HIV Screening Practices and Hospital Characteristics in the U.S., 2009–2010

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ABSTRACT

Objectives. The Centers for Disease Control and Prevention recommends HIV screening in U.S. health-care settings unless providers document a yield of undiagnosed HIV infections of <1 per 1,000 population. However, implementation of this guidance has not been widespread and little is known of the characteristics of hospitals with screening practices in place. We assessed how screening practices vary with hospital characteristics.

Methods. We used a national hospital survey of HIV testing practices, linked to HIV prevalence for the county, parish, borough, or city where the hospital was located, to assess HIV screening of some or all patients by hospitals. We used multivariate logistic regression analysis to assess the association between screening practices and hospital characteristics that were significantly associated with screening in bivariate analyses.

Results. Of 376 hospitals in areas of prevalence ≥0.1%, only 25 (6.6%) reported screening all patients for HIV and 131 (34.8%) reported screening some or all patients. Among 638 hospitals included, screening some or all patients was significantly ($p<0.05$) more common at teaching hospitals, hospitals with higher numbers of annual admissions, and hospitals with a high proportion of Medicaid admissions. In multivariable analysis, screening some or all patients was independently associated with admitting more than 15% of Medicaid patients and receiving resources or reimbursement for screening tests.

Conclusion. We found that few hospitals surveyed reported screening some or all patients, and failure to screen is common across all types of hospitals in all regions of the country. Expanded reimbursement for screening may increase compliance with the recommendations.

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Of the 1.2 million people in the United States who are infected with human immunodeficiency virus (HIV), it is estimated that 20% are unaware of their infection.[1] Early diagnosis of HIV infection allows infected people to obtain treatment that can prolong the quality and duration of their lives and can lead to reductions in high-risk behaviors and HIV transmission.[2–8] More generally, HIV infection satisfies the usual criteria for routine screening for infectious disease: it is a serious health disorder that can be diagnosed before symptoms appear; it can be detected by a reliable, noninvasive test; there are great potential health benefits to early detection; and the benefits of detection are large relative to the cost of screening.[9] For these reasons, and to reduce the number of undiagnosed people living with HIV, in 2006 the Centers for Disease Control and Prevention (CDC) recommended HIV screening in all health-care settings for all individuals aged 13–64 years, regardless of risk, seen at facilities with an HIV prevalence of undiagnosed infections ≥0.1% among a sample of patients, and annual screening for patients known to be at risk for HIV infection.[10]

Previous research has shown that the teaching status and size of hospitals, as well as the region and type of metropolitan area in which they are located, are associated with the availability of HIV testing in hospitals.[11] However, there are few published data about hospital characteristics that are associated with the adoption of CDC's revised testing recommendations, and existing studies do not consider the impact of external factors, such as state regulations or third-party reimbursement policies, that might influence whether hospitals adopt the testing guidelines. Also unknown is how the screening practices of hospitals that serve larger proportions of low-income and minority patients compare with the practices of other hospitals.

To address these open questions, we assessed the association between characteristics of hospitals and adoption of CDC's revised recommendations for HIV testing in health-care settings using data from a national hospital survey of HIV testing practices in 2009. The results of that national survey, comparing responses in 2009 with those from 2004, have been previously reported.[12] However, that report did not consider factors that might influence screening practices, such as county HIV prevalence, information on state HIV testing regulations, and information on the percentage of admissions of low-income and minority patients at participating hospitals.

METHODS

Sample

In 2009–2010, a national survey of HIV testing was sent to a random sample of 1,500 nonfederal general medical and surgical hospitals within the U.S. selected from the 4,554 hospitals in the 2006 American Hospital Association (AHA) Annual Survey database.[12] Infection-control practitioners from 754 (50.2%) hospitals responded. We obtained data on HIV prevalence by county, parish, borough, or city ("area") from CDC's national HIV surveillance system,[13] and each hospital was linked to the rate corresponding to the area in which it is located based on its address in the AHA Survey database. HIV prevalence rates are not reported for areas with fewer than five cases or with populations of <100 people. In addition, rates are not available for all states or areas; we excluded hospitals that could not be linked to available HIV prevalence data (n=116).

Variables

The primary outcome for this study was whether a hospital reported screening some or all patients for HIV. The current CDC recommendations for HIV testing in health-care settings only apply to providers serving patient populations with prevalence of undiagnosed infection ≥0.1%.[3] As we did not have rates of undiagnosed HIV infection at the provider level, we categorized each hospital according to the HIV prevalence in the area in which the hospital was located. Although the national HIV prevalence rate is estimated to be approximately 0.5%,[14] our random sample of hospitals was not stratified on population, leading to overrepresentation of small rural hospitals when compared with the number of patients in rural areas. As such, we had few hospitals in areas with HIV prevalence >0.5%; instead, we used strata of <0.1%, 0.1%–0.3%, and >0.3%.

Hospital characteristics included the following variables from the 2009 AHA Survey: metropolitan status (urban—defined as division, metropolitan, or micropolitan—or rural), teaching status (member of Council of Teaching Hospitals, having a residency program, or neither), ownership (public, private nonprofit, or private for profit), geographic U.S. Census region (Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; South: Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Texas, Virginia, Washington, D.C., and West Virginia; and West: Alaska,

Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming), total admissions per year (classified as ≤3,500, 3,501–10,000, and >10,000) after examining the distribution of hospitals, to create roughly equal-sized groups), and percentage of admissions that were Medicaid patients (classified as ≤15% vs. >15%, the approximate median).

We considered four additional independent variables. One variable was whether hospitals reported that they had an opt-out policy for HIV testing (i.e., hospitals performed testing unless patients specifically declined to be tested). A second variable was whether laws of states in which hospitals are located required separate written consent for HIV testing. We classified hospitals according to whether their state laws did not require separate consent prior to 2009, were modified to no longer require separate consent during 2009, or required separate consent as of the end of 2009.[15] A third variable we considered was whether hospitals reported receiving any type of third-party reimbursement for HIV screening. We classified a hospital as receiving reimbursement for screening if it reported that it "received funding, resources, or in-kind support from external organizations (e.g., local or state health departments, federal departments, and private foundations) to support HIV testing" or that it "received reimbursement from third-party payers (e.g., Medicaid, Medicare, or private insurance plans) for HIV tests that are performed *for screening purposes*" (emphasis in the survey). The fourth variable was the percentage of African American patients served by hospitals. Because data on the racial/ethnic distribution of people admitted to participating hospitals were not available, we used the percentage of African Americans among the Medicare admissions to the hospital, based on the 2007 Medicare Provider Analysis and Review file, as a proxy for the percentage of African Americans admitted to the hospitals. After examining the distribution of the primary outcome over deciles of this variable, we categorized the percentage of African Americans among Medicare admissions as either ≤40% or >40%.

Statistical analysis

We summarized hospital characteristics and their HIV screening practices and used Chi-square tests to compare characteristics of surveyed hospitals with and without prevalence data. For the primary outcome, we summarized the results by prevalence category; we also examined screening practices according to whether the hospital reported having an opt-out policy. To examine the bivariate association between independent variables and the primary outcome, we fit a series of logistic regression models. Then, to determine which hospital factors were independently associated with hospitals adopting HIV screening practices, we fit a multivariate logistic regression model that included all independent variables associated with screening some or all patients at $p<0.05$ on bivariate analysis. To determine if any of the independent effects were attenuated by the proportion of patients treated who were African American, we fit this final model with and without the percentage of African Americans among Medicare admissions as an independent variable. Because area HIV prevalence likely does not reflect the true rate of undiagnosed HIV at a given hospital, we replicated all analyses using only those hospitals in counties of prevalence ≥0.25% as a sensitivity analysis. Finally, because Medicaid is a potential source of reimbursement, we assessed whether there was an interaction effect between the Medicaid and reimbursement variables.

Hospitals missing data on screening practices (n=38) were omitted from analyses of screening practices. We used multiple imputation with 30 imputations to account for missing values for percentage African American (n=5 missing values) and third-party reimbursement (n=79 missing values).[16,17] We calculated Wald tests for multiple category variables.[18] We performed all analyses using Stata® version 12,[19] with $p<0.05$ considered statistically significant.

RESULTS

Of the 754 hospitals surveyed, area HIV prevalence data were available for 638 (84.6%) hospitals. The characteristics of surveyed hospitals are shown in Table 1. Hospitals lacking prevalence data and excluded from this analysis were less often teaching and for-profit hospitals and more often in the Midwest, with fewer admissions, and in rural areas than hospitals with prevalence data (all $p<0.001$). Hospitals included in the analysis were predominantly nonteaching (80.9%), private not for profit (66.5%), and urban (82.8%); the median area HIV prevalence per 1,000 population for the 638 hospitals was 0.13% (interquartile range 0.07, 0.29).

HIV screening practices

The HIV screening practices of participating hospitals are shown in Table 2. Among the 638 included hospitals, 35 (5.8%) reported screening all patients and 157 (26.2%) reported screening some patients. Of 376 hospitals in areas with HIV prevalence ≥0.1%, only 25 (6.6%) reported screening all patients for HIV and only 11 of 153 (7.5%) hospitals in areas with HIV prevalence >0.3% reported screening all patients; the corresponding numbers for screening some or all

Table 1. Characteristics of hospitals (*n*=754) included in a 2009–2010 survey of HIV testing practices in the U.S.

Characteristic	*Included in analysis (prevalence data present)* N *(percent)*	*Not included in analysis (no prevalence data)* N *(percent)*	P-*value*[a]
Total	638 (100.0)	116 (100.0)	
Teaching hospital			<0.001
No	516 (80.9)	112 (96.6)	
Yes	122 (19.1)	4 (3.4)	
Ownership			<0.001
Private not for profit	424 (66.5)	63 (54.3)	
Private for profit	74 (11.6)	48 (41.4)	
Public	140 (21.9)	5 (4.3)	
Annual admissions			<0.001
≤3,500	250 (39.2)	106 (91.4)	
3,501–10,000	181 (28.4)	6 (5.2)	
>10,000	207 (32.4)	4 (3.4)	
Region[b]			<0.001
Northeast	112 (17.6)	7 (6.0)	
Midwest	198 (31.0)	71 (61.2)	
South	245 (38.4)	17 (14.7)	
West	83 (13.0)	21 (18.1)	
Area			<0.001
Rural	110 (17.2)	89 (76.7)	
Urban	528 (82.8)	27 (23.3)	
State HIV testing regulations compatible with CDC revised recommendations[c]			0.922
Not	84 (13.2)	16 (13.8)	
Changed in 2009 to be compatible	97 (15.2)	19 (16.4)	
Yes	457 (71.6)	81 (69.8)	
Percentage of Medicaid admissions			<0.001
≤15%	460 (72.1)	75 (64.7)	
>15%	178 (27.9)	41 (35.3)	
Medicare percent African American[d]			0.370
≤40%	597 (93.6)	110 (94.8)	
>40%	35 (5.5)	4 (3.4)	
HIV prevalence per 1,000 population			<0.001
Mean percent (SD)	0.23 (0.30)		
Median percent (interquartile range)	0.13 (0.07, 0.29)		

[a]*P*-value based on Chi-square test of independence

[b]Northeast includes Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Midwest includes Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. South includes Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Texas, Virginia, Washington, D.C., and West Virginia. West includes Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

[c]Compatible regulations are those that allow hospitals to perform HIV testing after obtaining general consent for medical care and not specific consent for HIV testing.

[d]Percentages are based on hospitals with nonmissing data on race.

HIV = human immunodeficiency virus

CDC = Centers for Disease Control and Prevention

SD = standard deviation

patients were 131 out of 376 (34.8%) for hospitals in areas with HIV prevalence ≥0.1% and 60 out of 153 (39.2%) for hospitals in areas with HIV prevalence >0.3%. Of the 131 hospitals in areas with prevalence ≥0.1% that reported screening some or all patients for HIV, 52 (39.7%) reported having opt-out screening; of the 60 hospitals in areas with prevalence >0.3% that reported screening some or all patients for HIV, 22 (36.7%) reported having opt-out screening (data not shown). Ninety-six (25.5%) hospitals located in areas with HIV prevalence ≥0.1% reported performing opt-out HIV screening, whereas 37 (24.2%) hospitals

Table 2. HIV screening practices in hospitals (*n*=638) participating in a 2009–2010 survey of HIV testing practices in the U.S., by area[a] HIV prevalence

		Area[a] HIV prevalence			
HIV testing practice	*All* N *(percent)*	*<0.1%* N *(percent)*	*0.1%–0.3%* N *(percent)*	*>0.3%* N *(percent)*	P-*value*[b]
Total	638 (100.0)	262 (100.0)	223 (100.0)	153 (100.0)	
HIV screening performed[c]					0.061
No	397 (66.2)	175 (73.2)	139 (65.0)	83 (56.5)	
Yes	35 (5.8)	10 (4.2)	14 (6.5)	11 (7.5)	
Yes, some	157 (26.2)	51 (21.3)	57 (26.6)	49 (33.3)	
Don't know	11 (1.8)	3 (1.3)	4 (1.9)	4 (2.7)	
Opt-out screening performed					0.839
No	478 (74.9)	198 (75.6)	164 (73.5)	116 (75.8)	
Yes	160 (25.1)	64 (24.4)	59 (26.5)	37 (24.2)	
Screening performed in ED[c]					<0.001
No	508 (88.8)	214 (93.0)	184 (90.2)	110 (79.7)	
Yes	64 (11.2)	16 (7.0)	20 (9.8)	28 (20.3)	
Screening performed in inpatient units[c]					0.024
No	514 (89.9)	214 (93.0)	185 (90.7)	115 (83.3)	
Yes	57 (10.0)	16 (7.0)	19 (9.3)	22 (15.9)	
Don't know	1 (0.2)	0 (0.0)	0 (0.0)	1 (0.7)	
Screening performed in LD[c]					0.007
No	403 (70.3)	178 (76.7)	141 (69.1)	84 (61.3)	
Yes	170 (29.7)	54 (23.3)	63 (30.9)	53 (38.7)	
Screening performed in primary care clinic(s)[c]					0.176
No	469 (87.8)	199 (90.0)	165 (89.2)	105 (82.0)	
Yes	59 (11.0)	20 (9.0)	19 (10.3)	20 (15.6)	
Don't know	6 (1.1)	2 (0.9)	1 (0.5)	3 (2.3)	
Screening performed in urgent care[c]					0.051
No	467 (91.0)	200 (93.9)	164 (91.6)	103 (85.1)	
Yes	43 (8.4)	12 (5.6)	15 (8.4)	16 (13.2)	
Don't know	3 (0.6)	1 (0.5)	0 (0.0)	2 (1.7)	
Screening performed in substance abuse clinic(s)[c]					0.017
No	425 (89.3)	183 (92.9)	152 (89.4)	90 (82.6)	
Yes	47 (9.9)	13 (6.6)	18 (10.6)	16 (14.7)	
Don't know	4 (0.8)	1 (0.5)	0 (0.0)	3 (2.8)	

[a]"Area" refers to a county, borough, parish, or (Virginia only) city.

[b]*P*-value is for Chi-square test of independence of prevalence rate category (0.1%–0.3% and >0.3%) and hospital characteristic (all hospitals with prevalence >0.1%).

[c]Does not total 638 because of missing or not applicable responses

HIV = human immunodeficiency virus

ED = emergency department

LD = labor and delivery

located in areas with prevalence >0.3% reported performing opt-out HIV screening. Among the 96 hospitals in areas with HIV prevalence ≥0.1% that reported opt-out screening, 52 (54.2%) screened some or all patients. For emergency departments, inpatient units, labor and delivery, and substance abuse clinics, screening was significantly more likely in higher prevalence areas ($p<0.05$ for all).

Bivariate and multivariate analyses

Bivariate associations of hospital characteristics with screening practices are shown in Table 3. Screening some or all patients was more common in teaching hospitals than in nonteaching hospitals, in hospitals with >10,000 annual admissions (vs. those with ≤10,000 admissions), in urban (vs. rural) hospitals, in hospitals with >40% African Americans among Medicare admissions (vs. ≤40% African American Medicare admissions), and in hospitals that reported receiving reimbursement for HIV screening (vs. no reimbursement).

Table 3. Bivariate analysis of characteristics associated with screening some or all patients in hospitals (*n*=638) participating in a 2009–2010 survey of HIV testing practices in the U.S.

	Screen some or all vs. screen none		
Characteristic	*OR (95% CI)*	*P-value*	*Wald p-value*
Teaching hospital			<0.001
No	Ref.		
Yes	2.37 (1.58, 3.56)	<0.001	
Ownership			0.070
Private not for profit	Ref.		
Private for profit	1.01 (0.59, 1.70)	0.984	
Public	0.60 (0.38, 0.93)	0.023	
Annual admissions			<0.001
≤3,500	Ref.		
3,501–10,000	1.84 (1.18, 2.86)	0.007	
>10,000	2.97 (1.96, 4.51)	<0.001	
Region[a]			0.244
Northeast	Ref.		
Midwest	1.07 (0.65, 1.77)	0.790	
South	0.81 (0.50, 1.33)	0.406	
West	1.37 (0.75, 2.49)	0.306	
Area			0.003
Rural	Ref.		
Urban	2.17 (1.30, 3.65)	0.003	
Percentage Medicaid admissions			<0.001
≤15%	Ref.		
>15%	1.92 (1.34, 2.73)	<0.001	
Medicare percentage African American			0.003
≤40%	Ref.		
>40%	2.86 (1.43, 5.68)	0.003	
State HIV testing regulations compatible with CDC revised recommendations[b]			0.088
No	Ref.		
Changed to be compatible in 2009	1.12 (0.57, 2.24)	0.738	
Yes	1.65 (0.96, 2.86)	0.071	
Receives reimbursement			<0.001
No	Ref.		
Yes	2.62 (1.78, 3.86)	<0.001	
Area[c] HIV prevalence (per 0.1% increase)	1.10 (1.04, 1.16)	0.001	

[a]Northeast includes Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Midwest includes Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. South includes Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Texas, Virginia, Washington, D.C., and West Virginia. West includes Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

[b]Compatible regulations are those that allow hospitals to perform HIV testing after obtaining general consent for medical care and not specific consent for HIV testing.

[c]"Area" refers to a county, borough, parish, or (Virginia only) city.

HIV = human immunodeficiency virus

OR = odds ratio

CI = confidence interval

Ref. = reference group

The likelihood that a hospital screened some or all patients also increased with increasing HIV prevalence, with the probability increasing about 1% for each 0.1% increase in area HIV prevalence.

In multivariate analysis, only the percentage of Medicaid admissions and receipt of third-party reimbursement for HIV screening were independently associated with screening some or all patients in models that did and did not include as a covariate the percentage of African American patients among the Medicare admissions (Table 4). When we included a term for the interaction of percentage Medicaid and

reimbursement status in our models, we found no interaction effect ($p>0.7$ for both models); as such, the term was not included in the final models. Sensitivity analyses restricted to the 191 hospitals in areas with prevalence ≥0.25% gave similar results: in bivariate analysis, screening some or all patients was more common in teaching hospitals than in nonteaching hospitals, in hospitals with high annual admissions vs. those with annual admissions of ≤10,000, in hospitals with >40% African American Medicare admissions (vs. those with ≤40% African American Medicare admissions), and in hospitals receiving reimbursement (vs. no reimbursement), while in the multivariable model including these factors, only reimbursement was significantly associated with the outcome.

DISCUSSION

In this first study of factors associated with hospital adoption of CDC's revised recommendations for HIV testing in health-care settings in the U.S., we found that among 638 hospitals with HIV prevalence data, only 32.0% screened some or all patients, and that of 376 hospitals located in areas with area HIV prevalence ≥0.1%, approximately the same percentage reported screening some or all of their patients. In general, among these hospitals, the failure to screen was common across all categories of hospitals, while about one-quarter of hospitals reported having an opt-out policy regardless of area HIV prevalence.

These results add to those of the previous report of this survey by Voetsch et al., who used the full sample of survey respondents and found that 27.3% screened for HIV in at least one department. The authors also found that screening was more likely to occur in larger

Table 4. Multivariate analysis of characteristics associated with screening some or all patients in hospitals (*n*=638) participating in a 2009–2010 survey of HIV testing practices in the U.S.

	Model 1[a] *Screen some or all*			*Model 2*[b] *Screen some or all*		
	OR (95% CI)	*P-value*	*Wald p-value*	*OR (95% CI)*	*P-value*	*Wald p-value*
Teaching hospital			0.357			0.393
No	Ref.			Ref.		
Yes	1.27 (0.76, 2.13)	0.357		1.25 (0.75, 2.10)	0.000	
Annual admissions			0.117			0.093
≤3,500	Ref.			Ref.		
3,501–10,000	1.42 (0.86, 2.36)	0.175		1.44 (0.87, 2.40)	0.156	
>10,000	1.81 (1.03, 3.17)	0.039		1.86 (1.06, 3.27)	0.030	
Area			0.417			0.333
Rural	Ref.			Ref.		
Urban	1.29 (0.70, 2.38)	0.417		1.36 (0.73, 2.51)	0.333	
Percentage Medicaid admissions			<0.001			0.001
≤15%	Ref.			Ref.		
>15%	2.02 (1.37, 2.98)	0.000		1.96 (1.33, 2.90)	0.001	
Medicare percentage African American						0.054
≤40%				Ref.		
>40%				2.23 (0.99, 5.02)	0.054	
Receives reimbursement			<0.001			<0.001
No	Ref.			Ref.		
Yes	2.59 (1.70, 3.97)	0.000		2.57 (1.68, 3.95)	0.000	
Area[c] HIV prevalence (per 0.1% increase)	1.03 (0.97, 1.09)	0.372		1.00 (0.94, 1.07)	0.885	

[a]Includes the variables shown with significant bivariate association except for Medicare percentage African American

[b]Includes Medicare percentage African American

[c]"Area" refers to a county, borough, parish, or (Virginia only) city.

HIV = human immunodeficiency virus

OR = odds ratio

CI = confidence interval

Ref. = reference group

hospitals, urban hospitals, and teaching hospitals, with the lowest screening rates at public hospitals.[12] We examined a smaller set of hospitals—those with available HIV prevalence data, with a focus on the subset of those in areas of ≥0.1% HIV prevalence—and used a different outcome, "screening some or all patients," but found similar bivariate results. However, results of our multivariable analysis indicated that these associations disappear after adjusting for percentage of Medicaid patients and the availability of outside resources or reimbursement to support screening.

In the current study, several characteristics of hospitals were associated with screening some or all patients in the bivariate analysis: teaching hospitals, those in urban areas, those with higher annual admissions, those reporting being reimbursed for screening, and those with higher percentages of Medicaid and African American Medicare patients. However, of these factors, only receipt of resources or reimbursement for HIV screening and having Medicaid patients account for ≥15% of admissions were independently associated with an increased likelihood of screening some or all patients.

The association between third-party resources or reimbursement for screening tests and report of screening some or all patients indicates that cost may be an important barrier to testing. This finding is consistent with prior studies that have surveyed providers concerning the barriers to HIV screening.[20,21] It is not surprising that hospitals are more likely to screen patients if they are reimbursed for some or all of the costs associated with HIV testing, but it is notable that this factor was more important than all other factors except the percentage of Medicaid patients admitted. While hospitals were not asked to identify the source of reimbursement, it is known that Medicaid programs offer different levels of reimbursement in different states, with some state Medicaid programs reimbursing for screening.[22] Other possible sources of reimbursement mentioned in the survey question are Medicare, private insurers, local municipalities, and state and local health departments.[23] In 2010, Medicare adopted a policy of payment for screening of high-risk patients; while this policy will largely apply to disabled patients and patients older than 65 years of age, it may influence hospital practices for other patients.[24] While the observational cross-sectional nature of the study design does not let us draw causal inferences, this finding indicates that policy makers who wish to increase HIV screening should consider lack of reimbursement as an important barrier.

Another notable finding, likely related to reimbursement for screening, is that hospitals with Medicaid admissions accounting for >15% of all admissions were more likely to screen patients for HIV. This finding may reflect Medicaid reimbursement policies, although the absence of an interaction effect between percentage of Medicaid admissions and reimbursement suggests that this effect is distinct from the effect of reimbursement. Similarly, while the correlation between percentage of Medicaid admissions and area HIV prevalence in our sample was positive (Spearman's correlation coefficient $r=0.29$, $p<0.05$), our models were adjusted for prevalence rate, indicating that the effect of having a high proportion of Medicaid patients is independent of prevalence.

Limitations

This study was subject to several limitations. First, this study was observational; therefore, any associations cannot be inferred to be causal. However, it does provide the first cross-sectional look at the association between the HIV screening practices of hospitals, the prevalence of HIV, the available reimbursement for HIV screening, and the low-income and minority status of patients seen by the hospital. Another limitation was that only about half of the hospitals responded to the survey, and there may be a correlation between the hospitals' characteristics and practices and their response to this survey. However, Voetsch et al. reported that respondents differed from nonrespondents only with respect to region (with the Northeast overrepresented) and ownership (with public hospitals underresponding), suggesting minimal response bias with respect to the outcome.[12] Similarly, the outcome was self-reported and of unknown accuracy; however, the surveys were completed in each hospital by the infection-control director, who might be more likely to overstate than understate screening practices, and overstatement would only bias our main finding toward the null.

There were several important limitations related to our use of HIV prevalence data. The greatest such limitation was that we did not have hospital-specific prevalence data—only area prevalence data—although CDC's revised recommendations for HIV testing in health-care settings apply to people with undiagnosed HIV infection who present for health care. There are no prevalence data for areas in which the population was fewer than 100 people; the number of HIV cases was fewer than five; and for all of Hawaii, Idaho, North Dakota, South Dakota, and Vermont. However, as there are few counties with populations of <100 people that also have hospitals, the first two of these restrictions likely had little effect on our results. The lack of data for five states was more problematic, but still allowed us to make estimates based on the majority of states. More importantly, there may be little relationship between area prevalence and the proportion of undiagnosed

cases seen at a hospital. Whereas in rural areas the county or parish rate may be well-correlated with undiagnosed prevalence, in urban areas there may be large differences in the prevalence of undiagnosed infection among people served by different hospitals in the same area.[25] This difference would have biased our results toward the null, and may explain why we found no relationship between prevalence and screening practices in multivariable analysis. Finally, it is important to note that contemporary with the CDC guidelines, the U.S. Preventive Services Task Force (USPSTF) issued HIV screening recommendations for all people at high risk for HIV infection (Grade A recommendation), but made no recommendation for or against routinely screening for HIV adolescents and adults who are not at increased risk (Grade C recommendation).[26] Many hospitals and/or payers may have elected to implement as their standard of practice only those recommendations with a grade of A or B from the USPSTF.

CONCLUSION

This study presents the first assessment of findings from a national survey of HIV testing practices that takes reported HIV prevalence rates into consideration. Few hospitals reported following CDC's recommendations for HIV screening in 2009, and failure to screen is common across all types of hospitals in all regions of the country. As a first step, hospitals should be encouraged to establish the HIV prevalence rate among their patient population to clarify if the guidelines apply. Lack of reimbursement may be an important barrier to screening, but other strategies also need to be identified to increase compliance with screening guidelines.

The findings and conclusions in this article are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention (CDC). The study protocol and survey instrument were approved by CDC's Institutional Review Board as research that does not involve identifiable human subjects.

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