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Analysis and comparison of cumulative antibiograms for Charlotte Maxeke Johannesburg Academic Hospital adult intensive care and high care units, 2013 & 2017

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Appendix 1. Antibiogram for the *Enterobacteriaceae* (first-isolate results), 2013 versus 2017.

Isolates	Total *n* isolates		% Susceptibility to Routinely Tested Antimicrobial Agents															
			AMP	AMC	PTZ	CTX/ CRO	CAZ	CPM	ETP	MEM	IPM	CIP	GM	TOB	AMK	CT	TGC	SXT
2013 *Klebsiella* spp.	69	Total no. isolates with sensitivities	69	68	69	69	69	69	69	69	69	68	67	67	69	-	-	62
		No. of susceptible isolates	0	13	43	20	20	24	65	67	67	40	28	26	64	-	-	15
		Susceptible Isolates, %	0%	19%	62%	29%	29%	35%	94%	97%	97%	59%	42%	39%	93%	-	-	24%
		(95% CI)	(0-6)	(11-30)	(51-73)	(20-41)	(20-41)	(25-47)	(86-98)	(89-100)	(89-100)	(47-70)	(31-54)	(28-51)	(84-97)	-	-	(15-36)
2017 *Klebsiella* spp.	85	Total no. isolates with sensitivities	85	85	85	85	85	85	85	85	85	37	84	17	83	76	57	84
		No. of susceptible isolates	0	34	41	37	38	45	77	83	82	16	46	5	77	76	57	40
		Susceptible Isolates, %	0%	40%	48%	44%	45%	53%	91%	98%	96%	43%	55%	29%	93%	100%	100%	48%
		(95% CI)	(0-5)	(30-51)	(38-59)	(33-54)	(35-55)	(42-63)	(82-95)	(91-100)	(90-99)	(29-59)	(44-65)	(13-53)	(85-97)	(94-100)	(92-100)	(37-58)
2013 vs. 2017		*p* value	1,000	**0,008**	0,104	0,068	0,065	**0,034**	0,549	1,000	1,000	0,154	0,141	0,580	1,000	-	-	**0,006**
2013 *Escherichia* spp.	58	Total no. isolates with sensitivities	58	58	58	58	58	58	58	58	58	57	58	57	58	-	-	55
		No. of susceptible isolates	5	27	49	38	39	42	57	58	58	36	39	37	57	-	-	14
		Susceptible Isolates, %	9%	47%	84%	66%	67%	72%	98%	100%	100%	63%	67%	65%	98%	-	-	25%
		(95% CI)	(3-19)	(34-59)	(73-92)	(53-76)	(54-78)	(60-82)	(90-100)	(93-100)	(93-100)	(50-75)	(54-78)	(52-76)	(90-100)	-	-	(16-38)
2017 *Escherichia* spp.	69	Total no. isolates with sensitivities	68	69	69	69	69	69	69	69	69	35	69	16	68	62	45	68
		No. of susceptible isolates	7	31	55	45	53	58	69	69	69	24	52	12	68	62	45	18
		Susceptible Isolates, %	10%	45%	80%	65%	77%	84%	100%	100%	100%	69%	75%	75%	100%	100%	100%	26%
		(95% CI)	(5-20)	(34-57)	(69-88)	(53-75)	(66-85)	(73-91)	(94-100)	(94-100)	(94-100)	(52-82)	(64-84)	(50-90)	(94-100)	(93-100)	(91-100)	(17-38)
2013 vs. 2017		*p* value	1,000	0,860	0,644	1,000	0,240	0,130	0,457	1,000	1,000	0,657	0,330	0,555	0,460	-	-	1,000
2013 *Enterobacter* spp.	30	Total no. isolates with sensitivities	30	30	30	30	30	30	30	30	30	30	28	28	30	-	-	28
		No. of susceptible isolates	0	0	19	0	0	19	27	29	29	19	20	14	30	-	-	14
		Susceptible Isolates, %	0%	0%	63%	0%	0%	63%	90%	97%	97%	63%	71%	50%	100%	-	-	50%
		(95% CI)	(0-13)	(0-13)	(45-78)	(0-13)	(0-13)	(45-78)	(74-97)	(82-100)	(82-100)	(45-78)	(53-85)	(33-67)	(87-100)	-	-	(33-67)
2017 *Enterobacter* spp.	34	Total no. isolates with sensitivities	34	34	29	34	34	34	34	34	34	18	34	9	34	30	16	34
		No. of susceptible isolates	0	0	15	0	0	18	28	32	31	10	25	3	30	30	15	21
		Susceptible Isolates, %	0%	0%	52%	0%	0%	53%	82%	94%	91%	56%	74%	33%	88%	100%	94%	62%
		(95% CI)	(0-12)	(0-12)	(34-69)	(0-12)	(0-12)	(37-69)	(66-92)	(80-99)	(76-98)	(34-75)	(57-86)	(12-65)	(73-96)	(87-100)	(70-100)	(45-76)
2013 vs. 2017		*p* value	1,000	1,000	0,435	1,000	1,000	0,454	0,483	1,000	0,616	0,762	1,000	0,462	0,116	-	-	0,443
2013 Other *Enterobacteriaceae*	30	Total no. isolates with sensitivities	30	29	29	30	29	29	30	30	30	29	29	27	29	-	-	28
		No. of susceptible isolates	6	12	29	15	15	26	30	30	30	25	24	23	29	-	-	19
		Susceptible Isolates, %	20%	41%	100%	50%	52%	90%	100%	100%	100%	86%	83%	85%	100%	-	-	68%
		(95% CI)	(9-38)	(25-59)	(86-100)	(33-67)	(34-69)	(73-97)	(87-100)	(87-100)	(87-100)	(69-95)	(65-93)	(67-95)	(86-100)	-	-	(49-82)
2017 Other *Enterobacteriaceae*	31	Total no. isolates with sensitivities	31	31	30	31	31	31	31	31	30	16	31	7	31	30	30	30
		No. of susceptible isolates	6	14	25	17	17	28	29	30	29	14	29	6	28	9	9	17
		Susceptible Isolates, %	19%	45%	83%	55%	55%	90%	94%	97%	97%	88%	94%	86%	90%	30%	30%	57%
		(95% CI)	(9-37)	(29-62)	(66-93)	(38-71)	(38-71)	(74-97)	(78-99)	(82-100)	(82-100)	(63-98)	(78-99)	(47-99)	(74-97)	(17-48)	(17-48)	(39-73)
2013 vs. 2017		*p* value	1,000	0,800	0,052	0,800	1,000	1,000	0,492	1,000	1,000	1,000	0,247	1,000	0,238	-	-	0,427
2013 TOTAL *Enterobacteriaceae*	187	Total no. isolates with sensitivities	187	185	186	187	186	186	187	187	187	184	182	179	186	-	-	173
		No. of susceptible isolates	11	52	140	73	74	111	179	184	184	120	111	100	180	-	-	62
		Susceptible Isolates, %	6%	28%	75%	39%	40%	60%	96%	98%	98%	65%	61%	56%	97%	-	-	36%
		(95% CI)	(3-10)	(22-35)	(69-81)	(32-46)	(33-47)	(53-66)	(92-98)	(95-100)	(95-100)	(58-72)	(54-68)	(49-63)	(93-99)	-	-	(29-43)
2017 TOTAL *Enterobacteriaceae*	219	Total no. isolates with sensitivities	218	219	213	219	219	219	219	219	218	106	218	49	216	198	148	216
		No. of susceptible isolates	13	79	136	99	108	149	203	214	211	64	152	26	203	177	126	96
		Susceptible Isolates, %	6%	36%	64%	45%	49%	68%	93%	98%	97%	60%	70%	53%	94%	89%	85%	44%
		(95% CI)	(3-10)	(30-43)	(57-70)	(39-52)	(43-56)	(62-74)	(88-96)	(95-99)	(93-98)	(51-69)	(63-75)	(39-66)	(90-97)	(84-93)	(78-90)	(38-51)
2013 vs. 2017		*p* value	1,000	0,109	**0,017**	0,227	0,058	0,096	0,213	0,731	0,352	0,448	0,073	0,748	0,241	-	-	0,097

(-) Antibiotic not tested

AMP = ampicillin, AMP = amoxicillin-clavulanate, PTZ = piperacillin/tazobactam, CTX/CRO = cefotaxime/ceftriaxone, CAZ = ceftazidime, CPM = cefepime, ETP = ertapenem, MEM = meropenem, IPM = imipenem, CIP = ciprofloxacin, GM = gentamicin, TOB = tobramycin, AMK = amikacin, CT = colistin, TGC = tigecycline, SXT = trimethoprim-sulfamethoxazole

Appendix 2. Antibiogram for the non-fermentative gram-negative bacilli (first-isolate results), 2013 versus 2017.

	Total *n* isolates		% Susceptibility to Routinely Tested Antimicrobial Agents											
			PTZ	CAZ	CPM	MEM	IPM	CIP	GM	TOB	AMK	CT	TGC	SXT
2013 *Acinetobacter* spp.	65	Total no. isolates with sensitivities	56	65	65	65	55	64	61	64	63	19	-	62
		No. of susceptible isolates	6	20	6	7	14	31	33	43	18	19	-	17
		Susceptible Isolates, %	11%	31%	9%	11%	25%	48%	54%	67%	29%	100%	-	27%
		(95% CI)	(5-22)	(21-43)	(4-19)	(5-21)	(16-38)	(37-60)	(42-66)	(55-77)	(19-41)	(80-100)	-	(18-40)
2017 *Acinetobacter* spp.	57	Total no. isolates with sensitivities	57	57	57	57	57	56	57	36	43	57	38	57
		No. of susceptible isolates	9	6	10	11	11	18	18	11	14	55	34	9
		Susceptible Isolates, %	16%	11%	18%	19%	19%	32%	32%	31%	33%	96%	89%	16%
		(95% CI)	(8-28)	(5-21)	(10-30)	(11-32)	(11-32)	(21-45)	(21-45)	(18-47)	(20-48)	(87-100)	(75-96)	(8-28)
2013 vs. 2017		*p* value	0,581	**0,008**	0,191	0,209	0,500	0,094	**0,016**	**0,001**	0,673	1,000	-	0,182
2013 *Pseudomonas* spp.	52	Total no. isolates with sensitivities	52	52	52	51	52	51	49	52	51	52	-	-
		No. of susceptible isolates	48	42	40	36	38	41	43	42	42	52	-	-
		Susceptible Isolates, %	92%	81%	77%	71%	73%	80%	88%	81%	82%	100%	-	-
		(95% CI)	(81-97)	(68-89)	(64-86)	(57-81)	(60-83)	(67-89)	(75-95)	(68-89)	(70-91)	(92-100)	-	-
2017 *Pseudomonas* spp.	65	Total no. isolates with sensitivities	63	64	65	65	65	65	63	14	65	65	-	-
		No. of susceptible isolates	49	52	54	49	44	60	58	10	61	65	-	-
		Susceptible Isolates, %	78%	81%	83%	75%	68%	92%	92%	71%	94%	100%	-	-
		(95% CI)	(66-86)	(70-89)	(72-90)	(64-84)	(56-78)	(83-97)	(82-97)	(45-89)	(85-98)	(93-100)	-	-
2013 vs. 2017		*p* value	**0,040**	1,000	0,485	0,673	0,550	0,092	0,530	0,473	0,074	1,000	-	-
2013 Other Non-fermenters	7	Total no. isolates with sensitivities	-	7	-	2	-	-	-	-	-	-	-	7
		No. of susceptible isolates	-	4	-	2	-	-	-	-	-	-	-	5
		Susceptible Isolates, %	-	57%	-	100%	-	-	-	-	-	-	-	71%
		(95% CI)	-	(25-84)	-	(16-100)	-	-	-	-	-	-	-	(35-92)
2017 Other Non-fermenters	27	Total no. isolates with sensitivities	-	24	-	26	-	-	-	-	-	-	-	27
		No. of susceptible isolates	-	22	-	16	-	-	-	-	-	-	-	24
		Susceptible Isolates, %	-	92%	-	62%	-	-	-	-	-	-	-	89%
		(95% CI)	-	(73-99)	-	(42-78)	-	-	-	-	-	-	-	(71-97)
2013 vs. 2017		*p* value	-	0,062	-	0,524	-	-	-	-	-	-	-	0,268

(-) Antibiotic not tested or not appropriate

PTZ = piperacillin/tazobactam, CAZ = ceftazidime, CPM = cefepime, MEM = meropenem, IPM = imipenem, CIP = ciprofloxacin, GM = gentamicin, TOB = tobramycin, AMK = amikacin, CT = colistin, TGC = tigecycline, SXT = trimethoprim-sulfamethoxazole

Appendix 3. Antibiogram for the gram-positive cocci (first-isolate results), 2013 versus 2017.

	Total *n* isolates		% Susceptibility to Routinely Tested Antimicrobial Agents						
			P/AMP	CLOX*	CD	SXT	VA	LZD	RIF
2013 CoNS	65	Total no. isolates with sensitivities	62	61	62	60	43	62	62
		No. of susceptible isolates	4	7	24	14	43	61	23
		Susceptible Isolates, %	6%	11%	39%	23%	100%	98%	37%
		(95% CI)	(2-16)	(5-22)	(28-51)	(14-35)	(90-100)	(91-100)	(26-50)
2017 CoNS	84	Total no. isolates with sensitivities	71	75	74	74	76	74	75
		No. of susceptible isolates	4	21	36	31	75	73	40
		Susceptible Isolates, %	6%	28%	49%	42%	99%	99%	53%
		(95% CI)	(2-14)	(19-39)	(38-60)	(31-53)	(92-100)	(92-100)	(42-64)
2013 vs. 2017		*p* value	1,000	**0,020**	0,299	**0,028**	1,000	1,000	0,061
2013 *S. aureus*	49	Total no. isolates with sensitivities	49	49	49	49	49	49	48
		No. of susceptible isolates	6	25	34	24	49	49	35
		Susceptible Isolates, %	12%	51%	69%	49%	100%	100%	73%
		(95% CI)	(5-25)	(37-64)	(55-81)	(36-63)	(91-100)	(91-100)	(59-84)
2017 *S. aureus*	44	Total no. isolates with sensitivities	38	44	43	44	44	44	42
		No. of susceptible isolates	5	38	37	28	44	44	40
		Susceptible Isolates, %	13%	86%	86%	64%	100%	100%	95%
		(95% CI)	(5-28)	(73-94)	(72-94)	(49-76)	(90-100)	(90-100)	(83-100)
2013 vs. 2017		*p* value	1,000	**<0,001**	0,081	0,210	1,000	1,000	**0,005**
2013 *Enterococcus* spp.	72	Total no. isolates with sensitivities	72	-	-	-	72	72	-
		No. of susceptible isolates	22	-	-	-	60	72	-
		Susceptible Isolates, %	31%	-	-	-	83%	100%	-
		(95% CI)	(21-42)	-	-	-	(73-90)	(94-100)	-
2017 *Enterococcus* spp.	56	Total no. isolates with sensitivities	56	-	-	-	56	56	-
		No. of susceptible isolates	19	-	-	-	56	56	-
		Susceptible Isolates, %	34%	-	-	-	100%	100%	-
		(95% CI)	(23-47)	-	-	-	(92-100)	(92-100)	-
2013 vs. 2017		*p* value	0,706	-	-	-	**0,001**	1,000	-
2013 Other Gram positive cocci	10	Total no. isolates with sensitivities	7	-	-	-	7	7	-
		No. of susceptible isolates	6	-	-	-	7	7	-
		Susceptible Isolates, %	86%	-	-	-	100%	100%	-
		(95% CI)	(47-100)	-	-	-	(60-100)	(60-100)	-
2017 Other Gram positive cocci	16	Total no. isolates with sensitivities	14	-	-	-	12	13	-
		No. of susceptible isolates	12	-	-	-	12	13	-
		Susceptible Isolates, %	86%	-	-	-	100%	100%	-
		(95% CI)	(59-97)	-	-	-	(72-100)	(73-100)	-
2013 vs. 2017		*p* value	1,000	-	-	-	1,000	1,000	-

(-) Antibiotic not tested or not appropriate

*Cefoxitin is used as a surrogate test for cloxacillin sensitivity

CoNS = coagulase-negative staphylococci, P/AMP = penicillin/ampicillin, CLOX = cloxacillin, CD = clindamycin, SXT = trimethoprim-sulfamethoxazole, VA = vancomycin, LZD = linezolid, RIF = rifampicin

Appendix 4. Antibiogram for the *Candida* species (first-isolate results), 2013 versus 2017.

	Total *n* isolates		% Susceptibility to Routinely Tested Antifungal Agents			
			FLU	VOR	MIC	AMB
2013 *C. albicans*	54	Total no. isolates with sensitivities	33	33	-	-
		No. of susceptible isolates	33	33	-	-
		Susceptible Isolates, %	100%	100%	-	-
		(95% CI)	(88-100)	(88-100)	-	-
2017 *C. albicans*	48	Total no. isolates with sensitivities	39	38	36	36
		No. of susceptible isolates	39	38	36	36
		Susceptible Isolates, %	100%	100%	100%	100%
		(95% CI)	(89-100)	(89-100)	(89-100)	(89-100)
2013 vs. 2017		*p* value	1,000	1,000	-	-
2013 Other *Candida* spp.	30	Total no. isolates with sensitivities	24	23	-	-
		No. of susceptible isolates	4	8	-	-
		Susceptible Isolates, %	17%	35%	-	-
		(95% CI)	(6-36)	(19-55)	-	-
		No. of susceptible-dose dependent (SDD) isolates	10			
		Susceptible-dose dependent Isolates, %	42%			
		(95% CI)	(24-61)			
2017 Other *Candida* spp.	26	Total no. isolates with sensitivities	26	22	20	26
		No. of susceptible isolates	3	10	20	26
		Susceptible Isolates, %	12%	45%	100%	100%
		(95% CI)	(3-30)	(27-65)	(81-100)	(85-100)
		No. of susceptible-dose dependent (SDD) isolates	11			
		Susceptible-dose dependent Isolates, %	42%			
		(95% CI)	(26-61)			
Susceptible 2013 vs. 2017		*p* value	0,697	0,550	-	-
SDD 2013 vs. 2017		SDD *p* value	1,000			

(-) Antifungal not tested or not appropriate

FLU = fluconazole, VOR = voriconazole, MIC = micafungin, AMB = amphotericin B