

Diagnostic Strategy and Lab Preparedness in the Face of Emerging Diseases

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Emerging Infections

Emerging infections may be:

- A recognised infection spreading to new areas or populations
 - e.g. West Nile virus
- The result of discovering that a known disease is caused by infection
 - e.g. Hepatitis C
- A previously unrecognised infection appearing in areas where the habitat is changing
 - e.g. Nipah virus
- A new infection resulting from change(s) in existing microorganisms
 - e.g. pandemic influenza
- An "old" infection re-emerging because it has become resistant to treatment, or as a result of a breakdown in public health initiatives
 - e.g. tuberculosis (MDR), syphilis
- A novel infection described for the first time
 - e.g. novel coronavirus

Preceding events

- 49 year old Qatari man, previously healthy
- 31/7/12 – 18/8/12
 - Travel to Saudi Arabia
 - URTI, fully recovered 3 days after returned to Qatar
- 19/8/12 – 3/9/12
 - Back in Qatar, visited his own farm (camels and sheep)

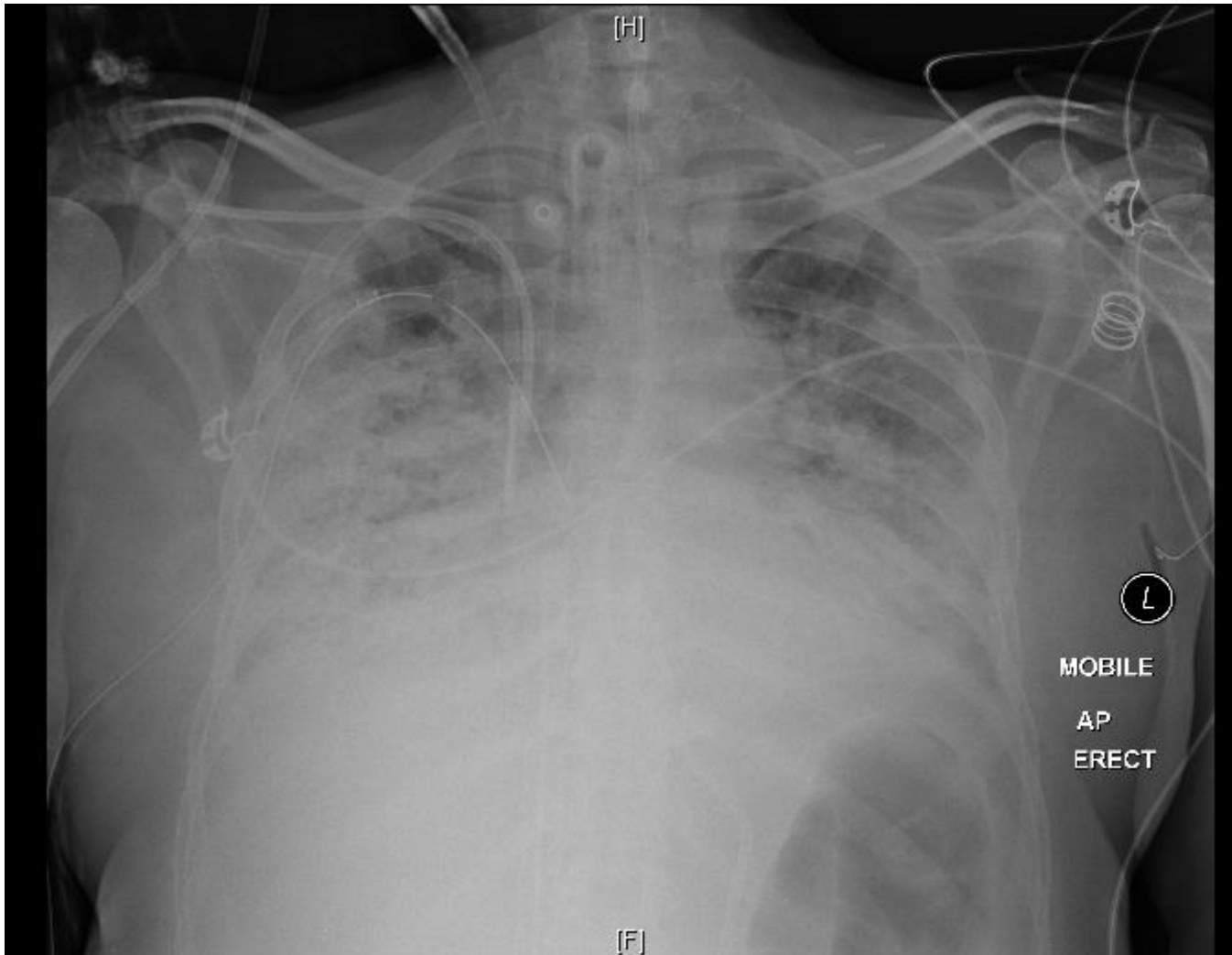
Onset of illness

- 3/9/12
 - Cough, myalgia, arthralgia, treated with antibiotics
- 8/9/12
 - Admitted to hospital with fever, hypoxia (sat 91% room air), CXR – bilateral lower zone consolidation, treated with ceftriaxone, azithromycin, oseltamivir
- 10/9/12
 - Deterioration. Require intubation and ventilation
 - Air lifted by air ambulance to London

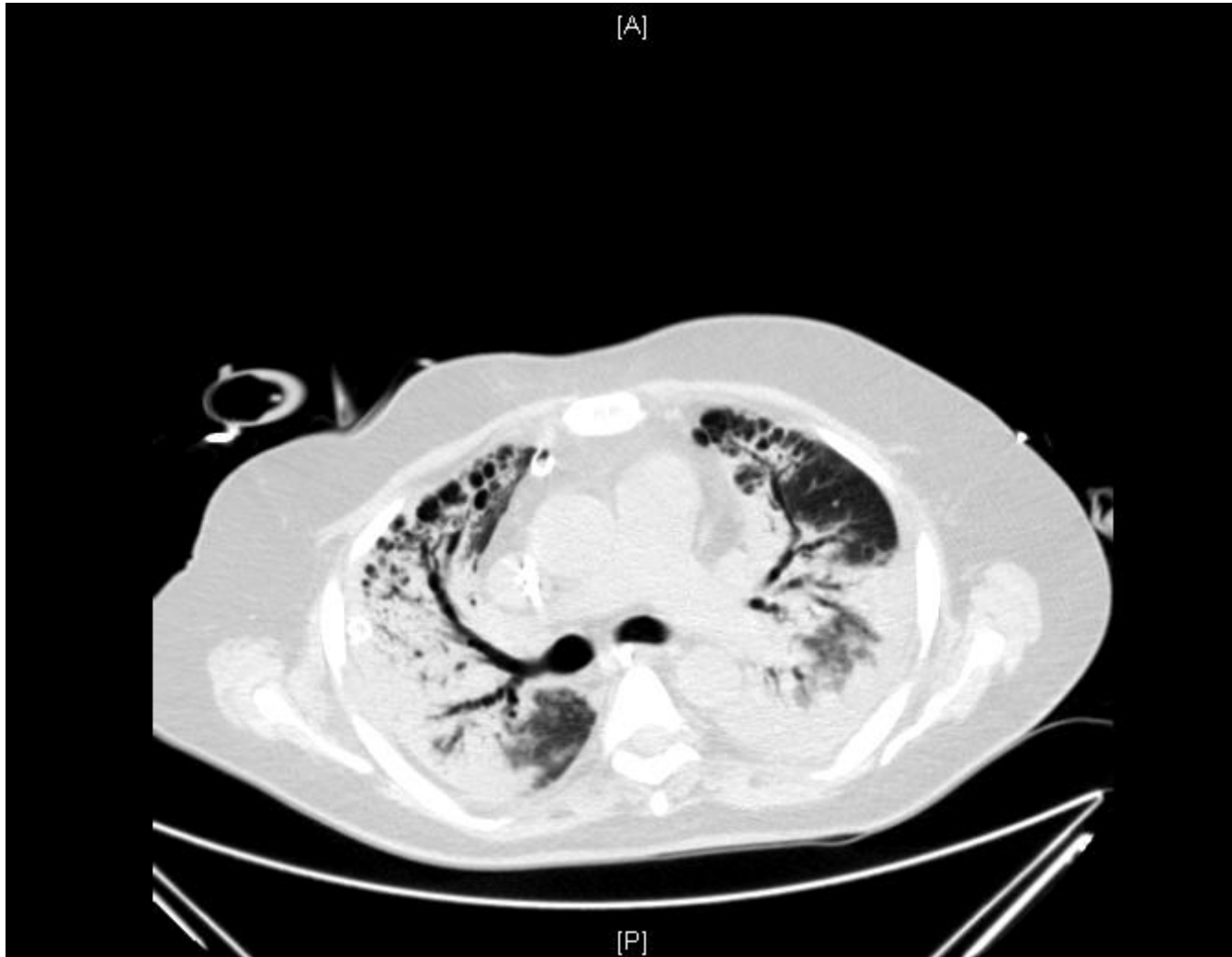
Arrival in London

- 11/9/12- 20/9/12
 - Managed in a private hospital
 - Further deterioration
- 20/9/12
 - Transferred to ITU of St. Thomas' Hospital for ECMO
 - Bronchoscopy performed

CXR on arrival at STH



CT on arrival at STH



Parallel event

- 20/9/12
 - ProMed report of a novel coronavirus in Saudi Arabia
 - Picked up by a registrar working in the imported fever service
 - Suspicion raised because of travel history

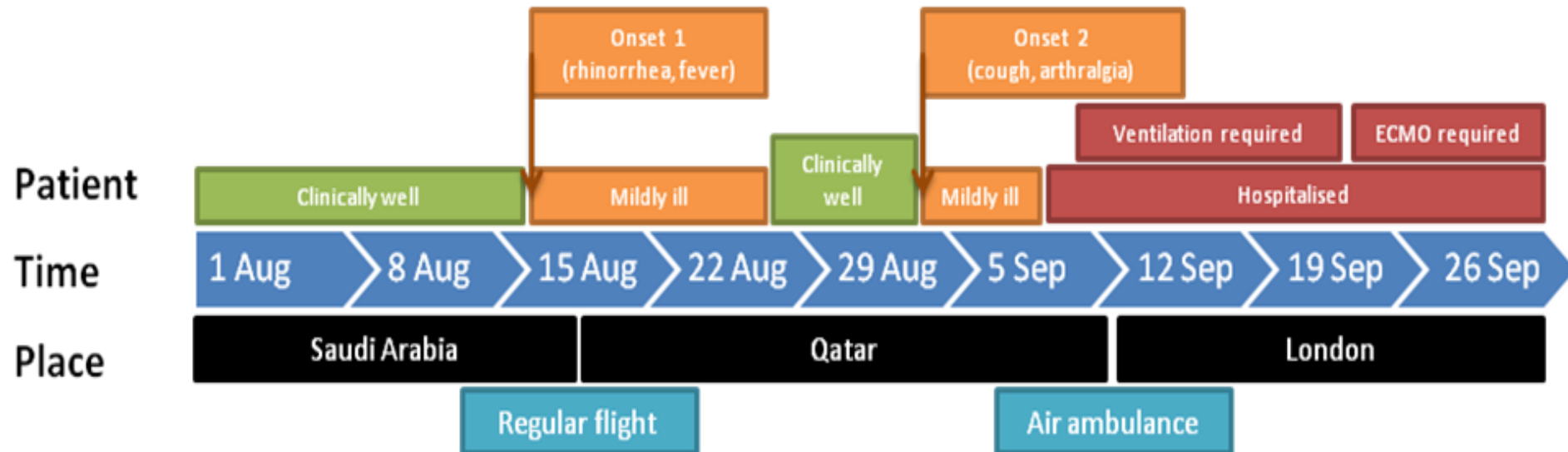
Fateful Friday evening

- 21/9/12
 - Pancoronavirus PCR positive
 - PCR for OC43, 229E, NL63, HKU1 negative
 - Alarm bell rang
- 22/9/12 – 23/9/12
 - 251 bp of NSP12 gene sequenced
 - Comparison to the Dutch sequence showed 99.5% homology

Aftermath of event

- 34 health care workers in contact with the patient
- An unprotected aerosol generating procedure performed on open ward
- Numerous teleconferences and outbreak meetings
- Thankfully, no secondary transmission identified

Summary timeline of events



Clinical Case definition



HPS nCoV CASE ALGORITHM

Version case_v13 19/02/2013

For all email contact with HPS Colindale, please use respiratory.lead@hpa.org.uk

INVESTIGATION AND PUBLIC HEALTH MANAGEMENT OF POSSIBLE CASES OF SEVERE ACUTE RESPIRATORY ILLNESS ASSOCIATED WITH A NOVEL CORONAVIRUS

POSSIBLE CASE

Any person with severe acute respiratory infection:

- Symptoms of fever ($\geq 38^{\circ}\text{C}$) or history of fever, and cough

AND

- With evidence of pulmonary parenchymal disease (eg. clinical or radiological evidence of pneumonia or Acute Respiratory Distress Syndrome (ARDS))

AND

- Not explained by any other infection or aetiology¹

AND EITHER

- History of travel to, or residence in an area where infection with novel coronavirus 2012 could have been acquired² in the 10 days before symptom onset
- OR
- Close contact³ during the **ten days** before onset of illness with a confirmed case of novel coronavirus infection while the case was symptomatic
- OR
- Healthcare worker based in ICU caring for patients with severe acute respiratory infection, regardless of history of travel or use of PPE
- OR
- Part of a cluster of two or more epidemiologically linked cases within a two week period requiring ICU admission, regardless of history of travel

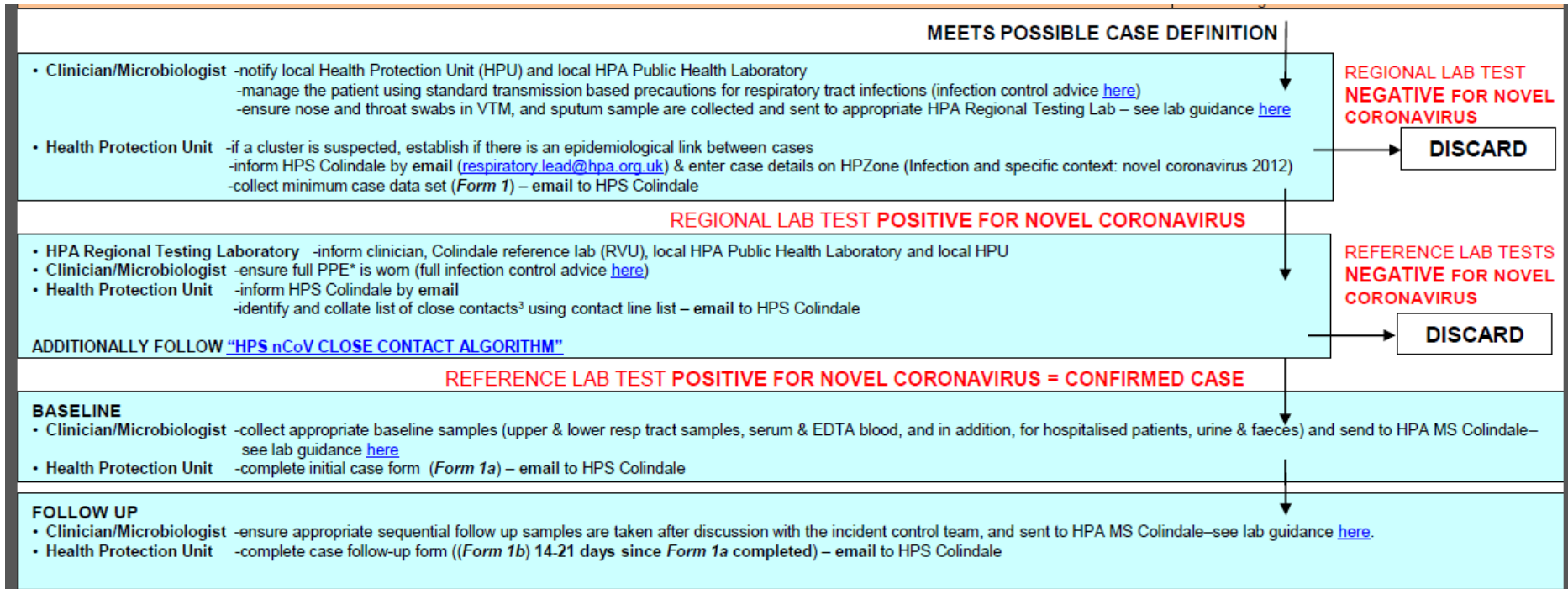
¹ if the patient has an alternative aetiology, but this does not fully explain the presentation and/or clinical course, then the patient should be considered a possible case and tested for novel coronavirus

²as of 03/12/2012.; Bahrain, Iraq, Israel, Jordan, Kingdom of Saudi Arabia, Kuwait, Lebanon, Occupied Palestinian territories, Oman, Qatar, Syria, UAE and Yemen – see [map](#)

³close contact is defined as:

- prolonged face-to-face contact (>15 minutes) with a symptomatic confirmed case in a household or other closed setting
- OR
- healthcare or social care worker who provided direct clinical or personal care or examination of a symptomatic confirmed case, or within close vicinity of an aerosol generating procedure AND who was not wearing full PPE* at the time

Confirmation of a case



Role of regional laboratories

Contact the Duty Microbiologist/Virologist at nearest HPA Public Health Laboratory who will make arrangements for transport of sample(s) to both the designated HPA Novel Coronavirus (nCov) testing laboratory and local HPA laboratory. The Local (referring) laboratory will inform the appropriate Health Protection Unit

Samples should be (at the very minimum):

A duplicate set of nose and throat swabs in viral transport medium, a sputum sample, and an acute serum sample

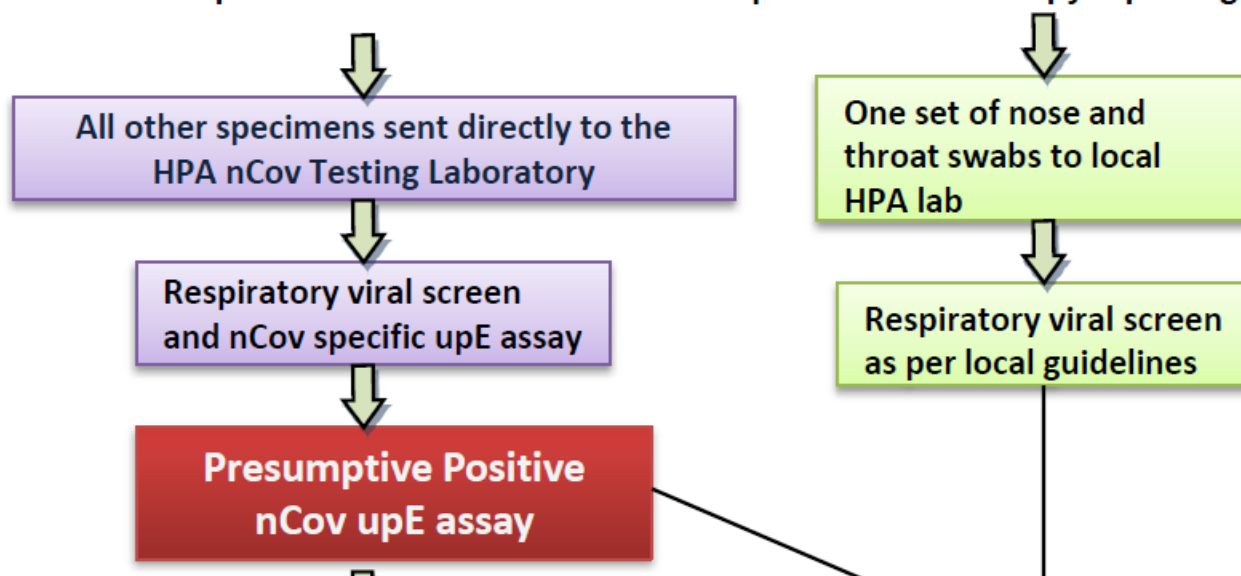
Samples should be sent by:

Enhanced Category B Transport

http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1317136377440

Samples **MUST** be handled at **Containment Level (CL) 3**

Please provide full contact details for telephone and hard copy reporting back to the originating laboratory




Contact details of HPA Public Health Laboratories

Manchester 0161 276 8853
Birmingham 0121 424 3244
Leeds 0113 392 3499
Southampton 02380 796408
Cambridge 01223-257037
Bristol 0117 342 5551
Newcastle 0191 282 1150
London (The Royal London) 0203 246 0311



**Locations of
the Regional
Public Health
Laboratories
in England**

Confirmation by a Central Reference Laboratory



Virus detected by screening tests
(but not confirmed)

HPA Testing Lab will send residual material
URGENTLY to HPA Colindale for confirmatory testing



Positive

CONFIRMED CASE



REPORTING RESULTS

- The Public Health testing Laboratory will report results to source Trust/GP by telephone and hard copy report. Refer queries on results and clinical advice to the Duty Microbiologist/Virologist at your nearest/local HPA Public Health laboratory

REPORTING RESULTS:

- Colindale will report results to source Trust/GP, to the HPA Novel Coronavirus Testing Laboratory and the local HPA Public Health Laboratory by telephone and hard copy report. Refer queries on results and clinical advice to the Duty Microbiologist/Virologist at your nearest/local HPA Public Health laboratory

Interaction of the network

- Regular teleconferences between network laboratories
 - Exchange intelligence
 - Standardised method
- Proficiency panel
 - Test ability to detect pathogens
 - Test surge capacity
 - Test ability of a rapid turnaround time

Summary of Strategy

- A central reference laboratory
 - Confirmation of samples with positive screening
 - Standardise methodology
 - Alert to changes in viral sequences
 - R&D
 - Organise proficiency panel
- A network of regional laboratories with public health duty
 - Perform rapid local screening
 - Identify local outbreaks

Challenges

- Develop new assays for new infectious agents
- Update assays regularly as virus strain changes
- Privatised local laboratories with little incentive to public health commitments
- Budget cut
- Awareness fatigue in health care workers and the public