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EXERCISE

Rome 2018

Scenario

Scenario Timeline for Exercise Rome 2018

Event: Multi-country outbreak of severe sepsis and multi-organ abscesses with hyper-virulent carbapenem-resistant *Klebsiella pneumoniae* (hvCRKP)

Block 1

12 December:

- Spain two fatal cases of carbapenem-resistant *Klebsiella pneumoniae* (CRKP) infection in two young, previously healthy adults in the hospital.
- One patient was transferred three days earlier from the hospital in Genoa

13 December:

- Spain - third 43-year-old male patient with fulminant meningitis with CRKP is being treated in the ICU of the same hospital in Madrid.
- Spain - A review of *Klebsiella pneumoniae* isolates at the laboratory identifies three additional isolates from three different patients in the last fifteen days. Screening of all patients admitted in the ICU of the Hospital Universitario identified one more patient carrying carbapenem-resistant *Klebsiella pneumoniae*. The patient had no active infection. The strain was sent for further testing.

The Hospital in Genoa had three cases with carbapenem resistant *Klebsiella pneumoniae* sepsis in the surgical ward in the last fifteen days.

- a businessman, who had transferred three weeks ago from a University Hospital in Bulgaria,
- footballer who was transferred to Spain and died,
- third a Maltese national (34-years-old male) who remains in ICU. – Italy has more details.
- patients admitted to the same surgical ward as the businessman and the football player, two from Malta, one from Greece, one from Portugal and one from Turkey. The Greek, Portuguese and Turkish patients have since returned home for further treatment and recuperation.

Block 2

Day 10 (22 December):

The patient from Greece was a 21-year-old male who suffered from paraplegia after an accident three years ago and had undergone multiple surgical interventions because of recurrent pelvic osteomyelitis. He was transferred the same day the footballer died and is currently hospitalised in a private hospital in Athens with fulminant sepsis. Active screening with rectal swabs is initiated. Three patients, one from Albania, one from Montenegro and the third from Athens are sharing the same room and all are positive for hvCRKP. The carriers remain in the same room with dedicated nursing staff (patient and nurse cohorting). Contact precautions are implemented.

Whole genome sequencing (WGS) of the hvCRKP isolates is performed at the reference laboratory in Italy. All the isolates are K1-, *magA*-, *rmpA*- and *rmpA2*-positive, confirming the hypervirulent phenotype. The isolates are confirmed as pandrug-resistant, producing the NDM-1 and OXA-48 carbapenemases, and expressing the *mcr-2* gene. Core genome multilocus sequence typing (cgMLST) shows that the strain belongs to sequence type 23 (ST23). The results of WGS from six isolates from separate patients in Spain also confirm that three of them shared the same hypervirulent genomic signature. The other three were carbapenem-resistant but not hypervirulent. No further patients have been detected in the Spanish hospital with *Klebsiella pneumoniae* infection

The second Maltese patient (60-years-old male) is at home in Malta, recovering from the orthopaedic operation without symptoms. A screening culture is performed and he is positive for CRKP. The isolate is tested by the hospital laboratory and is confirmed to be hvCRKP by the “string test”.

The Greek patient transferred from Genoa to Hospital in Athens is presenting with high fever and confusion.

A screen of medical staff in the Genoa’s hospital has revealed that a Romanian nurse is colonised with the *Klebsiella pneumoniae* strain. This nurse has recently arrived in Italy having

EXERCISE ROME 2018

SCENARIO

previously worked in Romania for several years at the University Hospital of Bucharest. The nurse has been in Italy for approximately three months and is currently working two jobs, one at the Genoa's hospital and one at a private clinic specialising in plastic surgery. A highly respected Ukrainian plastic surgeon runs this clinic attracting many patients from his former country and from Croatia where he has a second clinic which he visits 1 week in 4 to conduct surgical procedures. He also has his original clinic in Kiev which he runs with his partner. Many Ukrainian patients have their initial consultation in this clinic in Kiev but the procedure is then carried out in the other two clinics before returning to Kiev to convalesce.

Block 3

(Consideration of measures taken in different settings).

Day 14 (26 December):

Vignette 1

A plastic surgeon who operates a network of private reconstructive (plastic) surgery clinics in Genoa, Italy; Split, Croatia and Kiev, Ukraine is requesting advice and support. He has been advised one of his employees, a nurse working in acute care, has been identified as a carrier of the hvCRKP strain following a screen at the Genoa's Hospital where she also works. He is seeking advice on what measures to take in his clinics. He is also concerned his business may be damaged if news of this incident leaks to the press.

Vignette 2

Extensive screening in the Bulgarian University Hospital has identified two cases of hvCRKP colonisation, one in a healthcare worker in a surgical ward and one in a patient in an orthopaedic ward, both by string test. Samples have been sent for whole genome sequencing and results are awaited. The hospital is requesting advice and support on what additional control measures to routine infection control to take.

Vignette 3

Extensive contact tracing and screening of patients who have attended as an inpatient at the University Hospital in Bucarest and who came into contact with the nurse carrying hvCRKP has begun. One case who was treated by the nurse, fully recovered, and returned to their geriatric nursing home, but later died of sepsis, is of particular interest. The hospital is requesting advice and support on what additional control measures to standard infection control are being recommended and the nursing home is also asking for advice on measures as a precaution whilst screening results are awaited.

Vignette 4

A Spanish patient in a private hospital in Porto, Portugal has told the hospital that he wishes to return home to his geriatric residential home near Salamanca, Spain. It was confirmed 4 days ago that he is carrying the hvCRKP strain. The nursing home are requesting advice and support from the hospital on what control measures are recommended and for how long these control measures need to be in place. The hospital is unsure what to say and have contacted both Spanish and Portuguese authorities to advise them of the situation.

Vignette 5

The Greek patient with fulminant sepsis and positive for hvCRKP hospitalised in a private hospital in Athens has sadly died. The Albanian and Montenegrin patients who had been sharing the same room and are now carrying the hvCRKP strain are insisting on returning to their home countries immediately and have been in touch directly with their embassies. The private hospital in Athens is looking for advice on what actions to take. The embassies are also seeking information to support their citizen's repatriation.

Vignette 6

Two patients in a geriatric medicine ward the Central hospital in Izmir, both positive for hvCRKP by the string test with the results from further confirmatory tests linking them to the wider outbreak reported in Italy and Spain awaited, are about to be discharged. One is returning to his village of Yeni Foça to work in the family hotel and restaurant. The other is returning to his residential home, which he shares with 80 other residents over the age of 70.

Vignette 7

The wife of the Maltese national (34-years-old male), who remains in ICU in the Genoa's hospital, is found to be carrying the hypervirulent CRKP strain by WGS. She is 36 weeks pregnant. It has been a difficult pregnancy and her obstetrician is planning for a caesarean section due to her pre-eclampsia in the coming days. The maternity hospital is looking for advice.

Day 23 (3 January):

Two new patients with completely different bacterium and antibiotic resistance phenotype identified in Portugal. The two patients have upper urinary tract infection and secondary bacteraemia caused by extensively drug-resistant *Salmonella enterica* serovar Kentucky (producing the VIM-2 carbapenemase). The first patient was a 38-year-old woman in the postpartum period and the second a 62-year-old man with kidney stones. Both cases were linked to a small outbreak of gastroenteritis in the hospital. An epidemiological investigation has identified a ward nurse carrying this *Salmonella* strain who had travelled to Bulgaria the previous month to visit her family and on return had an episode of mild self-limiting gastroenteritis.

Closing summary of outbreak:

Day 30 (12 January):

The results of a multi-country epidemiological investigation coordinated by ECDC on the initial outbreak are released. In total since 1st November 2018, 98 patients with hvCRKP have been identified and confirmed by WGS analysis to be ST23 and clustering within less than 10 allelic differences by cgMLST. Among them, 72 patients were carriers and 26 had infections. Most (21/26) of the infections were bacteraemias with fulminant sepsis. Among the remaining five infections, three patients had multiple liver abscesses, one patient had endophthalmitis and one had multiple foci of pyomyositis. The case fatality rate of hvCRKP infections was 85%.

All colonised patients are under contact precautions in hospital or at home. Follow-up cultures have been performed. The outbreak continues to be managed and no new cases have been reported. Health authorities are confident the outbreak is being managed effectively.