SARS-CoV-2 was accepted as the confirmed cause of death where SARS-CoV-2 was stated as a cause of death on the death certificate. Ethics approval to undertake this service evaluation was granted by chair action from the Faculty of Medicine and Health Ethics committee (Ref. 2019/20–139) and the Norfolk and Waveney Clinical Commissioning Group.

RESULTS

There were SARS-CoV-2 results for 615 tests on 521 residents in 44 care homes. In 10 North Norfolk care homes, 545 staff tests were included. Included residents received a median of 1 test each (mean 1.2, range 1 to 4 each) and staff who were tested by this service had mean 1.6 tests each (range information not collected). In homes where screening was adopted following detection of confirmed COVID-19 infection, 521 of 708 (73.6%) potential residents and an estimated 340 of about 434 potential staff (78.3%) were tested.

Table 1 describes demographic and clinical presentations of residents by SARS-CoV-2 test outcome. The

CHARACTERISTIC	N = 512	N = 103	P-VALUE
	–VE RESULT (%/RANGE)	+VE RESULT (%/RANGE)	
Overall (people) Overall (tests)	418 (80.1) 512 (83.2)	103 (19.9) 103 (16.7)	
Female	364 (71.1)	62 (61.2)	**0.029** [P]
Age (median)	89 (42–104)	89 (71–104)	0.768 [W]
Symptomatic	122 (23.8)	52 (50.5)	**0.000** [P]
Asymptomatic	n/a	38 (36.9)	n/a
Pre-symptomatic	n/a	13 (12.7)	n/a
From 607 tests where in previous 14 days, specific symptom data were available.			
Symptom history available	508	99	
CV-typical symptoms	66 (13.0)	37 (35.9)	**0.000** [P]
New cough	55 (10.8)	26 (26.3)	**0.001** [P]
Fever	26 (5.2)	22 (22.2)	**0.000** [P]
Anosmia	0	0	n/a
Anorexia	9 (1.8)	6 (6.1)	**0.012** [P]
Confused/agitated	14 (2.8)	6 (6.1)	0.092 [P]
Falls	2 (0.3)	4 (4.0)	**0.008** [F]
Fatigue	7 (1.4)	5 (5.0)	**0.032** [F]
GI Disturbance	15 (3.0)	3 (3.0)	1.000 [F]
Generally unwell	30 (5.9)	16 (16.2)	**0.000** [P]
Rash	2 (0.4)	2 (2.0)	0.126 [F]
Other (not specified)	13 (2.6)	1 (1.0)	0.486 [F]

Table 1 Demographic and clinical presentation for residents at time point of indicated SARS-CoV-2 test outcome.

CV: COVID-19; GI: gastronintestinal. Symptomatic, any mention of any symptom; Asymptomatic, no symptoms at test date or during the subsequent 14-day period; Pre-symptomatic, asymptomatic at test date but had any symptoms in subsequent 14-day period. Between group comparisons are with denominator = tests not persons, therefore some negative-test observations are for persons also included in the positive group. [P] Pearson's $\chi 2$; [F] Fisher's exact test; [W] ranksum (Mann Whitney U) test. Bold font indicates p-values < significance threshold 0.05.

median age of tested residents was 89 years (SD 9.3, range 42–104). Most residents who ever received a test were female (n = 365, 70%) and females in the test group were older (median age 90 years) than tested males (median age 86 years: between group p = 0.001 using Mann Whitney U-test). The range of symptoms was diverse.

Demographic data and symptom presentation for staff were not collected concurrently because the service was understandably focused on care-receivers. Among an estimated 340 staff tested as part of the ECHT service, 49 (14.4%) tested positive at least once in the monitoring period. No covid+ staff were understood to have been retested by ECHT during the monitoring period, hence 9% (n = 49) of all 545 tests administered on staff were positive.

SARS-COV-2 TEST RESULTS

One hundred and three individual residents tested positive. Most homes (n = 30, 68%) had no SARS-CoV-2-infections. In 14 care homes where SARS-CoV-2 was identified among residents, 103 residents tested positive (19.8% of all residents ever tested) while 49 staff tested positive in 7 homes (11.3% of all estimated staff; 9% of all staff tests). COVID-19 positivity tended to co-occur in both staff and residents. SARS-CoV-2-positive staff and resident groups were found jointly in 6 homes. There were SARS-CoV-2-negative staff but COVID+ residents in three homes. In one care home, three staff but no patients were SARS-CoV-2-positive. In other homes where at least some residents tested positive, staff were tested through other services (not ECHT) but we do not have data about these staff positivity rates. SARS-CoV-2-positive residents were similar in age to residents who ever tested negative (p = 0.768) but more likely to be male (Pearson's $\chi 2$, p = 0.029).

CLINICAL PRESENTATIONS LINKED TO TEST RESULTS

Of the 103 tests that were SARS-CoV-2-positive 52 (50.5%) were linked to residents with any symptoms while 37 (35.9%) were linked to typical SARS-CoV-2 symptoms (new cough or fever). At point of test, 51 (49.5%) SARS-CoV-2-positive residents had no symptoms. Of these, 38 (36.9%) remained asymptomatic during the following 14 days. The remaining 13 (12.7%) were pre-symptomatic and developed one or more symptoms during the following 14-days. Clinical presentations at time of test are shown (***Table 1***) by SARS-CoV-2-test result. SARS-CoV-2-positive results were more likely to be linked to typical symptoms (new cough, n = 26, p = 0.001; fever, n = 22, p =< 0.001) than tests that resulted SARS-CoV-2-negative. SARS-CoV-2-positive tests were much more likely than negative tests to be linked to residents who had had falls, exhibit suppressed appetite, fatigue or present as 'generally unwell' (all Pearson's chi-square or Fisher exact test results with p < 0.05).

Typical symptoms of SARS-CoV-2 are new cough, fever, and anosmia (NHS England, 2020). New cough was linked to 26 (25.2%) of positive tests, fever to 22 (22.2%) of positive tests. Anosmia was not detected, but within this cohort anosmia may be undiagnostic because around 62.5% people aged 80 to 97 have olfactory impairment yet self-reported olfactory impairment in older people is low (Murphy et al., 2002).

MORTALITY

Table 2 describes the distribution of SARS-CoV-2 cases, test outcomes and deaths by care home. Thirty-nine deaths were recorded. Death initially attributed to SARS-CoV-2 because of the ECHT SARS-CoV-2 monitoring service (n = 21, 54%) occurred across eight homes. Non-SARS-CoV-2 deaths (n = 18, 46%) included dementia (n = 7); old age or expected death (n = 3); multi-organ failure (n = 1); bronchopneumonia (n = 1); intracranial haematoma (n = 1), COPD (n = 1), and unknown causes (n = 4; all specified as not covid). All deaths with recorded cause = SARS-CoV-2 had tested positive for SARS-CoV-2. One death not initially attributed to SARS-CoV-2 was a patient who tested positive for SARS-CoV-2 through a different testing service. Under concurrent recording practices (Loke & Heneghan, 2020), this death was also considered attributable to COVID-19.

DISCUSSION

For staff and residents who were tested during this service delivery, around one in five residents and one in nine staff, were SARS-CoV-2-positive. SARS-CoV-2-positive staff and resident groups were jointly identified in six homes while three homes had both SARS-CoV-2-negative staff and residents, illustrating the binary nature of infection in care homes: i.e., either the care home community has infections or it does not (Brainard et al., 2020). The ECHT testing service facilitated early identification of +cases, sometimes before symptom onset.

Importantly, among atypical presentations it was common for residents to be 'generally unwell.' Low 'suspicion index' (McMichael et al., 2020) for COVID-19 was problematic during the early pandemic period in residential care homes, not least because many residents exhibit chronic respiratory symptoms. The data collected by the testing service demonstrated that identification of SARS-CoV-2 in older people should not be based solely upon the presence of typical symptoms. Residents presenting with any new symptom or who are 'generally unwell' were subsequently considered as putative SARS-CoV-2 cases. Although this recommendation may seem obvious now in light of research published in mid 2020 (Arons et al. 2020), it was not an expected outcome at the time that the ECHT test service was designed and deployed.

HOME ID	SARS-COV-2 TEST RESULT RESIDENT			SARS-COV-2 TEST RESULT STAFF*			DEATHS DURING MONITORING PERIOD	
	N	POS	%POS	N*	POS	% POS STAFF TESTS	N	TESTED + FOR SARS-COV-2
1	8	0	0					
2	5	0	0					
3	40	1	2.5	99	4	4		
4	76	13	17	70	9	13	3	2
5	9	1	11					
6	1	0	0					
7	3	0	0					
8	36	21	58	63	19	30	4	3
9	64	19	30				5	5
10	17	12	71	7	1	14	1	1
11	22	1	5				2	0
12	25	0	0	162	3	2	1	0
13	70	9	13	20	2	10	12	6
14	5	0	0					
15	2	0	0				1	0
16	1	0	0					
17	1	0	0					
18	6	0	0				1	0
19	43	3	7				1	0
20	37	0	0				2	0
21	10	1	10				1	0
22	29	16	55				2	2
23	5	0	0					
24	2	0	0					
25	1	0	0					
26	19	2	11	58	11	19		
27	36	3	8				2	2
28	1	0	0	25	0	0		
29	1	0	0					
30	1	0	0	21	0	0		
31	3	0	0	20	0	0		
32	18	2	11					
33	1	0	0					
34	1	0	0					
35	3	0	0					
36	2	0	0					
37	2	0	0					
38	1	0	0					
39	1	0	0					
40	1	0	0					
41	1	0	0					
42	2	0	0					
43	1	0	0					
44	2	0	0				1	0
Total	**615**	**103**	**20**	**545**	**49**	**9**	**39**	**21**

Table 2 SARS-CoV-2 test outcomes by residents and staff and resident mortality by care home.

Note: * Estimates of all staff-tests in each care home. Estimates of the number of staff tested were based on care home manager report of the proportion of staff tested, the number of staff employed in each home, and number of tests reported.

Overall, 51 (49.5%) SARS-CoV-2-positive residents lacked symptoms at the point of test. Of these, 38 (74.5%) did not subsequently develop symptoms (true asymptomatic) and 13 (25.5%) developed symptoms (pre-symptomatic). The high proportions of asymptomatic or pre-symptomatic cases was not recognised early in the pandemic at the time that the ECHT testing service was designed and initially deployed (start April 2020) and therefore these patients were also unexpected, not least because many of those persons with asymptomatic infection were clinically high risk due to other mental or physical frailty. As subsequently underscored by other research (Gandhi, Yokoe & Havlir, 2020), identifying pre- and asymptomatic patients is fundamental to breaking chains of transmission. Therefore, the ECHT testing service performed a valuable function in highlighting early to local teams that persons likely to be infectious might have diverse presentations including having no attributable symptoms at all.

Under counting deaths from COVID-19, not least due to shortage of laboratory tests, was a key concern early in the UK epidemic (Gilbert, Kirk & Bodkin, 2020). In early-mid 2020, any death after a COVID-19 infection was considered attributable to SARs-CoV-2 infection (Loke & Heneghan, 2020). Attribution practices were adjusted in late summer 2020 to initially count only deaths within 28 days of a positive test (Newton, 2020), with causes cited on death certificates as confirmed total Covid deaths over any specified time period. According to concurrent attribution practices (in spring-early summer 2020) and according to residents' death certificate information, the ECHT testing service was almost always able to accurately identify cause of death to COVID-19 among the residents who died during the monitoring period.

STRENGTHS AND LIMITATIONS

ECHT were able to rapidly develop and implement early SARS-CoV-2-testing. Early screening of residents and staff after ingress into care homes identified prevalence of pre- and asymptomatic infections and improved understanding of the diversity of symptom presentation in residents. This evaluation shows that an 'intelligent' testing strategy can facilitate early identification of correct cause of death.

Staff results were reported by home (not individual) and therefore numbers of staff tested are estimated. The service delivery focus on resident welfare and safety meant that information on individual staff were not collected and could not be reported. Data were only collected about staff test results when tested via the ECHT service; some staff were able to get tested for SARs-CoV-2 from other services. Prevalence of staff infection and the possible relationship between staff prevalence and resident prevalence will be better explored with a different design of study. This service evaluation is unable to address whether the ECHT testing service reduced resident mortality (no concurrent comparator data were collected in homes without a comparable testing service). In addition, proportions of infected residents relative to the full resident population eligible for testing are not possible to accurately calculate – partly because the full population could only be estimated based on maximum available bed count in each care home. Bed capacity is close to but not consistently at 100%. Some residents may not have been tested for ethical or clinical reasons. There were no repeat tests for patients who tested initially negative unless their symptoms escalated, which means some asymptomatic patients were possibly undetected. This risk was arguably inevitable in an environment with limited access to tests; the service had to deploy a strategic or 'intelligent' testing strategy rather than broad surveillance given available resources.

CONCLUSION

Because of test shortages and lack of national guidance until mid-late May 2020, English community care home management and nursing teams had to make independent and local decisions about how to identify COVID+ care home residents or staff. We have described how a nurse-led care home testing service was implemented in a resource scarce-environment with incomplete understanding of infectious disease presentation. Such local decision making may be a feature again in any future pandemic which means our experience can provide a useful exemplar of how well a care home testing programme may perform and be evaluated.

This local service helped local teams realise early that asymptomatic or atypical presentation is common amongst SARS-CoV-2-positive care home residents. As a result, the local community teams learned early (before national guidance was available) that where a resident appears generally unwell or has any new symptom, SARS-CoV-2-infection should be suspected. After SARS-CoV-2-infection was found, screening was useful to identify other infected residents and staff. The service initiative to deploy early testing and screening of staff and residents in care homes meant early and accurate identification of outbreaks, prevalence of infection and death, and accurate attribution of cause of death.

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COMPETING INTERESTS

The authors have no competing interests to declare.

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