Journal of Urban Health: Bulletin of the New York Academy of Medicine, Vol. 83, No. 2
doi:10.1007/s11524-005-9021-6

Hospital Utilization for Injection Drug Use-Related Soft Tissue Infections in Urban versus Rural Counties in California

Keith G. Heinzerling, David A. Etzioni, Brian Hurley, Paul Holtom, Ricky N. Bluthenthal, and Steven M. Asch

ABSTRACT *Drug related-soft tissue infections (DR-STIs) are a significant source of hospital utilization in inner-city urban areas where injection drug use is common but the magnitude of hospital utilization for DR-STIs outside of inner-city urban areas is not known. We described the magnitude and characteristics of hospital utilization for DR-STIs in urban versus rural counties in California. All discharges from all nonfederal hospitals in California in 2000 with ICD-9 codes for a soft tissue infection and for drug dependence/abuse were abstracted from the California Office of Statewide Health Planning and Development discharge database. There were 4,152 DR-STI discharges in 2000 from hospitals in 49 of California's 58 counties. Residents of 12 large metropolitan counties accounted for 3,598 discharges (87% of total). The majority of DR-STI discharges were from urban safety net hospitals with county indigent programs and Medicaid as the expected payment source and opiate related discharge diagnoses. Hospital utilization for DR-STIs in California is highest in large urban metropolitan counties, although DR-STI discharges are widespread. Increased access to harm reduction services and drug treatment may reduce government health care expenditures by preventing unnecessary hospital utilization for DR-STIs.*

KEYWORDS *Hospital utilization, Injection drug use, Medicaid, Soft tissue infection, Urban, Rural.*

INTRODUCTION

Soft tissue infections are a common complication of injection drug use[1–5] and have been reported to be a significant source of hospital utilization in inner-city urban areas where injection drug use is common. For example, drug related soft tissue infections (DR-STI) were the leading cause of admissions to San Francisco General Hospital in 1999, resulting in charges of nearly $10 million.[6] Recent reports suggest that injection drug use is increasing in suburban and rural areas,[7,8] yet the magnitude of hospital utilization for DR-STIs outside of inner-city urban areas is

Heinzerling is with the Department of Family Medicine, David Geffen, School of Medicine at UCLA Los Angeles, California, USA; Heinzerling and Asch are with the VA Greater Los Angeles Health Care System, USA; Etzioni is with the Department of Surgery, David Geffen, School of Medicine at UCLA, USA; Hurley and Holtom are with the Keck School of Medicine, University of Southern California, USA; Bluthenthal and Asch are with the Health Program and Drug Policy Research Center, RAND, USA.

Correspondence: Keith G. Heinzerling, MD, MPH, UCLA Department of Family Medicine, 11075 Santa Monica Blvd., Suite 200, Los Angeles, CA 90025, USA. (E-mail: heinzk@ucla.edu)

not known. Therefore, we described the magnitude and characteristics of hospital utilization for DR-STIs in urban versus rural counties in California.

MATERIALS AND METHODS

The study used the California Office of Statewide Health Planning and Development (OSHPD) hospital discharge dataset, which includes all discharges from nonfederal hospitals in California. DR-STI discharges were defined as any discharge in 2000 from an acute care hospital for a patient aged 15 to 74 years with a primary diagnosis of abscess and/or cellulitis of the trunk, buttocks, or extremities (*International Classification of Diseases, Ninth Revision* [ICD-9]) codes 682.2–682.7 and 682.9)

TABLE 1. Hospital utilization for drug related-soft tissue infections in Metropolitan, Micropolitan, and Rural Counties in California in 2000

County	DR-STIs, number	DR-STIs, incidence*	Total population
Metropolitan counties			
Los Angeles	923	14.1	9,519,338
San Francisco	855	147.9	776,733
Alameda	320	23.1	1,443,741
San Diego	274	13.4	2,813,833
Sacramento	233	26.6	1,223,499
Santa Clara	174	21.1	1,682,585
Orange	168	8.5	2,846,289
Contra Costa	167	16.3	948,816
San Bernardino	145	11.4	1,709,434
Riverside	119	11.4	1,545,387
San Joaquin	118	30.0	563,598
Fresno	102	21.6	799,407
Stanislaus	72	19.8	446,997
Kern	59	12.7	661,645
Sonoma	43	10.8	458,614
San Mateo	38	7.9	707,161
Ventura	34	6.9	753,197
Monterey	31	11.5	401,762
Imperial	27	33.0	142,361
Tulare	26	10.8	368,021
Solano	18	32.2	394,542
Yuba	18	5.2	60,219
Santa Cruz	16	6.0	255,602
Santa Barbara	15	19.2	399,347
Madera	15	7.4	123,109
San Luis Obispo	14	14.3	246,681
Yolo	14	5.6	168,660
Placer	13	5.9	248,399
Sutter	11	20.9	78,930
Marin	9	2.9	247,289
Butte	6	9.7	203,171
Merced	5	3.9	210,554
Shasta	5	1.8	163,256
Kings	4	4.7	129,461
El Dorado	2	7.7	156,299

TABLE 1. ***Continued***

County	DR-STIs, number	DR-STIs, incidence*	Total population
San Benito	1	2.5	53,234
Napa	0	0.0	124,279
Micropolitan counties			
Humboldt	31	19.1	126,518
Lake	3	5.7	58,309
Mendocino	3	3.7	86,265
Nevada	3	2.5	92,033
Tehama	2	3.2	56,039
Inyo	1	7.0	17,945
Tuolumne	1	1.3	54,501
Del Norte	0	0.0	27,507
Rural counties			
Amador	6	9.4	35,100
Calaveras	3	44.7	40,554
Plumas	2	3.5	20,824
Colusa	1	10.2	18,804
Mariposa	1	4.8	17,130
Siskiyou	1	2.3	44,301
Alpine	0	0.0	1,208
Glenn	0	0.0	26,453
Lassen	0	0.0	33,828
Modoc	0	0.0	9,449
Mono	0	0.0	12,853
Sierra	0	0.0	3,555
Trinity	0	0.0	13,022

*Per 100,000 California population adjusted for age, gender, and race/ethnicity.

and a primary or secondary diagnosis of opiate, cocaine, or amphetamine dependence/abuse (ICD-9 codes 304.0, 305.5, 304.2, 305.6, 304.4, 305.7). Demographics and expected payment source for DR-STI discharges were abstracted.

Counties were categorized using 2000 US Census data according to Office of Management and Budget definitions[9] as metropolitan (at least one urbanized area of 50,000 or more population), micropolitan (at least one urban cluster of 10,000 to 49,999 persons), or rural (neither metropolitan nor micropolitan). The number of DR-STI discharges and incidence adjusted for age, gender, and race using the direct method[10] with the 2000 US Census population of California as the standard population[11] were calculated by county, race/ethnicity, and expected payment source. The number of DR-STI discharges identified in the OSHPD dataset was compared to the number identified via chart review of a random sample of 150 discharges for soft tissue infections at a single California hospital.

The study was approved by the Institutional Review Board at the West Los Angeles VA Medical Center and the University of Southern California School of Medicine.

RESULTS

There were a total of 4,152 DR-STI discharges from non-federal hospitals in 49 of California's 58 counties in 2000 (Table 1). Residents of large metropolitan counties

TABLE 2. Hospital utilization for drug related-soft tissue infections by race/ethnicity, drug-related discharge diagnoses, and expected payment source in California in 2000

Race/ethnicity	Number	Percent (%)*
White		
Male	1,341	21.7
Female	908	15.6
African American		
Male	508	67.9
Female	261	32.2
Hispanic		
Male	541	18.0
Female	223	6.9
Asian/Pacific Islander		
Male	26	1.9
Female	5	0.3
Native American		
Male	16	23.6
Female	18	25.9
Other race		
Male	185	64.2
Female	100	34.4
Missing		
Male	10	N/A
Female	10	N/A
Drug-related discharge diagnoses	Number	Percent (%)
Opiates	3,206	77
Cocaine	558	13
Amphetamines	344	8
Combination	54	2
Expected payment source	Number	Percent (90)
County indigent	1,454	35
Medicaid	1,090	27
Self-pay	584	14
Medicare	392	9.5
Private insurance	345	8
Other govt./indigent	286	7
Payor data missing	1	0

*Per 100,000 California population adjusted for age.

accounted for the majority of DR-STI discharges, with 12 metropolitan counties accounting for 3,598 discharges (87% of total). The largest absolute number of DR-STI discharges was in Los Angeles while the highest adjusted incidence of DR-STI discharges was in San Francisco. While the absolute number of DR-STI discharges in micropolitan and rural counties was small, the adjusted incidence of DR-STI discharges in Humboldt and Calaveras Counties was similar to that in metropolitan counties.

The greatest absolute number of DR-STI discharges was among Non-Hispanic Whites while the highest age-adjusted incidences of DR-STI discharges were for ethnic minorities (Table 2). Opiate dependence/abuse was the most frequent drug-related discharge diagnosis, followed by cocaine and amphetamines. The most common expected payment sources for DR-STI discharges were county indigent

programs, Medicaid, and self-pay. Fourteen (14) of California's 585 non-federal hospitals accounted for 2,938 DR-STI discharges (71% of total), of which 12 were urban city/county or safety net facilities (data not shown).

Review of hospital charts at a single California hospital yielded an estimate of 271 DR-STI discharges at that facility per year, compared to 336 DR-STI discharges identified in the OSHPD database for that hospital in 2000.

DISCUSSION

We found that hospital utilization for DR-STIs at California non-federal hospitals is highest in large urban metropolitan counties, particularly San Francisco. These results confirm previous reports from San Francisco[6] and may reflect a higher prevalence of injection drug use in San Francisco,[12] more frequent injection practices associated with DR-STIs, including subcutaneous or intramuscular injecting,[3] or use of black tar heroin,[13,14] especially given the predominance of opiate use among DR-STI discharges.

While utilization for DR-STIs was highest in large urban centers, at least moderate levels of utilization were present throughout California, suggesting that injection drug use and the associated health complications are not limited to large urban centers. Despite the widespread occurrence of discharges for DR-STIs, services for treating and preventing DR-STIs are not widely available. For example, syringe exchange programs can prevent DR-STIs by providing injection drug users with sterile syringes, instruction in proper vein care, and early access to wound care.[15] Yet four of the 12 California counties with the largest number of DR-STI discharges (Orange, San Bernardino, Riverside, and San Joaquin) have no syringe exchange programs,[16] suggesting that wider implementation of harm reduction services, including syringe exchange programs, vein care education, and low threshold wound care clinics[17] is needed.

We also found that utilization for DR-STIs in California disproportionately impacts vulnerable populations and the publicly funded programs and facilities that provide their care, including Medicaid, county indigent care programs, and safety net hospitals. The concentration of utilization and the resulting expenditures among public programs and safety net hospitals suggests that increased public funding for harm reduction services and drug treatment programs to prevent DR-STIs is likely to be cost effective due to subsequent reductions in government expenditures for expensive hospital care.

The study has several limitations. Discharges from federal hospitals are not included in the OSHPD database. Given the high prevalence of injection drug use at Veterans Administration hospitals,[18] our study likely underestimates hospital utilization for DR-STIs in California. Also, our study identified DR-STIs using discharge diagnoses for drug dependence/abuse, which may underestimate DR-STI discharges if drug-related discharge diagnoses were not recorded. Our estimate of DR-STIs is similar to that obtained via our chart review at a single hospital, suggesting that our estimate is reliable.

In conclusion, hospital utilization for DR-STIs is greatest in large metropolitan urban areas, although utilization for DR-STIs is widespread. Wider implementation of harm reduction services and drug treatment programs to prevent hospitalization for DR-STIs is warranted.

ACKNOWLEDGEMENTS

This study was performed with support from the UCLA RWJ Clinical Scholars Program and the VA Health Services Research Fellowship Program.

REFERENCES

1. Ochoa KC, Hair TL, Heinzerling KG, Hyde J. Abscesses and cellulitis common among injection drug users attending needle exchange, American Public Health Association Annual Meeting, San Francisco, California, November 15–19, 2003.
2. Binswanger IA, Kral AH, Bluthenthal RN, Rybold DJ, Edlin BR. High prevalence of abscesses and cellulitis among community-recruited injection drug users in San Francisco. *Clin Infect Dis*. 2000;30:579–581.
3. Murphy EL, DeVita D, Liu H, et al. Risk factors for skin and soft-tissue abscesses among injection drug users: a case-control study. *Clin Infect Dis*. 2001;33:35–40.
4. Vlahov D, Sullivan M, Astemborski J, Nelson KE. Bacterial infections and skin cleaning prior to injection among intravenous drug users. *Public Health Rep*. 1992;107:595–598.
5. Spijkerman IJ, van Ameijden EJ, Mientjes GH, Coutinho RA, van den Hoek A. Human immunodeficiency virus infection and other risk factors for skin abscesses and endocarditis among injection drug users. *J Clin Epidemiol*. 1996;49:1149–1154.
6. Centers for Disease Control and Prevention. Soft tissue infections among injection drug users—San Francisco, California, 1996–2000. *MMWR Morb Mortal Wkly Rep*. 2001;50:381–384.
7. Centers for Disease Control and Prevention. Trends in injection drug use among persons entering addiction treatment—New Jersey, 1992–1999. *MMWR Morb Mortal Wkly Rep*. 2001;50:378–381.
8. Falck RS, Siegal HA, Wang J, Carlson RG, Draus PJ. Nonmedical drug use among stimulant-using adults in small towns in rural Ohio. *J Subst Abuse Treat*. 2005;28:341–349.
9. Office of Budget and Management. Standards for defining metropolitan and micropolitan statistical areas, notice. *Fed Regist*. 2000;65:82228–82238.
10. Gordis L. *Epidemiology*. Philadelphia: W.B. Saunders; 2000:xii, 308 p.
11. United States Census Bureau. California Population Report, 2000 Census. 2000.
12. Friedman SR, Tempalski B, Cooper H, et al. Estimating numbers of injecting drug users in metropolitan areas for structural analyses of community vulnerability and for assessing relative degrees of service provision for injecting drug users. *J Urban Health*. 2004;81:377–400.
13. Ciccarone D, Bourgois P. Explaining the geographical variation of HIV among injection drug users in the United States. *Subst Use Misuse*. 2003;38:2049–2063.
14. Lonergan S, Rodriguez RM, Schaulis M, Navaran P. A case series of patients with black tar heroin-associated necrotizing fasciitis. *J Emerg Med*. 2004;26:47–50.
15. Grau LE, Arevalo S, Catchpool C, Heimer R. Expanding harm reduction services through a wound and abscess clinic. *Am J Public Health*. 2002;92:1915–1917.
16. Human Rights Watch. *Injecting Reason: Human Rights and HIV Prevention for Injection Drug Users*. New York: Human Rights Watch, 2003.
17. Harris HW, Young DM. Care of injection drug users with soft tissue infections in San Francisco, California. *Arch Surg*. 2002;137:1217–1222.
18. Dominitz JA, Boyko EJ, Koepsell TD, et al. Elevated prevalence of hepatitis C infection in users of United States veterans medical centers. *Hepatology*. 2005;41:88–96.