Original Article

A whole healthcare system mortality review of the second wave COVID-19 pandemic response, were lessons learned?

JW Tankel, D Ratcliffe, M Smith, C Hindley, A Mullarkey, D Waterhouse, A Riley & D Green

Abstract

We previously reported a study of features of emergency healthcare response to COVID-19 that could be modified to mitigate against future excess deaths. Here we determined what themes persisted in later waves.
This was an expert panel review of all components of care delivered to COVID-19 patients who died (primary and secondary care, community services, NHS 111 and 999, COVID oximetry at home, virtual wards).
174 deaths were included. 5% were deemed >50% avoidable, 75% included avoidability themes.
Contact with primary care remains mostly via telephone, creating diagnostic risk. Patient decision to avoid healthcare contact was common.
Recommendations include: better utilisation of home monitoring in future pandemics; improved avoidance of nosocomial spread; patients be encouraged to seek medical advice earlier.

Keywords

COVID-19, mortality

Background

Since the start of the novel coronavirus sars-cov-2 (COVID-19) pandemic there have been several distinct waves. In the UK, Despite the absence of a strict definition, the first was between March 2020 and the end of May 2020 in England.[1] We have previously reported a study of this first wave to ascertain the characteristics of patients and features of the emergency healthcare response that could be modified to mitigate against excess deaths in future waves.[2]

From this we made several recommendations which are outlined in box 1. This included changes to the entry criteria to the national Oximetry at Home (CO@H) programme that was starting to be implemented at that time.[3,4] This included a) lowering the age for entry from the national 65 years of age to ≥50 years for males and ≥55 years for females, and b) broadening of inclusion from extremely clinically vulnerable to any at-risk group. We also recommended that when conducting an assessment of a patient with COVID-19 specific enquiry should made as to the wellbeing of other house members. The lessons and changes to the national programme was made through clinical presentations at local meetings and a local on-line newsletter.

The second wave of COVID-19 is estimated to have started at the beginning of September 2020; there was an initial peak in mid-November after which infection levels decreased before rising again in December following the emergence of the Alpha variant; the wave peaked in early January 2021 and ended at the end of April 2021. [1] It was at the end of November 2020 That we introduced a dedicated primary care hub for suspected and positive cases of COVID-19. This service also carried out the CO@H service.

In this present study we aimed to determine if there were any new themes that had emerged which could be mitigated against and if previous lessons had been learnt and recommendations embedded.

Methods

Deaths of Salford residents who were registered with a Salford GP and who died in the Salford area from either a primary or contributory COVID–19 infection in the nine-month period from 15/11/2020 to 31/07/2021 were included in the analysis. Data was provided from the Primary Care Mortality Database (PCMD), The Primary Care Mortality Database (PCMD) allows authorised users to access mortality data provided at the registration of a death. This includes demographic details, cause of death, place of death, certifying GP details and coroner's details.

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Box 1. Recommendations from previous study. Adapted from: Consequences of the emergency response to COVID-19: a whole health care system review in a single city in the United Kingdom.[2]
Patients must be encouraged to seek medical advice when they have symptoms that they would normally seek advice for, and not delay because of the Pandemic or advice to "Stay at Home".
More targeted face to face assessments may reduce future risk.
Stay at home advice must be given in the context of the patient's medical and social vulnerabilities.
Patients at high risk of complications should be contacted early in their illness when medical services become aware of a positive test.
Patients with a positive COVID-19 test and symptoms need active reviews to detect early desaturation to facilitate early admission to hospital.
A low threshold should be set for planned follow up calls after any telephone contact.
Care homes may need access to specialist palliative care at short notice.
Pre-emptive telephone welfare checks for vulnerable relatives of positive cases should be considered as they are at high risk of infection.
A joined-up approach to follow up between primary care, secondary care, ambulance services, and NHS 111 is necessary after first contact.
Pre-emptive discussions about ceiling of care and preferred place of death should be held with care home residents, and families where appropriate.
As evidence of survivability emerges, decisions to not ventilate must be fully evidence based.
Decision making should be patient focussed, not service focussed.
Telephone consultations should not be made with second or third party carers unless unavoidable.

A comprehensive review of all components of care delivered to patients by community, ambulance, and hospital-led services was undertaken by reviewing electronic records from GP practices, secondary care, community health and care services, NHS 111 and 999 emergency services, COVID oximetry at home and virtual wards. This "whole patient journey" approach facilitated understanding of how the changes in care pathways in each domain have impacted on the patient since the first mortality review in 2020 and the recommendations that were made at that time. To ensure that data from the whole patient journey were captured, an arbitrary three-week (21 days) period prior to the date of death was included, where the patient may have had contact with health and social care services. It was important that all points of contact were captured within the three-week timeframe to understand any potential missed opportunities within the patient journey prior to the patient's date of death.

Records from Hospital, GP, 999 and NHS 111 services were reviewed. General Practice (GP) and Hospital records are directly linked at a patient level to create an integrated Greater Manchester Care Record (GMCR) and was included in the review. Most patients in care homes in Salford are registered with a single General Practice with shared care provided by the hospital Care of the Elderly Physicians, facilitating joined-up review of care records.

Data sharing agreements and a Data Protection Impact Assessment were completed and approved by the Caldicott Guardian for each participating organisation. The approach followed the terms of the NHS Control of Patient Information Regulations 2020 for sharing of information in the context of the COVID-19 pandemic. [5] As such, no formal application for ethical approval was sought, nor was any consent for participation. All data searches, queries and case record reviews were undertaken on computers which hosted secure servers to the hospital, Clinical Commissioning Group (CCG) and North West Ambulance Service (NWAS) records. Patient level data linkage was via NHS number, or by postcode and other features in cases where NHS number was not available (such as 999 calls made by third party bystanders). Patients were allocated a unique ID for this review so that anonymised datasets could be extracted and shared with the review panel as set out below. The study protocol was performed in accordance with the relevant guidelines detailed above.

A team of clinicians with experience of the Health Innovation Manchester Utilisation Management Unit undertook the data collection adopting a mixed methods approach using quantifiable data as well as an initial assessment of clinical themes. A pilot of 20 records was performed to refine processes and agree on final data extraction. A clinical review panel independently reviewed each case utilising a Structured Judgement Review (SJR) methodology and allocated a score using a system aligned to the Royal College of Physicians "avoidability of death" scale from the National Mortality Case Record Review Programme (figure 2). [6] The panel then met to decide a consensus score for each death. The panel comprised the Medical Director of the Salford CCG, the Urgent Care lead for Greater Manchester Health & Social Care Partnership, the Salford Care Organisation Clinical Director for Mortality, and the Emergency Medicine Consultant representative on the Greater Manchester Mass fatalities and Excess Deaths Planning group.

Figure 1. The Royal College of Physicians "avoidability of death" scale.
Score 1 Definitely avoidable
Score 2 Strong evidence of avoidability
Score 3 Probably avoidable (more than 50:50)
Score 4 Possibly avoidable, but not very likely (less than 50:50)
Score 5 Slight evidence of avoidability
Score 6 Definitely not avoidable

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Results

Population characteristics

There were 206 deaths during the study period. Of these, 174 were included in this final report. The reasons for exclusion of the remaining 32 deaths is detailed in figure 2. The majority of those excluded were deaths that occurred outside of the Salford catchment area (n=26). Table 1 provides an overview of the cohort divided according to place of death. Overall, the mean age was 78 ± 12 years, 58% were male, 79% were Caucasian. Cardiovascular disease represented the most common co-morbidity group (65% of the population), followed by respiratory disease (43%), dementia (30%), neurological conditions (28%), mental health conditions (23%) and chronic kidney disease (20%). 75% of people had between 2 and 4 co-morbidities. Only 3 had no co-morbidities. COVID-19 was listed as primary cause of death in 145 of 174 cases (83%) and as a secondary cause in the remainder. 146 people had a DNAR order in place at the time of death (84%). Only 17 people had received a first dose of COVID-19 vaccine.

The majority of people died in hospital (79%). 12% of people died in a care home or residential home and 7% in their own home. The remaining 2% died in a hospice. During the first review, the respective figures for hospital, care home and own home deaths were 50%, 43% and 3% indicating that proportionately many fewer COVID-19 deaths were occurring in care homes during the second wave. [2] Of the 137 hospital deaths, 36 died in intensive care and 46 were given ward level non-invasive ventilation. Only 1 hospital death occurred suddenly, all others had a DNAR in place at the time of death.

Community healthcare contact

98 patients had contact with a GP. Contact with the person's own GP occurred in 78 cases (45%) and with an out-of-hours GP in 20 cases (11%). Contact was by telephone in 72 cases, face to face in 19 and other methods e.g. video call in 7.

The outcome of GP contact was most commonly referral to the Emergency Department (n=20), an urgent community response (n=18), advice given (n=13) and treatment given (n=12).

54 people had a second GP contact prior to death. Here, 7 were face to face. End of life care was the most common activity (n=19) and occurred in nursing or care home residents. 4 people were referred to the Emergency Department after second GP contact.

Of the 98 people who had GP contact, 41 (24%) were admitted to hospital within 24 hours. Of the remaining 57, all were aged ≥50 years with at least one co-morbidity. 8 of 57 (14%) were placed on the Oximetry at home pathway. Excluding patients from care homes where oximetry is available anyway, 7 of 47 (15%) eligible patients were placed on the CO@H pathway. Of these 7, 6 died in hospital and 1 died in a care home. Of the remaining 40 CO@H eligible patients not usually resident in a care home, 18 died in hospital, 12 died in a care home or hospice, and 8 died in their own home.

64 people had contact with other community services a total of 141 times. The most common services were district nurses (n=81 visits, 100% face to face), urgent care rapid response (n=21, 90% face to face), home COPD service (n=7, 71% face to face), COVID-19 community team (n=13, 38% face to face).

30 people contacted the NHS 111 helpline. 14 were transferred to 999 for ambulance conveyance, 8 were referred to their GP, 3 were provided with an urgent community response. By contrast 110 people contacted 999 directly. Of these, an ambulance was dispatched in 108 (98%) cases. Ambulance dispatch times did not show as significant delays as was found during the first review. [2] A summary of mean, minimum and maximum dispatch times is found in table 2, divided according to category of

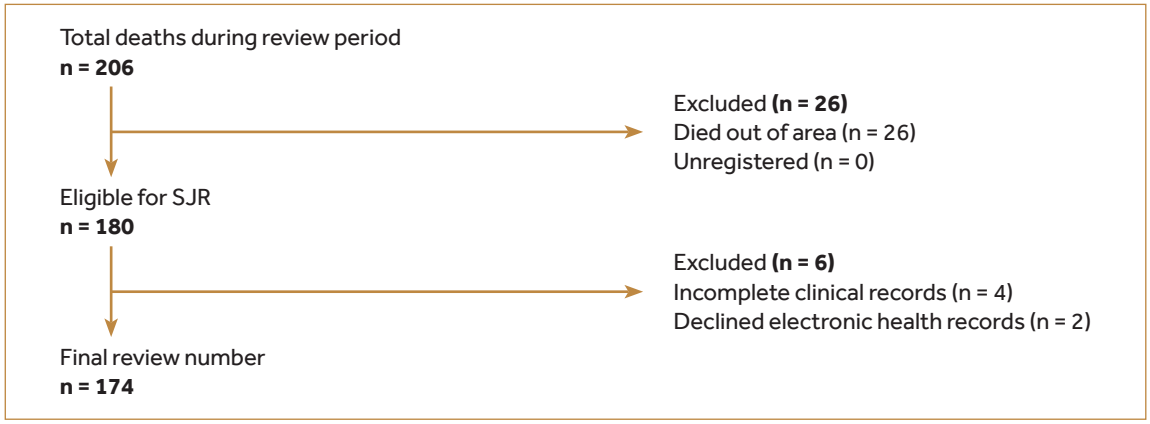


Figure 2. Review exclusion flowchart.

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Table 1. Overview of characteristics of the cohort undergoing structured judgement review, divided according to place of death.

	Place of death			
	Care or residential home	**Own home**	**Hospital**	**Hospice**
Number of cases (% of total)	21 (12)	12 (7)	137 (79)	4 (2)
Co-morbid features:				
Age (year, mean ± SD)	88 ± 7	78 ± 13	77 ± 12	81 ± 16
Male gender (%)	48	75	60	25
Dementia (%)	80	16	14	66
Cardiovascular (%)	71	66	73	66
Gastrointestinal (%)	28	16	16	33
Musculoskeletal (%)	28	16	29	0
Renal (%)	23	0	32	0
Diabetes (%)	19	16	37	33
Respiratory (%)	19	50	39	66
Malignancy (%)	14	33	17	66
Mental Health (%)	4	16	16	33
Ethnicity (%):				
Caucasian	85	67	78	100
Asian	0	0	1	0
Black	0	0	2	0
Other / not specified	14	33	16	0
Usual residence (%):				
Care home	38	0	5	25
Own Home	0	V91	82	75
Residential Home / Sheltered	61	8	12	0
1a listed cause of death (count):				
COVID-19	21	10	112	2
Pneumonia	-	1	14	-
Other respiratory	-	-	3	-
Cardiovascular	-	-	4	-
Malignant disease	-	-	-	2
Other	-	1	4	-
Avoidability of death score (count)				
1	-	-	-	-
2	-	1	1	-
3	-	-	7	-
4	2	1	35	-
5	16	5	71	-
6	3	5	23	4

Key: SD = standard deviation; BMI = body mass index; uDNAR = unified do not resuscitation document; EoL = end of life. * this value includes 8 cases of sudden death where cause is unknown and so no score was able to be appropriately allocated. # 14 of 15 were deaths in a hospice. ~ indicates hospital visit separate to final admission.

urgency. The mean response time was 11 minutes for category 1 calls and 26 minutes for category 2 calls. All category 1 calls were dispatched within 60 minutes and 2 only of 65 category 2 calls took more than 2 hours for dispatch. One was downgraded.

The mean early warning score as measured by paramedics on arrival to a person's home indicated more severe illness for higher priority people, as expected. In category 1 people the mean NEWS2 score was 8 ± 2. However, even those in category 3 had a mean NEWS2 of 5 ± 3. For oxygen saturations, the mean value in category 1 was 82 ± 9% compared with 84 ± 16% in category 2 and 89 ± 6% in category 3. Full details are found in table 3.

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Table 2. Ambulance dispatch times, divided by category of urgency.

Ambulance category	n	Dispatch time (mean)	Dispatch time (min)	Dispatch time (max)	Journey time (mean)	Journey time (min)	Journey time (max)
1	7	00:11:43	00:01:00	00:51:00	00:09:00	00:04:00	00:22:00
2	65	00:26:12	00:01:00	06:46:00	00:11:22	00:03:00	00:29:00
3	22	00:59:16	00:03:00	03:09:00	00:12:35	00:01:00	00:27:00
4,5	4	02:22:30	00:46:00	04:59:00	00:23:45	00:06:00	00:41:00

Key: time format shown as hh:mm:ss. Category was unknown in 10 of 108 dispatches.

Table 3. Physiological parameters measured by paramedics, divided by ambulance category.

	Ambulance category			
	1	2	3	4,5
NEWS 2 score	8±2	6±3	5±3	3±1
% oxygen saturations	82±9	84±16	89±6	92±2

Key: NEWS2 = National Early Warning Score 2.

Table 4. Comparison of the avoidability of death scores and most common themes in this review and the COVID-19 deaths in the previous review.

	Current review	Previous review
Avoidability of death score (% of patients)		
2	1.1	0.5
3	4.0	4.2
4	21.8	6.3
5	52.9	38.1
6	20.1	50.8
Most common themes		
1	Nosocomial – Secondary Care (22%)	Exposure to COVID-19 – Care Home (22%)
2	Access to care delayed - patient (18%)	Delay in testing – primary care (13%)
3	Nosocomial – Nursing / Care Home (11%)	Sub-optimal care – Primary Care / EoL (6%)

Avoidability of death scoring

Overall, 35 people received a score of 6 indicating no avoidability (20%). 130 people (75%) received a score of 4 or 5 indicating some avoidability but a less than 50% likelihood that death could have been avoided. 9 people received a score of 2 or 3 indicating a greater than 50% chance that the death could have been avoided. No deaths received a score of 1 (definitely avoidable). A breakdown of the avoidability of deaths according to place of death is found in table 1. Eight of the 9 deaths with scores of 2-3 occurred in hospital. A comparison of the relative frequency of avoidability of death scores in this review and the COVID-19 deaths from our first review is found in table 4.

There was evidence that avoidable deaths were more likely in younger people, acknowledging the limitation of much smaller numbers. 17% (n=1) of deaths in people under the age of 55 years had an avoidability score of 2, indicating strong evidence of avoidability. 15% (n=2) of deaths in those aged 55-74 years were felt to be more than 50% avoidable. No deaths in older people aged 75 years or more were judged to be more avoidable than not. In the further sub-groups of older people divided by place of residence, those who lived in their own home had higher levels of avoidability of death than those in a care home. This is consistent with the findings of our first report.

For people who lived in their own home, 39% (n=14) had an avoidability score of 4, compared with 7% (n=1) in care homes and 14% in residential homes (n=4). Fewer people who lived in their own home had no avoidability (14% compared to 20% for care home residents). People who lived alone were not at greater risk of avoidable death.

The majority of people were of Caucasian background. (76%) of whom scored 5 or 6 indicating little or no avoidability. There were very few black or Asian people who died during this period, but of those that did, there were fewer scores of 5 or 6 than in the Caucasian population. Both Asian people who died scored 4 on avoidability, as did 2 of 4 black people who died. These findings are found in more detail in table 5.

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Table 5. Percentage of people with group with each avoidability of death score.

	n	Avoidability of death score				
		2	3	4	5	6
Age group						
< 55 years	6	17	0	17	50	17
55 – 74 years	52	2	13	27	40	17
75+ years	116	0	0	20	59	22
Residence in older people (age 75+ years)						
Residential	29	0	0	14	69	17
Care home	15	0	0	7	73	20
Own home	36	0	0	39	47	14
Lived alone	36	0	0	11	56	33
Ethnicity						
Caucasian	138	1	4	19	54	22
Asian	2	0	0	100	0	0
Black	4	0	0	50	25	25
Gender						
Male	102	1	4	25	49	22
Female	72	1	4	18	58	18

Thematic review

Themes associated with potential avoidability of death were found in 142 of 174 case reviews. More than 1 theme was noted in 51 cases. The most common theme was nosocomial spread of COVID-19 (69 cases), followed by delays in access to care (53), suboptimal care (44), and exposure to COVID-19 outside of a healthcare setting (10). Other themes occurred in fewer than 5% of case reviews. All themes are detailed in table 5, divided according to avoidability of death score and by age category.

In people with the highest scored degree of avoidability (scores 2-3) the common themes were delays in access to care and suboptimal care. In 6 patients a partner had recently been admitted and also died. In the 4 cases of avoidable deaths where care was suboptimal, 2 events lay in primary care, one in secondary care and one ambulance service. Younger people were more likely to experience delays in accessing care than those aged 75+ years. Death due to nosocomial COVID-19 infection was overwhelmingly experienced by older people. Differences in themes between ethnic groups was not clear due to the small number of deaths in non-Caucasian people. A complete breakdown of the number of thematic episodes divided by age, ethnicity and avoidability of death score is found in table 6. Table 7 outlines the source of themes. Patient driven delays were far more common during this review than in our previously published review. Here, 39 people (22%) delayed seeking medical care during their final illness. Table 4 provides comparisons of the three most common themes in this review and the COVID-19 deaths from our first review. Exposure to COVID-19 in care homes is the only theme to appear in the top three in both reviews, although was more common in the first review (22%) compared to the second review (11%).

Discussion

This was a real-life observational study which attempted to discern whether lessons learnt in a local health economy from wave one of the COVID-19 pandemic were embedded for wave two and if there were new themes. This study only looked at COVID-19 deaths unlike the previous study which looked at all deaths. All positive COVID-19 tests from the Pillar 2 testing in the community were notified to practices. Locally, practices had been advised to pro-actively contact patients with a positive test who were over the age of 50 years (male), 55 years (female), or had risk factors. A local hub was set up for patients suspected of having COVID-19 or who had a positive diagnosis notified to the practice by Pillar 2 testing to be seen and monitored. Therefore it was very disappointing that only 8 out of a possible 57 patients who died were admitted to this service. This calls into question the ability of some GP practices to integrate previous educational messages and modify their clinical practice.

Remote monitoring of community-based COVID-19 patients has been shown to be effective in reducing mortality via programmes such as

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Table 6. The number of thematic episodes divided by age, ethnicity and avoidability of death score.

	Total	Avoidability score			Age			Ethnicity			
		2-3	4-5	6	<55 years	55-74	75+ years	Caucasian	Asian	Black	Other
Access to Care delayed	53	6	42	5	4	29	20	34	2	1	16
Admission delay	1			1			1	1			
Exposure to COVID-19	10	2	4	4		4	6	8			2
Good end of life Care	5		3	2		2	3	5			
Importance of integrated records	2		2				2	2			
Lack of face-to-face care	8		7	1	1	1	6	6			2
Nosocomial infection	69	1	67	1	1	8	60	59		1	9
Patient declined admission	3		2	1	1		2	3			
Not COVID-19 death	2		1	1			2	2			
Suboptimal Care	44	4	32	8	2	13	29	32	1	1	10
Testing delayed	5		4	1		4	1	2	1		2
No theme	32	2	15	15	1	9	22	27		1	4
Total	**238**	**15**	**182**	**41**	**10**	**74**	**154**	**181**	**5**	**6**	**46**

Table 7. The source of thematic episodes divided by age, ethnicity and avoidability of death score.

	Total	Avoidability score			Age			Ethnicity			
		2-3	4-5	6		2-3	4-5	6		2-3	4-5
Bereavement	6	2	3	1		4	2	4			2
End of life care	6		3	3		1	5	5			1
Family or close contacts	10	2	4	4		4	6	8			2
Care home	22		21	1		1	21	20			2
Ambulance service	8	2	5	1		6	2	5			3
Patient	37	3	32	2	4	22	11	22	2	1	12
Primary Care	20	2	13	5	2	5	13	16		1	3
Secondary Care	60	2	57	1	1	10	49	48	1	1	10
Source Unknown	3		3			1	2	2			1
Theme not Assigned	66	2	41	23	3	20	43	51	2	3	10
Total	**238**	**15**	**182**	**41**	**10**	**74**	**154**	**181**	**5**	**6**	**46**

COVID watch so must be better implemented in the future.[7] However, it is acknowledged that the supplementary benefit of pulse oximetry lacks the same supporting evidence. Indeed, the addition of oximetry to standard monitoring in *COVID watch* did not change outcomes.[8]

It was also notable that while community services were usually face to face this was not the case for GP services. It is possible that the reason for this was the existence of the community assessment service. The existence of such a service may mean that other primary care sites do not have the confidence to see such patients due to lack of experience or skill in applying full personal protective equipment.

Ambulance categorisation seemed to correlate with NEWS 2 and oxygenation levels and this could either be due to good stratification at the initial patient call or is a result of the extra average wait.

In this report there was no evidence for lack of escalation being a factor in preventable themes; in contrast to the previous report. Patients who delay seeking help remains at serious risk, especially those who had themselves been recently bereaved. This is a specific group of COVID-19 contacts and we would recommend active engagement with this group of patients in the future to check for symptoms of infection or possible deterioration.

Ninety eight percent of patients had been conveyed to hospital and this suggests that ambulance services were making correct decisions as to who needed to be conveyed and correlates with the findings of others.[9]

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Box 2. Summary of key findings and recommendations

Findings
Fewer patients were dying in care homes in the second wave than during the first wave.
Exposure to COVID-19 in care homes is the only theme to appear in the three most frequent themes in both reviews and nosocomial infection remains the most common theme in avoidable deaths.
In those patients who died, oximetry at home referrals from primary care were extremely low, indicating that this service was underutilised for COVID-19 patients who died, and that attempts to promote the take up of the service locally took time to embed and were not as quick as needed .
The majority of contact with primary care remains via telephone which creates risk for accurate diagnosis and assessment of disease severity.
Ambulance services were making correct decisions as to who needed to be conveyed to hospital.
Patient decision to delay or avoid healthcare contact was common. Some deaths may have been avoided if patients had sought medical review earlier.
Recommendations
Home monitoring must be better utilised in future pandemics.
Avoidance of nosocomial spread is possibly the most important factor in preventing excess death.
High risk infected patients must be encouraged to seek medical advice at an early stage of illness.
Delays in the early implementation of new services can have serious adverse consequences and ways of ensuring early adoption needs to be found.

We were surprised by the number of cases that had avoidable factors. The most common was nosocomial infection. The importance of avoiding infection in hospitals and within care homes is paramount. Many patients had delay in access to care and the importance of seeking help soon when symptomatic needs to emphasised in public health messages which are meaningful to patients.

Box 2 provides a summary of the key findings from this review.

Strengths and limitations

This study is limited in having only reviewed Covid-related deaths. There is also the risk of bias due to the nature of the methodology. However all reviews were carried out by a skilled team who extracted data and there were always three or four clinicians who reviewed themes and assigned an avoidability score.

Conflict of Interest

The authors have no conflicts of interest to declare.

Sharing Statement

Full data sharing will not be available due to the potential identifying factors included. Additional data tables and analyses can be provided upon request where appropriate.

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