

Three years of Enhanced Surveillance of Multi-Drug Resistant *K. pneumoniae* (MDRKP) in Ireland: 2014– 2016

Key points

- Comparing 2016 with 2015, there was a **19% increase** in the total numbers of MDRKP reported
- The MDRKP/CRE phenotype **increased by approximately two-fold (195%)**: with 119 cases reported in 2016 compared with 61 cases in 2015

Introduction

A national increase in **multi-drug-resistant *Klebsiella pneumoniae* (MDRKP)** was first identified by the Antimicrobial Resistance and Microbial Ecology (ARME) Group at NUI Galway in the autumn of 2013. Following this, an increase in bloodstream infections (BSI) caused by MDRKP was also confirmed through the Irish European Antimicrobial Resistance Surveillance Network (EARS-Net) data reported to the Health Protection Surveillance Centre (HPSC). An outbreak control team (OCT) was established at HPSC in October 2013 to review existing surveillance data and request additional data from hospital laboratories. Following this, prospective national surveillance for MDRKP commenced in January 2014.

Case definition

The **first isolate per patient per quarter** of *K. pneumoniae* derived from any specimen type (both clinical and screening) that are (1) ESBL-producers and non-susceptible to both ciprofloxacin and gentamicin **OR** non-susceptible to 3rd generation cephalosporins (3GC) and ciprofloxacin and gentamicin, where investigation for ESBLs is not routinely carried out [**MDRKP/Non-CRE**] **AND/OR** (2) carbapenemase-producers [**MDRKP/CRE**].

Results

Appendix 1 summarises the data reported by acute hospitals and Hospital Groups during the three years of prospective MDRKP surveillance in Ireland.

- Over three years (2014 – 2016), 1,449 MDRKP cases were reported by 53 (88%) of 60 acute hospitals in Ireland (Tables 1 & 2). Seven acute hospitals; specialty (n=5), general (n=1) and private (n=1) did not report any MDRKP cases. By Hospital Group, the total MDRKP cases (including hospitalised and non-hospitalised) ranged from 172 (RCSI Hospitals Group) to 303 (South/South-West Group), with paediatric and private hospital data excluded. The Midwest Group reported the highest number of MDRKP/CRE (n=86, or 37% of all MDRKP/CRE cases)
- MDRKP/Non-CRE accounted for 1,215 (84%) and MDRKP/CRE for 234 (16%). Of the MDRKP/CRE cases, 23% also fulfilled the MDRKP/Non-CRE criteria, but were categorised as MDRKP/CRE for the purposes of this report
- Clinical specimens accounted for the majority of MDRKP isolates (n=1,171; 81%). However, an upward trend is evident in the proportion detected from screening specimens (rectal swabs/faeces); 25% in 2016 versus 16% in both 2014 and 2015
- While two-thirds of cases were associated with patients admitted to or attending an acute hospital, one-third of cases were detected in patients attending general practice or residents of long-term care facilities (LTCF)

- Of 804 MDRKP cases from hospital inpatients:
 - Information on antimicrobial therapy for MDRKP infection was provided for 484 (58%), of whom 282 (58%) had required antimicrobial therapy for MDRKP infection prior to case notification
 - Information on patient isolation was provided for 553 (66%), of whom 465 (84%) were isolated within 24 hours of the laboratory reporting MDRKP detection. Therefore, 16% were not isolated and the isolation status of 34% was either not provided or unavailable

Trends over time

In 2016, there were 534 cases of MDRKP (415 MDRKP/Non-CRE and 119 MDRKP/CRE) from 480 patients, with some previously known patients with MDRKP reported again in a different quarter (Table 2). This reflects **an increase of 19%** from 449 cases (388 MDRKP/Non-CRE and 61 MDRKP/CRE) from 385 patients in 2015. Excluding repeat notifications from the same patient, defined as **one isolate per patient over the 12-month period**, there was **an increase of 25%** from 385 cases in 2015 to 480 cases in 2016 (Table 1).

In 2016, the number of MDRKP/CRE cases **increased by almost two-fold (or 195%)**, with 119 cases (representing 22% of all MDRKP cases) reported (Table 1) compared with 61 cases in 2015 (14% of all MDRKP cases).

Table 1. Annual summary of MDRKP cases: 2014 to 2016

	TIME PERIOD								COMMENT ON TOTAL DATA
	2014		2015		2016		TOTAL		
	Jan-Dec	Jan-Dec	Jan-Dec	Jan-Dec	Jan-Dec	Jan-Dec	Jan 2014-Dec 2016	Jan 2014-Dec 2016	
MDRKP (based on case definition of 1st isolate per patient per quarter, see Table 1 above)	n	%	n	%	n	%	n	%	of which 976 cases (67%) associated with 53 (of 60) acute hospitals (including outpatients)
	466		449		534		1449		
Patients with MDRKP (based on one isolate per patient per year)	411		385		480		1276		
of which:									
MDRKP/Non-CRE	363	88%	332	86%	379	79%	1074	84%	71 KPC, 88 OXA-48, 42 NDM, 1 NDM/OXA-48
MDRKP/CRE	48	12%	53	14%	101	21%	202	16%	

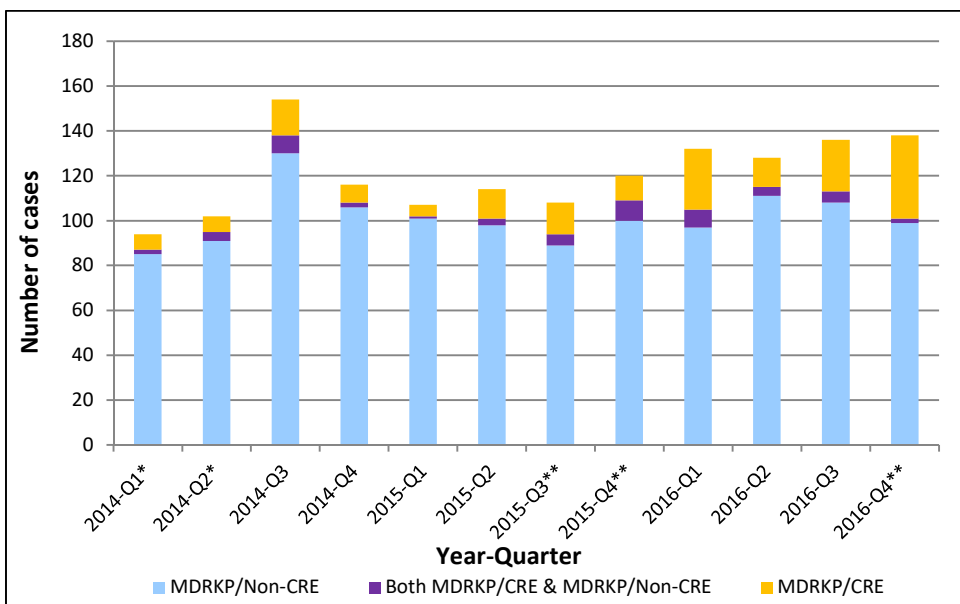


Figure 1. Quarterly MDRKP cases (CRE and Non-CRE): Q1 2014 – Q4 2016

*No data from one tertiary hospital for Q1-2 2014; ** No data from one general hospital for Q3-4 2015 and Q4 2016

Table 2. Summary of MDRKP (based on 1st isolate per patient per quarter as per case definition) by time period, Jan 2014 to Dec 2016

	TIME PERIOD								COMMENT ON TOTAL DATA
	2014		2015		2016		TOTAL		
	Jan-Dec	Jan-Dec	Jan-Dec	Jan-Dec	Jan-Dec	Jan-Dec	Jan 2014-Dec 2016	Jan 2014-Dec 2016	
	n	%	n	%	n	%	n	%	
MDRKP cases (based on case definition of 1st isolate per patient per quarter)	466		449		534		1449		of which 976 cases (67%) associated with 53 (of 60) acute hospitals (including outpatients)
of which: MDRKP/Non-CRE	412	88%	388	86%	415	78%	1215	84%	
MDRKP/CRE	54	12%	61	14%	119	22%	234	16%	93 OXA-48, 82 KPC, 58 NDM, 1 NDM/OXA-48
Clinical vs screening									
Clinical	393	84%	376	84%	402	75%	1171	81%	including 87 CRE: 35 OXA-48, 32 KPC, 20 NDM
Screening	73	16%	73	16%	132	25%	278	19%	including 147 CRE: 58 OXA-48, 50 KPC, 38 NDM, 1 NDM/OXA-48
Source (specimen type for clinical isolates only)									
Normally sterile site	29	7%	37	10%	33	8%	99	8%	including 9 CRE: 8 OXA-48, 1 KPC
Urine	279	71%	259	69%	301	75%	839	72%	including 53 CRE: 23 KPC, 16 NDM, 14 OXA-48
Sputum/respiratory	29	7%	38	10%	21	5%	88	8%	including 14 CRE: 7 OXA-48, 6 KPC, 1 NDM
Swab/tissue/pus/other	56	14%	42	11%	47	12%	145	12%	including 11 CRE: 6 OXA-48, 3 NDM, 2 OXA-48
Location									
Hospital*	318	68%	299	67%	358	67%	975	67%	including 188 CRE: 88 OXA-48, 71 KPC, 28 NDM, 1 NDM/OXA-48
Inpatient (non-ICU)	207	44%	206	46%	259	49%	672	46%	including 146 CRE: 72 OXA-48, 52 KPC, 21 NDM, 1 NDM/OXA-48
ICU	27	6%	36	8%	19	4%	82	6%	including 17 CRE: 11 OXA-48, 4 KPC, 2 NDM
ED	41	9%	22	5%	41	8%	104	7%	including 5 CRE: 3 KPC, 1 NDM, 1 OXA-48
Outpatient	43	9%	35	8%	39	7%	117	8%	including 20 CRE: 12 KPC, 4 NDM, 4 OXA-48
Nursing home<CF/GP	148	32%	152	34%	174	33%	474	33%	including 46 CRE: 30 NDM, 11 KPC, 5 OXA-48
Nursing home<CF	55	12%	63	14%	99	19%	217	15%	including 36 CRE: 25 NDM, 8 KPC, 3 OXA-48
GP	93	20%	89	20%	75	14%	257	18%	including 10 CRE: 5 NDM, 3 KPC, 2 OXA-48
Demographics									
Male	238	51%	250	56%	259	49%	747	52%	
Age range	0-97		0-103		0-101		0-103		
Median age	73		72		73		72		
Inter-quartile range	57-82		58-81		61-82		58-82		75% of patients are aged 58 years or older
Interventions (for in-patients only)¹									
Total no. MDRKP cases from inpatients**	250		234		320		804		Data collected from Feb 2014 onwards only
Case treated for MDRKP infection?									
Treated for infection	95	38%	96	41%	91	28%	282	35%	
Not treated for infection	51	20%	49	21%	102	32%	202	25%	
Unknown/Not answered	104	42%	118	50%	127	40%	349	43%	
Isolation within 24 hours of MDRKP identified?									
Isolated within 24 hours	148	59%	137	59%	180	56%	465	58%	
Not isolated within 24 hours	31	12%	28	12%	29	9%	88	11%	
Unknown/Not answered	71	28%	98	42%	111	35%	280	35%	
Healthcare-association (for all patients)²									
Total no. all MDRKP cases	399		449		534		1382		Data collected from Mar 2014 onwards only
Healthcare-association of MDRKP?									
Healthcare-associated	186	47%	200	45%	262	49%	648	47%	
Not healthcare-associated	48	12%	52	12%	76	14%	176	13%	
Unknown/Not answered	165	41%	197	44%	196	37%	558	40%	

* includes Inpatients (non-ICU), ICU, ED and Outpatients

** includes in-patient (non-ICU), ICU and ED

¹ Data from Feb 2014 onwards only; ² Data from Mar 2014 onwards only

Appendix 1. Total MDRKP cases reported by acute hospitals from Q1 2014–Q4 2016

Hospital Group	HOSPITAL	Category	Total MDRKP	MDRKP/Non-CRE	MDRKP/CRE	Hospitalised patients only	% of cases detected on screening	% Hospitalised cases that were treated†	% Hospitalised cases that were isolated†
Dublin Midlands	Coombe Womens and Infants University Hospital	Specialist	3	3	0	2	67%	0%	50%
Dublin Midlands	Midland Regional Hospital, Portlaoise	General	9	9	0	3	0%	0%	67%
Dublin Midlands	Midland Regional Hospital, Tullamore	General	19	15	4	10	0%	50%	40%
Dublin Midlands	Naas General Hospital	General	51	51	0	13	2%	NA	NA
Dublin Midlands	St James's Hospital	Tertiary	66	66	0	32	2%	87%	97%
Dublin Midlands	St Luke's Hospital, Rathgar	Specialist	3	3	0	3	0%	100%	100%
Dublin Midlands	Tallaght Hospital ¹	Tertiary	120	76	44	97	28%	30%	67%
Dublin North East (RCSI)	Beaumont Hospital	Tertiary	109	104	5	66	5%	47%	53%
Dublin North East (RCSI)	Cavan General Hospital ²	General	15	15	0	6	0%	100%	20%
Dublin North East (RCSI)	Connolly Hospital, Blanchardstown	General	20	19	1	12	5%	67%	78%
Dublin North East (RCSI)	Louth County Hospital, Dundalk	General	0	0	0	0	NA	NA	NA
Dublin North East (RCSI)	Our Lady of Lourdes Hospital, Drogheda	General	25	24	1	15	4%	83%	92%
Dublin North East (RCSI)	Rotunda Hospital	Specialist	3	3	0	3	33%	0%	100%
Ireland East	Cappagh National Orthopaedic Hospital	Specialist	0	0	0	0	NA	NA	NA
Ireland East	Mater Misericordiae University Hospital	Tertiary	54	54	0	30	0%	NA	NA
Ireland East	Midland Regional Hospital, Mullingar	General	4	3	1	3	0%	100%	100%
Ireland East	National Maternity Hospital, Holles St.	Specialist	5	5	0	5	60%	40%	100%
Ireland East	Our Lady's Hospital, Navan	General	4	1	3	3	75%	NA	NA
Ireland East	Royal Victoria Eye and Ear Hospital, Dublin	Specialist	0	0	0	0	NA	NA	NA
Ireland East	St Columcille's Hospital, Loughlinstown	General	3	3	0	3	0%	100%	100%
Ireland East	St Luke's Hospital, Kilkenny	General	5	3	2	5	20%	50%	100%
Ireland East	St Michael's Hospital, Dun Laoghaire	General	1	1	0	0	0%	NA	NA
Ireland East	St Vincent's University Hospital, Elm Park	Tertiary	101	95	6	49	19%	93%	97%
Midwest (UL)	Croom Hospital	Specialist	1	1	0	0	0%	NA	NA
Midwest (UL)	Ennis Hospital	General	10	4	6	10	50%	100%	100%
Midwest (UL)	Nenagh Hospital	General	11	6	5	8	18%	NA	NA
Midwest (UL)	St John's Hospital, Limerick	General	10	4	6	9	60%	20%	80%
Midwest (UL)	University Hospital Limerick	Tertiary	133	64	69	67	39%	17%	88%
Midwest (UL)	University Maternity Hospital Limerick	Specialist	0	0	0	0%	NA	NA	NA
South/South West	Bantry General Hospital	General	7	7	0	7	0%	100%	NA
South/South West	Cork University Hospital	Tertiary	127	126	1	68	2%	98%	78%
South/South West	Kerry General Hospital, Tralee	General	65	65	0	18	3%	NA	0%
South/South West	Kilcreene Orthopaedic Hospital, Co. Kilkenny	Specialist	0	0	0	0	NA	NA	NA
South/South West	Mallow General Hospital	General	2	2	0	2	0%	100%	NA
South/South West	Mercy University Hospital	General	22	22	0	22	5%	52%	100%
South/South West	South Infirmary/Victoria University Hospital, Cork	General	4	4	0	3	0%	0%	100%
South/South West	South Tipperary General Hospital, Clonmel	General	10	8	2	9	20%	86%	100%
South/South West	University Hospital Waterford	Tertiary	66	38	28	53	29%	56%	100%
South/South West	Wexford General Hospital	General	9	8	1	9	56%	63%	100%
West/North West (Saolta)	Galway University Hospitals	Tertiary	155	150	5	95	27%	29%	95%
West/North West (Saolta)	Letterkenny General Hospital ³	General	40	14	26	6	55%	60%	67%
West/North West (Saolta)	Mayo General Hospital, Castlebar	General	26	20	6	14	12%	83%	90%
West/North West (Saolta)	Portiuncula Hospital, Ballinasloe	General	15	15	0	9	13%	100%	100%
West/North West (Saolta)	Roscommon County Hospital	General	12	11	1	11	67%	33%	71%
West/North West (Saolta)	Sligo Hospital	General	17	16	1	10	24%	90%	67%
Acute Paediatric Services	Children's University Hospital, Temple St.	Specialist	5	5	0	5	60%	40%	100%
Acute Paediatric Services	Our Lady's Children's Hospital, Crumlin	Specialist	27	21	6	18	59%	25%	100%
Acute Paediatric Services	Tallaght Hospital (National Children's Hospital)	Specialist	0	0	0	0	NA	NA	NA
Private	Aut Even Hospital, Kilkenny	Private	0	0	0	0	NA	NA	NA
Private	Beacon Hospital, Sandyford	Private	2	1	1	2	0%	NA	100%
Private	Blackrock Clinic	Private	3	3	0	3	0%	100%	100%
Private	Bon Secours Hospital, Cork	Private	11	11	0	10	18%	25%	89%
Private	Bon Secours Hospital, Galway	Private	1	1	0	1	0%	NA	NA
Private	Bon Secours Hospital, Glasnevin	Private	10	10	0	5	0%	33%	100%
Private	Bon Secours Hospital, Tralee	Private	2	1	1	2	0%	NA	100%
Private	Galway Clinic, Doughiska	Private	10	10	0	9	60%	0%	100%
Private	Hermitage Medical Clinic, Lucan	Private	3	3	0	3	0%	100%	100%
Private	Mater Private Hospital, Cork	Private	3	3	0	2	0%	0%	100%
Private	Mater Private Hospital, Dublin	Private	5	5	0	5	0%	100%	100%
Private	St Vincent's Private Hospital	Private	3	1	2	3	33%	0%	100%
Other/Non-acute	Other/Non-acute	Other/Non-Acute	2	2	0	0	50%	NA	NA
TOTAL			1449	1215	234	858	19%	58%	84%

¹ No data from Jan-Jun 2014; ² No data from Oct-Dec 2016; ³ No data from Jul-Dec 2015

84% 16% 59%

† Proportion of cases for which this information was provided; * Data not provided or insufficient data (i.e. answered for less hospitalised cases); NA, Not applicable