SBAR- Risk Assessment regarding Impact of Design Ventilation on managing HAI risk in RHCYP & DCN clinical areas (not including Paediatric Critical Care)

1. Situation:

NHS Lothian are required by the National Oversight Group "*to consider its clinical service model in light of the ventilation arrangements in place for general wards and other non critical areas (incorporating literature review and design information not yet available)*".

"Engage clinical leads and Infection Prevention and Control colleagues in developing service provision strategies in the event of air handling plant failure"

In relation to the project design provided which aims to deliver the 6 air changes required by SHTM 03-01 Part A to shared bed spaces and single room accommodation through mechanical supply for 4 air changes and 2 air changes through natural ventilation (although investigation is underway to establish if this is deliverable through window opening as had been designed). NSS have required that NHS Lothian "*Confirm that all areas served by this arrangement are suitable for categorisation as general ward areas or single rooms as listed in SHTM 03-01 Part a, Appendix 1.Undertake an IPCT risk assessment ward by ward/ speciality specific in relation to the guidance"*

Independent verification (by IOM) of the ventilation system has highlighted some areas where the ventilation performance requires further review and adjustment to ensure this performs in line with the design specification outlined above. This includes shared bed spaces and single room accommodation. NHS Lothian have been asked to demonstrate through risk assessment, that the Board is assured that the provision of 4 air changes per hour on mechanical supply, rather than 6 air changes per hour on mechanical supply does not compromise patient safety by introducing either an increased risk of transmission of infection or acquisition of healthcare associated infection.

2. Background:

In line with mandatory guidance (SHPN04-01 Adult In-patient facilities; HBN 23 Hospital accommodation for children and young people), RHCYP & DCN building provides a high percentage (greater than 50%) of single room accommodation for both children and adults. RHCYP provides 62% single room accommodation, and DCN 88% single room accommodation. This represents a significant increase in single room capacity over that which is currently available.

SHTM 03-01 part A (appendix 1) and SHPN 04 Supplement 1: Isolation facilities in acute settings define the air change rates, filter requirements, mode of delivery and pressure differentials required for hospital ventilation systems. The ventilation system at RHCYP & DCN was designed to deliver the following ventilation

	SHTM 03-01 requirement	Design specification	Current performance	Comments
General ward (multi-bedded bays)	6 air changes per hour (Ach/hr) – mix of supply and natural at balanced or slightly negative	4 air changes per hour supply	Awaiting clarification from IOM	

	pressure			
Single en-suite rooms	6 air changes per hour - mix of supply, extract and natural ventilation Balanced or negative pressure	4 air changes per hour supply Balanced or negative pressure	Awaiting clarification from IOM	
Isolation rooms (Positive pressure ventilated lobby-PPVL)	10 air changes per hour Lobby at 10 Pascals positive pressure	10 air changes per hour Lobby at 10 Pascals positive pressure	Compliant	
Treatment Room	10 air changes per hour Positive pressure		Awaiting clarification from IOM	

The ventilation design and performance for some multi-bedded bays and single rooms does not conform to SHTM 03-01 part A, in terms of supply ventilation[Independent verification (by IOM) of the ventilation system has highlighted some areas where the ventilation performance requires further review and adjustment to ensure this performs in line with the design specification .

Lochranza ward (Haematology Oncology) does not have HEPA filters in the air supply ventilation to the single rooms which is indicated for rooms where neutropenic patients would be managed. The grade of air filter fitted in the supply air for these rooms (F9) is of a higher standard than the filters advocated for general ward areas or single rooms in SHTM 03-01 Part A Appendix 1 (G4 filter). As such the supply air in the single rooms of Lochranza is of a “cleaner” quality than a general ward but is not of a High Efficiency Particulate Air (HEPA) standard and this benefit would be immediately removed by opening a window to outside air as windows in the single rooms will open. The supply air ventilation in the 5 PPVL isolation rooms does pass through HEPA filters in the room lobbies. The 5 PPVL rooms do perform to the parameters set in SHTM 03-01 for rooms where all neutropenic patients can be safely placed. Windows in the PPVL isolation rooms are sealed units and do not open.

It is understood that all multi bedded bays and single rooms which do not have an opening window are provided with 6 air changes per hour (achieved through mechanical supply and extract) and positive pressure maintained to the corridor. This will be confirmed on receipt of the IOM report on the performance of all rooms against the design specification.

Assessment:

3.1 A review of all clinical departments was undertaken by the clinical leads from the project team (Janice Mackenzie, Dorothy Hanley, Fiona Halcrow); lead infection prevention and control nurse (Lindsay Guthrie) and lead infection control doctor & consultant microbiologist (Dr Donald Inverarity). This was discussed with key clinical colleagues in paediatrics and neurosciences for comment and input prior to submission to the NHS Lothian Executive Steering Group: Royal Hospital for Children and Young People and Department of Clinical Neurosciences for approval.

3.2 In view of planned revision of ventilation systems in Critical Care & Neonatal Unit to meet conformance with SHTM 03-01, it was agreed that these locations did not require to be part of this review, and will not be considered further in this paper.

3.3 A summary table of all wards, bed configuration and clinical service types which informed this risk assessment is provided in [Appendix 1]. This outlines the risk profile of patients being cared for in each area based on the clinical speciality, known patient risk factors and type of treatment or interventions provided. It also identifies anticipated HAI/IPC risks associated with each clinical area.

3.4 The highest risk patient groups are defined as:

- Any haematology/oncology patient
- Any neutropenic patient
- Any other immunocompromised patient (related to underlying disease process or treatment induced)
- Any patient with Cystic Fibrosis
- Any patient with a complex wound dressing or burn treated in the Plastics Dressing Clinic (Dunvegan Ward)
- Any patient with a known infection alert (known colonisation or history of infection with alert organism)
- Any patient presenting with a suspected or confirmed infection transmitted by contact, droplet or airborne transmission

This categorisation of patient risk is in line with the definitions provided in Scottish Health Facilities Note 30 Part B: HAI Scribe Implementation strategy and assessment process; Health Protection Scotland interim guidance for routine sampling of Pseudomonas in augmented care areas (2018); and HPS National Infection Prevention and Control Manual.

3.5 Paediatric renal dialysis is not provided at RHCYP. Any child or young person requiring this is referred to QEUH in Glasgow.

3.6 Paediatric organ transplantation is not provided at RHCYP. Any child or young person requiring this is referred to QEUH in Glasgow or specialist services in NHS England. The number of patients requiring transplantation are small, but following treatment they may be admitted to RHCYP to either a surgical ward (Tantallon) or medical ward (Dalhousie).These patients would be considered immunocompromised and managed in line with the NHS Lothian Prioritisation of Isolation Guidance, attached as [Appendix 2].

3.7 Within Lochranza (Haematology/Oncology), although the five PPVL isolation rooms provide 10 Air Changes/hour and 10 Pascals positive pressure from lobby to corridor, none of the single rooms available meet the specification for 'Neutropenic patient ward' defined in SHTM 03-01 Appendix 1 (also 10 Air Changes plus 10 Pascals positive pressure). Based on current occupancy, it is estimated by clinicians that currently there may be 5-10 neutropenic patients being cared for in RHSC on any given day. Although it is acknowledged that not all chemotherapy regimens result in the same intensity of immunosuppression and neutropenia, within the new facility, there may be a shortfall in the number of rooms which meet the SHTM 03-01 standard for safe placement of all neutropenic patients.

3.8 Appropriate patient placement and management is considered against the HPS National Infection Prevention and Control Manual (Appendix 11) and NHS Lothian Prioritisation of

Isolation Guidelines. The latter was developed by the IPCT in Lothian to assist clinical teams to risk assess and provide safe, effective patient care where demand for isolation or single room accommodation is exceeded by demand. Paediatric and Neuroscience teams have previously been directed to use this document which is applicable for placement of both paediatric and adult patients.

3.9 The review group agreed that the wards with the highest perceived overall risk of demand for isolation exceeding capacity (and thereby potential risk of onward transmission of infection) are: Castle Mey ward (Paediatric acute receiving unit); Dalhousie ward (Medical in-patients); Lochranza ward (Haematology/Oncology)

3.10 Ventilation in healthcare premises is designed to achieve a number of objectives including management of temperature and humidity, removal of odour (particularly required in wards with cancer patients receiving chemotherapy), provide a clean air path directing flow from 'clean' to 'dirty' and dilution of airborne contaminants. These latter two points are of most significance from infection prevention & control perspective.

3.11 The burden of seasonal respiratory viruses is recognised as a risk, particularly for RHCYP. This risk is however mitigated via the provision of a significantly increased availability of en-suite single room accommodation with doors. HPS National Manual Appendix 11 advocates that patients are cared for in such rooms. The risk of droplet transmission is greatest within 3 feet/1 metre of the patient. The primary protection therefore offered by en-suite single rooms is physical separation greater than 1 metre and containment of infectious patients by means of a closed door. The impact on transmission risk of a reduced air exchange rate from 6 to 4 air changes per hour in each shared bed space is unknown.

3.12 A review of all alert organism reports in the past 2 years for the current wards at RHSC and DCN demonstrates that the Paediatric Acute Receiving Unit (Castle Mey) is likely to experience the highest burden of patients with presentations due to respiratory viral infections, loose stool or diarrhoeal illness and will have both the highest turnover of patients and the highest demand on isolation and single rooms.

3.13 The risk of transmission of infection is also mitigated by application of other aspects of transmission based precautions i.e. enhanced cleaning with chlorine 1000ppm av chlorine, use of dedicated or single use equipment, use of appropriate facial or respiratory protection The application of standard infection prevention and control measures such as personal protective equipment used optimally, optimal hand hygiene and access to alcohol based hand rub across all clinical areas will also mitigate some risk of transmission of infection.

3.14 HFS have also asked that NHS Lothian risk assess and define the actions required if one or more air handling unit fails resulting in the loss of isolation room supply ventilation, noting that between 1 and 5 isolation rooms are provided off single air handling units in the new building. This specifically affects both Lochranza and Dalhousie wards. Taking cognisance of the above assessment, in the absence of an infectious disease of high consequence, and providing all other standard and transmission based precautions required by HPS NIPCM are in place, the risk of infection to patients, staff or visitors is likely to be low as SICPs would remain in use and physical isolation in a single room with doors would be maintained. Additionally an air flow from room to toilet air extract would likely continue even if supply air ventilation failed rendering the rooms at slight negative pressure or balanced pressure to the corridor with doors shut.

3.15 Depending on the nature and duration of the AHU failure, and in line with NHS Lothian Prioritisation of Isolation Guidance, a clinical risk assessment would be required in conjunction

with the IPCT to determine any further actions required on a case by case basis. This would take account of: the patient's overall clinical condition, the ward type, the infection risk and mode of transmission, the risk profile of adjacent patients and isolation room capacity unaffected by the outage.

3.16 Additional mitigating actions specific to infectious diseases of high consequence (such as MERS or Multi Drug Resistant TB) would also be required in the event of supply ventilation failure. However it is recognised that due to the low incidence and high risk consequence of such infections, that a multi disciplinary ward round or problem assessment group would likely be convened in response to a single case to support appropriate risk assessment and management.

3.17 The provision of PPVL isolation rooms rather than conventional negative pressure lobbied isolation rooms was discussed with the paediatric Infectious Diseases consultant on 11th September. It is recognised that some concern has been expressed at the suitability of this design for the care of patients with infectious diseases of high consequence (for example MERS, Multidrug resistant Tuberculosis).

3.18 It was noted that the PPVL rooms in the medical unit (Dalhousie) are served by AHU which discharge extract ventilation air through high level grilles on the roof. Therefore any potential risk to others from extracted air is minimised through upwards displacement, dilution and dispersal.

3.19 There is an agreed plan to manage any child or young person presenting through the emergency department with a suspected viral haemorrhagic fever (VHF). A change notice was discussed and agreed between the IPCT and Project team on 11/09/2015 to provide containment within 1 area of the ED including provision for ante room, toilet and treatment areas. Temporary hoardfasting will be installed which provides a physical/visual barrier to staff access.

3.20 NHS Lothian instructed IOM to confirm that the ventilation in this area was performing in line with the design specification and is balanced to corridor.

3.21 A written plan detailing how a child with potential VHF or other infectious disease of high consequence (e.g. MERS) would be managed will be developed and submitted to the Emerging Infections Preparedness Group chaired by the acute services nurse director for further scrutiny and approval. Where a high probability of VHF is suspected, the patient would be transferred directly to the nearest high level isolation facility (Freeman Hospital Newcastle)

3.22 In discussion with the senior Paediatric Haematology/Oncology clinical and management team on 3rd September, it was agreed that based on the changing risk appetite in NHS Scotland and changes in clinical practice which mean some children are rendered neutropaenic by palliative treatment, that it would be appropriate to bring all single room ventilation to the required specification for managing neutropenic patients. This is possible due to the delay in the migration of paediatric services onto the site. NHS Lothian instructed this additional work through a board change request on 6th September 2019.

3.23 A meeting was held with senior clinical staff and management from adult Neurosciences on 4th September. It was agreed that the ward configuration, patient pathways and predictable infection risks associated with both neurological and neurosurgical patients (including neuro-oncology patients) could safely be managed in the ward configuration and ventilation performance provided.

3.24 A meeting was held with a number of senior clinicians who care for children with Cystic Fibrosis on 6th September. It was agreed that further discussion relating to ventilation in RHCYP

and the impact on CF patient management would be concluded at a meeting with the wider CF team on 23rd September, with the agreement that the new hospital ventilation and delivery was not considered a barrier to safe management of patients with CF (as in-patients or out-patients). It was agreed that a service specific SOP will be developed in by a multidisciplinary CF specialist working group in conjunction with IPCT to guide appropriate CF patient placement and management of transmissible infections affecting this patient group (including Mycobacterium abscessus). It is anticipated that this work will be completed by Spring 2020.

3.25 The IPCT and Medical Director also met with Consultants in general medicine and other medical specialties on 11th Sept 2019. No concerns relating to ventilation, patient placement or patient safety were identified and staff were content with the actions described above as appropriate mitigation for the risk of transmission of infection.

3.26 The Lead Infection Prevention and Control Nurse and Doctor in conjunction with representatives from the NHS Lothian project team and Mott MacDonald (Technical Advisors to NHSL) undertook a full review of the ventilation design specification as provided by the environmental matrix, intended room function, patient risk profile and current ventilation performance based on initial IOM validation testing. A summary of that review is being finalised.

3.27 This detailed review did not reveal any further significant areas of non compliance or concern. A small number of actions were identified in relation to patient placement in OPD areas and these will be addressed through local standard operating procedures for the CF specialists, haematology oncology and therapies teams.

4. Recommendations

4.1 Staff at RHCYP and DCN should refer to and implement the NHS Lothian Prioritisation of Isolation Guidelines to ensure that all patients with a suspected or known infection risk, or who are vulnerable to opportunistic infections, are placed appropriately within all clinical care environments.

4.2 All NHS Lothian staff should continue to implement standard and transmission based precautions in line with national policy. This includes, but is not limited to, ensuring that patients with known or suspected infections are cared for in single or isolation room accommodation and the door to the room remains closed.

4.3 All children, young people or adults cared for in RHCYP & DCN who are receiving chemotherapy, radiotherapy or who are considered to be immunosuppressed should be prioritised for single room or isolation room accommodation where possible.

4.4 In line with national policy, co-horting of children with confirmed respiratory viral illness should be considered where this is clinically appropriate and demand for single room isolation has been exceeded. Strict application of standard and transmission based precautions is required for the duration of this

4.5 NHS Lothian RHCYP & DCN Executive Steering Group should note and accept the content of this SBAR assessment and relevant appendices on behalf of NHS Lothian as providing assurance that safe patient care with the controls described above can be provided in the new RHCYP & DCN building once all other remedial work specified in the Board action plan are completed. .

Appendix 1: Risk assessment patient profile, clinical activity & HAI risk

RHCYP DCN – Accommodation profile and HAI/IPC risk assessment September 2019

August 2019Ward	Total Beds	Multi bed Room	Single Room	Isolation Room	Clinical Specialties/Patient type/Procedure type	HAI/IPC Risk	Comments/Mitigation
Dalhousie: Medical Inpatients	23	3x4	3 (transitional care) 4	1 (transitional care) 3	Transitional care: • awaiting discharge • awaiting home care • step down from critical care Main ward: • Diabetes • Cystic Fibrosis • Rheumatology • Cardiology • Infectious Diseases • Meningitis (non critical care) • End of life care	Immunocompromised patients Drug induced neutropaenia (Rheumatology patients) • Known alert organism colonisation • Respiratory infection • Loose stool or diarrhoea • Febrile Rash • Febrile returning traveller	Transitional care not used for CF patient care
Kildrummy: Sleep Lab	2	0	2	0	Sleep studies Elective only - well children		

August 2019Ward	Total Beds	Multi bed Room	Single Room	Isolation Room	Clinical Specialties/Patient type/Procedure type	HAI/IPC Risk	Comments/Mitigation
Lochranza: Haematology/ Oncology **Lochranza: day case**	17*	0 1x3 (TCT) 1x6	12 0	5 0	Solid organ cancers Haematology ID immunocompromised patients (e.g. HIV) – protective isolation **Same patient profile as for in patient ward** Chemo/bloods/LP	Mixture of solid organ cancer & haematology Fluctuating demand for haematology beds 5 rooms for seriously neutropaenic patients Immunocompromised patients • Neutropaenia/Neutropaenic sepsis • Known alert organism colonisation • Respiratory infection • Loose stool or diarrhoea	In pt – *only 10 funded opened at any one time (any configuration of multi/single/isolation rooms) Have separate treatment room – clean utility etc
Dunvegan: Surgical short Stay	14	2x4	6	0	**(Elective, CEPOD & Trauma)** All surgical specialities: • Burns/Plastics • Orthopaedics • ENT • General Surgery • Oncology surgical procedures	• Known alert organism colonisation Less control over non elective patient risk factors Immunocompromised	≤72 hrs length of stay Elective patients- cancelled if 'infectious'

August 2019Ward	Total Beds	Multi bed Room	Single Room	Isolation Room	Clinical Specialties/Patient type/Procedure type	HAI/IPC Risk	Comments/Mitigation
						patients (inc short gut babies)	
Tantallon: Surgical Long Stay	15	2x4	7	0	**(Elective, CEPOD & Trauma)** • Orthopaedic & Spinal patients – #femur and ortho trauma • Oncology surgical procedures • Neonates (<10 days) requiring UV treatment (non infectious jaundice) post discharge from Simpsons	• Known alert organism colonisation Neonates –unclear if single rooms. Non infectious jaundice. Immunocompromised patients	Community midwife referrals as well as Simpsons
Dirleton: Programmed investigations		1x 4 (trolleys) 1x 5 (chairs)	3	0	Semi elective- inc. GP referral Medical day case Rash Specialist nurse clinics Diabetes **<u>Excludes</u>** • oncology patients	• Known alert organism colonisation Immunocompromised patients (IgG clinic)	Separate waiting area to segregate any child with potential infection

August 2019Ward	Total Beds	Multi bed Room	Single Room	Isolation Room	Clinical Specialties/Patient type/Procedure type	HAI/IPC Risk	Comments/Mitigation
Castle Mey: Paediatric Acute Receiving Unit (PARU)	34	3 x 4	21	1	• All medical specialties **<u>Excludes</u>** • Cystic Fibrosis • Diabetics	• Known alert organism colonisation • Respiratory infection • Loose stool or diarrhoea • Febrile Rash • Febrile returning traveller	Single room accommodation
Crichton: Surgical Admissions Unit	18	9x recovery trolley 6x pre theatre 3x chair day case	3		All surgical specialities: • Burns/Plastics • Orthopaedics • ENT • General Surgery • Oncology surgical procedures • Medical elective procedures (GI) • Oncology day care (Weekly Intrathecal list; line replacement) • Oncology CEPOD or urgent cases	• Known alert organism colonisation	Elective & CEPOD Includes Oncology patients

August 2019Ward	Total Beds	Multi bed Room	Single Room	Isolation Room	Clinical Specialties/Patient type/Procedure type	HAI/IPC Risk	Comments/Mitigation
Borthwick: Paediatric Neurosciences	12	2 x 4	3 - 2 x telemetry rooms	1	• Neurosurgery • Neuro-oncology • Neurology	Elective & non • Known alert organism colonisation • Respiratory infection • Loose stool or diarrhoea • Febrile Rash • Febrile returning traveller • Meningitis	Paediatric Neuro-oncology neutropaenic patients would be managed in Lochranza ward
Critical Care & Neonatal Unit					Critical Care Neonates		See separate risk assessment
Plastic Dressings Clinic					• Complex dressing changes • Burns dressing changes (very low numbers)	• Known alert organism colonisation	ARJO bath for soaking dressings – water safety plan to apply
ED					Accident and Emergency	• Known alert organism colonisation	Cubicles. Short length of stay (<4 hr)
Ward 130: Adult Neurosciences acute care	24	2x4	15	1	• LOS ≤72 hrs • Emergency admission ("new"/unknown	• Known alert organism colonisation • Respiratory	No level 2 or 3 capacity – go to RIE 118 (Adult Critical Care)

August 2019Ward	Total Beds	Multi bed Room	Single Room	Isolation Room	Clinical Specialties/Patient type/Procedure type	HAI/IPC Risk	Comments/Mitigation
					pt) SAH, trauma • Recovered craniotomy patients e.g. de-bulking of tumours • Spinal surgery e.g. anterior decompression • New cancers (undiagnosed)	infection • Loose stool or diarrhoea • Febrile Rash • Febrile returning traveller • Immunocompromised patients • Repatriated Neurosciences patients with MDRO/CPE risks	SOP to guide appropriate boarding from RIE to be developed in conjunction with IPCT, clinical services & site management team.
DCN theatres: Adult Day of surgery area		5 x couches			• admission/prep for surgery		Elective only Return to ward 230 post recovery
Ward 230: Adult Neurosurgery	24	0	23	1	• Step down from RIE 118 and 130 • Post operative patients (recovering) • Some direct elective admission	• Known alert organism colonisation	Single room accommodation
Ward 231: Adult Neurology	19*		18- 4 x telemetry	1	• Existing DCN patients – emergency admissions	• Known alert organism colonisation • Respiratory	*15 funded beds Single room accommodation

August 2019Ward	Total Beds	Multi bed Room	Single Room	Isolation Room	Clinical Specialties/Patient type/Procedure type	HAI/IPC Risk	Comments/Mitigation
	4	3 x chair 1 x trolley			• Planned elective investigations PIU – neurology pt for investigations	infection • Loose stool or diarrhoea	PIU Monday-Friday elective day case only

Appendix 2: NHS Lothian Prioritisation of Isolation Guideline (2017)

Patient Isolation Prioritisation and Assistance with Isolation Prioritisation Risk Assessment

1. Occupants of all single rooms should be reviewed daily by the clinical team of doctors and nurses managing the patient with regard to why they are still occupying a single room and whether that reason or reasons remain legitimate. This will include consideration of patients receiving end of life care.

2. The optimal and safe placement of infected patients and the patients who they may have contact with should be foremost in planning isolation prioritisation.

3. In prioritising isolation rooms, particularly where there demand for single rooms is greater than capacity, staff must consider:
   - The organism/disease (confirmed or probable) – see table 1
   - Patient symptoms (presenting patient)
   - Type of ward/environmental factors, and
   - Risk profile of other patients in immediate area.

4. If isolation is mandatory or preferable but not possible, the inability to isolate presents a significant clinical risk to patients and should be escalated to:
   - The site and capacity team
   - the clinical nurse manager/senior nurse on call for the area, and
   - the infection prevention and control team.

5. Immediate actions required by ward staff:
   - Arrange increased frequency of bed space cleaning immediately (using Chlor clean)
   - Reinforce and promote staff hand hygiene
   - Ensure compliance with the appropriate transmission based precautions (TBPs) enforced.
   - Consider restriction of any patient movement from the room or bay where the patient has been placed.
   - A clear risk assessment should be documented in case notes as to why isolation has not occurred.

6. If site & capacity staff or clinical teams are uncertain how to apply any part of this guidance; or prioritise a single room between 2 or more patients with conditions on this the list; a Microbiologist, Virologist or Infection Prevention & Control Nurse **MUST** be contacted to agree prioritisation of single room accommodation.

Table 1: Isolation Priorities

MANDATORY ISOLATION **'MUST ISOLATE'**	**ISOLATION IS OPTIMAL AND PREFERABLE** Further risk assessment required (see footnotes)	**ISOLATION NOT REQUIRED**
Viral Unexplained loose stool, diarrhoea[1] and vomiting (i.e. suspected infectious diarrhoea or proven Norovirus)[2] Community acquired respiratory infection with cough and fever > 38˚C pending viral investigation results [3,4] Respiratory Syncytial Virus (RSV) [4] Adenovirus [3,4] Human metapneumovirus [3,4] Measles Middle Eastern Respiratory Syndrome (MERS)[5] Viral Haemorrhagic Fevers [5] (suspected or proven) with direct person to person transmission e.g. Ebola, Lassa Fever, Congo Crimean Fever Rubella Chicken Pox (Varicella) Shingles if vesicles are on face or if patient is	**Viral** Hepatitis A [14, 24] Hepatitis E [14] Shingles [15] Rhinovirus [3,4] Parainfluenza [3,4] Mumps	**Viral** Viral Haemorrhagic Fevers that do not generally transmit directly person to person e.g. Dengue, Chikungunya, West Nile Fever Viral Meningitis HIV Hepatitis B [20] Hepatitis C [20] Glandular Fever/Epstein Barr Virus infection Herpes simplex virus Cytomegalovirus

immunocompromised. Any patient with an undiagnosed vesicular rash Vesicular rash due to an enterovirus. Influenza A or B [4,6] Rotavirus		
Bacterial *C. difficile* (toxin positive) with diarrhoea[1] *C. difficile* equivocal with diarrhoea[1] Untreated Smear Positive Pulmonary (Open) TB [5,7] Drug Resistant TB [5] Streptococcus pyogenes (Group A Strep) infections including Scarlet Fever (untreated or within 48 hours of starting antibiotics) [8] Panton Valentine Leukocidin (PVL) producing Staphylococcus aureus or PVL producing MRSA (with active soft tissue infection) [9] *Bordetella pertussis* (Whooping cough) [25] Salmonella with diarrhoea[1] *Salmonella typhi* or *Salmonella paratyphi*	**Bacterial** Non Pulmonary (Closed) TB or smear negative pulmonary TB [16] Necrotising Fasciitis [17] MRSA [18] Mycoplasma [3,4] Multidrug resistant (MDR) Gram negative bacteria [19] *Haemophilus influenzae* [3] (from respiratory samples) *Streptococcus pneumoniae*[3] (from respiratory samples)	**Bacterial** Non Tuberculous Mycobacteria e.g. *M. avium, M. intracellulare, M. abscessus etc.*[21] Legionella *C. difficile* equivocal with no diarrhoea[1] *C. difficile* (toxin positive) with no diarrhoea[1] for > 48 hours Invasive meningococcal disease (meningitis or septicaemia) after first 24 hours of antibiotic treatment *Streptococcus pyogenes* (Group A Strep) infection after first 24 hours of antibiotic treatment and evidence of a clinical response (e.g. resolution of temperature, normalisation of pulse and blood pressure, resolving cellulitis) [8] *Stenotrophomonas*

(carriage or infection) Shigella carriage or infection Campylobacter with diarrhoea[1] Verotoxin Producing *E. coli* (VTEC) carriage or infection Gram negative organisms resistant (or intermediate) to Meropenem (e.g. CPE, Acinetobacter)[10,11,12] Suspected bacterial meningitis but pathogen unknown Petechial rash with fever or other manifestations of invasive meningococcal disease (meningitis or septicaemia) within first 24 hours of antibiotic treatment. Neutropenic sepsis (post cytotoxic chemotherapy)[13] Vancomycin Resistant Enterococci (VRE)		*maltophilia* [21] *Burkholderia cepacia* [21] *Pseudomonas aeruginosa* [21] *Listeria monocytogenes* [22]
Other Body Lice Scabies	**Other** Pneumocystis jirovecii [23] Head Lice	**Other** Cryptococcal meningitis Intestinal parasites with no diarrhoea[1]
Adapted from CDC 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. http://www.cdc.gov/ncidod/dhqp/pdf/isolation2007.pdf		

Consider the following factors to allocate isolation rooms where demand is greater than single room capacity for patients with the same infection.

Table 2: Risk factors affecting isolation priority

Risk Factors For Transmission of Infection		
	Higher Risk of Transmission	**Lower Risk of Transmission**
Source Patient	• Incontinent of Stool • Loose stool or diarrhoea • Discharging skin lesions • Skin lesions not dressed or covered • Requires extensive hands on care • Is immunosuppressed • In ITU • Has invasive devices in situ • Poor compliance with personal hygiene or infection control practices e.g. cognitively impaired • Coughing patient (within 1 metre of other patients)	• Continent • Good personal hygiene • Skin lesions or wounds covered by dressings • Good respiratory hygiene • Able to self care • Complies with infection control precautions
Pathogen	• Survives well in environment (e.g. C difficile, *Streptococcus pyogenes*) • Low infective dose (e.g. E coli 0157, Shigella, norovirus) • Airborne (e.g. influenza, RSV) • Spread by direct contact (e.g. MRSA) • Able to colonise devices • Can have an asymptomatic carrier state (e.g. MRSA)	• Unable to survive long in environment • High infective dose • Low pathogenicity (e.g. campylobacter) • Short period of infectivity
Ward Environment	• Poor ward hygiene • Shared equipment • Equipment not adequately decontaminated between patients • Crowded facilities • Shared facilities (e.g. showers, baths, toilets, commodes, taps)	• Good ward hygiene • Dedicated equipment • Adequate bed spacing • Dedicated toilet and bathroom facilities • Low patient to nurse ratio

	• High patient to nurse ratio • Normal pressure ventilation and airborne pathogen	
Susceptibility of potential contacts if source patient not isolated	• ITU patients • Patients requiring extensive hands on care • Indwelling devices or invasive procedures being performed • Non intact skin • Debilitated, malnourished • Extremes of age • Recent antibiotic treatment • Immunosuppression • Not immunised against circulating pathogen (e.g. influenza)	• Able to self care • No indwelling devices • Intact skin and mucous membranes • Normal immune system • Immunised against circulating pathogen
Adapted from "Routine Practices and Additional Precautions For Preventing The Transmission of Infection in Health Care Settings" (2013) Public Health Agency of Canada.		

Appendix A: Explanatory Notes for Situations Listed in Table 1.

[1] World Health Organisation definition of diarrhoea is, “the passage of three or more loose or liquid stools per day (or more frequent passage than is normal for the individual). Frequent passing of formed stools is not diarrhoea, nor is the passing of loose, "pasty" stools by breastfed babies.”

[2] If patient has vomited or had diarrhoea within a multiply occupied area then the whole area/bay should close to admissions and transfers and the whole area/bay cleaned with Chlor Clean. The source patient should be isolated if possible and the remaining patients cohorted for observation of symptoms of D&V over the following 48 hours. If no single rooms are available for the source patient they should remain in the closed area cohorted with the other exposed patients.

[3] If patient febrile (>38˚C), coughing or sneezing then isolation is a priority but if has positive laboratory test but none of the above symptoms then isolation is not absolutely necessary as long as not in direct contact with immunocompromised patients or patients with chronic lung disease or cardiac disease. The need for isolation of respiratory infections is often driven more by the susceptibility of contacts than the pathogenicity of the organism e.g. effects are much more severe in patients undergoing cytotoxic chemotherapy and bone marrow transplant. There order of priority for isolation with respiratory viral infections is adenovirus takes priority over human metapneumovirus which takes priority over parainfluenza which takes priority over rhinovirus.

[4] If within 1 metre of patient who is coughing a fluid repellent fluid shield and eye protection should be worn.

If performing aerosol generating procedures then an FFP3 mask should be worn.

[5] Negative pressure isolation room should be used. Transfer of an already isolated patient with a novel or emerging pathogen (e.g. MERS) solely to accommodate in a negative pressure room is not advised.

[6] Close contacts of influenza patients prior to their isolation may benefit from post exposure prophylaxis with oseltamivir. The influenza vaccination history of close contacts must also be known to assess their risk of secondary infection.

[7] Patient can only be removed from isolation once the following criteria are met:

- The patient has had a minimum of 14 days of appropriate therapy **and**;
- The patient has had at least 3 consecutive negative sputum smears taken on
- separate days, or complete resolution of cough **and**;
- The patient has had a definite clinical improvement as a response to therapy, for example remaining afebrile for 1 week **and**;
- The patient has demonstrated tolerance to therapy and ability to agree to adhere to treatment **and**;
- Advice has been sought from a member of the Infection Prevention and Control Team (IPCT) before removing a patient from isolation. The IPCT should ensure that the patient is not placed by patients who are immuno-compromised.

[8] If treatment is only partial (e.g. devitalised or necrotic tissue or ulcer remains) carriage (and risk of onward transmission) can remain for up to 6 months. If there is a risk or evidence (e.g. *S. pyogenes* continues to be cultured from the patient) of persisting carriage, patient should remain in isolation until negative sample cultures are received. Clearance sampling should be collected 72 hours after antibiotics have stopped. Examples of patients that should remain in isolation are:

- Patients with significant discharge of infectious bodily fluids
- Patients with invasive Group A Strep (iGAS) infections
- Patients with infected eczema or other skin conditions associated with significant skin shedding
- Mothers and neonates on maternity units
- Patients on burns units

[9] Active lesions should also be covered with an appropriate dressing.

[10] Isolation must continue for the entire duration of the admission and should optimally occur within 6 hours of organism identification.

[11] Does not include *Stenotrophomonas maltophilia* which is always resistant to Meropenem.

[12] Screening of the source patient and contacts will be required. Discuss with infection control team.

[13] Isolation is to protect the patient from the environment and ideally the room should be under positive pressure compared to the corridor. If not possible normal atmospheric pressure is acceptable but negative pressure should not be used. Note that only patients who are neutropenic post cytotoxic chemotherapy require isolation, a transient drop in neutrophils below 1 x 10^9/L can occur in severe sepsis in immunocompetent people but in such patients neutrophils have transiently left the blood stream and are functional at the site of infection and so isolation is not required.

[14] Only needs isolation if PCR positive. Isolation not required if only serology is positive.

[15] Vesicles should be covered and patient should not be in contact with immunocompromised, non-immune or pregnant individuals. Shingles on the face or in individuals who are immunosuppressed should be treated as per chickenpox.

[16] If there is significant exudate or drainage then isolation is preferable. Only patients on appropriate treatment with evidence of response to treatment should be considered as appropriate candidates not to isolate. Any tuberculous lesions must be enclosed within the body or covered and the patient must not come into contact with immunocompromised patients.

[17] If the causative organism is not *Streptococcus pyogenes, Bacillus anthracis* or PVL producing MRSA or PVL producing MSSA isolation is not required.

[18] If patient is exuding body fluids, incontinent or shedding significant volumes of skin squames then isolation should be considered mandatory.

[19] Should be resistant to 3 or more of the following classes of antibiotic e.g. beta lactams ((such as amoxicillin, coamoxyclav, piperacillin-tazobactam, temocillin) cephalosporins (ceftriaxone, cefalexin, cefuroxime), monobactams (aztreonam)), aminoglycosides (gentamicin, amikacin), fluoroquinolones (ciprofloxacin, levofloxacin), glycylcyclines (Tigecycline) to merit isolation. Isolation should be prioritised if patient has loose stools or diarrhoea or discharging wounds. The requirement for isolation is prioritised as ESBL producing *Klebsiella sp.* > carbapenem resistant *Pseudomonas aeruginosa* > ESBL *E. coli* > AmpC producing Enterobacteriaceae.

[20] Isolation is not required if there is little possibility of body fluid contamination of the environment. If patient is bleeding or at risk of contaminating environment with body fluids (e.g. active bleeding) consider isolating. Patients for haemodialysis MUST be isolated.

[21] Isolate if patient has cystic fibrosis and/or likely to be in close contact with patients with cystic fibrosis, bronchiectasis or lung transplant.

[22] Presents a risk to pregnant individuals, neonates and immunocompromised patients and so may need to isolate the patient with Listeria infection if contact with such people is likely.

[23] Do not isolate in a ward with transplant patients.

[24] Post exposure vaccination should be considered for non immune contacts.

[25] If the patient has not been treated with appropriate antibiotics for a full 5 days- discuss with Microbiologist. Respiratory protection is required by staff (surgical face mask) until 5 days of appropriate antibiotic treatment is complete.