Infectious Causes of Death in the Medical Examiner's Office

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Abstract

Background: Medical examiners' offices certify approximately 20% of all deaths in the US. Violent deaths, unnatural deaths, deaths in custody, sudden and unexpected deaths, apparent natural deaths not under the care of a physician, and deaths with potential public health significance are within their purview. Infection causes a significant minority of these cases; little is known about these lethal infections and their epidemiology.
Methods: All autopsies from District 9 in Central Florida from 1 Jan 2005 - 1 July 2011 were surveyed; all cases in which infection was the primary or contributing cause of death were reviewed in detail.
Results: 6,777 cases were autopsied; infection was the cause or a significant contributing factor in 228 (3.4%). In 183 cases, microbiologic data (immediately pre-mortem or from the autopsy) were available. *S. aureus* accounted for 35% of cases in which an organism was identified; *S. pneumoniae* 10%, *B* hemolytic streptococci (A, B, C combined) 10%, and RSV 7%. Pulmonary infections accounted for 53% of fatal infections, cardiac (endocarditis, myocarditis) for 15% and GI and CNS infections 8% each. 31 of 228 (13.6%) were less than 2 years old. Of those over 2 years, 35/197 (15.4%) were HIV-infected. ME cases with an infectious cause of death were more likely to be male, drug using or homeless as compared to the general Central Florida population. Reasons for failure to access care in a timely fashion varied, but the most commonly cited was underestimating the severity of the illness.
Conclusion: Infections caused or were a major contributing factor in 3.4% of all unexplained deaths. *S. aureus* and streptococci accounted for over half of these; pulmonary infections were most frequent. Poor socioeconomic circumstances were often associated with infection death outside of the medical system.

Introduction

There has been no modern systematic study of infectious diseases seen in an US medical examiner's office or the factors that brought the deceased to the medical examiner's office. We reviewed infectious causes of death in a large ME's office to evaluate trends and patterns that increase risk of an infectious death outside of the hospital.

Methods

Cases used in this study occurred between January 1, 2005 to June 30, 2011 and were evaluated by the District 9 Medical Examiner's Office, which covers Orange and Osceola Counties, FL. Cases were selected if infection was listed as the cause of death or contributory to death, and an autopsy was performed. A retrospective chart review was then performed and data was collected on several variables including demographics, cause of death and comorbidities related to COD, manner of death, the reason an autopsy was conducted, organisms cultured, histopathologic diagnosis, chronic infection, duration of illness prior to death, access to health services, drug abuse, and housing situation.

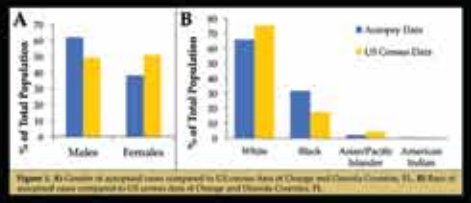

Figure 1. A) Gender of autopsied cases compared to US census data of Orange and Osceola Counties, FL. B) Race of autopsied cases compared to US census data of Orange and Osceola Counties, FL

Table 2. Significant Organisms Cultured and Culture Sites

Organism	Culture Sites						
	Blood	Pulmonary	Cardiac	CNS	Soft Tissue	Other	Total
S. aureus	10	23	11	3	4	1	51 (27.9%)
MRSA	3	7	0	0	1	1	12 (6.6%)
S. pneumoniae	3	10	1	3	0	1	18 (9.8%)
Other Streptococcus spp.	7	6	2	2	2	2	23 (12%)
E. coli	2	3	0	0	0	1	9 (4.9%)
H. influenzae	1	4	0	0	1	0	6 (3.3%)
N. meningitidis	1	1	0	1	0	2	5 (2.7%)
P. aeruginosa	0	2	0	0	1	0	4 (2.2%)
Clostridium spp.	2	0	0	0	2	0	4 (2.2%)
Klebsiella spp.	2	1	0	2	1	0	6 (3.3%)
M. tuberculosis	0	2	0	0	0	0	2 (1.6%)
Other Bacteria	4	2	0	0	0	0	7 (3.8%)
Polymicrobial	0	9	0	0	2	4	15 (8.2%)
H. fluenzae	0	0	0	0	0	1	1 (0.5%)
Fungi	0	1	0	0	0	2	3 (1.6%)
RSV	0	13	0	0	0	0	13 (7.1%)
Influenza A virus	0	1	0	0	0	0	1 (0.6%)
Other Viruses	0	4	0	0	0	0	4 (2.2%)
Total	37 (20.2%)	92 (50.3%)	14 (7.7%)	10 (5.5%)	14 (8.2%)	15 (8.2%)	183

Other represents CSF, synovial, brain and postmortem specimens. The percentages for these groups were 1.1%, 3.3%, 2.7%, and 1.7% of the total group respectively.

Table 3. Cases of Death Grouped By Age, HIV Status, and Organ System

	<2 Years of Age	2 and Up		Total
		HIV+	HIV-	
Pulmonary	24	20	77	121 (53.1%)
GI	1	0	15	16 (7.9%)
Cardiac	1	1	29	31 (14.9%)
Genitourinary	0	1	4	5 (2.2%)
Skin & Soft Tissue Infections	0	0	13	13 (7.7%)
Skeletal	0	0	2	2 (0.9%)
CNS	1	1	13	16 (7.9%)
Complications of Hep B/Hep C	1	2	3	7 (3.3%)
Postmortem Complications of AIDS	1	1	0	2 (1.2%)
Sepsis Without a Source	1	2	4	7 (3.3%)
Total	31 (13.6%)	30 (13.4%)	166 (73.0%)	228

Table 1. Housing Situation at Diagnosis

Housing Situation	# of Cases
Homeowner	126 (56.4%)
Low Income Housing	19 (8.6%)
Adult Living with Relatives/Friends	25 (11.1%)
Prisoner	26 (11.4%)
Homeless	14 (6.1%)
Other	12 (5.2%)
Transient/Homeless	14 (6.1%)

Results

- 6,777 cases were autopsied in the specified period. 228 cases (3.4%) met the study criteria, of which 141 (61.8%) were male and 87 (38.2%) were female.
- 150 individuals (65.8%) identified as white, 72 (31.6%) as black, 5 (2.2%) as Asian/Pacific Islander, and 1 (0.4%) as American Indian. This is in contrast to the census data, which reported 75.4% white, 17.3% black, 4.3% Asian/Pacific Islander, and 0.6% American Indian for Orange and Osceola Counties in 2011.
- Pulmonary infections account for 53% of fatal infections, cardiac (endocarditis, myocarditis) for 15% and GI and CNS infections 8% each.
- Of those over 2 years of age, 35/197 (15.4%) were HIV-infected.
- *S. aureus* accounted for 34.4% (63 out of 183) of cultured organisms.
- Of the 133 individuals who did not access healthcare prior to death, 53 (39.8%) did not seem ill and 31 (23.3%) did not realize the severity of their illness.
- 55 individuals had a history of drug abuse, a positive drug test at autopsy, or both, and of those individuals drug abuse was listed as cause of death or contributory to death for 28 individuals (12.3%). The US Census Bureau estimates that about 7.8% of the Florida population uses illicit drugs.
- 14 individuals (6.1%) were homeless. The Council on Homelessness' estimates the homeless population of Orange and Osceola Counties to be 0.26% of the total population of 1,445,270 in these two counties.

Conclusions

Infections were a major contributing factor in 3.4% of 6,777 autopsies. Men, blacks, the homeless, and drug users were overrepresented in our sample as compared to the rest of the population. Across all age groups, infections involving the pulmonary system were the most common cause of death. *S. aureus* was by far the most commonly cultured organism, and was the number one infectious cause of pneumonia, sepsis, meningitis, endocarditis, and soft tissue infections.