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BACKGROUND

Gonorrhea (GC) infections caused by *Neisseria gonorrhoeae* are an ongoing public health issue and have shown resistance to nearly all antibiotic classes, including cephalosporins.¹ CDC guidelines for treatment have been updated frequently since 2010 and current treatment guidelines recommend the combination of injectable Ceftriaxone and oral Azithromycin. A decline in gonorrhea culture testing by clinicians and decreased laboratory capabilities to perform this testing has made monitoring resistance challenging.² We investigated national GC testing and Ceftriaxone resistance in Veterans Health Administration (VHA) from 2010-2019.

METHODS

GC cases were identified from VHA data sources by either GC culture with or without sensitivity testing (Jan. 2010 – Dec. 2019) or molecular testing (Jan. 2013 – Dec. 2019). Patients were reviewed for positive results, whether culture testing was performed after 2 positive molecular GC results in <90 days, and cultures were reviewed for sensitivity patterns. Chi-square was performed for p-value.

RESULTS

- GC molecular testing (Table 1):
 - 17,651 of 1,013,205 (1.7%) GC molecular results were positive with annual number of positive cases ranging from 1,365 to 3,586 with percent positive ranging from 1.4% to 2%
 - Percent positivity for males was 15,743/584,700 (2.7%) and for females was 1,908/428,505 (0.4%) (p-value <0.001)
- GC culture testing (Table 1):
 - 2,203 of 2,653 (83%) GC cultures were positive with annual number of positive cultures ranging from 228 to 318 with percent positive ranging from 78% to 89%
 - Percent positivity for males was 2,121/2,338 (91%) and for females was 82/315 (26%) (p-value <0.001)
 - 1,497/2,203 (68%) positive GC culture tests had some sensitivity testing performed
- Repeat testing (Figure 1):
 - 3,449/17,651 (20%) of positive molecular test results had repeat testing <90 days with 513 (15%) positive on repeat testing
 - Of the 513 molecular tests positive upon repeat testing, only 30 (6%) had GC culture testing performed within 90 days of the second positive molecular test
 - 13 (3%) additional molecular tests had culture testing done on the same day as the initial positive molecular test
- Among all cultured isolates with resistance testing performed, resistance to Ceftriaxone was noted in 1 sample in 2017 in Missouri (also intermediate resistance to Tetracycline) and 1 in 2019 in New Jersey (also resistant to Penicillin, Tetracycline, and Ciprofloxacin)

Table 1. Gonorrhea Molecular and Culture Testing Performed in VHA, 2010-2019

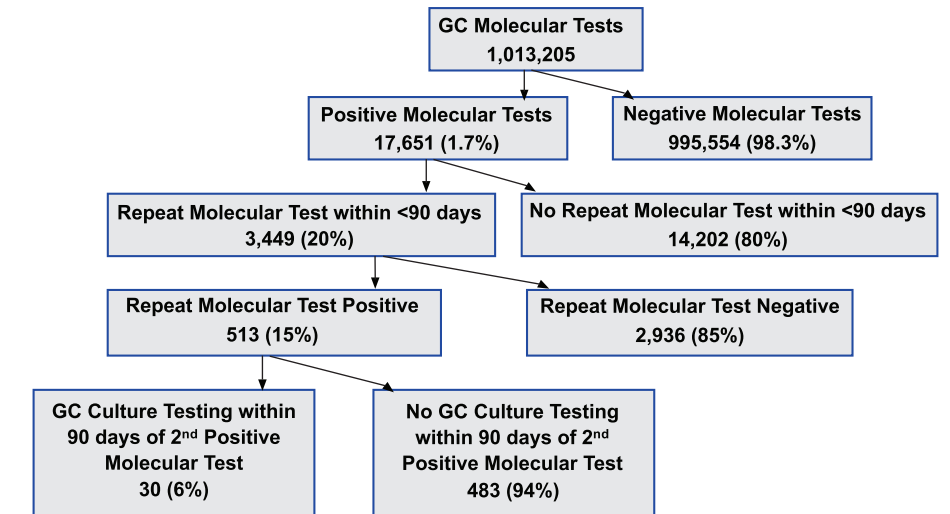
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Molecular Tests											
Number of Tests	NA	NA	NA	97618	110956	127194	144901	163905	183826	184805	1013205
Female (%)	NA	NA	NA	50808 (52)	53205 (48)	58125 (46)	65096 (42)	65899 (40)	73734 (39)	65996 (37)	428505 (42)
<25yo				11517	10586	11713	10328	12225	13062	12475	81906
25-44yo				28975	31153	34215	36684	38841	42410	39811	252089
45-64yo				10169	11196	11888	13484	14235	15501	14537	91010
>64yo				247	270	309	442	598	761	873	3500
Male (%)	NA	NA	NA	46710 (48)	57751 (52)	69069 (54)	83633 (58)	99006 (60)	111092 (61)	117809 (63)	584700 (58)
<25yo				2925	3071	3215	3273	3801	4100	4401	24786
25-44yo				21867	27705	34653	42182	49636	57966	60652	294661
45-64yo				17482	20813	23788	28887	33136	37277	38112	199475
>64yo				4436	6162	7433	9621	11433	12749	13944	65778
Number of Positive Tests	NA	NA	NA	1365	1581	1913	2559	3225	3586	3422	17651
Female (%)	NA	NA	NA	197 (14)	203 (13)	212 (11)	240 (9)	352 (11)	354 (10)	350 (10)	1908 (11)
<25yo				70	58	55	62	78	88	76	487
25-44yo				108	124	143	152	229	208	237	1201
45-64yo				18	21	14	26	42	57	35	213
>64yo				1	0	0	0	3	1	2	7
Male (%)	NA	NA	NA	1168 (86)	1378 (87)	1701 (89)	2319 (91)	2873 (89)	3232 (90)	3072 (90)	15743 (89)
<25yo				97	101	90	123	124	165	146	846
25-44yo				619	754	986	1335	1638	1907	1794	9033
45-64yo				402	433	538	736	955	1388	942	4994
>64yo				50	90	87	125	156	172	190	870
Percent Positive	NA	NA	NA	1.4	1.4	1.5	1.8	2	2	1.9	1.7
Number of States and Territories with Tests*	NA	NA	NA	48	49	49	49	50	50	49	50
Culture Tests											
Number of Tests	287	269	240	228	235	233	256	263	308	318	2653
Female (%)	31 (11)	36 (13)	24 (10)	24 (11)	30 (13)	33 (14)	28 (11)	25 (10)	38 (12)	46 (14)	315 (12)
<25yo	3	3	3	2	2	2	0	3	22	4	45
25-44yo	20	25	15	18	18	18	14	19	16	21	184
45-64yo	8	6	6	9	12	9	12	3	6	17	78
>64yo	0	0	0	0	0	0	0	0	0	0	5
Male (%)	256 (89)	233 (87)	216 (90)	204 (89)	205 (87)	206 (88)	238 (89)	238 (90)	270 (88)	272 (86)	2338 (88)
<25yo	20	14	16	15	8	12	9	8	11	7	120
25-44yo	126	112	109	106	97	128	122	122	149	139	1187
45-64yo	102	89	90	85	74	79	81	83	85	96	836
>64yo	9	18	11	15	21	22	27	27	30	30	195
Number of Positive Tests	239	211	213	199	193	188	220	234	254	252	2203
Female (%)	9 (4)	14 (7)	13 (6)	14 (7)	9 (5)	6 (5)	7 (1)	8 (5)	6 (2)	1 (<1)	82 (4)
<25yo	2	2	2	3	1	1	0	2	1	1	15
25-44yo	7	9	9	6	3	1	6	3	3	0	54
45-64yo	0	3	2	1	2	2	1	0	2	0	13
>64yo	0	0	0	0	0	0	0	0	0	0	0
Male (%)	230 (96)	197 (93)	200 (94)	185 (93)	184 (95)	182 (97)	218 (99)	226 (97)	248 (98)	251 (99)	2121 (96)
<25yo	17	14	16	13	16	13	8	8	10	7	113
25-44yo	116	99	102	98	90	118	119	144	144	131	1107
45-64yo	89	77	74	64	76	67	75	77	75	89	763
>64yo	8	7	8	10	10	13	17	22	19	24	138
Percent Positive	83	78	89	87	82	79	83	89	82	79	83
Number of States and Territories with Tests*	30	37	34	32	34	36	36	40	36	37	43
Number of Tests with Sensitivity Testing	179	138	1148	135	116	129	159	154	166	173	1497
Percent of Positive Tests with Sensitivity Testing	75	65	69	68	60	69	72	66	65	69	68

* Includes all 50 states, as well as Washington DC, American Samoa, Guam, Puerto Rico, Philippines, and Virgin Islands

LIMITATIONS

- Cases not tested or with results not documented in VHA's electronic health record could not be identified
- Resistance to Ceftriaxone may be underestimated as there was limited culture and sensitivity testing done on samples with repeat positive molecular gonorrhea testing within < 90 days
- Data was not obtained for the beginning of 2020 to determine if repeat testing was done on samples at the end of 2019
- Treatment and clinical outcomes were not evaluated in this study

Figure 1. Gonorrhea Molecular and Culture Testing Performed in VHA, 2013-2019



CONCLUSIONS

- In VHA, GC infections as well as testing for GC have been increasing
- Percent positivity was statistically lower in females compared to males possibly due to women's health screening programs
- GC culture testing and number of facility states with testing capabilities has remained stable despite increasing molecular testing
- Culture testing with sensitivity testing should be increased in VHA in cases where patients may have resistance to initial treatments (i.e., repeat positive testing less than 90 days after a positive test)
 - Consider having laboratories perform sensitivity on all positive GC cultures in setting of rising Ceftriaxone resistance
- Only 2 samples were identified with Ceftriaxone resistance between 2010 and 2019
 - However, this is likely an underestimation due to low rates of culture/sensitivity testing

REFERENCES

- Centers for Disease Control and Prevention. Gonorrhea. <https://www.cdc.gov/std/gonorrhea/default.htm> Last accessed Sept. 2020.
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