

Health Service Investigation - Interim Report

**Investigation into
Human
metapneumovirus
outbreak at Herberton
Hospital, January 2016**

February 2016

Health Service Investigation – Interim Report: Investigation into human Metapneumovirus outbreak at Herberton Hospital, January 2016

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Contents

Foreword	iv
1. Introduction	1
1.1 Background	1
1.2 Purpose of the investigation.....	1
1.3 Scope of the investigation.....	1
1.4 Methodology	2
2. The Herberton Hospital.....	3
2.1 Service capability.....	4
3. About Human Metapneumovirus.....	4
3.1 Institutional outbreaks of laboratory confirmed influenza and influenza-like illness in Queensland	5
4. Outbreak of hMPV at Herberton Hospital.....	6
4.1 Sequence of key events - Patient deaths.....	8
5. Cairns and Hinterland HHS Response.....	10
5.1 Notification to Tropical Public Health Services	10
5.2 Transmission based precautions	10
5.3 Initial response measures.....	11
5.5 Management of visitation during the outbreak.....	13
5.6 Limitations to effective isolation and cohorting	13
5.7 Internal review processes	14
6. Cairns and Hinterland HHS Preparedness	14
6.1 Regulation and other approaches to infection prevention and control	14
6.2 Infection control management plans	15
6.3 Accreditation.....	15
6.4 CHHHS Infection Control Services	16
6.4.1 Documentation.....	17
6.5 Hand hygiene	17
6.6 Vaccination	17
6.7 Herberton Hospital local protocols	18
6.7.1 Multi-disciplinary case review	18
6.7.2 Herberton Clinical Improvement Committee	18
7. Media coverage and response.....	19
8. Findings	19
9. Recommendations	19
Abbreviations.....	22
Glossary	23
References.....	25

Foreword

At the request of the Director-General, Department of Health I undertook an investigation into the preparedness and response of Cairns and Hinterland Hospital and Health Service following the outbreak of Human metapneumovirus at the Herberton Hospital in January 2016.

This interim report details my findings to date. I will prepare a final report following confirmation that the current outbreak is over. My final report will include consideration of internal review processes undertaken by CHHHS and provide a comprehensive assessment to the preparedness and response of CHHHS outbreak.

On considering the findings of this investigation to date, it is my view that:

- upon identifying a suspected outbreak of viral respiratory infection, Cairns and Hinterland Hospital and Health Service responded promptly and appropriately, including implementing the appropriate infection control measures to minimise the risk of transmission;
- appropriate actions and precautions were taken following laboratory confirmation of an outbreak of hMPV;
- the care of patients at Herberton Hospital was compliant with the relevant legislation, accreditation standards, policies and procedures;
- there was no admission to Herberton Hospital of any patient with symptoms of viral infection in the month preceding the outbreak;
- CHHHS' response to the outbreak did not contribute to any increased level of risk to the local community.

Based on these initial findings, I have made the following interim recommendations that should be considered by all similar facilities.

1. Facilities work to increase rates of annual influenza vaccination for staff and patients in all health facilities, particularly facilities that provide care for immunocompromised and vulnerable patients (e.g. elderly).
 - For residential care facilities the Communicable Diseases Network Australia identifies a target rate of 100% vaccination for residents and 90% for staff¹
 - Families and other regular visitors of patients or residents in aged care facilities should also be encouraged to have annual seasonal flu vaccination.
2. Consistent, regular and easily accessible advice is provided to staff and visitors not to attend care facilities when they have cold or flu-like symptoms to help minimise the potential risk of the spread of infection to staff, patients and other visitors.

¹ Communicable Diseases Network Australia, *A practical guide to assist in the prevention and management of influenza outbreaks in residential care facilities in Australia*, Canberra, CDNA, 2009.pg 10 <http://www.health.gov.au/internet/main/publishing.nsf/Content/cdna-flu-guidelines.htm>

- Staff should be supported to access sick leave when they have cold or flu-like symptoms and discouraged from attending work until symptoms subside.
 - Options for improving visitor access to information include placing signs at entrances and throughout the facility; and publication of advice on public websites. It is noted that this advice is included in the Herberton Hospital information brochure.
3. Local isolation and cohorting procedures should be determined in advance of an outbreak with pre-identified triggers, notification processes, isolation areas and staffing practices.
- It is noted that the ability of each facility to effectively isolate and cohort patients is highly dependent on the physical design and available infrastructure. Options and effectiveness may also be limited by the clinical and non-clinical care requirements of the patient or resident group e.g. physical relocation of complex dementia patients may result in distress and risk of poor clinical outcomes.
 - Where cohorting and/or isolation procedures are limited, enhanced attention to infection prevention measures are required. This can include ensuring plentiful supply of tissues, bins, alcohol hand gel; enhanced staff observations and support to patients to practice good hand and respiratory hygiene; and more frequent environmental cleaning in areas where sick patients reside.
 - Staff should also implement contact and droplet precautions between each patient
4. Restrict admissions, discharges or inter-facility transfers during a suspected or confirmed outbreak to minimise the risk of spread of the infection.
5. Adequate infection control expertise is made available to facilities to ensure awareness and compliance with established infection control practices to prevent and manage outbreaks; and to support the development of local protocols were required.
- Hand hygiene and droplet precaution practices should be ingrained in facility procedures with widespread and simple access to hand hygiene facilities and tissues and availability of appropriate personal protective equipment (PPE) such as face masks, as needed.
 - Practices that are associated with increased risk of droplet spread, such as use of nebulisers, should be limited and replaced by use of spacers if clinically appropriate.
6. Access to a rapid public health response with early involvement in outbreak management is ensured by development of local protocols and relationships that encourage early notification to public health units. Easy access to contact details will assist staff who do not have regular contact with PHUs.
7. Where it is deemed appropriate, the HHS engage with the local community and key stakeholders in outbreak management strategies in addition to mandatory notification requirements:

- During an outbreak, this may include placing signs at entrances and throughout the facility, publication of information and advice on the HHS website, media releases if required, and additional communication with patients' families.
- In smaller communities consideration should be given to direct engagement with key local stakeholders such as the Council and local MP, to ensure they are informed of the issue and any developments.

I would like to extend my thanks to those who participated in this investigation, particularly staff from Tropical Public Health Services (Cairns) and Herberton Hospital. I also offer my sincere thanks to the families of residents of Herberton Hospital who took the time to meet with me.

Dr Jeannette Young
Chief Health Officer
Queensland Health
12 February 2016

1. Introduction

1.1 Background

On 22 January 2016 Tropical Public Health Services, Cairns (TPHS) confirmed an outbreak of human metapneumovirus (hMPV) at Herberton Hospital within the Cairns and Hinterland Hospital and Health Service (CHHHS). According to accepted public health definitions the current outbreak is not yet over.

To date, 3 patients of Herberton Hospital and 2 staff members have tested positive for hMPV,

Seven patients of Herberton Hospital have died between 12 January and 1 February. Five of these residents had symptoms of a respiratory virus. Infection with hMPV may have been a potential precipitating factor in these 5 deaths. Only one of the patients who died was confirmed by laboratory testing as having hMPV infection. All 7 deaths have been reported to the North Queensland coroner by CHHHS.

Herberton Hospital is a 38-bed residential care facility located in the town of Herberton, 91km south-west of Cairns. The hospital provides high care, low care and dementia specific care and promotes a home-like environment.

Reports of the outbreak first appeared in local and statewide media on 23 January 2016, noting the deaths of 4 patients and illness amongst other patients and staff and citing community concerns regarding the handling of the outbreak and potential ongoing risk.

On 25 January the Director-General, Department of Health appointed the Chief Health Officer, Dr Jeannette Young to conduct a health service investigation into the outbreak.

In accordance with the terms of reference, this interim report provides a summary of findings relating to preparedness and response of CHHHS to the outbreak. Preliminary recommendations have been made in response to these findings.

A final report will be delivered once the current outbreak has been declared over.

1.2 Purpose of the investigation

The purpose of this health service investigation is to investigate and report on matters relating to the Cairns and Hinterland Hospital and Health Services' (CHHHS) preparedness and response to the outbreak of hMPV at Herberton Hospital in January 2016.

1.3 Scope of the investigation

The Chief Health Officer was appointed to investigate and report on matters relating to the management, delivery and administration of public sector health care services relating to CHHHS' preparedness and response to the outbreak of hMPV at Herberton Hospital in January 2016 including,

- a. review and assess the adequacy of any findings and recommendations of reviews, debriefs or similar processes relating to CHHHS' preparedness and response to the matter, which have been completed by the department or CHHHS, and associated material including reports;
- b. conduct any further review necessary of CHHHS' preparedness for, and responses within and across units, to the matter with a focus on matters pertaining to:
 - i. improvements that could have been achieved in CHHHS' preparedness for, and responses within and across units to the matter; and
 - ii. the ways in which the management, administration and delivery of public sector health services involved in similar matters, could be maintained and improved.
- c. reviewing the patient records for those patients diagnosed with hMPV;
- d. developing a sequence of key events and significant clinical decision-making points relevant to the clinical management of the outbreak of hMPV;
- e. reviewing the compliance or non-compliance with legislation, accreditation standards, policies and procedures (State-wide and local) applying in relation to treatment of the patients diagnosed with hMPV and infection control measures;
- f. make findings and recommendations regarding:
 - i. improvements that could have been achieved in CHHHS' preparedness for, and responses within and across units to the matter; and
 - ii. the ways in which the management, administration and delivery of public sector health services involved in similar matters, could be improved and maintained.
- g. submit to the Director-General, a final report that may be released publically, regarding the matters outlined above and identifying key issues, findings and recommendations.

1.4 Methodology

1.4.1 Interviews

Interviews were conducted in person by the Chief Health Officer during a visit to Cairns, Atherton and Herberton on 1-2 February 2016

Interviews were conducted with the Chief Executive and Acting Board Chair, CHHHS; medical and nursing staff from Tropical Public Health Services (Cairns); and medical, nursing, and allied health staff at Herberton Hospital including the Director of Nursing.

Meetings were held with representatives of families of the ten patients of Herberton Hospital whose deaths were initially reported.

A meeting was also held in Atherton with the Mayor of Tablelands Regional Council.

1.4.2 Documents collected

Under the powers conferred by section 194 of the HBBA, documentation was sought from Cairns and Hinterland Hospital and Health Service, including documents specifically related to Herberton Hospital and Tropical Public Health Services

All documentation provided has been taken into consideration, although it may not specifically be referred to in this interim report.

As part of this investigation records were reviewed for the following patients,

- All who died between 12 January and 1 February 2016
- All who displayed symptoms of viral infection

The following additional Herberton Hospital data was reviewed,

- Annual number of deaths 2007-2015
- Admissions records since beginning of December 2015
- Staff sick leave rates January - December 2015

Additional materials and clarification were sought from CHHHS via email and phone during the course of the investigation.

Regard was also given to relevant publically available documents including national infection prevention and control standards and guidelines.

2. The Herberton Hospital

Herberton Hospital is a 38-bed residential care facility within Cairns and Hinterland Hospital and Health Service (CHHHS). The hospital provides high care, low care and dementia specific care. The hospital promotes a home-like environment with a communal dining and lounge area, and outdoor courtyard and garden.

The existing main hospital building was opened in 1983.

The communal dining and lounge area is air-conditioned, however the bedrooms have only natural ventilation.

Recent infrastructure works have been undertaken to provide better access for service delivery and ambulance vehicles and extra visitor parking.

Additional funding has been allocated by CHHHS to enable the hospital to operate at its full capacity.

During visits to Herberton Hospital conducted during the course of this investigation it was immediately evident that, given the age of the facility, it is well maintained and achieves very high levels of cleanliness. This is an important factor in consideration of matters relating to infection control.

2.1 Service capability

The Queensland Health Clinical Services Capability Framework for public and licensed private health facilities (CSCF) describes minimum capability requirements for clinical and support services by service capability level.

The CSCF self-assessment summary for Herberton Hospital lists the following service capability levels²:

- Level 2: Medical, medication, palliative care
- Level 1: Pathology

3. About Human Metapneumovirus

Human metapneumovirus (hMPV) is a regular and seasonal cause of viral respiratory infection worldwide. Global studies indicate that most children have been infected by the time they are 5 years old [1]. Children under the age of 2 are particularly susceptible.

The virus was first described in 2001 in the Netherlands with retrospective studies showing that it had been present in human populations for more than 50 years [2].

An initial infection does not ensure future immunity and re-infection can occur throughout life with older patients suffering more frequent re-occurrences [4].

In most cases, adults with hMPV infection experience only mild flu-like symptoms including cough, sore throat, runny nose, nasal congestion and mild fever. Infected children and adults may remain asymptomatic after contracting the virus. However in some cases, particularly in older and vulnerable adults, more severe complications such as severe pneumonia and death have been reported [3]. Between 4% and 5% of severe acute respiratory diseases in adults are understood to be the result of hMPV infection [4].

Symptoms due to hMPV infection cannot be clinically distinguished from those resulting from infection by other respiratory viruses. Laboratory confirmation for a suspected case is the only way to confirm infection and is the other method if other viruses such as influenza and RSV are co-circulating.

² **Level 1:** Provides *low-risk* ambulatory care clinical services *only*; Predominantly delivered by health providers such as registered nurses (RN) and/or health workers rather than a general practitioner (GP). However, a visiting GP may intermittently provide a medical service; Patients requiring a higher level of care can be managed for short periods before transfer to a higher level service.

Level 2: Provides *low-risk* inpatient and ambulatory care clinical services; Delivered mainly by RNs and GPs with admitting rights to the local hospital; Some limited visiting/outreach allied health services provided; Manages emergency care until transfer to a higher level service; May have a university affiliation including an education and teaching commitment.

Clinical Skills Capability Framework, Queensland Health <https://www.health.qld.gov.au/clinical-practice/guidelines-procedures/service-delivery/cscf/default.asp> (Accessed 12 February 2016).

Transmission of hMPV is by direct or close contact with the secretions of an infected person, including saliva, droplets or large particle aerosols. The virus is found in excretions 5 to 14 days from the onset of symptoms, and the incubation period between infection and illness onset is estimated to be 4 to 6 days [1].

Accepted precautions to prevent droplet transmission include ongoing hand hygiene, use of personal protective equipment such as face masks and eye protection. In health care facilities, isolation or cohorting of people with relevant symptoms is recommended where possible.

Respiratory tract infections are a significant cause of morbidity and mortality in elderly people living in long-term care facilities [5]. The first reported outbreak of hMPV in an Australian aged care facility is reported to have occurred in the Hunter Valley in New South Wales in 2008 [6]. Additional outbreaks in aged care facilities have been reported in Japan, Canada and the United States [7,8,5].

In temperate climates higher rates of viral respiratory infections, including hMPV, are typically experienced during late winter and spring. However, in tropical regions higher infection rates can be expected in the wetter, summer season [9].

Notably, summer outbreaks of hMPV in long-term care facilities have been reported in numerous countries supporting the importance of year-round surveillance for hMPV, particularly in aged care settings [8].

Understanding of the virus has increased significantly in the 15 years since it was first identified. To date there is no approved therapeutic drug or vaccine against hMPV infections, however research into the development of strategies including antivirals and vaccines is progressing [4].

Queensland was one of the first jurisdictions to include the virus in its regular testing panel for respiratory viruses. In 2015 49,074 respiratory virus screens were performed, including for hMPV.

The outcome of hMPV infection is not required to be notified nationally and provided to the Commonwealth National Notifiable Diseases Surveillance System (NNDSS). For this reason comprehensive data on outbreaks of hMPV is unavailable.

3.1 Institutional outbreaks of laboratory confirmed influenza and influenza-like illness in Queensland

As stated above, hMPV is not required to be notified nationally. In addition, there is no mandatory requirement for public health units (PHU) to notify the Queensland Department of Health of suspected or confirmed cases within their hospital and health service.

The table below is drawn from data voluntarily reported by PHUs and shows the total number of reported outbreaks of influenza and influenza-like illness in Queensland between 2012-2016 (to date). The number of these that were confirmed as hMPV outbreaks is also provided.

The reported data indicates that the average time from outbreak to notification to PHUs is 7-9 days.

Notably, to date in 2016 there have been 3 known confirmed outbreaks of hMPV in residential care facilities in Queensland – 1 public (Herberton) and 2 private (Blackall and Mareeba). Local public health units have been advised of all 3 outbreaks and have provided advice and assistance to the affected facilities.

Table 1: Reported outbreaks of influenza and ILI-like illness in Queensland 2012-2016

	2012	2013	2014	2015	2016
Total	31	8	14	38	3
hMPV	2	3	1	1	3

4. Outbreak of hMPV at Herberton Hospital

According to the Australian Guidelines for Prevention and Control of Infection in Healthcare an outbreak may be defined as the occurrence of infections at a rate greater than that expected within a specific geographical area and over a defined period of time.

On 22 January 2016 Tropical Public Health Services, Cairns (TPHS) confirmed an outbreak of hMPV at Herberton Hospital. As at the delivery of this interim report the outbreak has not been declared over.

The outbreak will be declared over when 3 weeks have passed from onset of symptoms in the last case, without any new infection.

To date, data collected during this outbreak indicates a total of 26 people fallen ill with symptoms of viral infection. There have been 5 confirmed cases of hMPV.

Table 2: Symptomatic and confirmed cases of viral infection – Herberton Hospital, January 2016

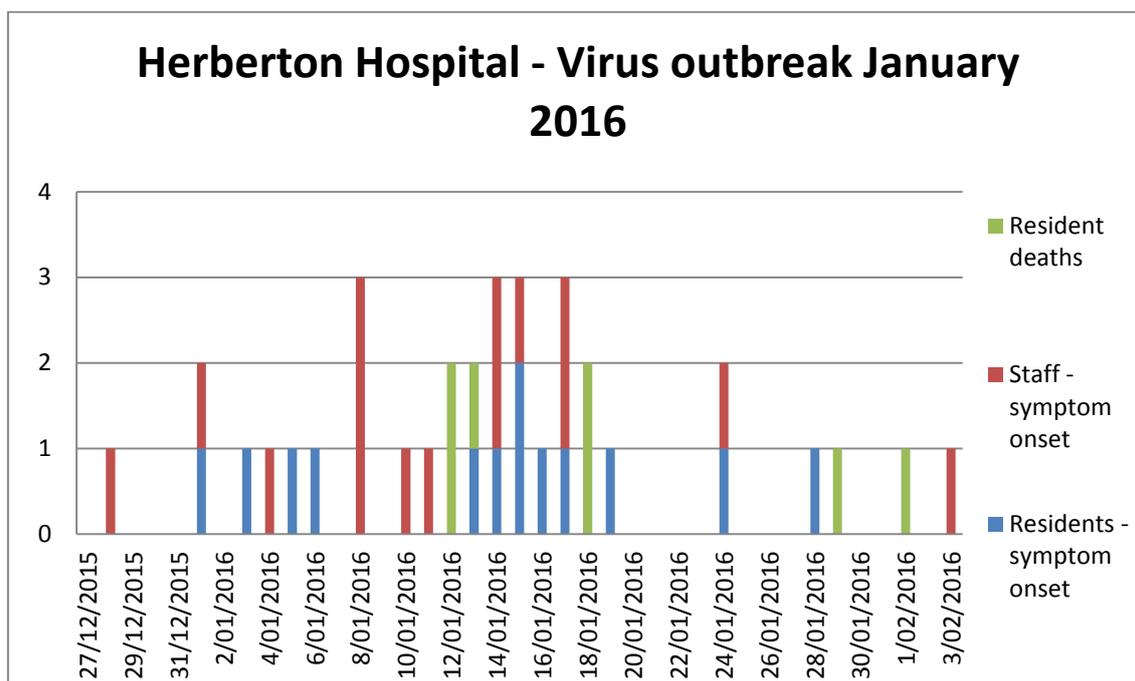
	Total symptomatic	Confirmed hMPV	Confirmed other VRI
Patients	13	3	1 – RSV (+ hMPV) 1 – Adenovirus
Staff	13	2	1 – Adenovirus

Between 12 January and 1 February, 7 patients of Herberton Hospital died. Five of these patients had symptoms of a respiratory virus. Infection with hMPV may have been a potential precipitating factor in these 5 deaths. Only one of the patients who died was confirmed by laboratory testing as having hMPV infection. Further details are provided at Table 3 (pg. 7).

The chart below shows the dates and numbers of staff and patients who displayed symptoms including temperature, cough, sore throat, runny nose/sneezing, fatigue, myalgia and headache.

The chart also shows the dates of patient deaths between 12 January and 1 February.

Figure 1: Timeline of staff and patient symptom onset and patient deaths



Tables 3 and 4 below provided additional detail on the onset of symptoms, testing and diagnosis of patients and staff respectively, based on case notes and information collated by TPHS.

Table 3: Patients - symptom onset and confirmed cases

Patient	Symptom onset	Test date	Diagnosis	Co-horted	Date of death
1	02/12/15 ¹	18/01/16 ³	Neg	N/A	N/A
2	03/01/16	N/A	N/A	N/A	12/01/16
3	05/01/16	N/A	N/A	N/A	12/01/16
4	N/A	N/A	N/A	N/A	13/01/16
5	06/01/16	25/01/16 ^{2,4}	Neg	N/A	N/A
6	13/01/16	18/01/16 ³ 21/01/06 ⁴	Neg Adenovirus ⁵	N/A	N/A
7	14/01/16	18/01/16 ³	Neg	18/01/16	N/A
8	15/01/16	18/01/16 ³	Neg	N/A	18/01/16
9	15/01/16	18/01/16 ³ 21/01/16 ⁴	Neg hMPV	N/A	N/A
10	16/01/16	18/01/16 ³	Neg	N/A	18/01/16
11	17/01/16	18/01/16 ³	Neg	18/01/16	N/A
12	19/01/16	19/01/16 ⁴	hMPV	25/01/16	N/A
13	24/01/16	25/01/16 ⁴	Neg	N/A	N/A

Patient	Symptom onset	Test date	Diagnosis	Co-horted	Date of death
14	N/A	N/A	N/A	N/A	29/01/16
15	28/01/16	28/01/16 ⁴	hMPV RSV ⁶	N/A	01/02/16

Notes:

¹ Date of onset reported as 25/12/15 but no symptoms recorded in notes until 02/01/16.

² No symptoms recorded in case notes for this date

³ Nasal swabs

⁴ Nasopharyngeal swabs

⁵ Adenovirus – group of viruses known to cause upper respiratory infection

⁶ Respiratory syncytial virus (RSV) – common virus that causes infections of the lungs and respiratory tract.

Table 4: Staff – symptom onset and confirmed cases

Staff member	Symptom onset	Test date	Diagnosis
A	27/12/15	N/A	N/A
B	01/01/16 03/02/16	N/A	N/A
C	04/01/16	N/A	N/A
D	08/01/16		
E	08/01/16	19/01/16 ¹	hMPV
F	08/01/16	19/01/16 ¹	Adenovirus
G	10/01/16 24/01/16	N/A 25/01/16 ¹	N/A Neg
H	11/01/16	N/A	N/A
I	14/01/16	N/A	N/A
J	14/01/16	N/A	N/A
K	15/01/16	19/01/16 ¹	hMPV
L	17/01/16	N/A	N/A
M	17/01/16	N/A	N/A

Notes:

¹ Nasopharyngeal swabs

² Adenovirus – group of viruses known to cause upper respiratory infection

4.1 Sequence of key events - Patient deaths

12 January

On 12 January 2016 two long-term male patients died (Patient #2 and Patient #3). The primary cause of death for both patients aged 92 and 88 respectively, was certified by the treating medical officer as acute bronchopneumonia with viral respiratory infection listed as a secondary cause. No pathology was taken to confirm the presence of viral respiratory infection in either patient.

Clinical records for Patient #2 indicate the onset of symptoms (cough and temperature) on 3 January 2016.

Clinical records for Patient #3 indicate the onset of symptoms (temperature, fatigue) on 5 January. Records and discussion with staff also indicate the presence of cough on feeding due to reduced swallowing capacity.

Patient #2 and #3 were bed bound and records indicate that both had ongoing risk of aspiration pneumonia. This was confirmed in interviews with medical and allied health staff at Herberton Hospital.

Patient #2 and #3 shared the same 4-bed room with two other male patients. Clinical records for one of the other patients in the room (Patient #1) first indicate onset of ILI symptoms on 2 January (runny nose, headache). Cough was recorded on 5 January, and fatigue on 14 January. No fever was recorded at any time. Patient #1 tested negative for viral infection when tested on 18 January (nasal swab) and 21 January (nasopharyngeal swab).

The fourth patient in the room did not display symptoms at any time and no testing was conducted.

13 January

On 13 January a 91-year old long-term female patient died (Patient #4). The cause of death was certified by the treating medical officer as multiple myeloma. Clinical records, and discussion with medical and nursing staff, confirm this patient was in a terminal phase of illness and displayed no ILI symptoms in the days preceding death. As a result, no pathology tests were conducted.

18 January

On 18 January, 2 long-term female patients died - Patient #8, aged 91 and Patient #10, aged 89. The primary cause of death for both patients was certified by the treating medical officer as acute bronchopneumonia with viral respiratory infection listed as a secondary cause.

Clinical records for Patient #8 indicate the onset of symptoms (fever, cough and fatigue) from 15 January.

Clinical records for Patient #10 indicate the onset of cough on 16 January.

Nasal swabs were taken from Patients #8 and #10 on 18 January. Both tested negative to viral infection.

29 January

On 29 January a 97-year old male patient died (Patient #14). Patient #14 had been receiving palliative care and the cause of death was certified by the treating medical officer as gastrointestinal bleed. There is no record of ILI symptoms, and no pathology testing was conducted.

1 February

On 1 February a 79-year old male patient died (Patient #15). Patient #15 had been receiving palliative care. The primary cause of death was certified by the treating medical officer as acute bronchopneumonia with aspiration listed as a secondary cause. Records for Patient #15 indicate the onset of ILI symptoms (cough and temperature) on 28 January. A nasopharyngeal swab was taken for testing on that date. Tests results received on 2 February indicate that Patient #15 was positive for hMPV and RSV.

5. Cairns and Hinterland HHS Response

This interim report provides an overview of the response of Cairns and Hinterland Hospital and Health Service to the outbreak of hMPV at Herberton Hospital. The final report will give further consideration to any potential improvements that could have been achieved in order to inform the future management of similar matters.

5.1 Notification to Tropical Public Health Services

On 18 January 2016 the Director of Nursing at Herberton Hospital notified Tropical Public Health Services (Cairns) (TPHS) by phone of the two deaths on 12 January and that 8 patients and 5 patients had shown symptoms of potential influenza-like illness.

The criteria for reporting potential outbreaks of influenza-like illness is the identification of 3 cases within 72 hours. Based on a review of patient records and data collated by TPHS, this case definition may have been met on the evening of Friday 15 January. However it is unlikely that this delay had any significant impact on clinical outcomes.

Residential care facilities are considered to be high-risk environments for outbreaks of influenza, the consequences of which can be serious particularly for vulnerable populations. In the absence of laboratory-confirmed presence of a specific pathogen, guidance from the Communicable Diseases Network Australia [10] is for the response to proceed as a potential influenza outbreak, until confirmed otherwise.

5.2 Transmission based precautions

The Australian Guidelines for the Prevention and Control of Infection in Healthcare [11] details the type and duration of precautions for specific infections and conditions.

With respect to hMPV droplet precautions are advised for all patients for the duration of illness. Special air handling and ventilation are not required and doors may remain open.

Consistent with recommendations regarding use of droplet precautions the following key measures were implemented by CHHS in response to the outbreak at Herberton Hospital,

Cairns and Hinterland HHS – Key response measures to hMPV outbreak

- No new admissions to, or transfers from, the facility
- Co-horting of symptomatic patients where possible
- Isolation of patients to rooms – no use of communal dining and lounge areas
- Availability of PPE (face masks) for use by staff and visitors
- Advice to families/visitors regarding transmission precautions, including hand hygiene and use of PPE
- Advice to visitors to defer visits if unwell
- Advice to unwell staff to not attend work until well
- Additional staff flu vaccination and use of preventative antiviral medication
- Testing of symptomatic patients and some staff

5.3 Initial response measures

In keeping with national guidelines and standards TPHS initially utilised a standard case definition for influenza that requires the presence of at least 3 symptoms,

Influenza case definition:

- sudden onset of fever ($\geq 38^{\circ}\text{C}$) PLUS
- cough and/or other respiratory symptoms (e.g. shortness of breath) PLUS
- one or more systemic symptom/s (fatigue, muscle soreness, headache).

Other symptoms may include

- sore throat
- stuffy/runny nose.

Symptoms in the elderly may also include:

- onset of or increase in confusion
- exacerbation of chronic obstructive pulmonary disease
- loss of appetite.

TPHS provided advice via telephone to the Director of Nursing, Herberton Hospital on the management of a potential influenza outbreak including implementation of recommended transmission control measures;

Additionally, TPHS arranged for supplies of influenza antiviral medication to be sent to Herberton Hospital on the same day, and commenced retrospective collection of data regarding the onset of symptoms in staff and patients.

On 18 January, in response to advice from TPHS staff at Herberton Hospital collected nasal swabs from 7 patients and moved two symptomatic patients to different rooms.

On 19 January medical and nursing staff from TPHS and CHHHS Infection Control Services attended Herberton Hospital – a public health registrar, infection control nurse

and two public health nurses (including an immunisation nurse). The public health registrar returned to Herberton on 20 January. During that time assessment and response was concentrated on patients and permanent hospital staff.

Nasopharyngeal swabs were taken from two Herberton Hospital staff members. A further staff member had a test conducted by a private general practitioner (GP) that returned a positive result. A number of other staff members had attended private GPs following the onset of symptoms but did not undertake any diagnostic testing. This is consistent with accepted practice for symptoms of this nature in otherwise healthy adults.

Two symptomatic staff members were advised to leave work. The exclusion period for staff was defined as a minimum of 5 days away from work from the onset of symptoms. This advice was provided to staff.

52 permanent staff members were offered a preventative dose of influenza antiviral medication. 50 staff members accepted and received the antiviral.

TPHS determined that treatment doses of antivirals were not required as the medication needs to be administered within 48 hours of the onset of symptoms in order to be effective. Only two staff members would have met these criteria.

Of the 52 staff members assessed, 28 had not received a recent vaccination against influenza. Vaccines were subsequently administered by TPHS to 15 of these staff members over 19-20 January. A further 12 declined to be vaccinated and one was unable to attend the hospital to receive the vaccine.

Two staff members (B & G) recovered from initial symptoms but displayed symptoms indicative of reinfection 4 weeks and 2 weeks later, respectively.

At this time TPHS commenced a review of charts for symptomatic patients and commenced collection of data in line with the case definition. An outbreak control team was established comprising the Director of Nursing, Herberton Hospital, Director TPHS, public health registrar TPHS, public health nurse and infection control nurse. Regular meetings of the team are held during the outbreak for case review and management.

It is noted that initial testing of symptomatic patients was conducted using nasal swabs and that these tests were negative for viral infection including hMPV. Subsequent testing was conducted using nasopharyngeal swabs would be expected to achieve a higher sensitivity to isolation of viruses depending on the laboratory test method used.

5.4 Restrictions on admissions, transfers and discharge

An important component of infection control procedures is the implementation of restrictions on admissions, transfers and discharges involving the affected facility. These restrictions were implemented at Herberton Hospital on 18 January and will remain in place until the current outbreak is declared over.

A review of admission records dated to the beginning of December 2015 provide no evidence that any patient was admitted to Herberton Hospital with symptoms of viral infection.

5.5 Management of visitation during the outbreak

Visitation by families and friends is encouraged and facilitated by the staff at Herberton Hospital. It is evident from visiting the facility and discussions with staff and family members, that many families make regular and frequent visits to patients in the hospital and maintain a close relationship with the staff.

In the initial days following notification to TPHS on 18 January of a potential outbreak, the Director of Nursing, Clinical Nurse Coordinator or reception staff spoke in person with visitors to explain the infection control measures that were in place. Visitors were also asked to defer their visit if they had any cold or flu symptoms.

Families who phoned the hospital prior to visiting out of hours were also informed of the situation by nursing staff.

Visitors who were well and wishing to visit symptomatic patients were instructed on the use of PPE (face masks) and hand hygiene by nurses in charge and working in the area.

Families of patients who were symptomatic and/or cohorted within the hospital were notified by phone immediately to advise the status of the family member and about transmission precautions.

From 25 January, the Director of Nursing systematically contacted nominated representatives from families of asymptomatic patients to advise that their family member was not affected by the outbreak at that time, and to explain the virus and infection control measures that had been implemented. Families were provided with contact details for the Director of Nursing and encouraged to contact her directly for any additional information and updates.

5.6 Limitations to effective isolation and cohorting

Australian guidelines recommend that patients on droplet precautions should be placed in single rooms. If there are no private rooms, patients should be cohorted.

'Cohorting' refers to the grouping together of individuals suspected or confirmed to be infected with the same pathogen within a specific area in order to minimise the risk of transmission between infected and non-infected individuals.

In some cases room availability and/or facility design means isolation to single rooms and/or cohorting is not possible. In this situation patients should be placed at least 3 feet (0.91m) away from any other patient.

Herberton Hospital is a 38-bed facility with only two single rooms which are allocated based on clinical need. Patients have access to shared bathroom facilities and a communal dining and lounge area.

The current design of the Herberton Hospital significantly limits the ability to effectively isolate patients. Additionally, the clinical and non-clinical care needs of the patients population limit some cohorting options. However, the current layout of the shared rooms means that each bed is more than 3 feet (0.91m) apart.

Due to the clinical condition of the two patients currently allocated to single rooms these rooms were unavailable for isolation during this outbreak.

During the current outbreak all patients have been restricted to their rooms and have been unable to access the communal dining and lounge areas. Given Herberton Hospital's commitment to fostering a home-like environment, staff should be mindful of the potential impact of on-going confinement on the emotional wellbeing of patients, especially those with dementia. During visits to the hospital conducted in the course of this investigation it was noted that staff were maintaining regular one-on-one contact with patients.

5.7 Internal review processes

As part of established procedures CHHHS is undertaking a number of actions to review the response to the hMPV outbreak at Herberton Hospital. This includes a clinician lead review of the 7 deaths that occurred between 12 January and 1 February.

The final report into this investigation will give consideration to the internal review processes undertaken by CHHHS.

6. Cairns and Hinterland HHS Preparedness

6.1 Regulation and other approaches to infection prevention and control

This interim report provides an overview of key aspects of CHHHS' preparedness to successfully manage outbreaks such as the hMPV outbreak at Herberton Hospital. A more comprehensive assessment of the HHS' preparedness will be included in the final investigation report.

Successful management of outbreaks is dependent on the implementation of, and compliance with a robust system for infection prevention and control. Relevant frameworks apply at various levels including,

- Regulation—legislation which can be supported by codes of practice, guidelines and protocols that may further articulate required or recommended practice.
- Standards—published documents setting out specifications and procedures designed to ensure products, services and systems are safe, reliable and consistently perform the way they were intended. They establish a common language that defines quality and safety criteria. Standards are voluntary consensus documents that are developed by agreement and their application is by choice unless their use is mandated by government or called up in a contract.
- Accreditation—health and aged care facilities are required to be accredited against national standards.

- Guidelines and related advice—these are generally advisory documents that provide more detailed guidance to practice and, when referenced in legislation, to assist with compliance.
- Local policies, procedures and protocols – documents that define processes and arrangements that recognise and respond to the context of the health service organisation in which they apply.

6.2 Infection control management plans

Chapter 4 of the *Public Health Act 2005* (Qld) (the Act) requires every health care facility to have an Infection Control Management Plan (ICMP) for the facility.

The ICMP must identify the infection risks at the facility and detail the measures to be taken to prevent or minimize the risks. All facilities that perform declared health services as defined under the Act must have an existing ICMP and review and update it before offering new declared health services.

In accordance with the Act every HHS is responsible for development and implementation of an ICMP. The ICMP for CHHHS was updated most recently in September 2014 following a risk assessment. The plan is accessible to staff via the Queensland Health intranet.

6.3 Accreditation

All public hospital organisations are required to attain accreditation against the ten National Safety and Quality Health Service (NSQHS) Standards developed by the Australian Commission on Safety and Quality in Health Care (ACSQHC) and implemented from 1 January 2013.

The standards, listed below, aim to protect the public from harm and improve the quality of care provided by health care organisations.

National Safety and Quality Health Service (NSQHS) Standards

1. Governance for Safety and Quality in Health Service Organisations
2. Partnering with Consumers
3. Preventing and Controlling Healthcare Associated Infections
4. Medication Safety
5. Patient Identification and Procedure Matching
6. Clinical Handover
7. Blood and Blood Products
8. Preventing and Managing Pressure Injuries
9. Recognising and Responding to Clinical Deterioration in Acute Health Care
10. Preventing Falls and Harm from Falls

Of particular relevance to this investigation is NSQHS Standard 3 *Preventing and Controlling Healthcare Associated Infections* [12], the intention of which is to minimise the risk for patients in acquiring preventable infections and to enable the effective management of infection when they occur by using evidence-based strategies.

In November 2014 CHHHS underwent an organisation-wide accreditation survey against the EQULP National Standards that incorporate the NSQHS standards along with 5 additional quality standards.

An Advanced Completion (AC) Review was conducted in February 2015 to consider core actions that were not met at the November 2014 survey. The AC Review determined that all outstanding actions had been satisfactorily met.

With regard to Standard 3, the final accreditation survey report, delivered after the AC Review, notes CHHHS' systematic approach to infection control via an infection control management plan which has been endorsed by the CHHHS Infection Control (IC) Committee.

The IC Committee, chaired by the Executive Director for Nursing and Midwifery, is responsible for clinical and non-clinical infection control practices across the HHS and reports through the established committee structure. A standing agenda item for each monthly meeting is the review of infection control reports for each inpatient facility including Herberton Hospital.

Additionally, the survey report notes the following improvements related to requirements under Standard 3:

- Increased representation from rural sites on the CHHHS Infection Control (IC) Committee
- All relevant reports for clinical and non-clinical data reported through the IC Committee
- Development of a standardised risk report to communicate current status including surveillance outcome indicators, auditing process indicators, infection control services (e.g. staff screening and vaccinations), and escalation of ICP associated risks.
- Improved IPC audit plan including standard and transmission-based precautions, personal protective equipment and aseptic techniques
- Monthly monitoring by IC Committee of auditing results and status

6.4 CHHHS Infection Control Services

Infection control practices across CHHHS are guided by the Infection Control Management Plan in accordance with NSQHS standards, in particular Standard 3.

CHHHS Infection Control Services (ICS) provides education and advice, and is responsible for key aspects of the HHS' infection control strategy including the staff vaccination program.

CHHHS currently has 8.3 FTE infection control staff, including 1 full time clinical nurse consultant, 3 full time clinical nurses and 1 full time clinical nurse – staff immunisations. The remaining 3.3 FTE are allocated to infection control nurses located at 8 facilities across the HHS, including Herberton Hospital.

6.4.1 Documentation

It is noted that CHHHS ICS maintain a significant presence on the Queensland Health intranet via the CHHHS site³ with links to documentation including meeting minutes, guidelines and procedures for hand hygiene, outbreak management and risk management, and the CHHHS Infection Control Management Plan.

A sub-page provides access to a suite of infection control procedures and documents. The Director of Nursing, Herberton Hospital specifically referenced this as a valuable source of information particularly during the initial stages on the current outbreak.

6.5 Hand hygiene

Hand hygiene is one of the most important aspects of preventing the spread of infection.

The accreditation report notes that CHHHS' auditing of hand hygiene meets requirements with audits conducted 3 times a year. Results of the 2015 audits are shown below for Herberton Hospital and CHHHS.

Hand hygiene compliance audits	Feb/Mar 2015	Jul 2015	Oct 2015
Herberton Hospital	78.99%	79.34%	78.01%
Cairns & Hinterland HHS – all facilities (average)	80.12%	79.72%	79.19%
Queensland Health – all public facilities (average)	81.0%	80.0%	81.0%
National – public & private facilities (average)	82.2%	82.8%	83.2%

6.6 Vaccination

Compliance with NSQHS Standard 3 requires that a workforce immunisation program that complies with current national guidelines is in use. As stated above, CHHHS Infection Control Services is responsible for delivery of the staff vaccination program and there is currently one full-time clinical nurse appointed for staff vaccinations.

When TPHS staff attended Herberton Hospital on 19 January 52 staff were assessed. 24 of those staff (48%) had received a current influenza vaccination. Vaccinations were administered to 15 unvaccinated staff, bringing the vaccination rate for that staff cohort to 75%. All but one patient of Herberton Hospital is vaccinated against influenza.

In 2015 work was conducted by TPHS to determine the need for influenza vaccine education in public and private aged care facilities located within CHHHS. This work included an informal survey of patient and staff vaccination rates in each facility. High

³ Cairns and Hinterland Hospital and Health Service Infection Control Services intranet page (not publically accessible) http://gheps.health.qld.gov.au/cairns/html/infect_cont_pro.htm

rates of patient vaccinations were reported by facilities with significantly lower rates for staff, consistent with the situation encountered by TPHS at Herberton Hospital.

6.7 Herberton Hospital local protocols

With regard to infection prevention and control, Herberton Hospital operates under the same requirements and the broader HHS. No specific local protocols or procedures have been implemented. However, the hospital is to be commended on the implementation of a number of local processes to improve the quality of care delivered to patients and the community.

6.7.1 Multi-disciplinary case review

In line with EQUIP National Standard 12 – *Ongoing assessment and care planning*, Herberton Hospital has implemented a system of multidisciplinary clinical case review for each patient involving medical, nursing and allied health staff. Reviews are conducted at least annually, with additional ad hoc reviews if required. This process is documented in a work instruction, '*Multidisciplinary team clinical case review – CHHHS, Herberton Hospital*'.

Residents' families are invited to participate in the case review process to ensure collective input and engagement in the care of each patient.

Following each case review, reports are appended to the resident's clinical record and care plans are updated by primary nurses responsible for the patient.

In visits to the hospital conducted in the course of this investigation, and in discussion with medical, nursing and allied health staff, there is evidence of a strong commitment to delivering high quality, multi-disciplinary care that contributes significantly to patients' quality of life.

6.7.2 Herberton Clinical Improvement Committee

The Herberton Clinical Improvement Committee is convened monthly and chaired by the Director of Nursing, Herberton Hospital. The committee's stated objectives are to "enhance and maintain safe practice standards and service delivery targets for Herberton Hospital, Ravenshoe and Mt Garnett Health Clinic and; support a culture that strives to achieve outstanding clinical practice in a rural health setting".

Key aims of the committee are to ensure alignment of local quality improvement systems and processes with the broader HHS, and to provide education related to accreditation activities specific to the hospital and health centres generally.

Standing agenda items for each meeting include updates on each of the national accreditation standards, including monthly rural facility infection control reports. These reports are also submitted to the CHHHS Infection Control Committee.

7. Media coverage and response

In late January 2016, there was extensive local media coverage on the outbreak. The first media reports between 23 and 25 January, focused on the decision of CHHHS to not issue a community alert for the outbreak of hMPV and further concerns were also raised about the appropriateness of the level of engagement by Dalrymple MP Shane Knuth and Tablelands Mayor Rosa Lee Long.

Further media coverage between 26 and 30 January, provided comments from family members of patients who had died during the outbreak on the need for those sick patients to be isolated within the facility.

On 3 February CHHHS issued a media statement confirming the deaths of 7 patients at Herberton Hospital, and notification to the North Queensland coroner of all 7 deaths. This statement also noted the commencement of this health service investigation.

8. Findings

To date, the investigation undertaken in relation to outbreak of human metapneumovirus at Herberton Hospital in January 2016 has found that:

- upon identifying a suspected outbreak of viral respiratory infection, Cairns and Hinterland Hospital and Health Service responded promptly and appropriately, including implementing the appropriate infection control measures to minimise the risk of transmission;
- appropriate actions and precautions were taken following laboratory confirmation of an outbreak of hMPV;
- the care of patients at Herberton Hospital was compliant with the relevant legislation, accreditation standards, policies and procedures;
- there was no admission to Herberton Hospital of any patient with symptoms of viral infection in the month preceding the outbreak;
- CHHHS' response to the outbreak did not contribute to any increased level of risk to the local community.

9. Recommendations

The symptomatic similarity of hMPV with other respiratory virus infections, and lack of any specific treatment options supports the use of a generic approach to management of respiratory infections. This reinforces consistent behaviours and common arrangements that strengthen preparedness for other potentially serious infections that can cause outbreaks in aged care facilities (e.g. outbreaks of seasonal influenza or Respiratory Syncytial virus). It also minimises the potential risk of confusion if there are disease specific arrangements.

As such these recommendations, while based on the experience of hMPV, are deliberately generic and extend across the spectrum of respiratory infection.

Based on initial findings, the following interim recommendations are made and should be considered by all similar facilities.

1. Facilities work to increase rates of annual influenza vaccination for staff and patients in all health facilities, particularly facilities that provide care for immunocompromised and vulnerable patients (e.g. elderly).
 - For residential care facilities the Communicable Diseases Network Australia identifies a target rate of 100% vaccination for residents and 90% for staff⁴
 - Families and other regular visitors of patients or residents in aged care facilities should also be encouraged to have annual seasonal flu vaccination.
2. Consistent, regular and easily accessible advice is provided to staff and visitors not to attend care facilities when they have cold or flu-like symptoms to help minimise the potential risk of the spread of infection to staff, patients and other visitors.
 - Staff should be supported to access sick leave when they have cold or flu-like symptoms and discouraged from attending work until symptoms subside.
 - Options for improving visitor access to information include placing signs at entrances and throughout the facility; and publication of advice on public websites. It is noted that this advice is included in the Herberton Hospital information brochure.
3. Local isolation and cohorting procedures should be determined in advance of an outbreak with pre-identified triggers, notification processes, isolation areas and staffing practices.
 - It is noted that the ability of each facility to effectively isolate and cohort patients is highly dependent on the physical design and available infrastructure. Options and effectiveness may also be limited by the clinical and non-clinical care requirements of the patient or resident group e.g. physical relocation of complex dementia patients may result in distress and risk of poor clinical outcomes.
 - Where cohorting and/or isolation procedures are limited, enhanced attention to infection prevention measures are required. This can include ensuring plentiful supply of tissues, bins, alcohol hand gel; enhanced staff observations and support to patients to practice good hand and respiratory hygiene; and more frequent environmental cleaning in areas where sick patients reside.
 - Staff should also implement contact and droplet precautions between each patient

⁴ Communicable Diseases Network Australia, *A practical guide to assist in the prevention and management of influenza outbreaks in residential care facilities in Australia*, Canberra, CDNA, 2009.pg 10 <http://www.health.gov.au/internet/main/publishing.nsf/Content/cdna-flu-guidelines.htm>

4. Restrict admissions, discharges or inter-facility transfers during a suspected or confirmed outbreak to minimise the risk of spread of the infection.
5. Adequate infection control expertise is made available to facilities to ensure awareness and compliance with established infection control practices to prevent and manage outbreaks; and to support the development of local protocols were required.
 - Hand hygiene and droplet precaution practices should be ingrained in facility procedures with widespread and simple access to hand hygiene facilities and tissues and availability of appropriate personal protective equipment (PPE) such as face masks, as needed.
 - Practices that are associated with increased risk of droplet spread, such as use of nebulisers, should be limited and replaced by use of spacers if clinically appropriate.
6. Access to a rapid public health response with early involvement in outbreak management is ensured by development of local protocols and relationships that encourage early notification to public health units. Easy access to contact details will assist staff who do not have regular contact with PHUs.
7. Where it is deemed appropriate, the HHS engage with the local community and key stakeholders in outbreak management strategies in addition to mandatory notification requirements:
 - During an outbreak, this may include placing signs at entrances and throughout the facility, publication of information and advice on the HHS website, media releases if required, and additional communication with patients' families.
 - In smaller communities consideration should be given to direct engagement with key local stakeholders such as the Council and local MP, to ensure they are informed of the issue and any developments.

Abbreviations

CDNA	Communicable Diseases Network Australia
CHHHS	Cairns and Hinterland Hospital and Health Service
HHS	Hospital and Health Service
hMPV	Human Metapneumovirus
NHMRC	National Health and Medical Research Council
NNDSS	Commonwealth National Notifiable Diseases Surveillance System
RSV	Respiratory syncytial virus
TPHS	Tropical Public Health Services (Cairns)

Glossary

Adenovirus	Any of a group of DNA viruses first discovered in adenoid tissue, most of which cause respiratory diseases.
Aged care	Aged care means care of one or more of the following types: <ul style="list-style-type: none"> • Residential care • Home care • Flexible care
Antiviral	An agent that kills a virus or that suppresses its ability to replicate and, hence, inhibits its capability to multiply and reproduce.
Cohorting	Grouping together of individuals suspected or confirmed to be infected with the same pathogen within a specific area in order to minimise the risk of transmission between infected and non-infected individuals.
Department of Health	When referring to the department only.
Droplet precautions	A set of practices used for patients known or suspected to be infected with agent transmitted by respiratory droplets.
Epidemiology	The study of the distribution and determinants of health conditions or events among populations and the application of that study to control health problems.
Hand hygiene	A general term referring to processes aiming to reduce the number of microorganisms on hands.
Healthcare facility	Means a facility at which a declared health service is provided and includes: Mobile premises associated with the facility Other premises or places at which persons employed or otherwise engaged at the facility provide declared health services for the facility
Hospital and Health Service	17 statutory bodies each governed by a Hospital and Health Board
Human Metapneumovirus (hMPV)	Human metapneumovirus (hMPV) is a single negative-stranded RNA-enveloped virus classified in the Pneumovirinae subfamily of the Paramyxoviridae family.
Incubation period	The time interval between initial exposure to infection and appearance of the first symptom or sign of disease
Infectious agent	A biological agent that causes disease or illness to its host (also called a pathogen or germ).
Immunocompromised	Having an immune system that has been impaired by disease or treatment
Influenza-like illness (ILI)	Influenza-like illness (ILI) is a medical diagnosis of possible influenza or other illness causing a set of common symptoms.
Long term care facilities	A range of residential and outpatient facilities designed to met the bio-psychosocial needs of person with sustained self-care deficits.
Notifiable condition	A medical condition prescribed under a regulation as a notifiable condition and which requires certain persons to notify the relevant state health department under prescribed conditions

Outbreak	The occurrence of infections at a rate greater than that expected within a specific geographical area and over a defined period of time
Pathogen	Organism capable of causing disease
Personal protective equipment (PPE)	A variety of barriers used alone or in combination to protect mucous membranes, skin and clothing from contact with infectious agents. PPE includes gloves, masks, respirators, protective eyewear, face shields and gowns.
Queensland Department of Health	The Queensland public sector health department comprising three divisions, two commercialised business units and the Office of the Director-General. Since the national and Queensland health reforms, the service delivery arm of the former department is now made up of 17 Hospital and Health Services which are statutory bodies with Hospital and Health Boards that are accountable to the local community and the Queensland Government.
Queensland Health	Term used to describe the public sector health system i.e. the Queensland Department of Health and the 17 Hospital and Health Services collectively.
Respiratory syncytial virus (RSV)	RSV is a virus that causes infections of the lungs and respiratory tract. RSV is a leading cause of lower respiratory tract infections in infants and young children but can also infect adults.
Standard precautions	Work practices that constitute the first-line approach to infection prevention and control in the healthcare environment. These are recommended for the treatment and care of all patients.
Symptomatic	Exhibiting or involving medical symptoms
Virus	A group of infectious agents characterised by their inability to reproduce outside of a living host cell. Viruses may subvert the host cells' normal functions causing the cells to behave in a manner determined by the virus.

References

1. Haas, LE et al., 'Human metapneumovirus in adults', *Viruses*, vol. 5, no. 1, 2013, pp. 87-110.
2. Van den Hoogen, BG et al., 'A newly discovered human pneumovirus isolated from young children with respiratory tract disease', *Nature Medicine*, vol. 7, 2001, pp. 719-724.
3. Bolvin, G et al., 'An outbreak of severe respiratory tract infection due to human metapneumovirus in a long-term care facility', *Clinical Infectious Diseases*, vol. 44, no. 9, 2007, pp. 1152-1158.
4. Feuillet, F et al., 'Ten years of human metapneumovirus research', *Journal of Clinical Virology*, vol. 53, no. 2, 2007, pp. 97-105.
5. Liao, RS et al., 'An outbreak of severe respiratory tract infection due to human metapneumovirus in a long-term care facility for the elderly in Oregon', *Journal of Clinical Virology*, vol. 53, no. 2, 2012, pp.171-173.
6. Osbourn, M et al., 'Outbreak of human metapneumovirus infection in a residential aged care facility', *Communicable Diseases Intelligence*, vol. 33, no. 1, 2009, pp.38-40.
7. Hamada, N et al., 'Performance of a rapid human metapneumovirus antigen test during an outbreak in a long-term care facility', *Epidemiology and Infection*, vol. 142, no. 2, 2014, pp.424-427.
8. Louie, JK et al., 'A summer outbreak of human metapneumovirus infection in a long-term care facility', *Journal of Infectious Diseases*, vol. 196, no. 5, 2007, pp. 705-708.
9. Shek, L P-C. and B-W Lee, 'Epidemiology and seasonality of respiratory tract virus infections in the tropics', *Paediatric Respiratory Reviews*, vol. 4, no. 2, 2003, pp. 105-111.
10. Communicable Diseases Network Australia, *A practical guide to assist in the prevention and management of influenza outbreaks in residential care facilities in Australia*, Canberra, CDNA, 2009.
<http://www.health.gov.au/internet/main/publishing.nsf/Content/cdna-flu-guidelines.htm> (Accessed 12 February 2016).
11. NHMRC, *Australian Guidelines for the Prevention and Control of Infection in Healthcare*, Canberra, Commonwealth of Australia, 2010.
<https://www.nhmrc.gov.au/guidelines-publications/cd33> (Accessed 12 February 2016).
12. Australian Commission on Safety and Quality in Healthcare, *Safety and Quality Improvement Guide Standard 3: Preventing and Controlling Healthcare Associated Infections*, Sydney, ACSQHC, 2012.
http://www.safetyandquality.gov.au/wp-content/uploads/2012/10/Standard3_Oct_2012_WEB.pdf (Accessed 12 February 2016).