ARHAI Scotland
Antimicrobial Resistance and Healthcare Associated Infection

NHS
National
Services
Scotland

Hospital onset COVID-19 cases in Scotland

Surveillance Protocol

Updated January 2022

Contents

Document Control

Key Personnel

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Introduction

Antimicrobial Resistance and Healthcare Associated Infection (ARHAI) Scotland, part of National Services Scotland, works closely with Public Health Scotland to deliver the COVID-19 response.

A system for monitoring COVID-19 is critical to tracking hospital transmission and will inform infection prevention and control measures. The published data can be used to improve care of patients. The transmission of COVID-19 is thought to occur mainly through respiratory droplets generated by coughing and through contact with contaminated surfaces. As sustained community transmission has occurred as the pandemic has progressed, it has become more challenging to identify true cases of hospital transmission. Further information on the epidemiology of COVID-19 in healthcare settings can be found on the Public Health Scotland website.

This protocol outlines the processes in place to extract, validate and analyse COVID-19 cases by hospital onset COVID-19 status.

Aims

ARHAI Scotland aims to capture all instances of COVID-19 where cases first test positive as a hospital in-patient. Surveillance data are essential for monitoring trends and assisting in outbreak investigations and to understand the extent of ongoing transmission within the hospital setting. ARHAI Scotland offers support to NHS boards across Scotland to aid their local COVID-19 prevention strategies.

Case Definitions

Definition of a COVID-19 Case
A COVID-19 case is defined as an individual who has tested positive for COVID-19 by SARS-COV-2 RT-PCR test. Only the first positive test for each individual is counted. The case list is sourced from Corporate Data Warehouse (CDW), where episodes correspond to daily reported COVID-19 cases released by **Public Health Scotland** (PHS).

Definition of Hospital Onset COVID-19
All COVID-19 cases are broken down into five Hospital Onset categories, firstly by determining if the case was a hospital in-patient at the time of their first positive specimen, and if so how many days after admission was the test taken.

The agreed nosocomial case definition for the UK is based on the number of days since admission to an NHS health board to the date of specimen sampling for a positive SARS-CoV-2 RT-PCR test.

Time since admission to specimen sampling is categorised as:
- community onset (first positive specimen taken in the community)
- non-hospital onset (first positive specimen on day 1 or 2 of admission to NHS board)
- indeterminate (first positive specimen on days 3 to 7 of admission to NHS board)
- probable (first positive specimen on days 8 to 14 of admission to NHS board)
- definite hospital onset (first positive specimen date was 15 or more days after admission to NHS board)

These definitions are necessary due to the maximum incubation period of 14 days. See table below:

Day of sampling post admission	Nosocomial categorisation
Before admission	Community onset COVID-19
Day 1 of admission/on **admission to NHS board**	Non-hospital onset COVID-19
Day 2 of admission	Non-hospital onset COVID-19
Day 3 of admission	Indeterminate hospital onset COVID-19
Day 4 of admission	Indeterminate hospital onset COVID-19
Day 5 of admission	Indeterminate hospital onset COVID-19
Day 6 of admission	Indeterminate hospital onset COVID-19
Day 7 of admission	Indeterminate hospital onset COVID-19
Day 8 of admission	Probable hospital onset COVID-19
Day 9 of admission	Probable hospital onset COVID-19
Day 10 of admission	Probable hospital onset COVID-19
Day 11 of admission	Probable hospital onset COVID-19
Day 12 of admission	Probable hospital onset COVID-19
Day 13 of admission	Probable hospital onset COVID-19
Day 14 of admission	Probable hospital onset COVID-19
Day 15 of admission and onwards to discharge	Definite hospital onset COVID-19
Post discharge	Community onset COVID-19

Notes/Limitations

- Admission to NHS board was agreed as the appropriate point to start counting the duration of hospital stay to first positive specimen date, rather than the date of admission to a single hospital, since patients can be transferred between hospitals which would lead to restarting the clock to 'day 1' each time and therefore underestimating the number of nosocomial infections.

- Any discharges and re-admissions within the same health board which occur within the same calendar day will be classed as a continuous stay; the clock will not be restarted in these instances, only when a readmission occurs on the second day or more after any discharge.

- COVID-19 cases identified after discharge from hospital but within 14 days may be associated with the hospital. These cases, including those identified on readmission to hospital, are not included as hospital onset. This may result in under-reporting of COVID-19 cases associated with hospital care.

- It is acknowledged that patients can be transferred between NHS health boards and if transferred into a different health board during the same hospital stay, then the clock is restarted to 'day 1' which could lead to an underestimation of cases. However, the decision to restrict start date to admission to a single NHS health board represents the requirement to report at the health board-level.

- For definite, probable, indeterminate and non-hospital onset, the NHS board reported is where the first sample was taken. Since the definition of hospital-onset COVID-19 was determined using date of admission to NHS board, the board assigned may not represent the board of attribution of hospital-onset COVID-19 infection (Table above).

- For community onset (no admission), the NHS board of residence will be used for board-level reporting, according to the Corporate Data Warehouse (CDW) lab surveillance database.

- Any cases where the first positive samples are taken within Accident or Emergency specialties (A&E) prior to admission to hospital are coded as community onset.

- Non-Scottish patients whose records are available within the CDW are also considered. If the non-Scottish patient is coded as hospital onset, then they are included in reporting against the NHS board of admission/test. Any non-Scottish patients coded as community onset are excluded since they cannot be attributed to a Scottish NHS board of residence.

- In December 2021 the case inclusion criteria was updated to include data feeds from private labs (in addition to NHS and UK Government labs) within the overall PHS COVID-19 dataset.

Methods

Data Extraction and Validation

COVID-19 case data are extracted by ARHAI on the Tuesday of each week prior to validation:

- **Case data source:** Source of data are Corporate Data Warehouse (CDW) that contains test results from Electronic Communication of Surveillance in Scotland (ECOSS) in addition to private laboratory data.

Case data are then linked to identify cases where admissions data are available:

- **Admissions Data Source:** Rapid Admission Preliminary Inpatient Data (RAPID) or Local Patient Admissions Systems.

RAPID is an unvalidated preliminary data source for admission data, and is known to be incomplete for some locations (primarily for non-acute/long term stay hospital settings). Therefore these records require to be validated by NHS boards against local patient admissions systems to ensure accuracy and completeness prior to calculation of hospital onset status. In addition to cases where admission data has been linked, COVID-19 records listed as "Hospital" within the "Specimen Origin" field (derived from the location of the request sent to the NHS laboratory) within CDW are also sent to NHS boards for validation to complete any admission dates which may be unavailable within RAPID.

Data from the corresponding reporting week are sent to Infection Control Managers (ICMs) and other nominated team members within Infection Prevention and Control teams within each NHS board to validate the list of potential hospital onset COVID-19 cases.

NHS boards have one week to validate their data and return validation sheets to ARHAI Scotland, whereby data are compiled and the hospital onset status is calculated. Please see the "List of Fields Collected" section below for details on the data items included in the validation process.

Data Queries and Amendments Process

During the validation process, NHS boards are able to query any submitted results with local records, to ensure that in addition to admissions data, other details of the laboratory record including personal identifiers, specimen dates etc, are also correct. ARHAI Scotland communicate regularly with PHS in order to investigate and amend any incorrect data as advised by NHS boards, so that CDW is as accurate as possible.

Due to this amendment process within ARHAI, and the constant feed of data from laboratories into the CDW (with new/retrospective records and amendments), COVID-19 data are live and may change on a regular basis. Any changes to retrospective data are tracked by ARHAI Scotland and how they may affect previously reported figures are detailed in the Hospital Onset COVID-19 report each week.

List of Fields collected

Surveillance Data Definitions

Data item:	Row.names
Response required:	N/A
Definition:	
Choices:	
Rationale:	Provides numeric id number for case on validation sheet for highlighting queries with the data.
Comments:	

Data item:	CHI
Response required:	Essential
Definition:	Community Health Index number for patient identification
Choices:	
Rationale:	Part of unique record
Comments:	Populated using ECOSS data, and do not need to be amended.

Data item:	SpecimenDate
Response required:	Essential
Definition:	Collection date of first positive SARS-COV-2 RT-PCR test
Choices:	dd/mm/yyyy
Rationale:	Part of unique record
Comments:	Populated using ECOSS data, and do not need to be amended.

Data item: monthofspecimen

Response required: N/A

Definition:

Choices:

Rationale: Part of unique record

Comments: Populated using ECOSS data, and do not need to be amended.

Data item: ECOSSBoard

Response required: Essential

Definition: NHS Board where first positive SARS-COV-2 RT-PCR test taken

Choices: AA, BR, DG, FF, FV, GR, GGC, HG, LN, LO, GJ, OR, SH, TY, WI

Rationale: Part of unique record

Comments: Populated using ECOSS data, mapped from the location code of the sample, and does not need to be amended.

Data item: ECOSSHospitalofTest

Response required: Essential

Definition: Hospital where first positive SARS-COV-2 RT-PCR test taken

Choices:

Rationale: Part of unique record

Comments: Populated using ECOSS data, and do not need to be amended.

Data item: BoardofFirstPositiveTest

Response required: Essential

Definition:

Choices: Multiple (see appendix 1)

Rationale:

Comments: Pre-populated using RAPID data if available. Check / amend / add / remove where appropriate.

Data item: AdmissionDatetoBoard

Response required: Essential

Definition: Date of Admission to NHS board associated with first positive SARS-COV-2 RT-PCR test.

Choices: dd/mm/yyyy

Rationale: To describe admission associated with first positive SARS-COV-2 RT-PCR test.

Comments: Pre-populated using RAPID data if available. Check / amend / add / remove where appropriate. As this data is altered, the calculated hospital onset status on the validation sheet will update.

Data item: AdmissionDatetoHospofTest

Response required: Essential

Definition:	Date of Admission to the hospital where first positive SARS-COV-2 RT-PCR test was taken.
Choices:	dd/mm/yyyy
Rationale:	To describe admission associated with first positive SARS-COV-2 RT-PCR test.
Comments:	Pre-populated using RAPID data if available. Check / amend / add / remove where appropriate. As this data is altered, the calculated hospital onset status on the validation sheet will update.

Data item:	HospitalofFirstPositiveTest
Response required:	Essential
Definition:	Hospital where the first positive SARS-COV-2 RT-PCR test was taken.
Choices:	Multiple (see appendix 1)
Rationale:	To describe admission associated with first positive SARS-COV-2 RT-PCR test.
Comments:	Pre-populated using RAPID data if available. Check / amend / add / remove where appropriate.

Data item:	Associated with cluster?
Response required:	Optional
Definition:	Case has been a part of a known COVID-19 hospital cluster.
Choices:	No
	Yes, [cluster ID]
	Yes, ID not listed
Rationale:	To identify any association with a COVID-19 hospital cluster.
Comments:	

Data item:	Symptomatic or asymptomatic at time of test?
Response required:	Optional
Definition:	https://publichealthscotland.scot/publications/covid-19-guidance-for-healthcare-settings-public-health-guidance/
Choices:	Symptomatic, meets current case definition
	Symptomatic, clinical judgement
	Asymptomatic
	Unknown
Rationale:	To indicate if the patient was symptomatic or asymptomatic at time of their first positive test.
Comments:	

Data item:	If Asymptomatic - Symptomatic 5 days after positive test?
Response required:	Optional
Definition:	https://publichealthscotland.scot/publications/covid-19-guidance-for-healthcare-settings-public-health-guidance/
Choices:	Yes, meets current case definition

	Yes, clinical judgement
	No
	Unknown
Rationale:	Completed for patients who were asymptomatic at time of their first positive test, to indicate if the patient was symptomatic 5 days after their first positive test.
Comments:	

Data item:	RecordChecked
Response required:	Essential
Definition:	
Choices:	Y / N
Rationale:	To identify that the case has been validated by the NHS board and that all data are correct.
Comments:	All cases are pre-populated as "N" initially for the NHS board to switch to Y when validated.

Data item:	HAIOnsetStatus
Response required:	N/A
Definition:	See above
Choices:	Community Onset
	Non-Hospital Onset
	Indeterminate Hospital Onset
	Probable Hospital Onset
	Definite Hospital Onset
Rationale:	Displays Hospital onset category
Comments:	Calculated field to advise the NHS board on expected hospital onset status based on current data entered into 'AdmissionDatetoBoard' field relative to "SpecimenDate".

Data item:	Missing data
Response required:	N/A
Definition:	
Choices:	
Rationale:	Highlights there may be missing data.
Comments:	Calculated field to advise NHS board/ARHAI of possible further information required.

Reporting Process and Schedule

The Hospital Onset COVID-19 data are published 3-4 weeks in arrears, due to lag time in specimen results and RAPID data being available for the corresponding reporting week, and the time taken for validation by NHS boards.

Reports are pre-released each Monday corresponding to data 3 weeks prior, and publicly released each Wednesday on the PHS website: **https://publichealthscotland.scot/publications/hospital-onset-covid-19-cases-in-scotland/**

Typical timescales for an example report are outlined below:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
25th Reporting Week	26th Reporting Week	27th Reporting Week	28th Reporting Week	29th Reporting Week	30th Reporting Week	31st Reporting Week
1st	2nd	3rd	4th	5th	6th	7th
8th	9th Data from reporting week are extracted from CDW, linked with RAPID, validation sheets sent to NHS boards.	10th NHS boards validation time	11th NHS boards validation time	12th NHS boards validation time	13th NHS boards validation time	14th NHS boards validation time
15th NHS boards validation time	16th Validation deadline	17th ARHAI Scotland carry out final queries with NHS boards, compile data, analyse and compile report	18th ARHAI Scotland compile data, analyse and compile report	19th Report is completed and signed off by Consultant	20th	21st
22nd Report is pre-released to list of stakeholders.	23rd	24th Report is published at 12noon	25th	26th	27th	28th

Appendices

Appendix 1 – Publication metadata

NHS Board	Hospital
NHS Ayrshire and Arran (AA)	Ailsa Hospital
	Arran War Memorial Hospital
	Arrol Park Resource Centre
	Ayrshire Central Hospital
	Biggart Hospital
	Brooksby Day Hospital
	Community Hospital
	Davidson Cottage Hospital
	Girvan Community Hospital
	Kirklandside Hospital
	Lady Margaret Hospital
	University Hospital Ayr
	University Hospital Crosshouse
	Woodland View
NHS Borders (BR)	Borders General Hospital
	Crumhaugh House
	Galavale House
	Hawick Community Hospital
	Hay Lodge Hospital
	Huntlyburn House
	Kelso Hospital
	Melburn Lodge
	The Knoll Hospital
NHS Dumfries and Galloway (DG)	Acorn House
	Annan Hospital
	Castle Douglas Community Hospital
	Crichton Royal Hospital
	Cromarty
	Darataigh
	Dumfries & Galloway Royal Infirmary
	Galloway Community Hospital
	Heather Lodge (CETU)
	Innistaigh
	Kirkcudbright Cottage Hospital
	Lochmaben Hospital
	Midpark Hospital
	Moffat Community Hospital
	Newton Stewart Hospital
	Thomas Hope Hospital

	Thornhill Hospital
	Treastaigh
	Wellgreen Cottages
NHS Fife (FF)	Adamson Hospital
	Cameron Hospital
	Glenrothes Hospital
	Lynebank Hospital
	Queen Margaret Hospital
	Randolph Wemyss Memorial Hospital
	St Andrews Community Hospital
	Stratheden Hospital
	Victoria Hospital
	Victoria Maternity Unit
	Whytemans Brae Hospital
NHS Forth Valley (FV)	Bellsdyke Hospital
	Bo'ness Hospital
	Clackmannanshire Community Healthcare Centre
	Falkirk Community Hospital
	Forth Valley Royal Hospital
	Lochview Hospital
	Stirling Community Hospital
NHS Grampian (GR)	375 Great Western Lodge
	Aberdeen Maternity Hospital
	Aberdeen Royal Infirmary
	Chalmers Hospital
	City Hospital
	Dr Gray's Hospital
	Aboyne Hospital
	Fleming Cottage Hospital
	Fraserburgh Hospital
	Glen O'Dee Hospital
	Elmwood
	Insch & District War Memorial Hosp.
	Inverurie Hospital
	Jubilee Hospital
	Kincardine Community Hospital
	Leanchoil Hospital
	Maidencraig House
	Peterhead Community Hospital
	Pluscarden Clinic
	Rehabilitation Hospital
	Roxburghe House
	Royal Aberdeen Children's Hospital

	Royal Cornhill Hospital
	Seafield Hospital
	Stephen Cottage Hospital
	Turner Memorial Hospital
	Turriff Cottage Hospital
	Ugie Hospital
	Woodend General Hospital
	Hyperbaric Centre
NHS Greater Glasgow and Clyde (GGC)	2-4 Waterloo Close
	Beatson West of Scotland Cancer Centre
	Blythswood House
	Dumbarton Joint Hospital/Riverview Resource Centre
	Dykebar Hospital
	Gartnavel Royal Hospital
	Glasgow Royal Infirmary
	Inverclyde Royal Hospital
	Larkfield Unit
	Leverndale Hospital
	Lightburn Hospital
	Mansionhouse Unit
	Mearnskirk House
	Netherton
	New Victoria Hospital
	Parkhead Hospital
	Pineview
	Queen Elizabeth University Hospital
	Queen Mother's Hospital
	Ravenscraig Hospital
	Rowanbank Clinic
	Royal Alexandra Hospital
	Royal Hospital for Children
	Stobhill Hospital
	Orchard View
	The Princess Royal Maternity Unit
	Vale of Leven General Hospital
	Gartnavel General Hospital
	West Glasgow
NHS Highland (HG)	Belford Hospital
	Caithness General Hospital
	Campbeltown Hospital
	Argyll and Bute Hospital
	Cowal Community Hospital
	Dunbar Hospital

	Glencoe Hospital
	County Community Hospital Invergordon
	Islay Hospital
	Lawson Memorial Hospital
	Lorn & Islands Hospital
	Mackinnon Memorial Hospital
	Mid-Argyll Community Hospital and Integrated Care Centre
	Migdale Hospital
	Mull and Iona Community Hospital
	Nairn Town and County Hospital
	Portree Hospital
	Raigmore Hospital
	RNI Community Hospital
	Ross Memorial Hospital
	Ian Charles Cottage Hospital
	The New Craigs
	Victoria Hospital
	Victoria Hospital Annexe
	Victoria Integrated Care Unit
	Wick Town and County Hospital
	St Vincent's Hospital
NHS Lanarkshire (LN)	Beckford Lodge
	Cleland Hospital
	Coathill Hospital
	Airbles Road Centre
	Hartwoodhill Hospital
	Kello Hospital
	Kirklands Hospital
	Coathill House
	Lockhart Hospital
	Roadmeetings Hospital
	Stonehouse Hospital
	Strathclyde Hospital
	Udston Hospital
	University Hospital Hairmyres
	University Hospital Monklands
	University Hospital Wishaw
	Victoria Memorial Cottage Hospital
	Wester Moffat Hospital
	Lady Home Cottage Hospital
NHS Lothian (LO)	Astley Ainslie Hospital
	Belhaven Hospital
	Edenhall Hospital

	Edington Cottage Hospital
	Ellen's Glen House
	East Lothian Community Hospital
	Ferryfield House
	Findlay House
	Herdmanflat Hospital
	Learning Disabilities Service Healthcare Houses
	Liberton Hospital
	Midlothian Community Hospital
	Princess Alexandra Eye Pavillion
	Roodlands General Hospital
	Corstorphine Hospital
	Royal Hospital for Sick Children (Edinburgh)
	Royal Infirmary of Edinburgh at Little France
	Royal Victoria Hospital
	St John's Hospital
	St Michael's Hospital
	The Islay Centre
	Tippethill Hospital
	Western General Hospital
	Whitburn House
	William Fraser Centre
	Royal Hospital for Children and Young People
	Maple Villa
	Royal Edinburgh Hospital
NHS Golden Jubilee (GJ)	Golden Jubilee National Hospital
NHS Orkney (OR)	Balfour Hospital
NHS Shetland (SH)	Gilbert Bain Hospital
NHS Tayside (TY)	Bluebell Intermediate Care Unit
	Brechin Infirmary
	Carseview Centre
	Crieff Community Hospital
	Dudhope House (Young Persons Unit)
	Dudhope Young Peoples Inpatient Unit
	Kings Cross Hospital
	Kingsway Care Centre
	Little Cairnie Hospital
	Montrose Royal Infirmary
	Aberfeldy Cottage Hospital
	Arbroath Infirmary
	Blairgowrie & Rattray Cottage Hospital
	Pitlochry Community Hospital
	Royal Victoria Hospital

	St Margaret's Hospital
	Stracathro Hospital
	Strathmartine Hospital
	Whitehills Health and Community Care Centre
	Whitehills Hospital
	Ninewells Hospital
	Perth Royal Infirmary
	Murray Royal Hospital
NHS Western Isles (WI)	Western Isles Hospital
	St Brendans Cot Hospital
	Uist & Barra Hospital

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