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I-MOVE-COVID-19 Network

Multidisciplinary European network for research, prevention and control of the COVID-19 pandemic

COVID-19 European Hospital Surveillance:

Sixth Bulletin

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I-MOVE-COVID-19 Network

WP3 coordinated by Public Health Scotland

Authors:

Heather Mutch (1), Fatima Sadiq (1), Mark Hamilton (1), Ciaran Harvey (1), Johanna Young (1), James McMahon (1), Damilola Mokogwu (1), Lesley Wallace (1), Georgia Ladbury (1), Josie Evans (1), Angela Rose (2), Josie Murray (1)

Affiliations: (1) Public Health Scotland; (2) Epiconcept

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List of Abbreviations

COVID-19	Coronavirus disease 2019
EEA	European Economic Area
ECDC	European Centre for Disease Prevention and Control
ECMO	Extracorporeal membrane oxygenation
EU	European Union
GP	General practitioner
HCW	Healthcare worker
HDU	High dependency unit
ICD	International Classification of Diseases
ICU	Intensive care unit
ILI	Influenza-like illness
I-MOVE	Influenza – Monitoring Vaccine Effectiveness in Europe
RT- PCR	Real-Time Polymerase Chain Reaction
SARI	Severe Acute Respiratory Infection
SARS-CoV-2	Severe Acute Respiratory Syndrome – Coronavirus 2
WP3	Work Package 3

Summary

This final surveillance bulletin summarises information from the Influenza – Monitoring Vaccine Effectiveness in Europe – Coronavirus Disease 2019 (I-MOVE-COVID-19) hospital surveillance network. The I-MOVE-COVID-19 hospital surveillance aims to reinforce and complement the COVID-19 epidemiological data in the European Union (EU)/ European Economic Area (EEA), Albania and the United Kingdom (UK) that are compiled and reported by the European Centre for Disease Prevention and Control (ECDC).

England and Scotland are able to report national data, whilst all other sites send data from one or more sentinel hospitals. The data consist of patients who have been hospitalised with suspected, probable or confirmed cases of SARS-CoV-2 virus. These case definitions are outlined in Appendix 1.3. Data were collected according to a generic protocol[1]. The data collected by each site are dependent on a variety of factors, including: health care systems in place, hospital admission policy and the data collection methods utilised, therefore there are differences in the range and completeness of data between each site.

A total of 132,783 cases were reported to the surveillance system between 01 February 2020 and 31 December 2021; 127,810 (96%) laboratory confirmed, 323 (<1%) probable and 4,650 (4%) suspected. As England and Scotland have submitted national data, the number of cases provided by these sites comprise the majority of the pooled dataset accounting for 52% (69,386/132,783) from England and 33% from Scotland (43.372/132,783) respectively. To

[1] I-MOVE-COVID-19 hospital surveillance protocol V8.1

reduce this over-representation of cases from England and Scotland, selection methodology was applied prior to analysis of the pooled dataset. This selection process is discussed in detail in the Methodology section.

This final surveillance bulletin reports on the entire data collection period from 01 February 2020 to 31 December 2021. As confirmed hospitalised cases represent 96% of the dataset, this report will exclusively focus on these. The trends in admission date, onset date, severity indexes, presenting symptoms and chronic conditions of each case are explored overall and monthly trends are investigated.

Summary of results

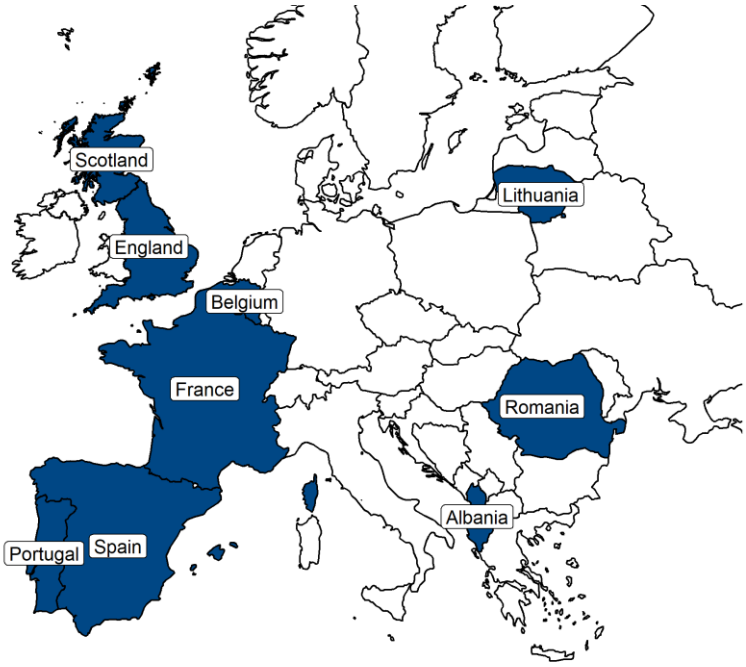
- After selection of a proportion of records from England and Scotland, 25,971 laboratory-confirmed COVID-19 cases were analysed from 11 sites across Europe between 01 February 2020 and 31 December 2021
- There were at least five instances of peaked hospital activity across Europe in relation to the COVID-19 pandemic
    - The highest case numbers in a day were observed in March 2020
    - Numbers have since dropped but have persisted over winter periods
- A median of 6 days between symptom onset and date of hospitalisation was observed
- 54% (14,191/25,971) of all patients hospitalised with COVID-19 were male
- Those aged 75 years or older represented 35% (9,008/25,971) of all hospitalisations
- The overall median age of hospitalisation was 67 years of age
    - The median age of hospitalisation was 69 years in March 2020 but decreased to 64 years of age in December 2021
- Hypertension, heart disease, diabetes and obesity were the most commonly reported chronic conditions
- General deterioration, cough, shortness of breath and fever were the most commonly reported symptoms
- 81% (18,557/22,863) of patients with a known outcome of death or discharge, were discharged from hospital
- The median length of hospital stay was 8 days
    - Older patients tended to have the longest hospital stays
    - The median length of hospital stay decreased over time

- A median of one day between hospital and ICU/HDU admission was observed
    - 0 days for patients aged 0-14 years and 2 days for 75+ years
- Of those with the information available, 13% (3,196/23,289) of hospitalised patients required admission to ICU/HDU
    - The median age of ICU/HDU admission was 63 years
    - Males were admitted to ICU/HDU in higher proportions than females ($p < 0.0001$)
- The median length of stay in ICU/HDU was 8 days
- Where information was available, 38% (6,754/17,590) of all patients required mechanical ventilation
    - High-flow oxygen and non-invasive ventilation was most commonly used
    - 29% (4,076/14,191) of males required ventilation compared to 23% (2,678/11,780) of females ($p < 0.0001$)
- 19% (4,306/22,863) of patients with COVID-19, with a known outcome, died
    - The proportions of patients who died in hospital decreased from the beginning of the pandemic to December 2021
    - Of those with a known outcome of death or discharge, 20% (2,544/12,428) of males died compared to 17% (1,762/10,435) of females
    - 36% (2,897/8,100) of those aged 75 years or older died and this age group comprised the largest proportion of deaths, at 67% (2,897/4,306)
    - A median of 10 days between admission and death was observed
    - Patients with two or more chronic conditions had a higher probability of dying than those with zero or one chronic condition ($p < 0.001$)

Background

The I-MOVE-COVID-19 Work Package 3 (WP3) hospital surveillance is coordinated by Public Health Scotland (PHS), in collaboration with Epiconcept. The I-MOVE-COVID-19 network comprises 11 surveillance sites in nine European countries: Albania, England, Scotland, and six EU Member States (Belgium, France, Lithuania, Portugal, Romania, and Spain), see Figure 1. Spain and France have two participating sites in different regions.

Figure 1: Map of countries of the hospitals participating in I-MOVE-COVID-19 WP3 hospital surveillance, 2020-2021

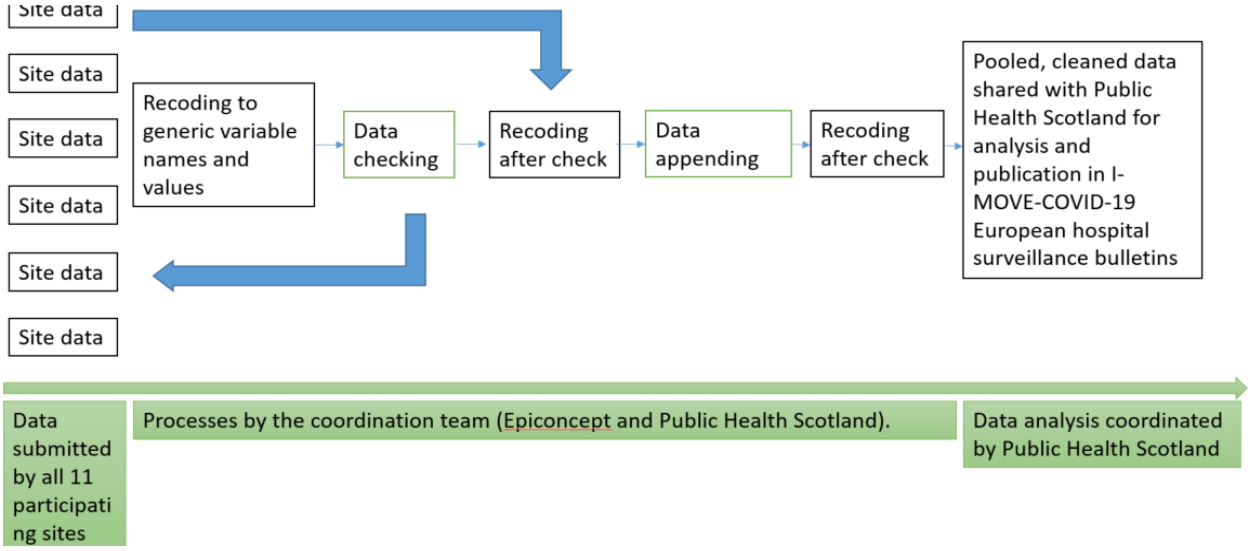


The primary objective of the I-MOVE-COVID-19 WP3 is to describe the clinical and epidemiological characteristics of SARI patients who have been hospitalised with COVID-19, as well as the virological characteristics of SARS-CoV-2 within these hospitalised patients, in order to contribute to the knowledge base, guide patient management and inform the public health response. Further information and objectives of I-MOVE-COVID-19 hospital surveillance WP3 can be found at the I-MOVE-COVID-19 WP3 webpage.

Methods

Sites submit surveillance data securely to Epiconcept every quarter, where data are checked to ensure all cases are suitable for analysis; the data are then cleaned and pooled. The anonymised, pooled dataset is then analysed by PHS. For clarity, the data flow of the process is shown in Figure 2. Most sites generate their data using surveillance forms implemented at a small number of sentinel hospitals; however, the surveillance data provided by England and Scotland are collected at a larger number of hospitals and therefore represent the greatest proportions of the European pooled dataset at 52% (69,386/132,783) and 33% (43,372/132,783) respectively. To prevent over-representation of any site within the dataset, random samples of the English and Scottish data were selected for analysis.

Figure 2: The dataflow of the I-MOVE-COVID-19 hospital surveillance WP3, utilised 2020-2021



Selection of English cases

The data submitted from England went through a selection process as this site provides data from most hospitals to the I-MOVE-COVID-19 network, therefore presenting a large share of the total number of hospitalisations. In addition to this, the only mandatory requirement in England is to submit data from Intensive Care Unit/High Dependency Unit (ICU/HDU facilities); therefore, data sent from England will not provide a true national picture of those admitted to any ward within hospitals in this site. This mandatory reporting from ICU/HDU facilities skews the data towards those who have experienced a more severe outcome that could bias the entire pooled dataset.

These issues were mitigated using the following selection process: a sentinel variable was introduced to the dataset to identify the 53 hospitals within England that report from all hospital wards. Only data from those sentinel sites were included in the final sample for analysis. Furthermore, the number of cases from these 53 sentinel hospitals was chosen to be 6,500. This arbitrary figure of 6,500 was chosen to align with the number of cases provided by Spain-Navarra as they have submitted the largest number of cases after England and Scotland. These 6,500 cases were selected randomly from the sentinel hospitals by assigning each English record a row number and extracting 6,500 cases using a function in R Studio which allows records to be randomly chosen and retained for analysis.

Selection of Scottish cases

Scotland provides national coverage of all hospitalised COVID-19 cases, from all wards in all hospitals, through linkage of routinely updated national registers. Without carrying out a selection process, data from Scotland would be significantly over-represented within the

European pooled dataset. As only England and Scotland are able to provide forms of national data, and the number of cases from England was adjusted as described in the previous section, the number of cases from Scotland also had to be adjusted. As England does not provide coverage from all wards within all hospitals, the geographical populations could not be used as a basis for reducing the numbers for Scotland. Instead, the ratio of proportions of data received from England and Scotland (1.6 English cases: 1 Scottish case) and included within the pooled dataset prior to selection of cases from England were fixed and carried forward to the final selection used for analysis. Utilising this method, 4,000 Scottish cases were randomly selected for analysis, similarly to English cases.

Final selection included for analysis

This surveillance bulletin focuses exclusively on confirmed cases of COVID-19, as these comprise a significant majority of the dataset at 96% (127,810/132,783), with suspected and probable cases of the disease excluded from the analysis. All cases recorded before 01 February 2020 were excluded, as data quality was poor before this date, and any information captured after 31 December 2021 was excluded as not all sites were able to provide data after this date. The case definitions utilised throughout this surveillance bulletin are shown in Table 1. The number of cases used for analysis throughout this surveillance bulletin is outlined in Table 2. This surveillance bulletin covers the entire period of data collection, from 01 February 2020 to 31 December 2021, exploring the overall results as well as observing the trends over a monthly basis.

Case definitions

Table 1: Case definitions utilised for the final I-MOVE hospital surveillance WP3 bulletin

Case	Definition
Hospitalised patient	A hospitalised patient is defined as a patient who has been admitted to one of the participating hospitals during the surveillance period and has not been discharged before 24h.[2]
Suspected patient	A suspected COVID-19 patient is defined as a hospitalised person with: • at least one systemic symptom or sign: fever or feverishness, malaise, headache or myalgia or deterioration of general condition (asthenia or loss of weight or anorexia or confusion or dizziness) AND • at least one respiratory symptom or sign (cough, sore throat or shortness of breath; **or** tachypnoea **or** signs of low oxygen saturation) at admission or within 48 hours after admission. All patients fulfilling the above criteria, until they are re-classified as COVID-19 negative, probable or confirmed (see below), are considered as suspected COVID-19 patients.
Confirmed case of COVID-19 (confirmed case)	A confirmed COVID-19 is defined as a patient hospitalised during the surveillance period with a respiratory sample positive for SARS-CoV-2
Probable case of COVID-19 (probable case)	A probable COVID-19 case will be defined as a patient hospitalised with suspected COVID-19 during the surveillance period for whom: • testing for virus causing COVID-19 is inconclusive (according to the test results reported by the laboratory) OR • testing was positive on a pan-coronavirus assay OR • no laboratory tests are available but there is clinical confirmation with suggestive radiology

[2] Patients are excluded from surveillance if they are unwilling to participate or unable to communicate and give consent (the consent may also be given by her/his legal representative, or by specific consent procedures, acceptable according to the local ethical review process). Note: in some countries, individual patient consent is not required for routine surveillance.

Case	Definition
Severe COVID-19 case	For the purposes of surveillance, all patients hospitalised due to confirmed COVID-19 disease are severe COVID-19 cases. However, these hospitalised patients will be further classified as "severe hospitalised COVID-19 patients" if they have any of the following clinically, analytically or radiologically significant alterations/outcomes mentioned in the admission or discharge diagnosis: • Bilateral pneumonia with ground-glass opacities • Admitted to ICU/HDU • On ventilation • Invasive (i.e. with intubation) • non-invasive (e.g. high-flow oxygen; or those needing >6L) • Extracorporeal membrane oxygenation (ECMO) • Death
COVID-19 death	A COVID-19 death is defined as a confirmed COVID-19 case who died during hospitalisation (regardless of cause of death).
Patient residing in supported living arrangement	A patient who: • Lives at home but is dependent on home support or care OR • Is institutionalised
Pregnant patient	A female patient who is aged between 15-55 years and is pregnant
Current smoker	A patient who at time of admission identified as a smoker or someone who quit smoking less than one year prior
Former smoker	A patient who at time of admission had previously smoked but had stopped smoking at least one year prior
Close contact	A patient who was identified as being within a close-contact setting with a probable or confirmed case of COVID-19 in the 14 days prior to symptom onset

Table 2: The number of patients hospitalised with confirmed COVID-19 (after English and Scottish selection) from each participating site of the I-MOVE-COVID-19 hospital surveillance WP3, that are included in the analysis of this surveillance bulletin.

Country	Region	Participating hospitals	Number of cases (%)	Admission of first reported case		Admission of last reported case	
				Date	Week	Date	Week
Albania (AL)	-	Two hospitals	2,341 (9.0)	20 Feb 2020	08	28 Dec 2021	52
Belgium (BE)	-[3]	One hospital	1,683 (6.5)	21 Feb 2020	08	31 Dec 2021	52
England (EN)	Nationwide[4]	Randomly selected from 53 sentinel hospitals	6,124 (23.6)	15 Mar 2020	11	04 Dec 2021	48
France (FR)	Two sites:						
	FR-R (REIVAC)	Five hospitals	1,797 (6.9)	01 Feb 2020	05	30 Nov 2021	48
	FR-V[5] (ViVI)	Two hospitals	18 (0.1)	10 May 2020	19	22 Oct 2020	43
Lithuania (LT)	-	Two hospitals	741 (2.9)	07 Mar 2020	10	28 Dec 2021	52
Portugal (PT)	-	Three hospitals	1,437 (5.5)	13 Feb 2020	07	31 Dec 2021	52
Romania (RO)	-[6]	Two hospitals	596 (2.3)	10 Mar 2020	11	28 Dec 2021	52
Scotland (SC)	Nationwide[7]	Randomly selected from all hospitals	3,917 (15.1)	03 Mar 2020	10	31 Dec 2021	52
Spain	Two sites:						
	ES[8]	Two hospitals	1,236 (4.8)	16 Mar 2020	12	16 Nov 2021	46
	NA	Navarra region: six hospitals	6.079 (23.8)	06 Feb 2020	06	06 Dec 2021	49
Total			**25,971**	**01 Feb 2020**	**05**	**31 Dec 2021**	**52**

[3] BE had a possible 1,755 records but 1,683 were confirmed, 35 were probable (excluded) and 37 were suspected (excluded)
[4] Randomly selected 6,500 cases from sentinel hospitals in England which record all hospital admissions.
[5] FRV had a possible 20 records but 18 were confirmed, 1 was probable (excluded) and 1 was suspected (excluded)
[6] RO had a possible 765 records but 596 were confirmed, 14 were probable (excluded) and 155 were suspected (excluded)
[7] Randomly selected 4,000 cases from Scotland's sample.
[8] ES had a possible 5,088 records of those 5,088, those hospitalised on Tuesday and Wednesday were systematically selected but 1,236 were confirmed, 271 were probable (excluded) and 3,581 were suspected (excluded)

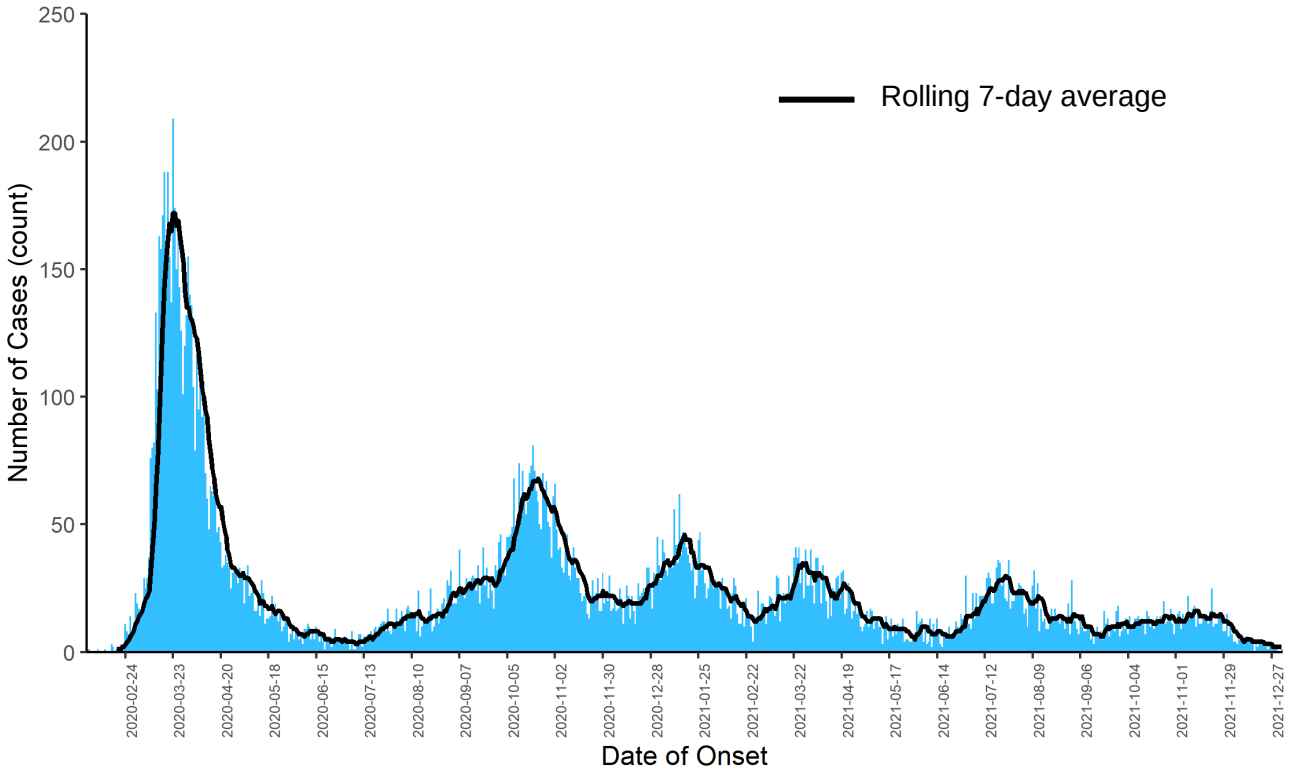
Results

Demographic characteristics

This section explores the overall demographics of the confirmed hospitalised cases of COVID-19. Initially, the number of cases by date of symptom onset and date of admission are presented, with the distribution of the time interval between the dates of admission and symptom onset explored. Following that, the overall age and sex distributions are presented as well as the numbers and proportions of various risk groups.

Number of hospitalised cases by date of onset[9]

Figure 3: Number of hospitalised confirmed cases of COVID-19 reported by week of symptom onset in hospitals participating in I-MOVE-COVID-19 hospital surveillance WP3, 2020-2021 (n =17,109)



[9] Patients without a given onset date were excluded from this analysis

Number of hospitalised cases by date of admission

Figure 4: Number of hospitalised confirmed cases of COVID-19 reported by week of hospital admission in hospitals participating in I-MOVE-COVID-19 hospital surveillance WP3, 2020-2021 (n =25,971)

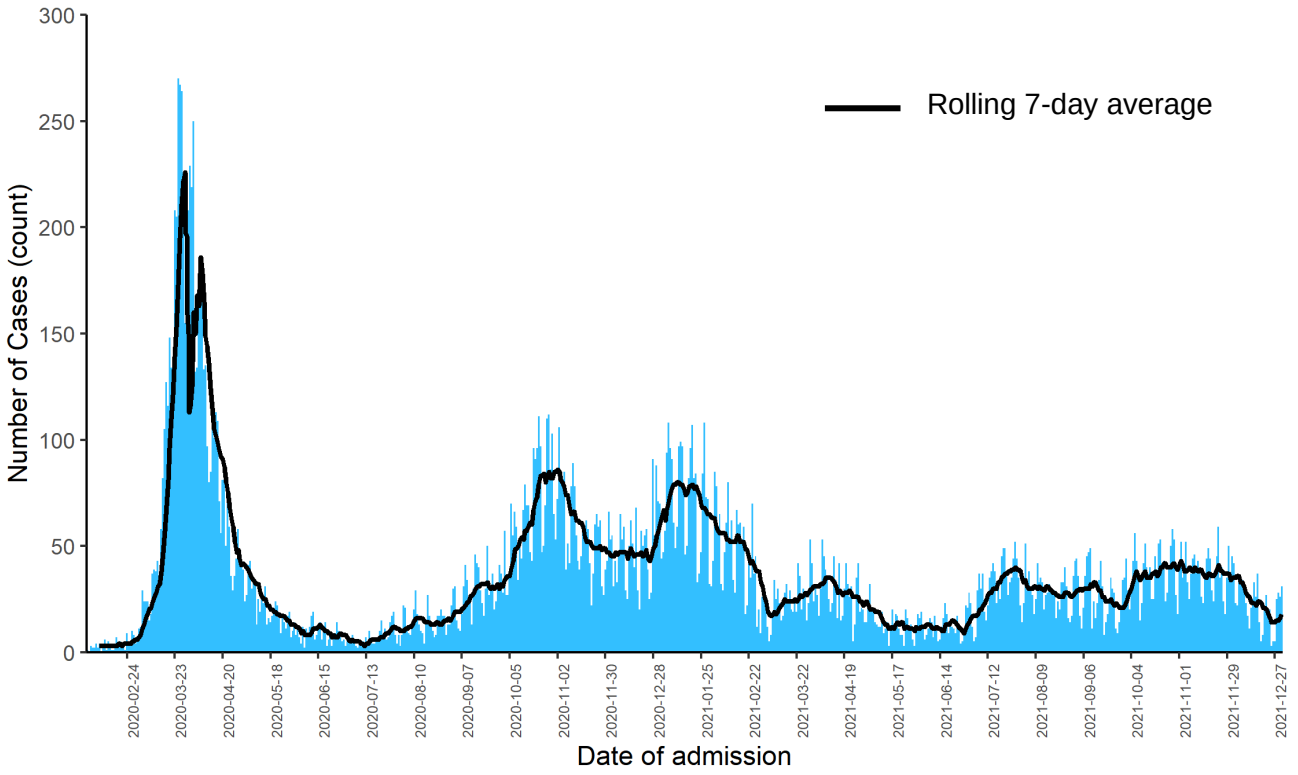


Figure 3 and Figure 4 show the number of hospitalised confirmed cases of COVID-19 reported weekly by date of symptom onset and date of hospital admission, respectively. Figure 3 shows six areas of peaked activity relating to March and October/November of 2020, January, March/April, July/August and October/November of 2021. In Figure 4, several of these peaks are observed but the baseline of cases remains fairly consistent from July to November 2021. In both figures, the first peak in March 2020 records the highest number of hospitalised cases observed within one week, with more than 1,500 hospital admissions. This is the highest seen in one week over the entire time period. This first peak is remarkably different when compared to the others as the number of hospitalised cases rise and decrease sharply. The other peaks experience a steady rise over time, never matching the maximum

number of hospitalisations in a week. These peaks also never see the cases fall as close to zero as the first peak. This could be explained by each hospital experiencing less sharp peaks or experiencing peaked activity at slightly different times, possibly due to the different public health interventions brought about within the constituent sites at different times.

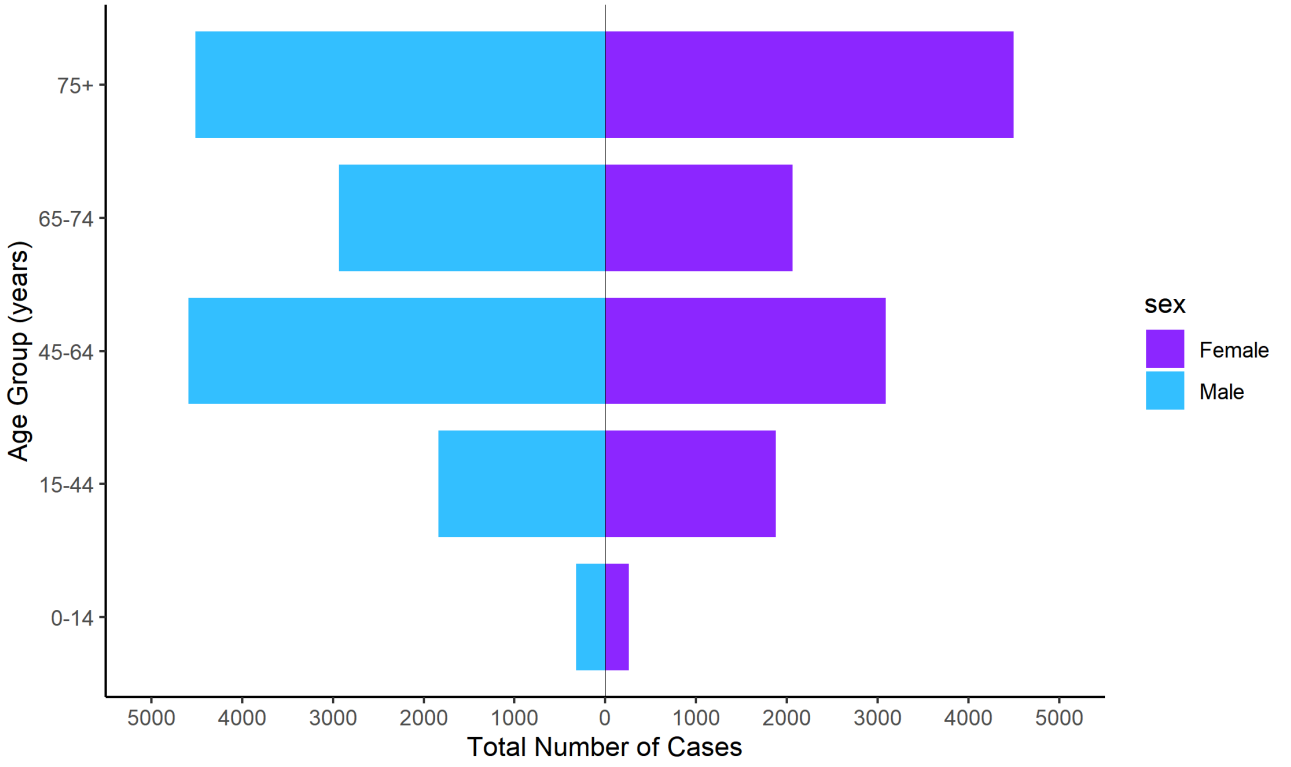
Comparing Figure 3 and Figure 4 shows that despite each graph showing similar patterns, the peaks are slightly offset depending on the chart in question. This is the result of the onset date often occurring on a different date than the date of hospital admission. This prompted investigations into the distribution of the time interval between the date of symptom onset and the date of hospital admission. The median number of days between symptom onset and hospitalisation was 6 days[10] (IQR = -73 days and 198 days)[11] and patients most frequently experienced symptom onset one week prior to hospitalisation[12].

Age and sex distributions

Figure 5 shows the overall age and sex distribution of confirmed COVID-19 hospitalised cases. Note that the numbers shown in the figure are absolute and are not age-adjusted according to the population structure of any particular site. In addition to this, not all sites receive paediatric patients or collect date on paediatric cases (<18 years of age), so these cases may be under-represented.

[10] Not all sites provided symptom onset date. In addition to this, symptom onset dates recorded within England were often defaulted to date of admission, therefore all symptom onset dates collected from England were excluded from this analysis. Patients with an onset of more than 120 days before admission were excluded from this analysis as were patients with an onset date after their discharge date. This led to n = 13,371.
[11] Some patients have long hospital stays and large positive intervals between symptom onset and hospitalisation which could suggest a nosocomial infection.
[12] Patients without a given onset date were excluded from this analysis

Figure 5: The overall age and sex distribution of hospitalised confirmed COVID-19 cases reported by hospitals participating in I-MOVE-COVID-19 hospital surveillance WP3, 2020-2021 (n = 25,971)

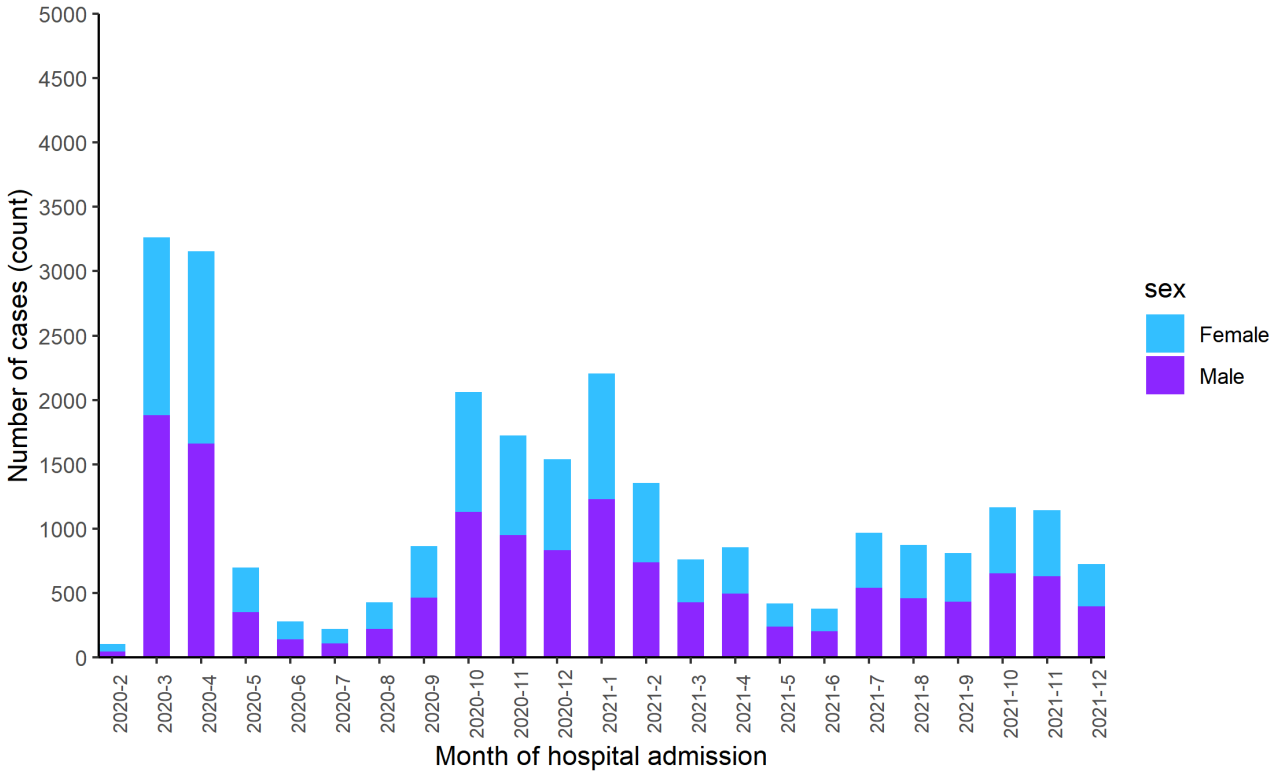


Overall, males made up 55% (14,191/25,971) of all cases hospitalised within COVID-19. Patients aged 75 years or older comprised the largest proportion of patients hospitalised with COVID-19 at 35% (9,008/25,971), followed by those aged 45–64 years at 30% (7,675/25,971) and those aged 65–74 years at 19% (4,996/25,971). 14% (3,713/25,971) of all COVID-19 hospitalisations were aged between 15 and 44 years and only 2% (579/25,971) were aged 0–14 years.

Figure 6 outlines the sex breakdown of those hospitalised with confirmed COVID-19 for each month between February 2020 and 31 December 2021 inclusive. It is important to note that the number of cases in February 2020 is lower than any other month in question and therefore results may not be truly representative of the hospital admissions. In March and April 2020

and from September 2020 onwards males were consistently hospitalised from COVID-19 in higher proportions than females.

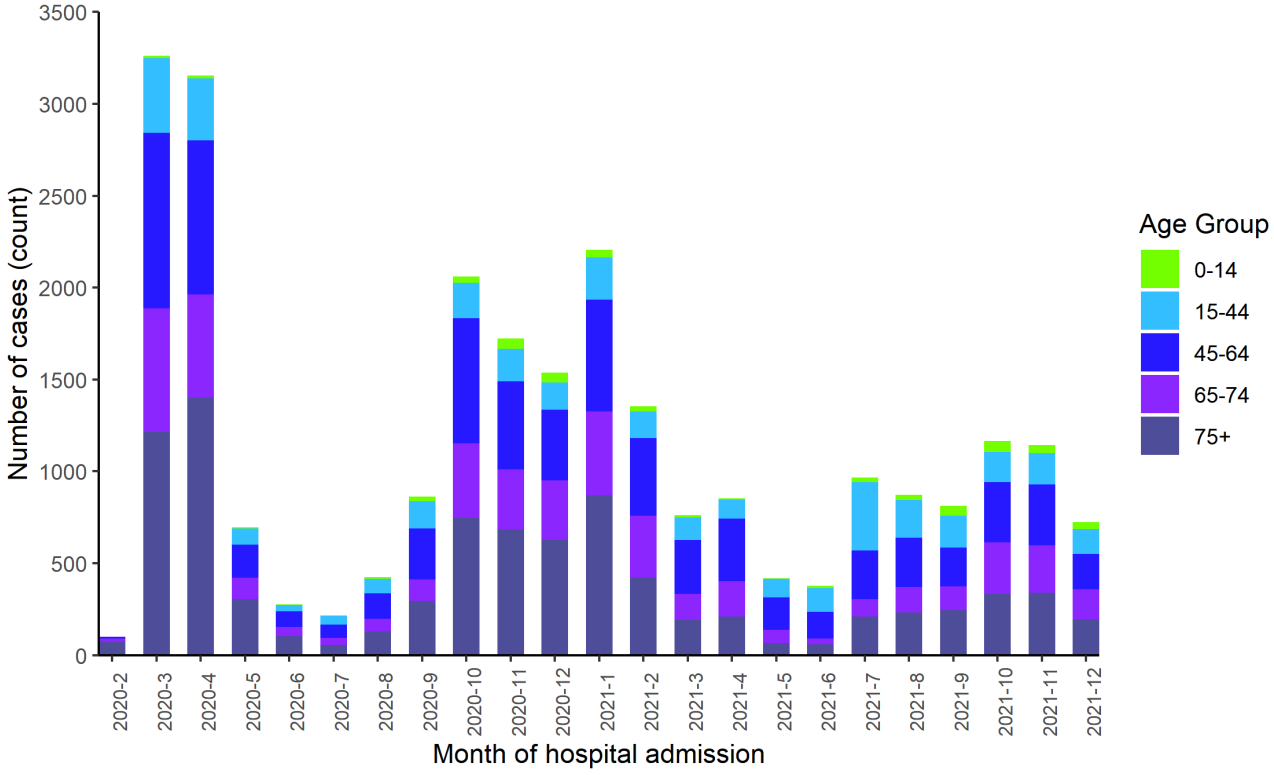
Figure 6: Number of hospitalised patients with confirmed COVID-19 reported overall by month of hospital admission and sex, in hospitals participating in I-MOVE-COVID-19 hospital surveillance WP3, 2020-2021 (n = 25,971)



At the beginning of the pandemic those aged 75 years and over comprised the largest proportion of individuals admitted to hospital with confirmed COVID-19 (Figure 7). This remained the case until February 2021 when those aged 45–64 years started to consistently overtake any other age group, and they now represent a high proportion of hospital admissions, albeit for a considerably smaller number of overall hospital admissions. Since June 2021, the proportions of individuals aged 0–14 years and 15–44 years have also been increasing, although they represent the smallest proportions overall. This is indicative of an overall trend, where the median age of those hospitalised has generally decreased from 69

years of age in March 2020 to 64 years in December 2021[13]. It is possible that this is the result of public health interventions such as the introduction of COVID-19 vaccinations which were initiated in December 2020 in older age groups and higher-risk individuals. The phased nature of the vaccine roll-out could also describe the increase in the proportion of the younger age groups hospitalised more recently.

Figure 7: Number of hospitalised patients with confirmed COVID-19 reported overall by month of hospital admission and age group , in hospitals participating in I-MOVE-COVID-19 hospital surveillance WP3, 2020-2021 (n = 25,971)



[13] The figures for December 2021 are susceptible to data lag and therefore should be interpreted with caution.

Risk Groups

Over the entire time span, the percentage of patients residing in supported living arrangements was 13% (2,076/16,056) (Table 3). In February and March of 2020, this remained close to the average but an increase to 30% (582/1,964) was observed in April 2020. This increase could coincide with localised epidemics of COVID-19 among older patients in care homes. Since October 2021 an increased number of patients requiring supported living arrangements were admitted to hospital for COVID-19, which also could be the result of localised epidemics caused by the increased transmission rates of the Omicron variant which spread across Europe during this time.

Healthcare workers represented 3% (477/15,881) of the hospitalised COVID-19 cases. The bulk of these hospitalisations tended to occur in the early stages of the pandemic, between March and May 2020. Since May 2020, there was a marked decrease in the proportion of healthcare workers hospitalised with COVID-19. This could be a result of improvements in knowledge surrounding the disease and increased use of personal protective equipment or other measures carried out within hospitals. This is also likely to be the result of vaccinations since 2021, as healthcare workers would have been vaccinated against COVID-19 as a priority group early in the pandemic in participating countries. It is important to note that the proportion of cases with information on healthcare worker status decreased from 82% (2,677/3,280) in March 2020 to 29% (212/512) in December 2021, therefore, the number of healthcare workers hospitalised could be under-represented.

Where information was available (for 32% of all cases, 8,325/25,971), the overall proportion of current smokers was 11% (916/8,325); of former smokers was 25% (2,047/8,325); and

those who had never smoked represented 64% (5,362/8,325) of all hospitalised cases of COVID-19[14] (Table 3).

Completion of pregnancy status totalled 56%[15] (1,868/3,312) overall for women of pregnancy-bearing age. The ages of the pregnant women ranged between 18–45 years. Only 170 pregnant cases were recorded in the dataset, representing 9% (170/1,868) of all women where information was available. The monthly trends are not depicted due to the small numbers of pregnant women and the potential risk of statistical disclosure.

[14] Smoking status was not submitted by all sites resulting in low completion.
[15] Pregnancy status was not submitted by all sites resulting in low completion.

Table 3: The proportion of hospitalised confirmed COVID-19 cases attributed to different risk groups by month of admission where information was available, reported by hospitals participating in I-MOVE-COVID-19 hospital surveillance WP3, 2020-2021

Month of hospitalisation	Number of cases	Supported living arrangements[16] (%)	Healthcare workers[17] (%)	Current smoker[18] (%)	Former smoker[19] (%)
March 2020	3,262	219 (11)	113 (4)	140 (10)	329 (23)
April 2020	3,154	582 (30)	120 (5)	91 (10)	182 (20)
May 2020	696	107 (22)	42 (9)	15 (12)	19 (15)
June 2020	276	21 (13)	<10 (*)	<10 (*)	15 (33)
July 2020	218	22 (13)	<10 (*)	12 (13)	17 (18)
August 2020	426	53 (13)	<10 (*)	16 (7)	71 (29)
September 2020	862	72 (9)	26 (3)	59 (13)	95 (21)
October 2020	2,060	159 (10)	45 (3)	93 (12)	185 (23)
November 2020	1,722	159 (13)	27 (2)	66 (13)	125 (26)
December 2020	1,538	99 (12)	21 (3)	30 (12)	74 (30)
January 2021	2,207	122 (9)	16 (1)	51 (10)	96 (19)
February 2021	1,355	48 (7)	<10 (*)	41 (10)	109 (26)
March 2021	761	31 (6)	<10 (*)	33 (8)	124 (30)
April 2021	854	34 (5)	<10 (*)	64 (13)	140 (29)
May 2021	418	17 (6)	<10 (*)	22 (10)	73 (33)
June 2021	378	15 (6)	<10 (*)	12 (11)	38 (33)
July 2021	968	63 (9)	<10 (*)	36 (12)	92 (32)
August 2021	873	60 (11)	12 (3)	27 (11)	48 (19)
September 2021	811	26 (7)	<10 (*)	11 (7)	41 (27)
October 2021	1,165	65 (14)	<10 (*)	29 (13)	71 (31)
November 2021	1,142	52 (12)	<10 (*)	32 (14)	57 (25)
December 2021	724	45 (21)	<10 (*)	26 (17)	27 (17)
Overall	25,971	2,076 (13)	477 (3)	916 (11)	2,047 (25)

[16] Supported living arrangements include patient living at home, but dependent on home support/care, or those who are institutionalised
[17] The case was a healthcare worker, answered yes to the question
[18] A current smoker is defined as currently smokes or previously smoked but quit less than one year ago
[19] A former smoker is defined as an individual who previously smoked but quit smoking at least one year ago

Clinical Characteristics

In this section, the clinical characteristics of hospitalised confirmed cases of COVID-19 are described, in terms of underlying chronic conditions. Symptom presentation among cases are also explored in this section, describing symptoms which were most often reported by the confirmed cases. These are also explored over time to assess whether presenting symptoms have changed over time.

Chronic conditions

Chronic condition information was available for 68% (17,652/25,971) of all patients hospitalised with COVID-19[20]. The data completeness for each chronic condition varies depending on the site. The chronic conditions for which data were most completed were heart disease with 76% (19,620/25,971), diabetes with 74% (19,118/25,971) and renal disease with 73% (18,975/25,971) variable completion respectively (Table 4). Conversely, data for asplenia (37% - 9,528/25,971) and tuberculosis (30% - 7,697/25,971) were the least commonly completed. The most common chronic condition was hypertension, with a prevalence of 44% (7,393/16,968). This was followed by heart disease and obesity, with reported prevalence of 33% (6,396/19,620) and 27% (4,660/17,209) respectively.

Hypertension has consistently been the first or second most reported chronic condition every month since data collection began. Heart disease has consistently been in the top five most reported chronic conditions since the start of the pandemic. Diabetes and obesity have also consistently been in the top five conditions every month excluding February 2020 and

[20] The completion rate for chronic condition was 68% overall, this was consistent in males and females but varied depending on the patient's age. The completion rate was highest in the oldest age group and lowest in the youngest age groups. 25% (142/579) in 0-14 years, 50% (1,838/3,713) in 15-44 years, 65% (4,982/7,675) in 45-64 years, 72% (3.608/4,996) in 65-74 years and 79% (7,082/9,008) in patients 75 years or older.

February/March 2020 respectively. Therefore, it is not unexpected that these conditions dominate the top five overall conditions.

Table 4: Number and proportion (%) of confirmed COVID-19 patients with underlying chronic conditions, reported by hospitals participating in I-MOVE-COVID-19 hospital surveillance WP3, 2020-2021

Chronic condition	Number (%) of cases with available information[21]	Number (%) of cases with chronic condition[22]
Hypertension	16,968 (65.3)	7,393 (43.6)
Heart disease	19620 (75.5)	6,396 (32.6)
Obesity	17,209 (66.3)	4,660 (27.1)
Diabetes	19,118 (73.6)	4,996 (26.1)
Cancer	17,418 (67.1)	2,882 (16.5)
Lung disease	18,435 (71.0)	2,897 (15.7)
Renal disease	18,975 (73.1)	2,924 (15.4)
Neuromuscular disorder	14,370 (55.3)	1,469 (10.2)
Asthma	18,237 (70.2)	1,828 (10.0)
Stroke	11,458 (44.1)	728 (6.4)
Rheumatic illness	16,915 (65.1)	1,068 (6.3)
Dementia	15,725 (60.5)	912 (5.8)
Liver disease	18,797 (72.4)	972 (5.2)
Anaemia	11,537 (44.4)	578 (5.0)
Immunodeficiency	17,196 (66.2)	542 (3.2)
Tuberculosis	7,697 (29.6)	81 (1.1)
Asplenia	9,528 (36.7)	93 (1.0)

[21] The proportion of cases which have a yes or no response (no null responses) to the chronic condition divided by the total number of cases (N = 25,971)
[22] The proportion of cases which have a yes response divided by the number of cases with available information

Symptoms

Sites report symptoms with different degrees of completion, except England who do not record symptoms. The completeness of each symptom is typically very low; therefore, the results should be interpreted with caution.

Patients hospitalised with confirmed COVID-19 were most likely to experience respiratory or febrile symptoms, as also reflected in the most commonly observed individual symptoms (Table 5). Of all the confirmed cases with available symptom information: 73% (3,944/5,402) presented with general deterioration, 73% also presented with a cough (4,365/5,991) and shortness of breath (4,544/6,263) and 59% (3,663/6,200) presented with a fever. Dermatological complaints and conjunctivitis were the least commonly reported symptoms.

Both general deterioration and cough were present in the top five reported symptoms every month. Shortness of breath was observed in the top five symptoms every month excluding February 2020. Fever was observed in the top five most reported symptoms each month (excluding June 2020, March and April 2021) until recently, where the percentage of patients reporting fever dropped from 59% (44/75) reporting fever in September 2021 to 32% (155/478) reporting in October 2021 and has continued to decline since. This change in the percentage of patients reporting fever could be a result of the differences in the COVID-19 variants causing different symptoms to be reported more or less frequently.

Table 5: Presenting symptoms of patients hospitalised with confirmed COVID-19, reported by hospitals participating in I-MOVE-COVID-19 hospital surveillance WP3, 2020-2021[23]

Symptom	Number (%) of cases with available information[24]	Number (%) of cases with symptom[25]
Symptom groups[26]		
Respiratory	6,642 (34.4)	5,990 (90.2)
Febrile illness	6,225 (31.5)	4,141 (66.5)
Gastrointestinal	5,660 (27.9)	2,597 (45.9)
Neurological	5,241 (25.3)	1,956 (37.3)
Other	6,544 (33.7)	4,965 (75.9)
Symptoms		
General deterioration	5,402 (20.8)	3,944 (73.0)
Cough	5,991 (23.1)	4,365 (72.9)
Shortness of breath	6,263 (24.1)	4,544 (72.6)
Fever	6,200 (23.9)	3,663 (59.1)
Myalgia	5,271 (20.3)	1,670 (31.7)
Nausea and/or vomiting	3,124 (12.0)	929 (29.7)
Tachypnoea	4,171 (16.1)	1,236 (29.6)
Headache	5,426 (20.9)	1,569 (28.9)
Feverish	2,941 (11.3)	818 (27.8)
Diarrhoea	5,044 (19.4)	1,250 (24.8)
Malaise	4,756 (18.3)	1,171 (24.6)
Sudden onset	2,829 (10.9)	617 (21.8)
Confusion	4,352 (16.8)	880 (20.2)
Dizziness	3,831 (14.8)	703 (18.4)
Chills	3,267 (12.6)	459 (14.0)
Vomiting	3,365 (13.0)	463 (13.8)
Chest pain	4,901 (18.9)	670 (13.7)
Sore throat	4,965 (19.1)	608 (12.2)
Nausea	3,061 (11.8)	370 (12.1)
Ageusia	4,651 (17.9)	525 (11.3)
Anosmia	4,657 (17.9)	475 (10.2)
Coryza	4,492 (17.3)	414 (9.2)
Abdominal pain	4,895 (18.8)	393 (8.0)
Palpitations	2,801 (10.8)	126 (4.5)
Dysgeusia	1,219 (4.7)	51 (4.2)
Rash/other dermatological manifestation	4,212 (16.2)	43 (1.0)
Conjunctivitis	4,237 (16.3)	18 (0.4)

[23] Nausea and/or vomiting, dysgeusia and sudden onset were only collected at a small number of sites, hence, the relatively small completion rate of these variables
[24] The proportion of cases with a yes/no response divided by total number of cases within the sample (N=25,971)
[25] The proportion of cases with a yes response divided by number of cases with available information
[26] **Respiratory** (coryza, cough, sore throat, shortness of breath, tahcypnoea, chest pain), **Neurological** (ageusia, anosmia, confusion, dizziness, dysgeusia, headache), **Gastrointestinal** (abdominal pain, diarrhoea, nausea, vomiting, nausea and/or vomiting), **Febrile illness** (Fever, feverishness, chills), **Other** (any other symptom listed)

Outcomes

This section describes the outcomes of patients who were hospitalised with confirmed COVID-19. These are defined as remaining in hospital receiving treatment, discharged from hospital alive, died whilst receiving treatment in hospital, and unknown outcome.

Figure 8: The overall percentage of patients hospitalised with confirmed COVID-19 by outcome and sex, reported by hospitals participating in I-MOVE-COVID-19 hospital surveillance WP3, 2020-2021

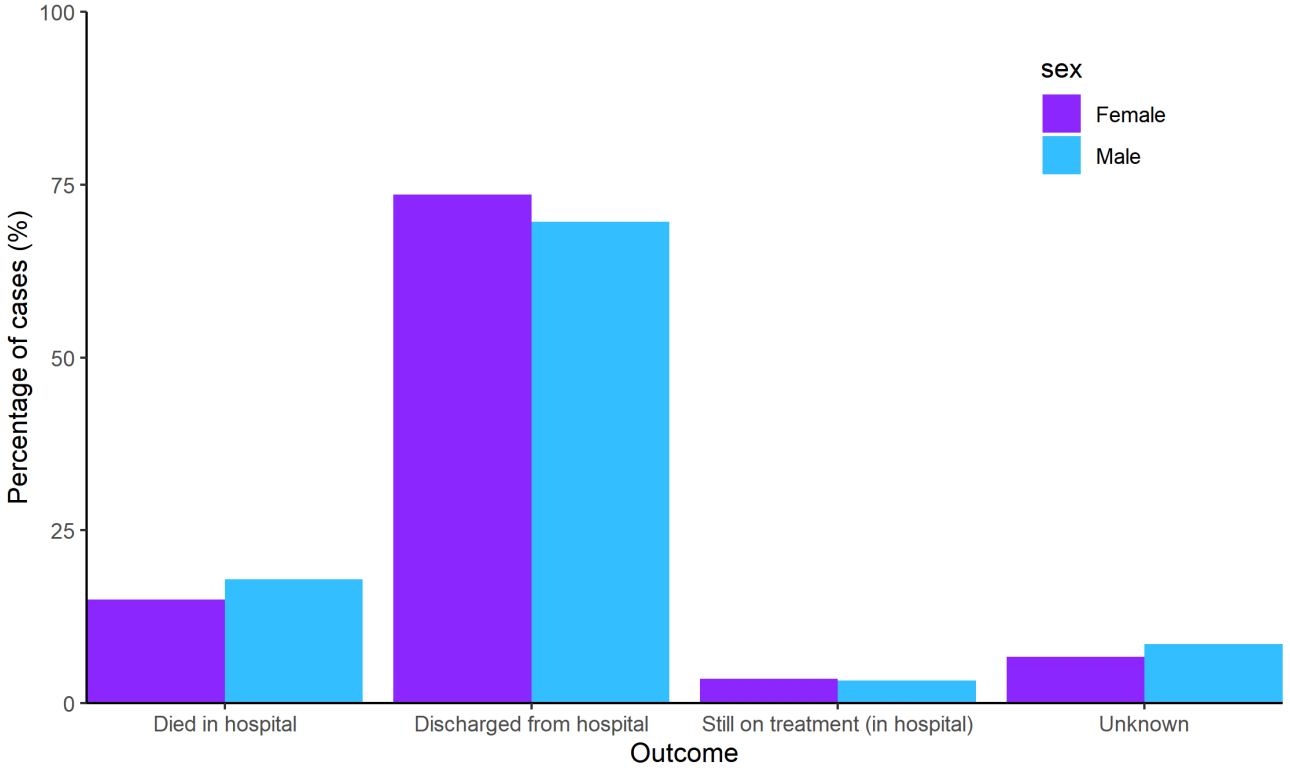


Figure 8 shows the proportion of the outcomes of each confirmed case by sex for the overall timespan investigated. The nature of this figure means that all cases including unknown outcomes are shown, which may account for the more recent admissions. The majority of individuals hospitalised were discharged from hospital, accounting for 71% (18,557/25,971) of all outcomes and 81% (18,557/22,863) of all known outcomes[27]. On average, 17%

[27] Known outcomes are patients who were discharged alive or who died (n = 22,863)

(4,306/25,971) of all hospitalised patients died whilst in hospital since the beginning of the pandemic. Around 3% (859/25,971) of patients remained in hospital receiving treatment. The remaining 9% (2,249/25,971) have an unknown status; this could potentially be the result of more recent admissions to hospital with a not yet updated outcome.

Length of hospital stay

The median length of hospital stay refers only to individuals who were discharged from hospital; individuals who have died are not included in this analysis. The median length of hospital stay across the entire time period was 8 days for both males and females. The overall median length of stay varied when the different age groups were considered: those aged 75 years or older experienced the longest median length of stay at 11 days; whilst those aged15–44 year olds stayed for 5 days and those aged 0–14 had a median length of stay equal to only 2 days.

The median length of hospital stay ranged between 10 days in May 2020 to 5 days in December 2021.[28] Figure 9 shows that males and females experienced a general decrease in the median length of stay as the pandemic progressed, but minimal difference was observed month-on-month between the two sexes.

Figure 10 shows that all age groups experienced a slight decrease in median length of stay over time.

[28] February 2020 was excluded due to the small numbers of cases in this month. In addition to this, data from the most recent months could be liable to change if more data was received and so should be interpreted cautiously

Figure 9: Median hospital length of stay by month of admission and sex, of patients with confirmed COVID-19 reported by hospitals participating in I-MOVE-COVID-19 hospital surveillance WP3, 2020-2021

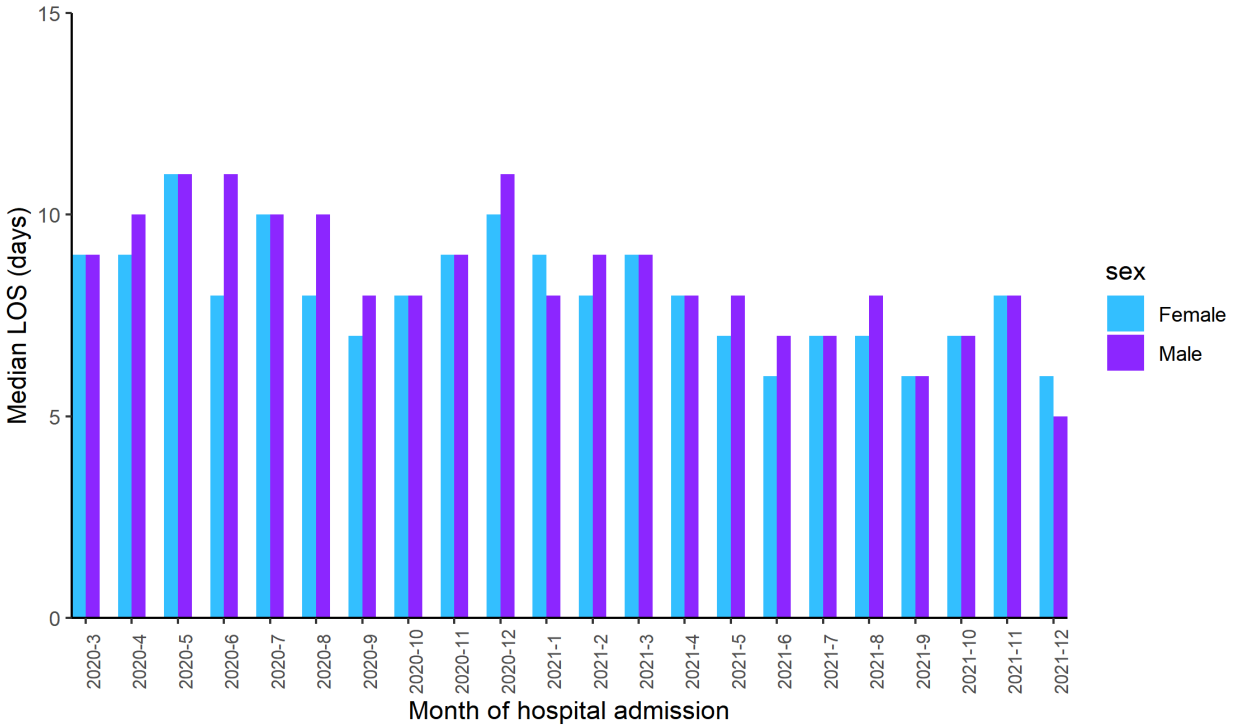
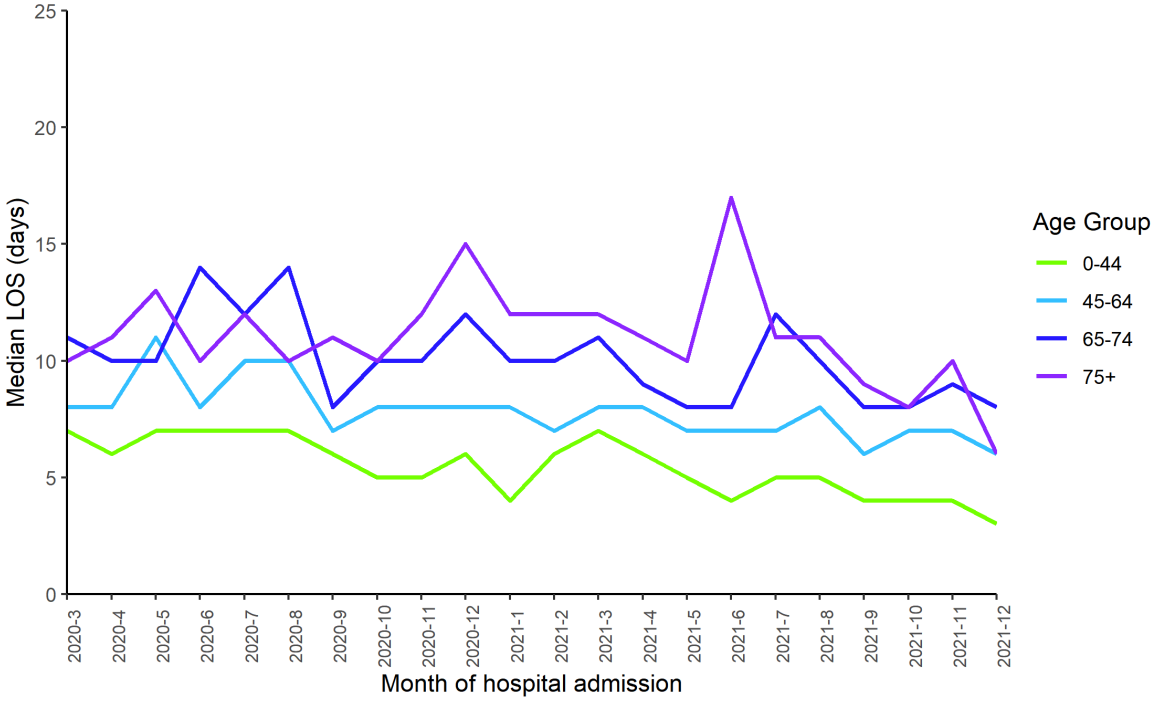


Figure 10: Median length of hospital stay by month of admission and age group , of patients with confirmed COVID-19 reported by hospitals participating in I-MOVE-COVID-19 hospital surveillance WP3, 2020-2021



ICU/HDU admission

Since the beginning of the pandemic, 14% (3,196/23,289)[29] of all confirmed cases were admitted to ICU/HDU facilities during their hospital stay. More males were admitted to ICU/HDU facilities than females, with a proportion of 66% (2,097/3,196), compared to 34% (1,099/3,196) among females. The median age of those admitted to ICU/HDU was 62 years of age. Those aged 45–64 years were most likely to be admitted to ICU/HDU facilities, accounting for 40% (1,292/3,196) of all patients admitted to ICU/HDU. This was followed by those aged 65–74 at 28% (898/3,196) and those aged 75 years or older at 17% (552/3,196). Individuals aged less than 15 years were the least likely to require care in ICU/HDU facilities.

Table 6 shows the demographics of patients hospitalised for COVID-19 and then admitted to ICU/HDU. More males required ICU/HDU than females (17%; 2,097/12,566 vs 10%; 1,099/10,723). This was significant, $p < 0.0001$, with OR = 1.75 (1.58, 1.94). The proportion of patients hospitalised with COVID-19 requiring treatment within ICU/HDU was highest in the 65–74 year olds with 21% (898/4,206) of all hospitalisations in this age group requiring admission to ICU/HDU. Excluding patients aged 75 years and older, the proportion of patients admitted to ICU/HDU increased with age, with those aged 0–14 years the least likely to require critical care treatment in ICU/HDU, $p < 0.0001$. For those aged 75 years or older only 7% (552/9,008) were admitted to ICU/HDU.

[29] ICU/HDU admission had a 90% completion rate with 23,289 out of 25,971 records having a clear yes or no response. All null responses were removed for this analysis.

Table 6: Demographic characteristics of patients hospitalised with COVID-19 who were admitted to ICU/HDU reported by hospitals participating in the I-MOVE-COVID-19 hospital surveillance WP3, 2020-2021

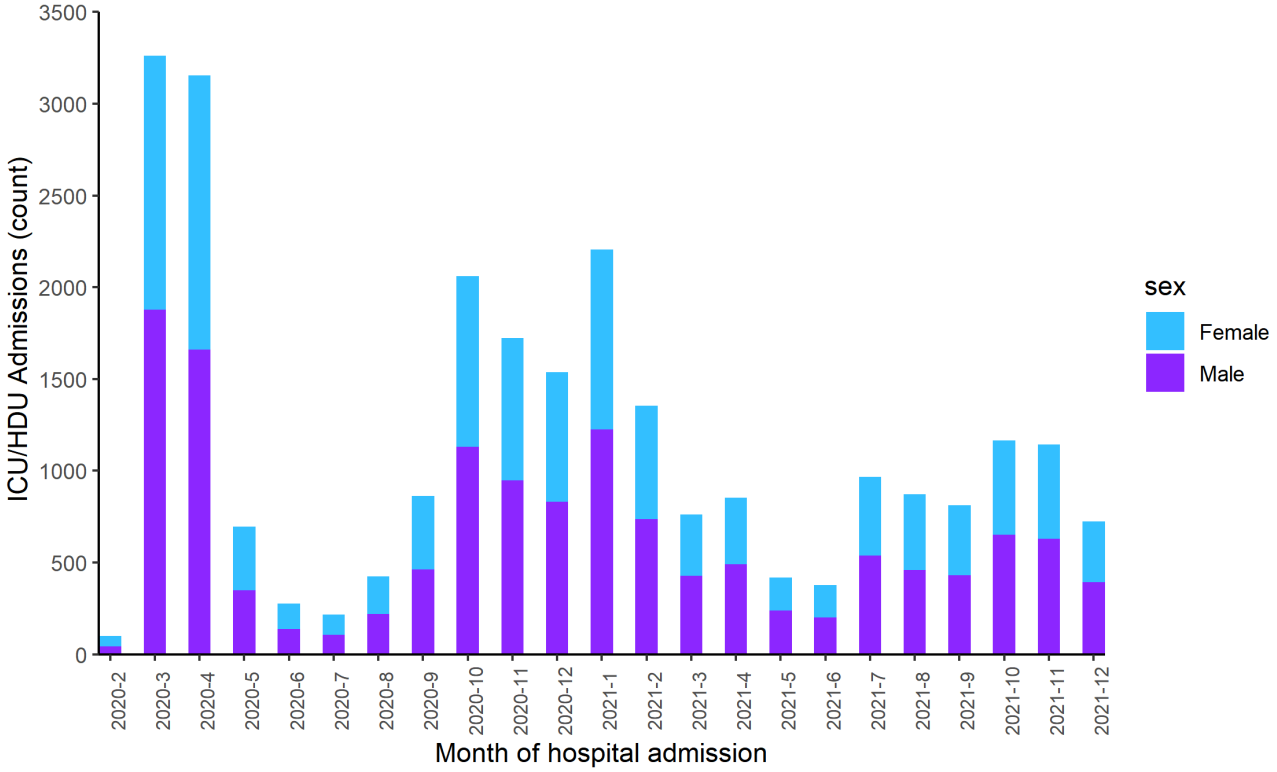
Demographics	Hospitalised (n = 25,971)	ICU/HDU information available / % (n = 23,289)	ICU/HDU (n = 3,196)	Proportion admitted to ICU/HDU %[30]
Sex				
Females	11,780	10,723 (91.0)	1,099	10.2
Males	14,191	12,566 (88.5)	2,097	16.7
Age group (years)				
0–14	579	420 (72.5)	26	6.2
15–44	3,713	3,443 (92.7)	428	12.4
45–64	7,675	6,909 (90.0)	1,292	18.7
65–74	4,996	4,206 (84.2)	898	21.4
75+	9,008	8,311 (92.3)	552	6.6

Since March 2020, the proportion of patients hospitalised with COVID-19 requiring ICU/HDU admission decreased from 19% (623/3,262) to 10% (85/811) in September 2021. It had fallen to 9% (43/492) in December 2021 but must be interpreted carefully as the completion of ICU/HDU status was lower than previous months at 68% (492/724) and therefore, could be the result of a data lag.

[30] Null responses for ICU/HDU admission removed from this analysis

Throughout the pandemic, the proportion of males with confirmed COVID-19 admitted to ICU/HDU has tended to be higher than the percentage of females (Figure 11).

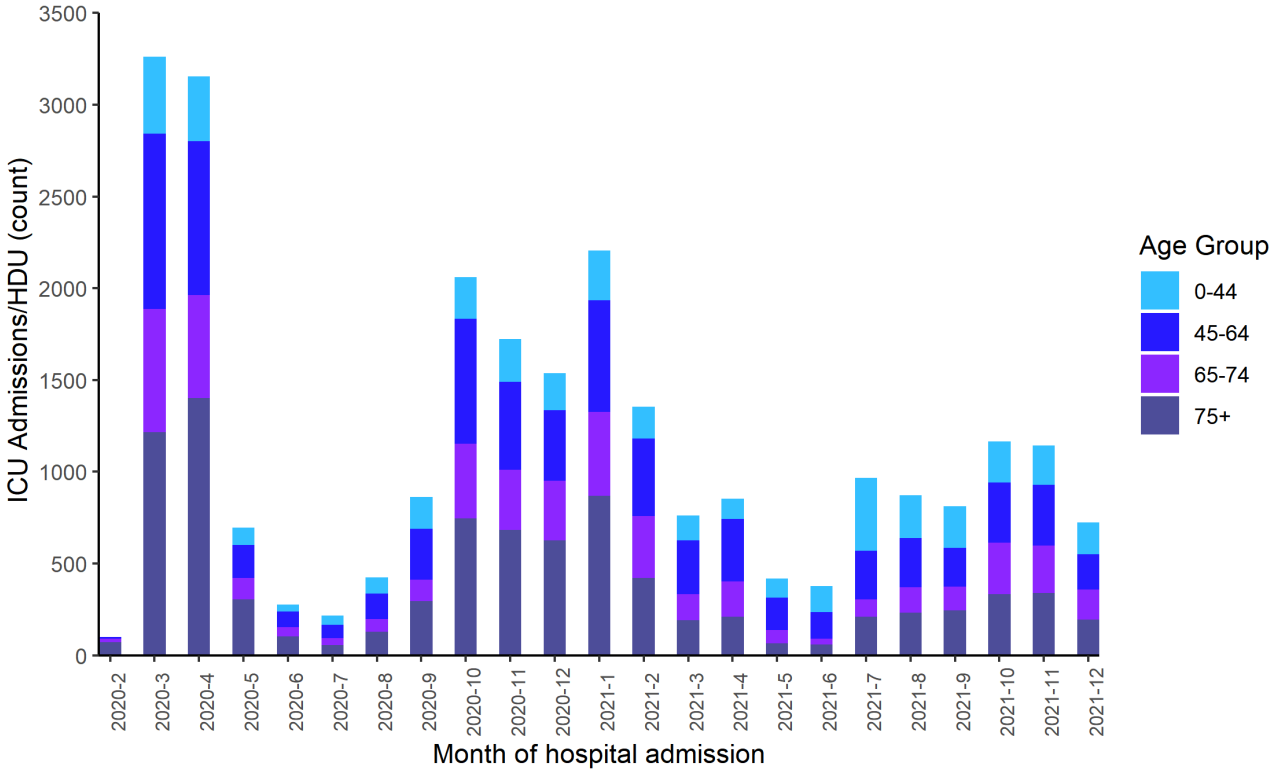
Figure 11: Number of ICU/HDU admissions of confirmed COVID-19 hospitalised patients by sex (N=3,196), reported by hospitals participating in the I-MOVE hospital surveillance WP3, 2020-2021[31]



Patients aged between 45–64 years consistently made up the greatest proportion of those admitted to ICU/HDU facilities over the entire timespan except in October and November 2021 (Figure 12). The proportion of patients aged between 0 and 44 years tended to be the smallest proportion of all ICU/HDU admissions before March 2021 but represented a larger proportion since then.[32]

[31] Results from February 2020 should be interpreted carefully due to the small number of cases. Results from late 2021 should be considered cautiously as the data may be incomplete.
[32] 0–14 and 15–44 year age bands were combined due to small numbers of patients admitted to ICU/HDU.

Figure 12: Number of ICU/HDU admissions of confirmed cases by age group (N=3,196), reported by hospitals participating in the I-MOVE hospital surveillance WP3, 2020-2021 [33]

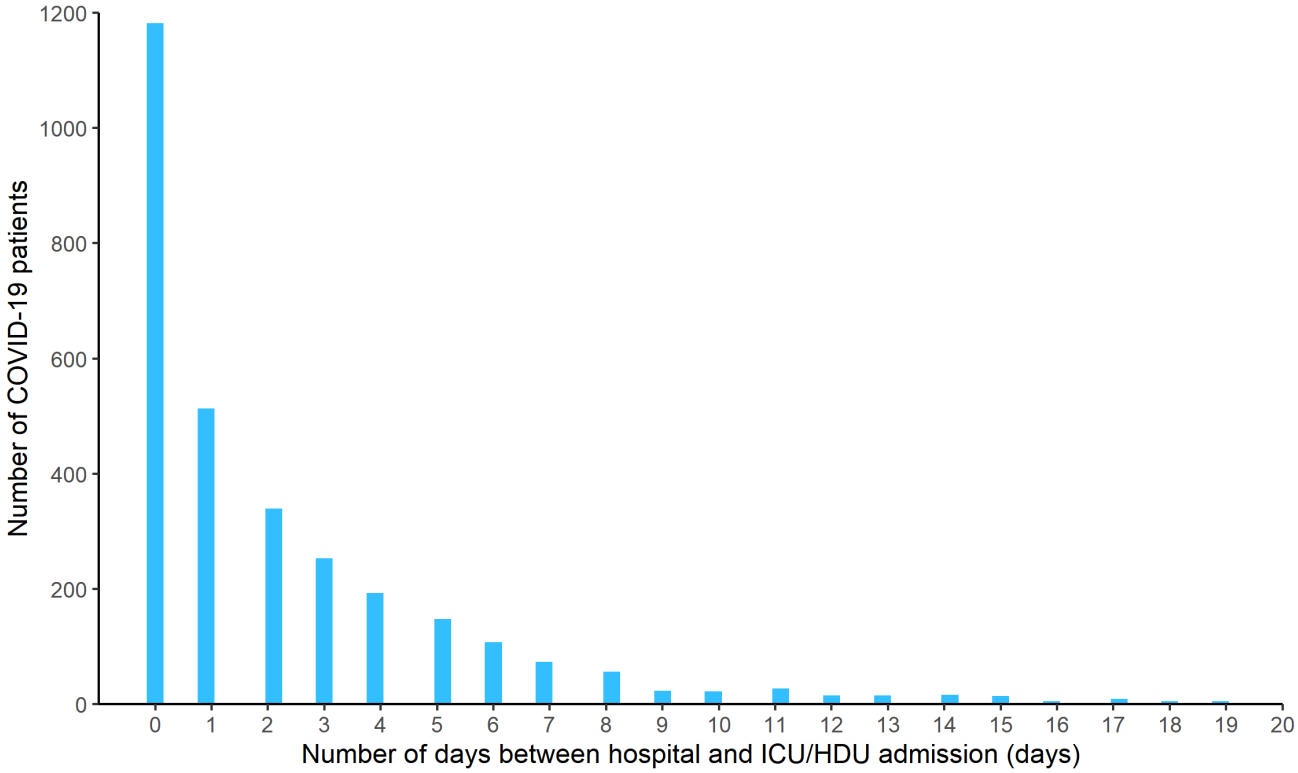


Interval between date of hospital admission and ICU/HDU admission

Patients were most frequently admitted to ICU/HDU on the day of their hospitalisation (Figure 13). A median of 1 day between hospitalisation and ICU/HDU admission was observed for males and females. The median number of days between hospital and ICU/HDU admission varied depending on the patient's age, with those aged 0–14 years most likely to be admitted to ICU/HDU on their date of admission. For those aged 75 years or older, there was a median of 2 days between hospital and ICU/HDU admission. All other age groups experienced a median of 1 day between hospital and ICU/HDU admission.

[33] Results from February 2020 should be interpreted carefully due to the small number of cases as should results from December 2021 as the data may be incomplete.

Figure 13: Number of days between the date of hospital admission and date of ICU/HDU admission (N=3,060), reported by hospitals participating in the I-MOVE hospital surveillance WP3, 2020-2021



Median length of ICU/HDU stay

The overall median length of stay in ICU/HDU was 8 days; 8 days in males and 7 days in females. This was highest in the 65–74 year olds at 10 days; 9 days in 45–64 years, 6 days in the 75 year and over age band and in those aged 0–44 years. The median length of ICU/HDU stay decreased from 9 days in March 2020 to 7 days or fewer since August 2021. Alongside the reduced proportions of patients admitted to ICU/HDU with severe COVID-19 more recently, this might suggest a lessening in severity of the disease since March 2020.

Ventilation

Table 7 shows the level of mechanical ventilation required by patients hospitalised with confirmed COVID-19. Information on ventilation status is completed for 68% (17,590/25,971) of patients overall. Some type of ventilation was required by 38% (6,754/17,590) of all those with available information. The majority of patients were ventilated using high-flow oxygen (24%), non-invasive types of ventilation (22%) or other unspecified mechanical ventilation (31%). ECMO (4%) was least commonly required, which could be explained by few patients being eligible for this treatment or potential lack of availability within different sites[34].

Males hospitalised with confirmed cases of COVID-19 had a higher probability of requiring ventilation than females ($p < 0.0001$). Patients aged 45–74 years comprised the largest proportion receiving ventilation. Those aged 0–14 were the least likely age group to receive mechanical ventilation ($p < 0.0001$).

[34] 5% (313/6,754) required some form of ventilation of unspecified type.

Table 7: Level of mechanical ventilation required for patients hospitalised with COVID-19, grouped by numerous risk/protective factors, reported by hospitals participating in the I-MOVE hospital surveillance WP3, 2020-2021[35]

Exposures (risk/protective factors)	Total N(%)	Any ventilation N(%)	Non-invasive ventilation N(%)	Invasive ventilation N(%)	High flow oxygen N(%)	ECMO N(%)	Other N(%)
All cases	25,971	6,754 (38.4)	1,503 (8.6)	1,007 (5.7)	1,608 (9.2)	249 (1.4)	2,074 (12.5)
Missing ventilation data	-	8,381 (32.3)	8,454 (32.6)	8,454 (32.6)	8,447 (32.5)	8,454 (32.6)	9,334 (35.9)
Sex							
Female	11,780 (45.4)	2,678 (39.7)	653 (43.4)	317 (31.5)	622 (38.7)	83 (33.3)	907 (43.7)
Male	14,191 (54.6)	4,076 (60.3)	850 (56.6)	690 (68.5)	986 (61.3)	166 (66.7)	1,167 (56.3)
Age groups (years)							
0-14	579 (2.2)	34 (<1.0)	14 (<1.0)	9 (<1.0)	<10 *	<10 *	<10 *
15-44	3,713 (14.3)	812 (12.0)	201 (13.4)	120 (11.9)	196 *	* *	250 (12.1)
45-64	7,675 (29.6)	2,164 (32.0)	472 (31.4)	409 (40.6)	524 (32.6)	90 (36.1)	575 (27.7)
65-74	4,996 (19.2)	1,475 (21.8)	294 (19.6)	324 (32.2)	335 (20.8)	50 (20.1)	399 (19.2)
75+	9,008 (34.7)	2,269 (33.6)	522 (34.7)	145 (14.4)	546 (34.0)	85 (34.1)	846 (40.8)
Healthcare worker[36]							
Yes	477 (3.0)	116 (2.5)	35 (3.6)	24 (3.0)	32 (2.5)	<10 *	16 (1.3)
No	15,404 (97.0)	4,544 (97.5)	928 (96.4)	778 (97.0)	1,231 (97.5)	* *	1,245 (98.7)

[35] 313 cases with an unknown ventilation which are included in "any ventilation" but in no other column of this table

[36] The small number of healthcare workers means that these should be interpreted with caution

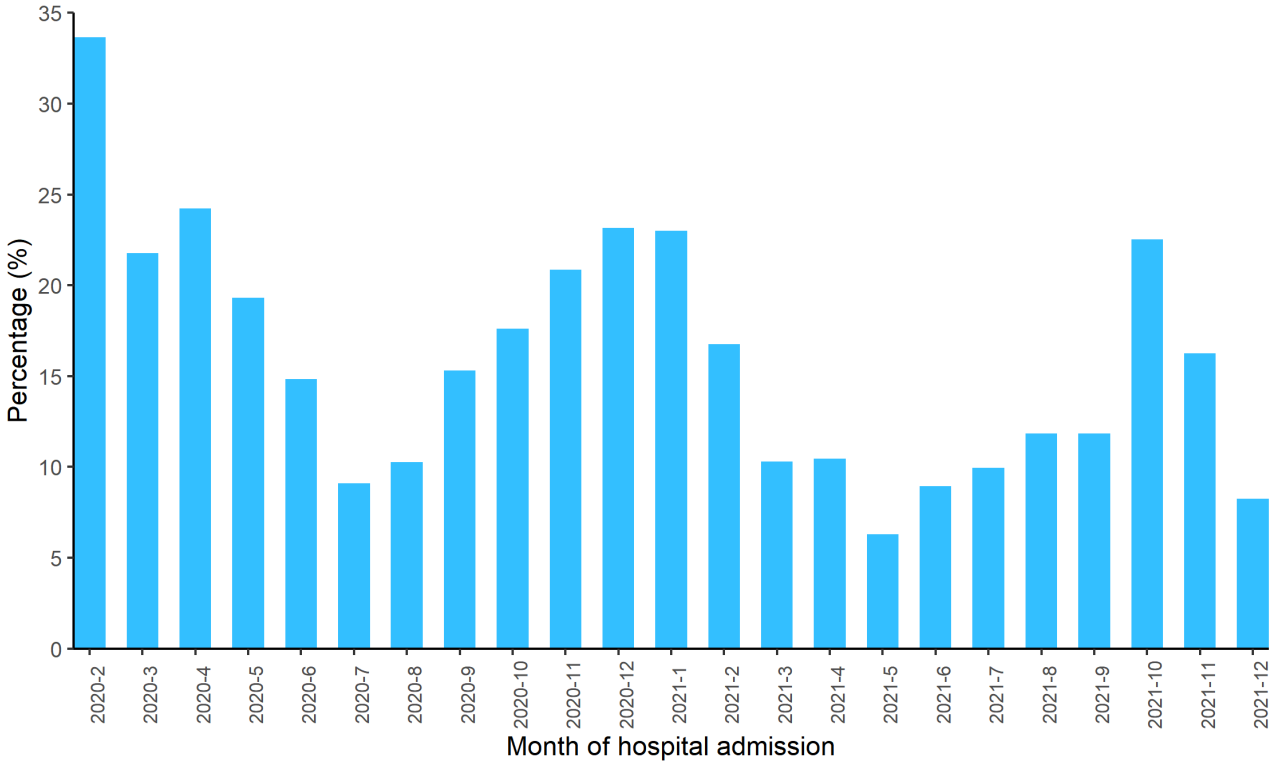
Exposures (risk/protective factors)	Total N(%)	Any ventilation N(%)	Non-invasive ventilation N(%)	Invasive ventilation N(%)	High flow oxygen N(%)	ECMO N(%)	Other N(%)
Smoker							
Current	916 (11.0)	232 (8.6)	52 (7.4)	60 (14.5)	78 (8.0)	<10 *	27 (8.4)
Former	2,047 (24.6)	804 (29.8)	186 (26.3)	131 (31.6)	271 (27.9)	<10 *	107 (33.4)
Never	5,362 (64.4)	1,658 (61.5)	468 (66.3)	223 (53.9)	622 (64.1)	26 (65.0)	186 (58.1)
Pregnant[37]							
Yes	170 (9.1)	28 (5.4)	<10 *	<10 *	<10 *	<10 *	<10 *
No	1,698 (90.9)	489 (94.6)	575 *	194 *	363 *	15 *	599 *
Close contact							
Yes	6,094 (84.1)	1,687 (76.9)	487 (90.4)	254 (75.8)	626 (74.4)	34 (70.8)	148 (64.6)
No	1,153 (15.9)	507 (23.1)	52 (9.6)	81 (24.2)	215 (25.6)	14 (29.2)	81 (35.4)
Interval between symptom onset and hospitalisation (days)							
0-4	7,189 (41.9)	2,848 (48.3)	682 (47.8)	354 (38.8)	634 (41.1)	18 (24.0)	1,054 (64.8)
5-9	5,906 (34.4)	1,987 (33.7)	491 (34.4)	362 (39.6)	640 (41.5)	31 (41.3)	351 (21.6)
10+	3,089 (18.0)	834 (14.2)	227 (15.9)	168 (18.4)	217 (14.1)	* *	123 (7.6)
Onset in hospital	971 (5.7)	223 (3.8)	28 (2.0)	39 (3.2)	52 (3.4)	<10 *	99 (6.1)

[37] Pregnant patients are defined as patients who are female and are aged between 15-55 years. Not all sites provided this information therefore, the completion is low.

Deaths

Of all patients hospitalised with confirmed COVID-19 with known outcomes[38], 19% (4,306/22,863) died during their hospital stay. This proportion of those who died decreased over time from 34% (34/100) in February 2020 to 9% (39/724) in December 2021[39]. The highest proportions of deaths were observed between February and April 2020, this then decreased in the summer of 2020 before it increased again in the winter of 2020/2021 (Figure 14). Since then, a general decrease was observed. This could be the result of a wider knowledge base of COVID-19 including the most effective interventions. It could also be attributed to the variant strains of COVID-19 behaving differently and with reduced severity.

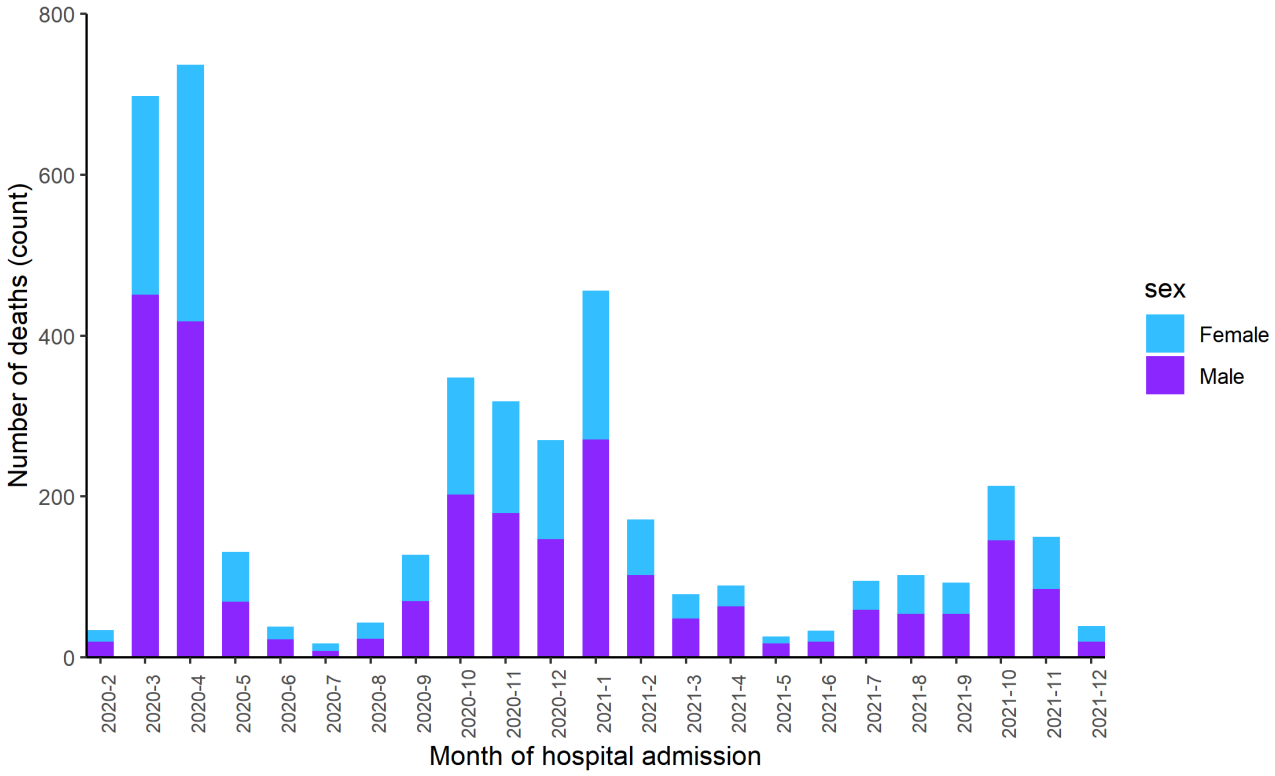
Figure 14: The proportions of deaths attributed to severe COVID-19 based on patient's month of admission (n = 4,306), reported by hospitals participating in the I-MOVE hospital surveillance WP3, 2020-2021



[38] A known outcome of discharge from hospital or death.
[39] Patients hospitalised in the most recent months may not have been hospitalised long enough for outcomes to be validated.

Twenty per-cent (2,544/12,428) of male patients hospitalised from COVID-19 died from the disease, compared to 17% (1,762/10,435) of female patients[40]. This translated to 59% (2,544/4,306) of all deaths from COVID-19 whilst hospitalised being among male patients and the remaining 41% (1,762/4,306) among female patients. Figure 15 shows the number of deaths by sex and month of admission.

Figure 15: Numbers and proportions of patients hospitalised with COVID-19 who died by sex and month of admission (n = 4,306), reported by hospitals participating in the I-MOVE hospital surveillance WP3, 2020-2021



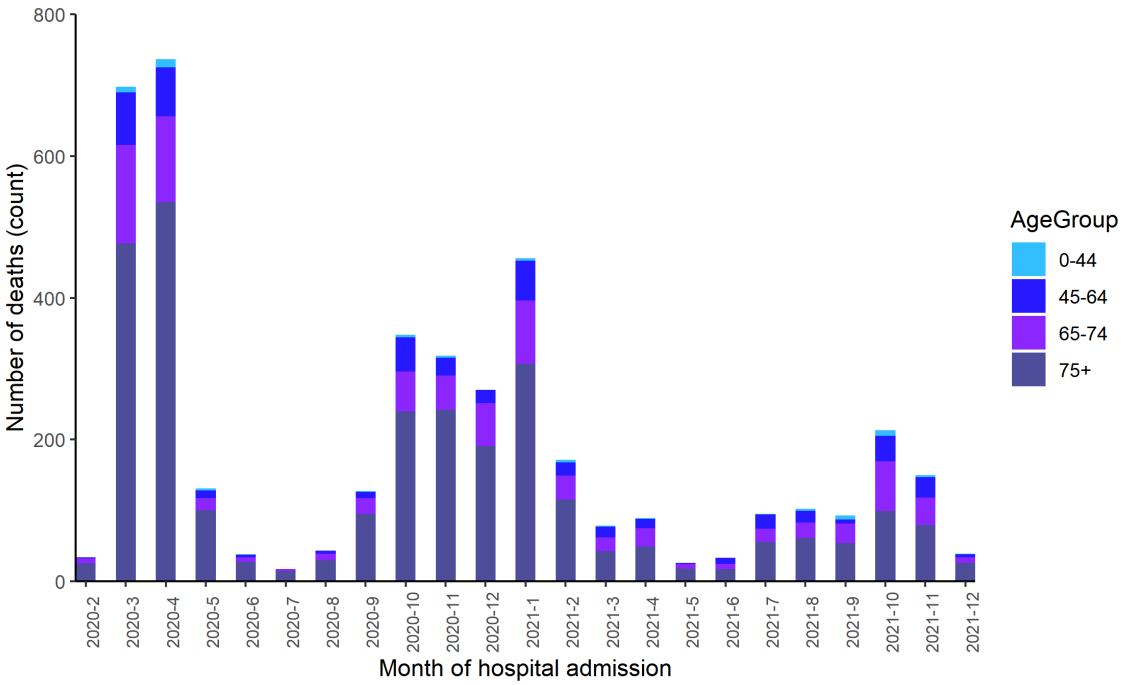
Patients hospitalised with severe COVID-19 aged 75 years or older were most likely to die from the disease with 36% (2,897/8,100) dying among those who had a known outcome. The likelihood of death decreased with age as, 21% (857/4,171) of 65–74 year olds died; 7%

[40] This is based on patients who had a known outcome of death or discharge

(489/6,830) of 45–64 year olds died; and only 1% (63/3,762) of patients under the age of 45 died. When the age bands of those who had died whilst hospitalised with severe COVID-19 were investigated, 67% (2,897/4,306) of all deaths were among patients aged 75 years or older; 20% (857/4,306) were attributed to 65–74 year olds; 11% (489/4,306) were attributed to 45–64 year olds and only 1% (63/4,306) was attributed to those aged 0–44 years.

Figure 16 shows the number of deaths by month of hospital admission and age group which enabled the trends in proportions of deaths to be examined. Patients aged 75 years or older consistently represented the largest number of deaths each month, but this decreased from 76% (100/131) in May 2020 to 47% (99/213) in October 2021. Proportions for some months, such as the summer months of 2020 and 2021, should be interpreted with caution due to the small denominators of overall deaths.

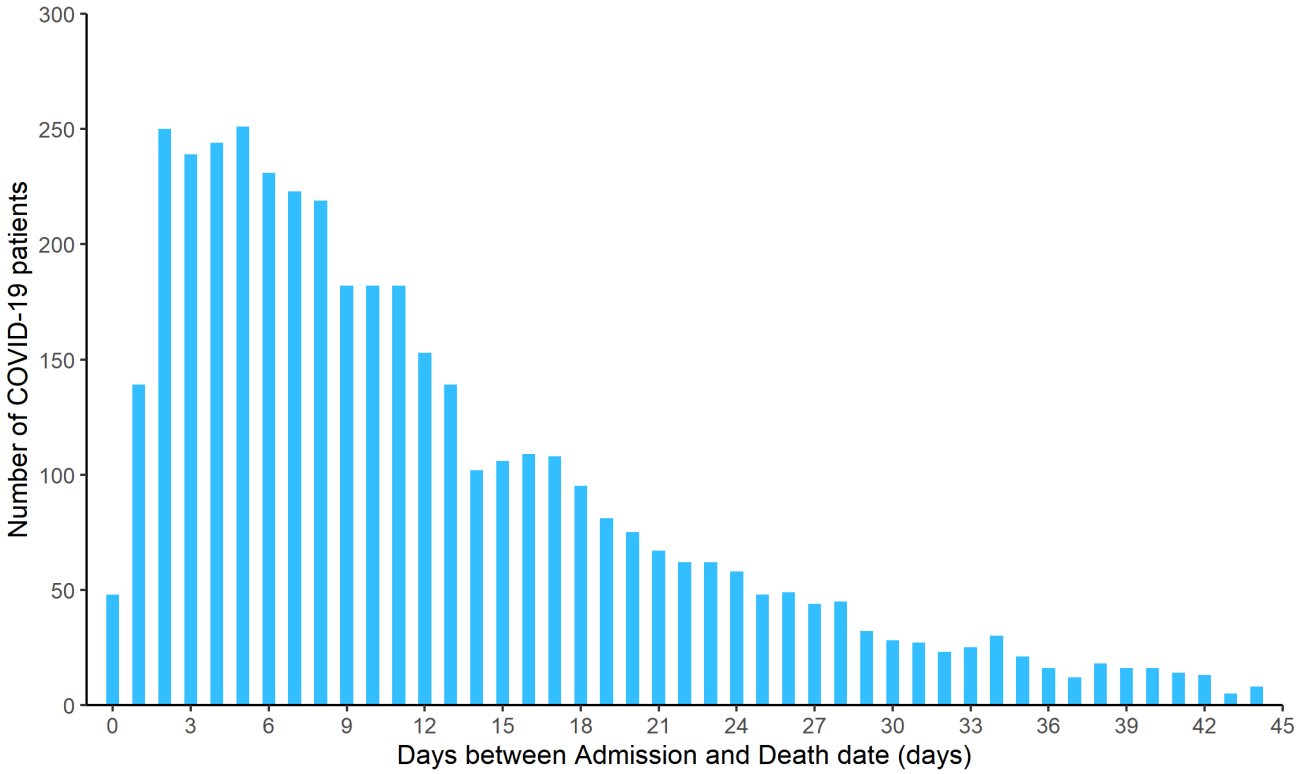
Figure 16: Numbers and proportions of those who died whilst hospitalised with COVID-19 by age band and month of admission (n = 4,306), reported by hospitals participating in I-MOVE hospital surveillance WP3, 2020-2021



Distribution of number of days between death and admission

The most common time interval between hospital admission and death was five days, with Figure 17 showing a decreasing frequency of the time interval with every subsequent day. This was a staggered decrease rather than a sharp decline. The median time interval between date of admission and date of death was 10 days (range 0 – 423 days). Males experienced a median time interval of 11 days between hospitalisation and death, whilst the median was 9 days for females. The median time interval between hospitalisation and death was 9 days for those aged 75 years or older, 12 days for 0-44 year olds and 65-74 year olds and 14 days for 45-64 year olds.

Figure 17: Distribution of number of days between date of admission and date of death of hospitalised patients with confirmed COVID-19. (N=4,305), reported by hospitals participating in I-MOVE hospital surveillance WP3, 2020-2021



ICU/HDU admission and death

The completion of the admission to ICU/HDU and death variables were high at 90% (23,289/25,971) and 88% (22,863/25,971) respectively (Table 8). Overall, 14% (3,196/23,289) of patients were admitted to ICU/HDU facilities over the entire time period and 19% (4,306/22,863) of patients died[41].

Of the healthcare workers, 13% (63/470) were admitted to ICU/HDU facilities and 5% (23/465) died. Due to the low sample number of healthcare workers, the results should be interpreted carefully. The proportions of current smokers, former smokers and patients who had never smoked, who were hospitalised with COVID-19, admitted to ICU/HDU and died stayed fairly constant which suggests that more complete data on smoking status is necessary for more robust analysis. The information available showed that only 9% (170/1,868) of all cases were pregnant and 18% (29/170) of all pregnant cases required admission to ICU/HDU.

[41] For this section, only patients who had a non-null response to ICU/HDU status and outcome (ICU/HDU status equal to yes or no and outcome equal to discharge or death) were included in the denominators

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Table 8: Outcome of patients hospitalised with COVID-19 by numerous risk/protective factors, reported by hospitals participating in the I-MOVE hospital surveillance WP3, 2020-2021

Exposures (risk/protective factors)	Total cases		ICU/HDU		Deaths	
	N	%	N	%	N	%
All cases	25,971	-	3,196	13.7	4,306	18.8
Missing data	-	-	2,682	10.3	3,108	12.0
Sex						
Female	11,780	45.4	1,099	34.4	1,762	40.9
Male	14,191	54.6	2,097	65.6	2,544	59.1
Age group (years)						
0-44	4,292	16.5	454	14.2	63	1.5
45-64	7,675	29.6	1,292	40.4	489	11.4
65-74	4,996	19.2	898	28.1	857	19.9
75+	9,008	34.7	552	17.3	2,897	67.3
Healthcare worker						
Yes	477	3.0	63	2.7	23	<1.0
No	15,404	97.0	2,266	97.3	2,755	99.2
Missing data	10,090	38.9	-	-	-	-
Smoker						
Current smoker	916	11.0	150	10.3	119	9.8
Former smoker	2,047	24.6	411	28.2	377	31.1
Never smoked	5,362	64.4	894	61.4	716	59.1
Missing data	17,646	67.9	-	-	-	-
Pregnant[42]						
Yes	170	9.1	29	11.9	-	-
No	1,698	90.9	214	88.1	30	100.0
Missing data	1,444	43.6	-	-	-	-
Close contact setting						
Yes	6,094	84.1	918	77.7	915	86.0
No	1,153	15.9	264	22.3	149	14.0
Missing data	18,724	72.1	-	-	-	-
Days between onset and hospitalisation (days)						
0-4	7,189	41.9	861	32.8	1,581	56.6
5-9	5,906	34.4	1,124	42.9	650	23.3
10+	3,059	18.0	526	20.1	277	9.9
Onset in hospital	971	5.7	112	4.3	287	10.3
Missing data	8,823	34.0	-	-	-	-

[42] Denominator is all women in the study aged between 15 and 55 years.

Those with two or more conditions made up the largest proportion of those hospitalised, admitted to ICU/HDU and deaths at 63% (9,988/15,804)[43], 64% (1,508/2,347) and 81% (2,622/3,227) respectively (

[43] Where 15,804 is equal to the number of patients with a known number of chronic conditions, known ICU/HDU status and known outcome. Null responses are removed here.

Table 9). When the proportions of patients by number of chronic conditions was considered, it was found that notably, the number of conditions each patient had resulted in minimal change in the admission to ICU/HDU (p = 0.1345). Thirteen percent (229/1,743) of those with no conditions; 15% (610/4,073) of those with one condition; and 15% (1,508/9,988) with two or more conditions were admitted to ICU/HDU. However, when looking at the numbers who had died a considerable difference was observed: 3% (57/1,743) with no underlying chronic conditions died, 14% (548/4,073) with one chronic condition died and 26% (2,622/9,988) with two or more chronic conditions died. This suggests that although the number of chronic conditions appeared to have minimal impact in the requirement of ICU/HDU treatment for patients hospitalised with severe COVID-19, it had a clear impact on death. Those hospitalised with COVID-19, with two or more chronic conditions were more likely to die in hospital than those with zero or one conditions[44].

[44] Comparing patients who had been discharged with those who had died with a known number of chronic conditions. Patients with 0 conditions vs 2 or more conditions , p < 0.0001, OR = 10.53 (7.22, 15.34). Patients with 1 condition vs 2 or more, p < 0.0001, OR = 2.29 (1.99, 2.64)

Table 9: The number and proportions of those hospitalised with confirmed COVID-19, admitted to ICU/HDU and deaths by number of chronic conditions, reported by hospitals participating in the I-MOVE hospital surveillance WP3, 2020-2021

Number of chronic conditions	Hospitalised (n = 15,804)[45]	ICU/HDU admission (n = 2,347)[46]	Proportion admitted to ICU/HDU (%)[47]	Death (n = 3,227)[48]	Proportion who died (%)[49]
0	1,743	229	13.1	57	3.3
1	4,073	610	15.0	548	13.5
2 or more	9,988	1,508	15.1	2,622	26.3

Of those admitted to ICU/HDU, 31% (935/3,037)[50] died and 69% (2,102/3,037) were discharged from hospital. This compares to 16% (3,069/18,983) who died without being admitted to ICU/HDU. This higher proportion of deaths after ICU/HDU admission is likely due to the increased severity of the infection.

[45] 8,164/25,495 (32%) patients had an unknown number of chronic conditions and were excluded from this analysis
[46] The remaining 679 patients admitted to ICU/HDU had an unknown number of chronic conditions
[47] For all patients who were admitted to ICU/HDU with a known outcome of discharge or death
[48] The remaining 161 patients who died had an unknown number of chronic conditions
[49] For all patients with a known outcome of discharge or death
[50] For all patients who were admitted to ICU/HDU with a known outcome of discharge or death

Conclusion

Most participating sites collected COVID-19 hospitalisation data using surveillance forms implemented at a small number of sentinel hospitals, while other sites collected their surveillance data at a larger number of hospitals, or from all hospitals therefore having a nationwide surveillance system in place. Between February 2020 and December 2021, 25,971 SARS-CoV-2 laboratory-confirmed hospitalised cases were reported. The results of this surveillance system have been described in detail in the I-MOVE COVID-19 hospital surveillance bulletins. An evaluation on this surveillance system was carried out highlighting the weaknesses and recommendations on how to strengthen these to inform the planning and monitoring of future enhanced surveillance activities during public health emergencies. While this is the final I-MOVE COVID-19 hospital surveillance bulletin, most participating sites will continue COVID-19 hospital surveillance either through their national surveillance programs or through new surveillance networks such as VEBIS (Vaccine Effectiveness, Burden and Impact Studies for COVID-19 and Influenza) and E-SARI-NET (European SARI surveillance network).