Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Prevalence, management, and outcomes of SARS-CoV-2 infections in older people and those with dementia in mental health wards in London, UK: a retrospective observational study

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Summary

Background People living in group situations or with dementia are more vulnerable to infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Older people and those with multimorbidity have higher mortality if they become infected than the general population. However, no systematic study exists of COVID-19-related outcomes in older inpatients in psychiatric units, who comprise people from these high-risk groups. We aimed to describe the period prevalence, demographics, symptoms (and asymptomatic cases), management, and survival outcomes of COVID-19 in the older inpatient psychiatric population and people with young-onset dementia in five National Health Service Trusts in London, UK, from March 1 to April 30, 2020.

Methods In this retrospective observational study, we collected demographic data, mental health diagnoses, clinical diagnosis of COVID-19, symptoms, management, and COVID-19-related outcome data of inpatients aged 65 years or older or with dementia who were already inpatients or admitted as inpatients to five London mental health Trusts between March 1 and April 30, 2020, and information about available COVID-19-related resources (ie, testing and personal protective equipment). Patients were determined to have COVID-19 if they had a positive SARS-CoV-2 PCR test, or had relevant symptoms indicative of COVID-19, as determined by their treating physician. We calculated period prevalence of COVID-19 and analysed patients' characteristics, treatments, and outcomes.

Findings Of 344 inpatients, 131 (38%) were diagnosed with COVID-19 during the study period (period prevalence 38% [95% CI 33–43]). The mean age of patients who had COVID-19 was 75·3 years (SD 8·2); 68 (52%) were women and 47 (36%) from ethnic minority groups. 16 (12%) of 131 patients were asymptomatic and 121 (92%) had one or more disease-related comorbidity. 108 (82%) patients were compulsorily detained. 74 (56%) patients had dementia, of whom 13 (18%) had young-onset dementia. On average, sites received COVID-19 testing kits 4·5 days after the first clinical COVID-19 presentation. 19 (15%) patients diagnosed with COVID-19 died during the study period, and their deaths were determined to be COVID-19 related.

Interpretation Patients in psychiatric inpatient settings who were admitted without known SARS-CoV-2 infection had a high risk of infection with SARS-CoV-2 compared with those in the community and had a higher proportion of deaths from COVID-19 than in the community. Implementation of the long-standing policy of parity of esteem for mental health and planning for future COVID-19 waves in psychiatric hospitals is urgent.

Funding None.

Introduction

Initial infection with and identification of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) occurred in China.[1] The resulting disease, COVID-19, spread rapidly and was declared a pandemic on March 11, 2020. To date, hospital admission and death rates due to COVID-19 have been higher in people who are older, male, of ethnic minority status, have underlying illnesses such as hypertension and diabetes, or have dementia than in other populations.[2–9] By contrast with this morbidity and mortality, a large number of people might have asymptomatic illness for some of, or the entire course of, their illness.[10] Some people also present with atypical symptoms such as altered mental state, including increased cognitive impairment (especially among those with dementia), agitation, refusal of care, and apathy.[11,12]

Because SARS-CoV-2 is highly infectious, morbidity and mortality among people living in group situations, such as care homes, are of particular concern, particularly among those with dementia. High mortality has been seen among people in care homes in many countries, accounting for a high absolute number and proportion of deaths.[5,13–16] People with severe mental illness are also thought to be at increased risk of contracting SARS-CoV-2

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For **WHO Director-General's announcement** see https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020

Research in context

Evidence before this study

We searched PubMed and Web of Science for publications in English between Jan 1 and Aug 17, 2020, using the terms ("mental*" OR "psychiatr*") AND ("COVID*" OR "coronavirus") AND ("hospital" OR "geriatric psychiatry" OR "psychogeriatr*"). We included primary research about people with dementia or older people with other mental health conditions who were inpatients at psychiatric units during the COVID-19 pandemic and at risk of developing or developed COVID-19. Although older people and people with dementia are at high risk of mortality, we found no such studies. Two reports of outbreaks in psychiatric hospitals in China and South Korea were identified from newspapers and further reported in medical journals.

Added value of this study

This is the first study to give details of older patients and those with dementia in psychiatric wards during the height of the COVID-19 pandemic. None of the patients included had known severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection when admitted but nearly 40% subsequently received a diagnosis of COVID-19. On average, sites received their first COVID-19 testing kits 4·5 days after the first clinical COVID-19 presentation. In three of five National Health Service Trusts in London, UK, personal protective equipment (PPE) became available before the first suspected case of COVID-19 was noted. In two Trusts, PPE became available 2–7 days after the first suspected case of COVID-19 and many were likely to have already developed undetected COVID-19 before isolation. We found that psychiatric wards achieved isolation of people who might be infectious and some gave oxygen treatment on the ward, administered anticoagulation, and had much closer liaison with physicians. Some Trusts also tested patients for D-dimer, ferritin, lymphocyte count, and vitamin D in addition to other pathology tests that were usually done. 15% of those clinically diagnosed as having COVID-19 died, which is a much higher mortality rate than in the community. The patients in our study had severe mental health problems and most of them were in hospital compulsorily using legislative framework for mental illness or an absence of decisional capacity.

Implications of all the available evidence

We found that isolation of people who might be infectious; testing patients for COVID-19; D-dimer, ferritin, and vitamin D concentrations; and oxygen treatment on the psychiatric ward, anticoagulation, and much closer liaison with physicians is possible in older age psychiatric wards to enable optimal treatment of patients in these settings during the current pandemic and any future pandemics. These measures could be widely implemented for future waves of COVID-19 or other pandemics so that much of the treatment in wards for physically ill people is available in mental health wards. Implementation of the long-standing policy of parity of esteem for mental health so that resources are as available to mental health patients is urgently needed.

and have worse outcomes after infection.[17] One large study from South Korea found that adults with mental illness were no more likely to be infected with SARS-CoV-2 than other adults without a diagnosed mental illness.[18] However, those who tested positive for SARS-CoV-2 with severe mental illness had an increased likelihood of an outcome of death, or invasive ventilation or admission to intensive care (adjusted odds ratio [OR] 1·3, 95% CI 1·0–1·7). People with dementia and those with severe mental illnesses living in a group situation, such as in a hospital, might be more susceptible to spreading the virus because they do not stay in bed during the day and psychiatric treatment encourages socialisation in communal areas to avoid patients becoming isolated. They also have relatively close contact with a large number of health-care and other staff.[19] People with dementia and those acutely unwell with severe mental illnesses might have difficulty adhering to physical distancing.[20] Patients with dementia might be additionally susceptible to the neurological consequences of COVID-19, including delirium.[21,22] One small study of people with mental illnesses and COVID-19 who had been admitted to intensive care units found that patients with dementia had higher white blood cell counts and urea concentrations than those with other mental disorders, and they suggested that an increased white blood cell count might be a prognostic marker that could guide possible future treatments of people with dementia and COVID-19.[23]

Although position papers have considered the increased risk of mental health problems, exacerbation of health inequalities, and challenges of mental health inpatient settings posed by the pandemic,[20,24] to our knowledge, no studies to date have reported details on COVID-19 prevalence, symptoms, and outcomes in inpatients in mental health hospitals. Two media reports have been published on this topic at the time of writing: *China News Weekly* reported 50 patients and 30 health-care workers who developed COVID-19 in a psychiatric hospital in Wuhan, and suggested that this spread was related to insufficient supplies of protective clothing and called for adequate attention to patients in psychiatric units;[25,26] and a South Korean newspaper reported that two nurses and 99 of 102 patients in a psychiatric ward developed COVID-19.[21,26]

In England and Wales, National Health Service (NHS) secondary care is divided into acute Trusts or general hospitals for physical illnesses and mental health Trusts. A mental health Trust is an NHS-funded organisation providing mental health services to a specific geographical area and can consist of several sites. Older people and people with dementia of any age, who are usually cared for within older people's services in the mental health Trust, might be at greater risk from COVID-19 than

younger people or those without dementia. We were concerned that this group who, as inpatients, were living in a group situation, and were therefore at increased risk, had not been studied in policy or research. We aimed to learn lessons from how inpatients were treated during the first wave of COVID-19 and to make recommendations. Specifically, we had four objectives: to describe the period prevalence of COVID-19 in the older inpatient psychiatric population and people with young-onset dementia in five NHS Trusts from March 1 to April 30, 2020; describe demographics, symptoms (and numbers of asymptomatic cases), management, and survival outcomes of COVID-19 in this population; explore the association between age, sex, ethnicity, dementia, and physical health and COVID-19-related outcomes; and to describe when testing and personal protective equipment (PPE) became available on these wards.

Methods

Study design and participants

In this retrospective, observational study, we collected data from inpatients in older adult services of five London mental health NHS Trusts: Camden and Islington NHS Foundation Trust, East London NHS Foundation Trust, South London and Maudsley NHS Foundation Trust, Central and North West London NHS Foundation Trust, and Barnet, Enfield and Haringey MH NHS Trust. These Trusts cover 14 boroughs in inner and outer regions of Greater London. These areas include approximately 4·6 million people, equating to 51% of the population of London, and 7% of the UK population.[27–29] The population in London is substantially ethnically diverse, comprising 59·2% white people, 18·4% Asian people, 11·9% Black people, and 10·6% mixed or other ethnic groups in 2018.[30] In this study, we included all older people (aged ≥65 years) and people with young-onset dementia (with no age restrictions) who were psychiatric inpatients at one of the five participating London mental health Trusts between March 1 and April 30, 2020, whether a current inpatient on March 1, or admitted during the study period. We excluded inpatients younger than 65 years without a diagnosis of dementia and those who developed COVID-19 outside of the 2-month study period.

The project received Health Research Authority and Health and Care Research Wales approval and full ethical approval (IRAS 284782) from Research Ethics Committee West Midlands – Coventry and Warwickshire Research (Ethics Committee reference 20/WM/0165). In the UK, the health and social care system is taking action to manage and mitigate the spread and impact of the current outbreak of COVID-19; therefore, our ethics approval allowed study clinicians to gather anonymised data retrospectively in their services without asking individual patients to consent.

Data collection

There were 16 wards in the five Trusts. Site clinicians at each Trust gathered detailed data using a standardised electronic data collection form for all patients who had suspected or confirmed COVID-19 and clinical details about each site. Patients were determined to have COVID-19 if they had a positive SARS-CoV-2 PCR test, or had relevant symptoms indicative of COVID-19, as determined by their treating physician.

For individuals, the following data were collected: demographic data (age, sex, ethnicity); mental health clinical details (ie, dementia or other diagnosis); Mental Health Act 1983 or Mental Capacity Act 2005 status[31] (these are legislative frameworks for those with mental illness, including an absence of decisional capacity, which in defined circumstances allow people to be detained in a hospital without giving consent); physical comorbidities; and COVID-19-related details, which were COVID-19 clinical diagnosis (date of clinical suspicion of COVID-19 and SARS-CoV-2 RT-PCR test result or results, if retested), possible COVID-19 symptoms (first symptom noted, presence of new persistent cough, shortness of breath [respiratory rate >20 breaths per min], temperature ≥37·8°C, new loss of smell or taste, sore throat, gastrointestinal symptoms, fatigue, loss of appetite, asymptomatic, duration of symptoms [days]), change to mental state related to COVID-19 (increased cognitive impairment or delirium, increased or new mood disturbance or psychosis); and management (do not attempt resuscitation status; whether the patient was receiving vitamin D treatment; isolation of patients and duration [days] if applicable; whether venous thromboembolism [VTE] prophylaxis was given before the patient became symptomatic; whether VTE prophylaxis was given after symptoms developed; whether antipsychotic medication had been stopped, started, or increased during SARS-CoV-2 infection and treatment, and new antipsychotic side-effects; whether prophylactic antibiotics were prescribed for community-acquired pneumonia or hospital-acquired pneumonia; whether oxygen therapy was administered on the ward; and whether the patient was transferred to a medical ward in a general hospital). We also collected blood results. We used patients' baseline initial blood results and tests during infection to identify any acute change outside the normal range. We identified patient outcome (death or survival). Patients were determined to have COVID-19-related deaths if they had a positive SARS-CoV-2 PCR test, or had relevant symptoms indicative of COVID-19, and their treating doctor judged the death to be related.

For sites, collected data included: number of patients in beds fulfilling study inclusion criteria and COVID-19 management at each site (ie, when PPE and SARS-CoV-2 PCR antigen tests became available; date that the first patient in a ward was suspected to have COVID-19; date that the first patient was tested for COVID-19; whether oxygen was used in the ward other than for

resuscitation during the study period; and arrangements for liaising between mental health staff and general hospital physicians for COVID-19).

Statistical analysis

We estimated that there would be around 500 patients on the older age wards during the study period, and from discussion with clinicians, we estimated a 20% prevalence of clinically diagnosed COVID-19 cases. This sample size would allow us to calculate the period prevalence with a precision of 0·07, so the 95% CI was predicted to be 13–27.

We calculated the period prevalence of COVID-19 between March 1 and April 30, 2020. We calculated the numerator from the number of people aged 65 years and older or with young-onset dementia who were SARS-CoV-2 positive and the denominator from the Trust-level data on the number of older people or people with young-onset dementia in the study population. We descriptively analysed all patient-level variables. For all variables, if the number of patients with a given characteristic or condition was fewer than ten, we combined categories into broader categories when possible. We combined categories because if we gave absolute numbers when there was a low number of patients they could become identifiable.

We described the characteristics of the cohort of patients with COVID-19, reporting the frequency and proportion for categorical variables and the mean (SD) or median (IQR) for continuous variables depending on the distribution. We also described the data by dementia status. We also described demographics by survival outcome. We reported the number of deaths and did a univariable logistic regression analysis accounting for clustering by NHS Trust with the sandwich estimator to determine individual-level factors associated with death judged to be due to COVID-19. We then did a multivariable logistic regression analysis, controlling for number of physical comorbidities. In a sensitivity analysis, we did univariable and multivariable logistic regression analyses of the outcome (died *vs* survived), including age and any dementia (*vs* no dementia) in the model. In a further univariable and multivariable logistic regression, we compared mortality in those with young-onset dementia and those without dementia to those with late-onset dementia.

Role of the funding source

There was no funding source for this study. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

Between March 1 and April 30, 2020, each of the five Trusts had between 33 and 92 inpatients who were aged 65 years or older or had dementia, totalling 344 patients. 131 (38%) of 344 patients were diagnosed with COVID-19, and the overall period prevalence was 38% (95% CI 33–43). 89 (68%) patients were already inpatients on March 1, 2020, and 42 (32%) were admitted during the study period. Infection rates in the five sites varied between 27 (29%) of 92 inpatients and 45 (52%) of 86 inpatients.

Among patients with a diagnosis of COVID-19, the mean age was 75·3 years (SD 8·2) overall, 75·7 years (SD 9·5) among those with dementia, and 74·9 years (SD 6·2) among those without dementia. 68 (52%) patients were women and 47 (36%) were from ethnic minority groups (table 1). Most inpatients were legally detained within the Mental Health Act (71 [54%]) and Mental Capacity Act Deprivation of Liberty safeguards (37 [28%]). 74 (56%) patients had dementia, of whom 13 (18%) had young-onset dementia, although three were now older than 65 years. 47 (82%) of 57 patients without dementia had a diagnosis of a psychotic illness and 28 (49%) were diagnosed with depression. Many people had more than one psychiatric diagnosis (40 [31%]) and 94 (72%) were prescribed antipsychotic treatment before COVID-19 was diagnosed. 121 (92%) patients had at least one comorbidity, most commonly hypertension, then chronic cardiac disease (atrial fibrillation, ischaemic heart disease, or heart failure; table 1). Only 13 (10%) of 130 patients with available data were obese (ie, body-mass index of ≥30 kg/m²), although 33 (25%) were overweight (25 to <30 kg/m²). Nine (7%) of 124 with available data were current smokers and 36 (29%) were former smokers.

The date of the first clinically suspected COVID-19 case on all 16 individual wards was between March 15 and March 23, 2020. On all but two wards, identification of symptomatic patients preceded the provision of PCR tests to detect SARS-CoV-2 infections. The first test became available on individual wards in our sample between March 16 and March 28, 2020, with an average delay of 4·5 days from the first suspected case of COVID-19. PPE became available at varying dates between March 9 and March 23, 2020. In three of five Trusts, PPE became available before the first suspected case of COVID-19 was noted. In two Trusts, PPE became available 2–7 days after the first suspected case of COVID-19 was noted, apart from one ward where PPE became available on the same day as the first case was noted. Two Trusts and some wards within a third Trust had oxygen available for treatment on the ward, and one of these Trusts added an oxygen concentrator. The other Trusts did not have ward oxygen treatment. Two Trusts had arranged increased contact with physicians for prevention, diagnosis, and management of COVID-19 over the duration of the study: one Trust had a webinar for staff, policy input from physicians, and direct telephone access to physicians specialising in respiratory medicine, and the other Trust had daily virtual ward rounds. One Trust called a primary care physician or the emergency services if needed and two other Trusts were able to access ad-hoc physician support.

Table 2 shows the clinical characteristics of patients diagnosed with COVID-19 and their symptoms and associated morbidity. Before SARS-CoV-2 PCR tests became available, staff treated patients as if they were infected and isolated them only if they were symptomatic, although physical distancing was attempted for others. All new patients were tested for SARS-CoV-2 once tests were widely available. Eight (7%) patients who were symptomatic were never tested for SARS-CoV-2 and one (1%) patient refused testing. Once testing became available, 105 symptomatic patients were tested, of whom 62 (55%) had positive results on the first PCR test, 38 (34%) were negative, three (3%) were inconclusive, and two (2%) had unknown results. 16 asymptomatic patients had positive results on the first PCR test. Later, another five symptomatic patients had positive PCR tests on retesting, so 67 (64%) of 105 symptomatic patients had positive results. Overall 83 (69%) of 121 symptomatic and asymptomatic patients who were tested were positive by PCR test, and 83 (63%) of 131 patients diagnosed with COVID-19 were positive by PCR test. The most common presenting symptoms were pyrexia, followed by new persistent cough, but many patients then developed these symptoms later, as well as fatigue and loss of appetite. No patient complained of loss of taste or smell. The most common biochemical abnormality was increased D-dimer concentrations, followed by increased ferritin, low vitamin D, and reduced lymphocyte concentrations (table 2). Of patients who had white blood cell measurements, seven (15%) of 46 with dementia and seven (19%) of 37 without dementia had increased white cell counts. 15 (33%) of 46 with dementia had acute deterioration in renal function compared with seven (18%) of 38 with other mental illness.

Table 3 gives information about management of patients with a suspected diagnosis of COVID-19. 103 (79%) of 131 patients were isolated for a median duration of 12 days (IQR 7–15). Others were cared for on a ward where all patients had COVID-19. Most patients had decisions recorded about whether a do not attempt resuscitation order was in place; 86 (66%) had a do not attempt resuscitation order, 36 (27%) were for resuscitation, and nine (7%) had no recorded decision.

The most common mental health complication was delirium or acute cognitive decline (table 3). 81 (85%) of 94 patients on antipsychotics continued on them and the dose was increased in three people. Changes in mental health by dementia status is shown in the appendix (p 3). Delirium or acute cognitive decline was more common in those with dementia (31 [42%] of 74) than in those without dementia (15 [26%] of 57). Those with young-onset dementia were not more likely to die than those with late-onset dementia (unadjusted OR 0·38, 95% CI 0·05–2·88; OR adjusted for physical number of comorbidities 0·51 (0·06–1·08; appendix p 4).

Staff prescribed 17 (14%) of 124 patients with available data VTE prophylaxis before a diagnosis of COVID-19 and this proportion increased to 27 (23%) of 118 with available data after diagnosis. Staff prescribed oxygen for 27 (21%) of 131 patients and prophylactic antibiotics for 54 (42%) of 127 patients with available data. 42 (32%) of 131 patients were transferred to a medical

	Patients (n=131)
Age, years	
Mean	75·3 (8·2)
Range	
51–64	10 (8%)
65–80	86 (66%)
81–95	35 (27%)
Sex	
Male	63 (48%)
Female	68 (52%)
Ethnicity	
White	84 (64%)
Black African, Caribbean, or British	28 (21%)
Asian or Asian British	13 (10%)
Mixed or other	6 (5%)
Dementia status	
Young-onset dementia	13 (10%)
Late-onset dementia	61 (47%)
No dementia	57 (44%)
Legal status on study entry	
Informal	23 (18%)
Mental Health Act Section 2	19 (15%)
Mental Health Act Section 3	52 (40%)
Mental Capacity Act Deprivation of Liberty safeguards	37 (28%)
Comorbidities	
Any comorbidity	121 (92%)
Hypertension	74 (56%)
Chronic cardiac disease	34 (26%)
Any diabetes	30 (23%)
Chronic kidney disease	26 (20%)
Chronic obstructive pulmonary disease*	20 (15%)
Asthma	8 (6%)
Active cancer	10 (8%)
Number of comorbidities	2 (1–4)
Body-mass index, kg/m²	
<18·5	18 (14%)
18·5 to <25	66 (51%)
25 to <30	33 (25%)
≥30	13 (10%)
Missing	1 (1%)
Smoking	
Non-smoker	79 (60%)
Former smoker	36 (27%)
Current smoker	9 (7%)
Missing	7 (5%)

Data are n (%), mean (SD), or median (IQR). *Data missing for one patient.

Table 1: **Sociodemographic characteristics and psychiatric diagnoses of patients diagnosed with COVID-19**

See **Online** for appendix

	Patients (n=131)
COVID-19 symptoms	
Asymptomatic	16 (12%)
Symptomatic	114 (87%)
Unknown	1 (1%)
First COVID-19 symptom noted	
Temperature >37·8°C	47 (36%)
New persistent cough	37 (28%)
Shortness of breath	13 (10%)
Gastrointestinal symptoms	6 (5%)
Fatigue	4 (3%)
Loss of appetite	3 (2%)
Other	4 (3%)
Loss of taste or smell	0
Missing	1 (1%)
Other symptoms or signs	
Temperature >37·8°C	74/129 (57%)
New persistent cough	57/128 (45%)
Fatigue	57/128 (45%)
Loss of appetite	42/125 (34%)
Respiratory rate >20 breaths per min	37/129 (29%)
Clinically dry or dehydrated	34/127 (27%)
Gastrointestinal symptoms	20/123 (16%)
Sore throat	4/107 (4%)
Pathology results	
Increased D-dimer	10/12 (83%)
Increased C-reactive protein	62/79 (78%)
Increased ferritin	24/32 (75%)
Low vitamin D	12/22 (55%)
Increased creatinine kinase	20/38 (53%)
Low lymphocytes	41/83 (49%)
Acutely increased liver function	22/80 (28%)
Acute deterioration in renal function	22/84 (26%)
Increased white blood cell count	14/84 (17%)
Hypernatraemia	11/83 (13%)
Hyponatraemia	3/83 (4%)

Data are n (%) or n/N (%).

Table 2: **COVID-19 characteristics**

	Patients (n=131)
Change in mental state	
Delirium or acute cognitive decline	46/131 (35%)
Depressive symptoms	10/129 (8%)
Increased level of aggression	10/131 (8%)
Visual hallucinations	6/124 (5%)
Manic symptoms	3/127 (2%)
Auditory hallucinations	2/124 (2%)
Vitamin D treatment	58/111 (52%)
Prophylactic antibiotics for community-acquired or hospital-acquired pneumonia	54/127 (43%)
Venous thromboembolism prophylaxis after symptoms developed	27/118 (23%)
Oxygen therapy given on the ward	27/131 (21%)
Antipsychotics	
Increase in dose	3/53 (8%)
Antipsychotics stopped	
Yes	83/127 (65%)
No	13/127 (10%)
New antipsychotic side-effects	
None	90/94 (96%)
Extrapyramidal side-effects	1/94 (1%)
Dystonia	3/94 (3%)
Not on antipsychotic medication	33/127 (26%)
Patient's nutritional intake recorded on food or fluid chart	67/104 (64%)
Transferred to a medical ward in a general hospital	42/131 (32%)
COVID-19 outcome	
Recovered	111/131 (85%)
Died	19/131 (15%)
Still unwell	1/131 (1%)

Data are n (%) and n/N (%).

Table 3: **COVID-19 treatment and outcome**

ward in a general hospital for inpatient treatment by physicians.

In each of the five Trusts, between none and five patients diagnosed with COVID-19 died, and all their deaths were determined to be related to COVID-19. Numbers of deaths ranged from none of 12 inpatients with COVID-19, five (11%) of 45, five (19%) of 27, four (19%) of 21, and five (19%) of 26. 19 (15%) of 131 patients died, all but one of whom had been symptomatic when COVID-19 was diagnosed. Seven (37%) patients who died had oxygen therapy on the psychiatric ward and 11 (58%) were transferred to a medical ward in a general hospital.

The mean age of those who died was 79 years (SD 7) and of those who survived 75 years (8; appendix pp 1–2). Of those who died, 12 (63%) of 19 had dementia, of whom one (8%) had young-onset dementia, and ten (53%) of 19 were male. Of the patients who died, 13 (68%) were white; four (21%) were Black African, Caribbean, or British; and two (11%) were Asian or Asian British. Five (26%) had not had a SARS-CoV-2 PCR test and three (16%) tested negative. All those who died had comorbidities and most of those who survived also had other illnesses (102 [91%] of 112). Table 4 shows the results of our univariable and multivariable logistic regression analyses. We found that older age, male sex, physical comorbidities, and dementia diagnosis appeared to be associated with increased death rates but uncertainty limits were wide and CIs crossed 1. Our sensitivity analysis with age and dementia (*vs* no dementia) both included in the model showed any dementia (in which the reference is no dementia) had an OR of 1·23 (95% CI 0·49–3·11), and older age (increasing by 1 year) had an OR of 1·07 (95% CI 0·99–1·16).

Discussion

To our knowledge, this is the first study to provide detailed data on COVID-19 prevalence, symptoms, and

outcomes in older inpatients in psychiatric units and those with dementia during the current pandemic. We found a high rate of infection and death in this population over a 2-month period during the height of the London pandemic. No patients were known to have COVID-19 when admitted to the psychiatric wards, but nearly 40% subsequently received a diagnosis of COVID-19. SARS-CoV-2 PCR diagnostic tests were not widely available at the beginning of the pandemic and many people probably had undetected SARS-CoV-2 infection before they had their first symptoms and were isolated from the other patients. This fact, together with a delay in receiving PPE, substantial frequency of false negative tests, and asymptomatic carriers, enabled the infection to spread. In some Trusts, resources to protect mental health patients and staff were unavailable at the time they became available for those admitted locally with physical illness, with patients in intensive care units being tested from March 3, 2020,[32] and symptomatic patients in general hospital wards being tested before March 28, 2020.[33] Of particular concern is the fact that this high rate of infection was in a patient group where there is an ethical imperative for protection by the state; 82% had no choice but to be in hospital because they had been compulsorily detained under provisions of legislative framework.

Our patient group consisted of people who were at high risk of mortality if infected with SARS-CoV-2 because they were generally older people with multimorbidity (over 90% had another illness), although obesity and smoking rates were low, and 36% were from ethnic minority groups. 15% of patients clinically diagnosed with COVID-19 died. This mortality rate is much higher than in the community, which was 3·2% according to WHO global figures, or 0·99% among the passengers of the Diamond Princess cruise ship, which comprised an older population who were all tested for SARS-CoV-2 infection.[34,35] UK figures for deaths due to COVID-19 are 41 988 deaths from 435 000 confirmed cases (9·7%) as of Sept 28, 2020, although these data do not include cases at the beginning of the outbreak not admitted to hospital and where no tests were available, and so will overestimate mortality.[36] Patients in our study did not come into hospital because of symptoms of COVID-19. The risk of death in our sample was higher in those who were older (per 1 year) and in men, although in the analysis by sex the CIs were wide in this relatively small sample. Our data suggest those with a diagnosis of dementia were more likely to die than those without dementia in our sample, adding to the evidence that dementia is in itself a risk factor, not only for becoming infected, but also for COVID-19-related mortality.[5,8] Young-onset dementia compared with late-onset dementia was not a risk factor in itself. Unlike the general population,[7,9] patients who were in ethnic minorities did not have higher mortality rates than those of white ethnicity. We are unsure why mortality in this group was different than in the general population, where there has been excess mortality, but one reason might be that patients from ethnic minorities who typically have difficulties accessing care in a timely fashion were already in specialist care when diagnosed with COVID-19, so treatment was given without any delay. Because inpatients in psychiatric units have similar morbidity, socioeconomic circumstances, and care, we found that ethnicity was not a risk in itself. Another potential reason might be that our low number of patients might have led to random bias.

We did not find a higher white cell count in people with dementia than in those with other mental illness, but we found some indication of particular problems with renal function that might be worth further investigation.

Our study has limitations. We only report data regarding patients from older age mental health services diagnosed with COVID-19 and cannot comment on other patients. Our figures of infection rates are likely to be an underestimate. Initially few PCR tests were done, and at first only symptomatic patients were tested. No patient was reported to have loss of taste or smell, which might have been because many patients were cognitively impaired or had a psychotic illness, impairing awareness and communication, which might have led to missed infections. Additionally, symptomatic patients had false negative test results, in line with or at a higher rate than in other populations, in which test sensitivity has been reported to be 70%,[37] implying a false negative rate of 11% and would suggest that 39 of 344 patients in our sample would have falsely tested negative. High rates of false negative test results might be because people on these wards were less able to cooperate with testing procedures, meaning we might have missed some asymptomatic carriers. Clinicians found that in the absence of PCR-positive results, high ferritin, increased D-dimer, low

	Univariable		Multivariable*	
	Odds ratio (95% CI)	p value	Odds ratio (95% CI)	p value
Older age (per 1 year)	1·07 (1·00–1·16)	0·06	1·07 (0·98–1·17)	0·12
Sex				
Female	1 (ref)	..	1 (ref)	..
Male	1·24 (0·36–4·26)	0·74	1·37 (0·43–4·38)	0·59
Ethnicity				
White	1 (ref)	..	1 (ref)	..
Black African, Caribbean, or British	0·91 (0·25–3·26)	0·89	0·90 (0·23–3·46)	0·88
Asian or Asian British	0·99 (0·11–9·16)	0·99	0·88 (0·10–7·38)	0·90
Mixed or other†	NA	..	NA	..
Mental health				
Any dementia	1·38 (0·69–2·75)	0·36	1·44 (0·77–2·68)	0·25
Number of physical comorbidities	1·28 (0·77–2·12)	0·34	..	..

*Adjusted for number of comorbidities. †All six people survived, so not included in regression analysis.

Table 4: **Regression analysis of factors associated with death in patients with COVID-19**

lymphocytes, and acutely increased liver function tests helped them be more confident of the diagnosis because these biomarkers had been reported in people with SARS-CoV-2 infection.[38–41] However, some of the symptomatic patients who tested negative might not have had COVID-19. Five of eight people who did not have tests, but were clinically judged to have COVID-19, died. Three others who died tested negative for SARS-CoV-2 but were clinically judged to have COVID-19; therefore, only 11 (58%) of 19 deaths were in people with laboratory-confirmed SARS-CoV-2 infection. Testing of patients who were asymptomatic started up to 2 weeks later than among those with known symptoms, and they were not tested in all Trusts, so asymptomatic patients with SARS-CoV-2 infections were likely to have been missed. Fewer patients were admitted to the participating Trusts than we anticipated, because some wards were closed to admissions and some patients were treated in isolation in the community. Additionally, we cannot know whether some patients would have died of other illnesses if they had not developed COVID-19. The relatively small sample size meant that we were unable to compare the effect of different management strategies on mortality. Our multivariable analyses were not mutually adjusted. The analyses were only adjusted for number of comorbidities because we did not have sufficient power to use more than two degrees of freedom with 19 deaths. None of the ORs generated reached statistical significance because of small sample size. Our sensitivity analysis found attenuated risk of older age and dementia possibly because of collider bias because all patients younger than 65 years had dementia.

Understanding optimal approaches to prevention and management of COVID-19 is clinically important to prevent future infection and deaths among inpatients during a resurgence of this or any other pandemic. The patients included in this study came to hospital for their mental health without known COVID-19. We recommend that all patients are screened for COVID-19 at the time of admission and, in suspected cases, isolated until the diagnosis is known. PPE must be easily available, because staff have to give close care and move between patients on the ward. In our sample of hospitals, these procedures are now in place and in some sites people are tested before admission if the admission has been planned (personal communication, confidential). Staff should also be tested for SARS-CoV-2 if they are symptomatic.

The relatively low sensitivity of the PCR tests mean that a negative result is not definitive and if patients stay in hospital for a long time, then retesting is important. We do not yet know how long this period between tests should be, but recommend every 28 days in line with UK policies in care homes.[42] Biochemical abnormalities commonly reported in COVID-19 helped doctors feel more confident of the diagnosis when PCR results were unavailable, and these factors should also be considered under similar circumstances in the future.

Not all our recommended changes are in place in all of the study sites. Close liaison between mental health staff and physicians is essential for very physically ill patients but is not happening in all Trusts. Some liaison services have been withdrawn so that patients have to be sent to emergency departments, while others have formed closer links with mental health Trusts and are easily available, despite the financial implications not necessarily being worked out (personal communication, confidential). Oxygen therapy and VTE prophylaxis should be available on wards but are not always. Vitamin D therapy should be routinely considered. The patients in our cohort had severe mental illnesses and most of them were in hospital using the Mental Health Act 1983 or Mental Capacity Act 2005. They are often difficult to care for in a general hospital, which generally do not have the resources or expertise to care for those with a severe mental illness. Many psychiatric wards implemented new investigations (eg, measuring D-dimer) and treatments (eg, oxygen therapy, VTE prophylaxis, palliative care pathways) that required direct liaison with physicians or daily virtual ward rounds. Consideration of what treatment is possible in mental health settings is important, and requires training of mental health staff in inpatient facilities in the implementation of these procedures to enable optimal treatment for patients. These procedures could be widely implemented for future waves of this or other pandemics.

During the peak of the COVID-19 pandemic in March–April, 2020, patients in psychiatric hospitals received resources later than those admitted locally with physical illnesses. This delay appears to have led to a higher proportion of SARS-CoV-2 infections and subsequent deaths than in the global community, possibly related to the patients' high level of comorbidity and older age, and a high viral load in the wards. Individuals with a severe mental illness have excess morbidity and mortality rates compared with those without severe mental illness, and therefore might be more susceptible to COVID-19-related health issues.[43] Most (82%) patients in our study had no choice but to be in hospital because they were compulsorily detained. Since 2006 in the USA, and since 2011 in the UK, a policy of parity of esteem has been in place between mental and physical health, sometimes interpreted as treating patients with equal respect and hope.[44] Implementation of the long-standing policy of parity of esteem for mental health is urgent.

Contributors

GL and HR devised the study concept. GL wrote the protocol and ethics application. LM wrote the initial analysis plan with input from GL, ASo, and KL. HR, PG, LH, ASh, and CK extracted the data from notes and provided data about management policy. LM carried out data analysis and produced tables. GL wrote the first draft of the manuscript and all authors contributed to editing and commenting on the final version.

Declaration of interests

We declare no competing interests.

Data sharing

Because the data for study were sensitive and gathered without individual permission, they are not available for sharing.

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