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Human Papillomavirus Vaccine Frequency for University of Kansas Medical Center Pediatric Patients

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ABSTRACT

Background. Human papillomavirus (HPV) vaccination is recommended for all adolescents aged 11 to 12 years, but coverage in Kansas is exceptionally poor. To understand local coverage, receipt of the 3-dose HPV vaccine series among pediatric patients at the University of Kansas Medical Center (KUMC) was evaluated.

Methods. All patients aged 11 to 12 years who were seen by a KUMC primary care provider (family medicine and pediatrics) in 2013 were included in the retrospective chart review. Records were reviewed through December 31, 2014 to capture the number of HPV doses received, and receipt of other recommended vaccines (tetanus-diphtheria-pertussis and meningococcal conjugate). Pearson's chi-squared tests were used to evaluate relationships between HPV vaccination and patient characteristics.

Results. Of the 261 eligible females and 243 eligible males, 71.2% received ≥ 1 HPV vaccine dose, 55.2% received ≥ 2 doses, and 39.3% completed the HPV vaccine series (3 doses). Although vaccine initiation was slightly lower in males compared to females (67.1% vs. 75.1%, $p = 0.047$), no difference in vaccine completion was seen between males and females (37.0% vs. 41.7%, $p = 0.319$). Over 80% of patients received other concurrently recommended vaccines (Tdap: 81.7%, meningococcal: 81.3%). HPV series completion occurred more often among Spanish-speaking females compared to English-speaking females (59.5% vs 37.7%; $p < 0.01$).

Conclusions. The proportion of adolescents who received the HPV vaccination at KUMC is substantially higher than national and state estimates, but there is room for improvement for both initiation and series completion. ***KS J Med 2016;9(1):1-5.***

INTRODUCTION

There are approximately 14 million new human papillomavirus (HPV) infections in the United States annually, making it the most common sexually transmitted infection in the country.[1] While the majority of HPV infections clear the body with no adverse outcomes, HPV also leads to an estimated 26,000 new cases of cancer every year in the United States.[2] Cervical cancer is the most common HPV-associated cancer, but HPV also can cause cancer of the oropharynx, anus, penis, vagina, and vulva. In addition, some HPV types cause genital warts. Approximately 50% of initial HPV exposures occur during the middle to late teenage years;[1] therefore, the 3-dose HPV vaccine is recommended routinely for all adolescents aged 11 to 12 years as part of the vaccine platform that includes the meningococcal conjugate vaccine and the tetanus, diphtheria, and pertussis vaccine (Tdap).[3]

Despite recommendations, HPV vaccination coverage remains low, especially compared to the other vaccines on the adolescent platform.[4] Nationally, completion of the Tdap and meningococcal vaccines in 2013 was estimated at 86% and 78%, respectively. However, administration of at least one dose of the HPV vaccine (vaccine initiation) is reported at only 57% in females and 35% in males. HPV series completion is drastically lower at 37.6% in females and 13.9% in males. Vaccination rates vary substantially by geographic region within the United States. Among females, Kansas reported 40% coverage for HPV vaccine initiation (receipt of ≥ 1 HPV dose), the lowest in the country. For males, vaccine initiation coverage was only 25%. In Kansas, completion of the 3-dose series among females was 21%.

The University of Kansas Medical Center (KUMC), located in Kansas City (Wyandotte County), KS, is one of the few tertiary care centers in Kansas and serves as a major center of healthcare for Kansas residents. There are currently no data on local HPV series completion at KUMC. In Wyandotte County, HPV series completion is estimated at about 25% for both males and females.[5] The aim of this study was to determine vaccination coverage at KUMC for both HPV vaccination initiation and HPV vaccination completion to identify baseline coverage, factors associated with series initiation and completion, and opportunities for local improvements.

METHODS

All medical records of KUMC outpatients who had at least one visit to KUMC in calendar year 2013 and were aged 11 or 12 years were reviewed. Eligible patients were seen in either the Family Medicine and/or select Pediatric (Prairie Village, Adolescent Clinic, and Medical Office Building) outpatient clinics at KUMC.

Data on HPV vaccination status and patient demographics were collected from either the visit where the first HPV vaccine dose was given (for all patients with at least one HPV vaccine dose in 2013) or the initial 2013 patient visit (for all patients without any HPV vaccine doses in 2013). Receipt of the other vaccines included on the adolescent platform (Tdap and meningococcal conjugate) was also captured. For patients who initiated the HPV vaccination series, additional data were reviewed through December 2014 to document receipt of any additional HPV vaccine doses. Extending the data collection period through December of 2014 allowed for sufficient time for patients to receive their second HPV vaccine dose (recommended for 2 months after the initial dose) and their third HPV vaccine dose (recommended for 6 months after the initial dose).

Initiation of the HPV vaccination series was defined as the proportion of the eligible population that received at least one dose (≥ 1 dose) of the HPV vaccine within the study timeframe. Series completion was defined as the proportion of the population that received all three recommended doses of the HPV vaccine within the study timeframe. To evaluate possible differences in initiation and completion coverage, data were stratified by demographic variables (i.e., gender, race, ethnicity, and language spoken at home) that could be used to identify potential risk factors or motivators for series initiation and completion. Insurance status was not accessible for this project. Statistical analyses were calculated using the Statistical Package for the Social Sciences (SPSS). Person's Chi-squared tests were used to test for statistically significant differences, with statistical significance set to a p-value of < 0.05.

RESULTS

Of 504 eligible patients, 51.8% were females (Table 1). About two-thirds of patients were non-Hispanic (68.5%), and charts of 80.8% showed that patients' primary language spoken at home was English. The most commonly noted race was white (38.9%), followed by black (23.2%).

TABLE 1. Demographic characteristics of study population.

	Number (%) (n=504)
Gender	
Male	243 (48.2)
Female	261 (51.8)
Race	
White	196 (38.9)
Black	117 (23.2)
Other	191 (37.9)
Ethnicity	
Hispanic	158 (31.5)
Non-Hispanic	344 (68.5)
Language spoken at home	
English	407 (80.8)
Spanish	85 (16.9)
Other	12 (2.4)

Almost three-quarters of patients (71.2%) had initiated the HPV vaccine series, receiving at least one HPV vaccine in 2013 (Figure 1). Roughly 82% of patients had received the other two vaccines recommended in the adolescent platform, Tdap and meningococcal conjugate. Over half (55.2%) of patients received at least two HPV vaccines by the end of 2014, and 39.3% of patients completed the HPV vaccine series (Figure 1). When stratified by gender, initiation and completion of the HPV vaccine series were very similar (Figure 1). Among females, 75.1% initiated the HPV vaccine, compared to 67.1% of males ($p = 0.047$). Completion was 41.4% among females and 37.0% among males ($p = 0.319$). Completion of the HPV series occurred more often among Spanish-speaking females (59.5%) compared to English-speaking females (37.7%; $p < 0.01$; Table 2). Although not statistically significant, other noted trends included higher initiation and completion rates among Hispanics vs. non-Hispanics and non-whites vs. whites.

DISCUSSION

Overall, HPV vaccination coverage at KUMC was substantially better than reported vaccination coverage at the state level (Figure 2). Vaccination initiation among females at KUMC was nearly double the coverage reported for the state of Kansas (75.1% vs 39.9%, respectively).[5] This is likewise true when comparing HPV vaccine initiation at KUMC to national coverage estimates. Based on the US Centers for Disease Control and Prevention (CDC) reported data, 57.3% of females and 34.9% of males have at least the first HPV vaccine dose.[4] Differences in coverage nationally, at the state level, and at KUMC also were apparent for HPV vaccine completion (3 doses), though less drastic.

While small differences in the vaccination coverage between females and males were seen, coverage in both groups was strikingly high, contrary to what has been reported previously for the state of Kansas and nationally.[4,5] This finding suggested equal promotion of the HPV vaccine to males and females at KUMC, despite prevailing beliefs that the HPV vaccine goal is to prevent cervical cancer.[6,7] Both state and national coverage estimates reflect a disparity in HPV coverage by sex; however the HPV vaccine has been recommended for both males and females since 2009.[3,8] KUMC performs on a similar level to the rest of the state and nation in regards to delivery of the Tdap vaccine, a vaccine long required for school admissions.[4,5] The other recommended adolescent vaccine, meningococcal conjugate, also is delivered more frequently at KUMC. Overall, administration of the recommended vaccines that are part of the adolescent platform exceeds other coverage estimates, possibly indicative of a generally broad approach to adolescent vaccine delivery practiced by KUMC nurses and clinicians. In anecdotal observations of clinical encounters conducted by the study authors, the HPV vaccine was recommended by the provider and presented as part of the adolescent platform. Provider recommendation is one of the main factors that can positively impact HPV vaccine uptake.[9]

Despite high HPV vaccine initiation, there was a gradual decline in the proportion of adolescents who received each additional HPV dose required to complete the series. The fact that the HPV vaccine requires multiple doses remains a barrier for series completion and adequate immunologic protection.

A two-dose series seemed to be non-inferior to a three-dose series in the short term.[10] Reducing the number of necessary doses could impact HPV vaccine series completion positively; however, other studies are needed to evaluate the true long term implications of fewer HPV vaccine doses.

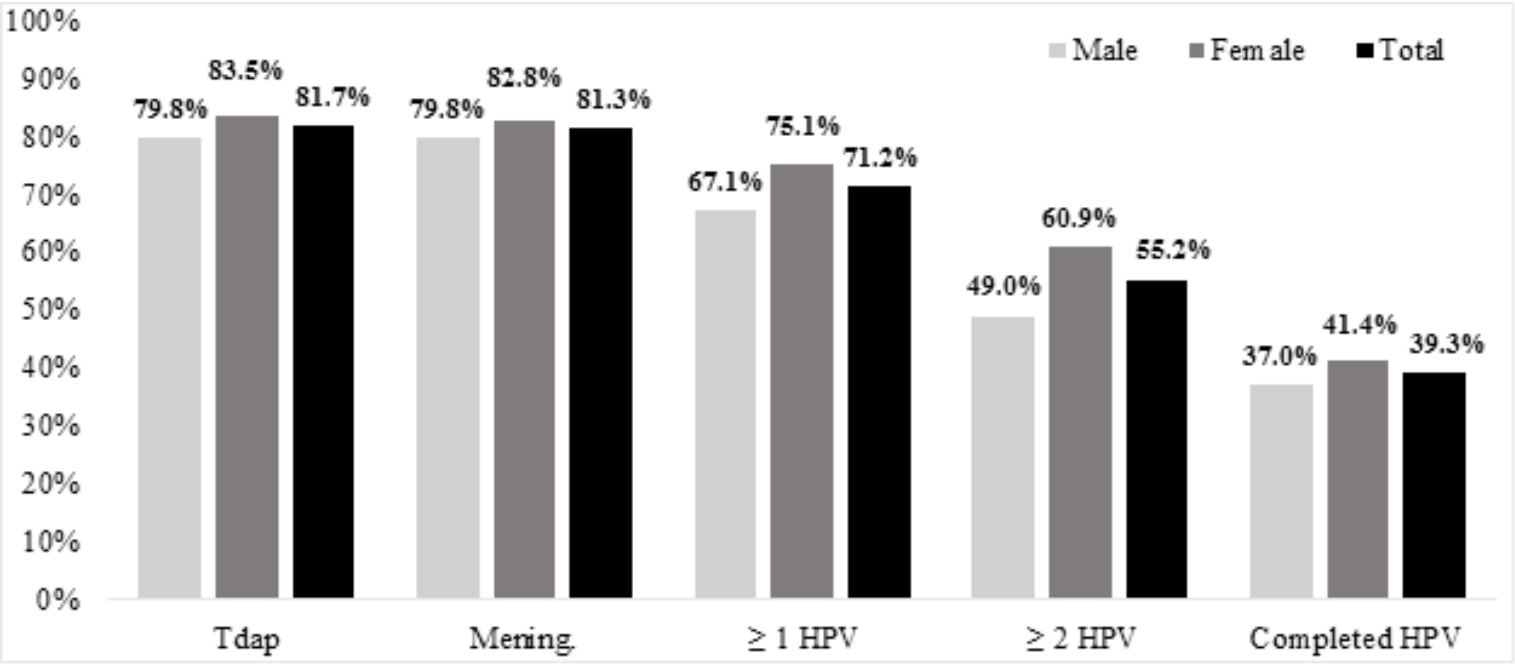

Figure 1. Vaccination coverage of recommended adolescent vaccines at KUMC, 2013.
Tdap= tetanus, diphtheria, and pertussis

Table 2. HPV vaccination coverage at KUMC by race, ethnicity and primary language spoken at home, 2013.

RACE					ETHNICITY				LANGUAGE			
Male HPV Series Completion					**Male HPV Series Completion**				**Male HPV Series Completion**			
Vaccine Status	Black	Other	White	p-value	Vaccine Status	Hispanic	Non-Hispanic	p-value	Vaccine Status	English	Spanish	p-value
Received ≥ 1 HPV dose					Received ≥ 1 HPV dose				Received ≥ 1 HPV dose			
	72.4%	72.4%	57.5%	0.059		71.1%	65.4%	0.371		64.6%	79.1%	0.068
Completed HPV Series					Completed HPV Series				Completed HPV Series			
	34.5%	42.9%	32.2%	0.292		41.0%	35.2%	0.380		34.9%	46.5%	0.152
Female HPV Series Completion					**Female HPV Series Completion**				**Female HPV Series Completion**			
Vaccine Status	Black	Other	White	p-value	Vaccine Status	Hispanic	Non-Hispanic	p-value	Vaccine Status	English	Spanish	p-value
Received ≥ 1 HPV dose					Received ≥ 1 HPV dose				Received ≥ 1 HPV dose			
	81.4%	74.2%	72.5%	0.432		84.0%	82.2%	0.813		73.6%	85.7%	0.095
Completed HPV Series					Completed HPV Series				Completed HPV Series			
	40.7%	46.2%	37.6%	0.460		50.7%	37.8%	0.057		37.7%	59.5%	0.009

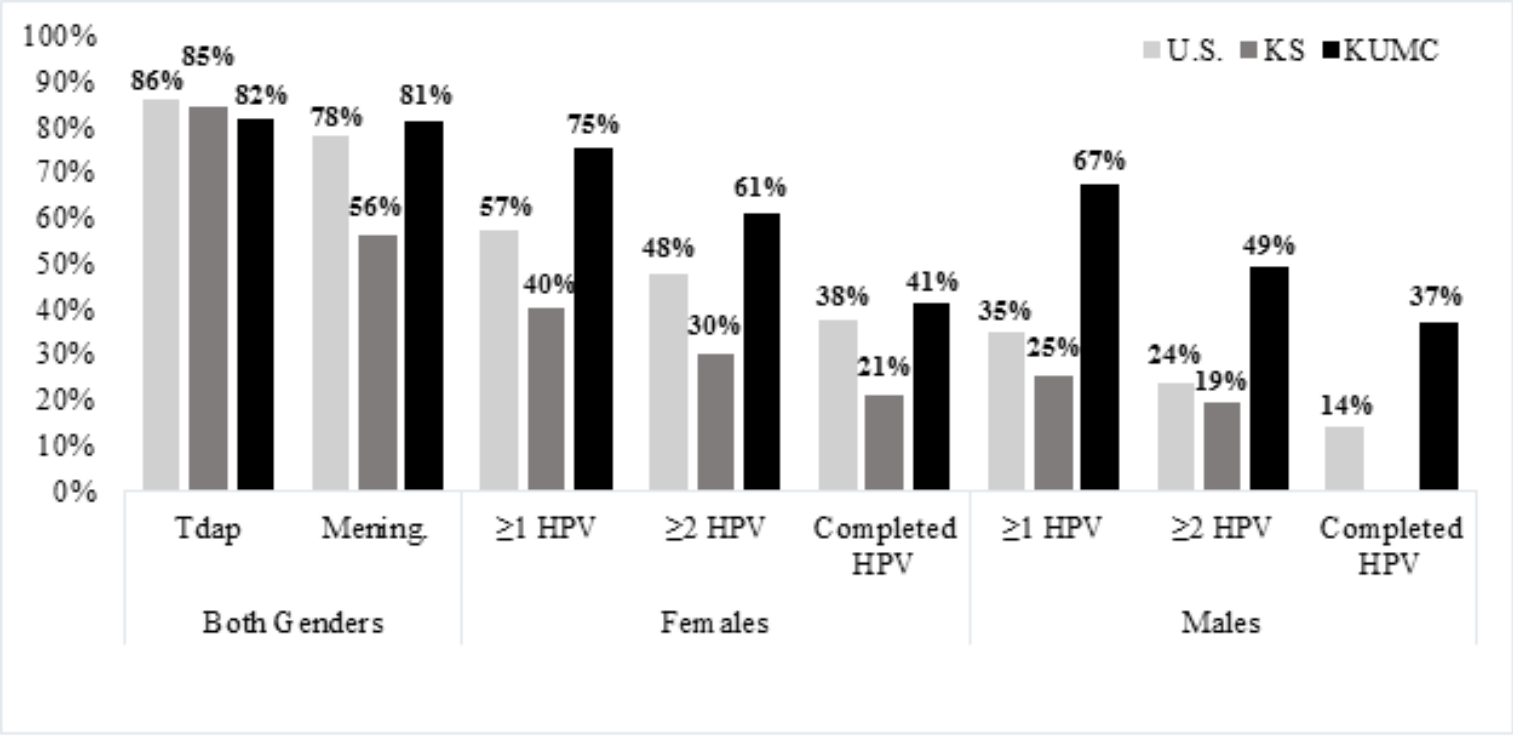

Figure 2. Comparison of vaccination coverage of recommended adolescent vaccines, United States, the state of Kansas,[4] and KUMC, 2013.
Note: No data were reported for males in Kansas who completed HPV vaccination.
KUMC = University of Kansas Medical Center
Tdap = tetanus, diphtheria, and pertussis
Mening. = meningococcal conjugate
HPV = human papillomavirus

There are other trends that highlight disparities that may impede vaccine series completion. National data showed higher HPV vaccine initiation among racial/ethnic minorities and those living in poverty, but higher HPV vaccine completion among white females and males and patients of higher socioeconomic status.[11] At KUMC, both higher initiation and completion rates were observed among minority populations, an important finding due to higher morbidity and mortality of HPV-associated cancers in these groups.[12-14] Barriers to vaccine completion, such as the added costs associated with extra appointments (i.e., transportation, etc.)[11] or youth not visiting a provider for a well-child visit may not be as prevalent among the population at KUMC, where the majority of the patient population consists of underserved ethnic/racial minorities who need to be seen for an annual well-child visit as a requirement for receiving Medicaid.

Vaccine receipt data for this study were collected from reviews of patient charts maintained at KUMC, which may not capture vaccine delivery at other institutions. Such underreporting would result in lower calculated HPV vaccine coverage than was present. In addition, calculated KUMC vaccination rates potentially could be higher than those reported here if patients were followed for a longer period of time. However, to follow the HPV vaccine delivery schedule recommended by CDC, follow-up was limited to one year. Limited chart access led to only a few demographic variables being assessed. Possibly important variables, like insurance status, may play a role in vaccination success in the KUMC population. While the findings presented are not generalizable to other locations, these data showed that higher coverage of all three recommended adolescent vaccines can be achieved in a busy, urban clinic setting.

While HPV vaccine initiation and completion at KUMC are significantly higher than expected based on previously reported national and state data, there is a need for improvement to achieve the minimum 80% vaccination level recommended by the Advisory Committee on Immunization Practices (ACIP).[3] Further studies are needed to evaluate practices at KUMC, including identifying effective approaches to increase HPV vaccine series completion.

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Keywords: Human papillomavirus vaccine, vaccination, adolescent, HPV

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The Influence of Loan Repayment and Scholarship Programs on Healthcare Provider Retention in Underserved Kansas

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ABSTRACT

Background. In an effort to redistribute healthcare providers to underserved areas, many states have turned to financial incentive programs. Despite substantial research on these programs on a national scale, little is known about the success of such programs in Kansas. The purpose of this study was to provide insight into the relationship between financial incentive programs and provider retention in Kansas.

Methods. A cross-sectional telephone survey was conducted in April and May of 2011 with participants who had completed their obligations to the Kansas State Loan Repayment Program (SLRP), the National Health Service Corps (NHSC) Loan Repayment program, or the National Health Service Corps Scholarship program in Kansas between January 2006 and January 2011.

Results. Of the 112 providers included in the study, 54.4% (n = 61) had left their program sites sometime after finishing their commitment, with the mean length of stay after the obligation period ended being 7.3 (median = 3) months. Of the 54 participants who had left their program sites and whose current locations were known, 33.3% (n = 18) were located in new Health Professional Shortage Areas (HPSA), 25.9% (n = 14) were in a new non-HPSA, and 40.7% (n = 22) had left the state. Family satisfaction with the community and attending a professional school in Kansas were associated statistically with retention of physicians in Kansas.

Conclusions. Nearly half of all participants had remained at their sites even after their obligation period ended, with family satisfaction with the community appearing to be the strongest predictor for retention among those who had stayed. Efforts to match a provider's family with the community successfully and to support the family through networking may improve future provider retention. ***KS J Med 2016;9(1):6-11.***

INTRODUCTION

In 2011, more than 50 million Americans lacked access to healthcare.[1] To meet such a need would require the addition of 27,000 primary care providers.[1] In 2004, 65% of rural counties in the United States were underserved, qualifying as Health Professional Shortage Areas (HPSAs).[2] There are 5,900 primary care HPSAs, 4,600 dental HSPAs, and 3,800 mental health HPSAs in the United States.[3]

In its 2012 report on underserved areas, the Kansas Primary Care Office specified 101 primary care HPSAs in Kansas.[4] In addition, the state had 98 designated dental care HPSAs and 106 mental health HPSAs.[4] It was estimated in 2011 that Kansas needed an additional 74 primary care providers, 87 dentists, and 29 mental health providers.[5]

In an effort to redistribute healthcare workers to underserved areas, many states have turned to financial incentive programs such as loan repayment and scholarship programs. In return for monetary awards toward educational loans, or payment of stipend and tuition, participants care for patients in federally designated HPSAs for a minimum of two years.[4] Financial incentive programs are effective in the recruitment of healthcare providers to underserved areas because they ease or erase the education-debt of providers. However, the effect of such programs on the retention of providers in underserved areas is less understood, with prior studies suggesting contradictory findings.[6-9]

The purpose of this research was two-fold: 1) to determine the retention rates of healthcare professionals after the completion of their obligations in Kansas HPSAs, and 2) to investigate demographic, professional, and satisfaction factors that may be associated with the retention of healthcare workers in Kansas HPSAs.

METHODS

This study was approved by the Human Subjects Committee at the University of Kansas School of Medicine-Wichita.

Participants and Instrument. Healthcare (medical, nursing, dental, and allied health) professionals (N = 112) who participated in the Kansas State Loan Repayment Program, the National Health Service Corps Loan Repayment program, or the National Health Service Corps Scholarship program in Kansas and completed their obligation between January 2006 and January 2011 were eligible to participate in this study.

The instrument was a 16-item phone survey which included demographic items, Likert-type items prompting respondents to report the importance of loan repayment on their decision of practice site, overall individual satisfaction with the practice and community, and family satisfaction with the community. Additionally, open-ended items prompted respondents to report their intent to remain at their practice site and likelihood of re-enrollment if they were to make the decision again.

Procedures. This was a cross-sectional telephone survey conducted in April and May of 2011. Participants were identified by the Primary Care Office at the Kansas Department of Health and Environment (KDHE). The Primary Care Office also

provided the original site locations, provider-type, and assignment start and end dates for the healthcare providers.

Analysis. Retention was defined in two ways: 1) as a dichotomous variable measuring whether or not the provider stayed at the original program site, and 2) as the length of stay (months) at the original program site. Healthcare providers who were not retained were classified further into either working in a different HPSA in Kansas, working in a non-HPSA in Kansas, or working outside of Kansas.

To come to a consensus when qualitatively analyzing results, several raters defined themes and discussed them. However, interrater reliability was not assessed.

Cox proportional hazard regression was utilized to predict the retention of healthcare providers in HPSAs. Eight candidate predictors were considered for the Cox regression analysis: gender, ethnicity, program influence on decision to practice in an underserved area, attendance of residency in or out of Kansas, attendance of professional school in or out of Kansas, provider satisfaction with the practice, provider satisfaction with the community, and family satisfaction with the community.

The aggregate data were analyzed using SPSS Version 18.0 and NVIVO8. Cox proportional hazard regression analysis was conducted to analyze healthcare provider retention. All statistical analyses were two-sided. P-value greater than 0.05 was considered to be statistically significant.

RESULTS

A total of 112 healthcare providers from 54 sites were included in the final analysis. Of the 112 healthcare providers, 11.6% (n = 13) were SLRP participants, 84.8% (n = 95) were NHSC Loan Repayment participants, and 3.6% (n = 4) were NHSC Scholarship Program participants.

Retention rates of healthcare providers in Kansas HPSAs. A Chi-square analysis was conducted to identify the association between the three programs and whether the respondents still worked at the original program sites. Participants of the NHSC scholarship program (n = 4) and respondents with unknown responses to survey questions were excluded from analysis. Forty-five percent of the providers continued to work at their original program sites (Table 1). Among the 54 providers who left their original site, one-third (33.3%, n = 18) of the providers who left their original program sites and had a current known location were located in a different HPSA in Kansas, 25.9% (n = 14) were in a non-HPSA in Kansas, and 40.7% (n = 22) had left the state and their status in a HPSA or non-HPSA area was unknown. The program type was not associated with whether the participants remained in the original worksite (p = 0.5238) nor the final destination (p = 0.2718).

Table 1. Final location of healthcare providers.*

	SLRP (n = 13)	NHSC Loan Repayment (n = 95)	NHSC Scholarship (n = 4)	Combined Programs (n = 112)	p-value
Remain at original KS worksite					**0.5238**
No	8 (61.5%)	49 (51.6%)	4 (100%)	61 (54.5%)	
Yes	5 (38.5%)	45(47.4%)	0	50 (44.6%)	
Unknown	0	1 (1.1%)	0	1 (0.9%)	
Final Destination					**0.2718**
Original site	5 (38.5%)	45 (47.4%)	0	50 (44.6%)	
Left state	5 (38.5%)	15 (15.8%)	2 (50%)	22 (19.5%)	
New HPSA	1 (7.7%)	17 (17.9%)	0	18 (16.1%)	
New non-HPSA	2 (15.4%)	12 (12.6%)	0	14 (12.5%)	
Unknown	0	6 (6.3%)	0	8 (7.1%)	

*** The p-values calculated from the Chi-square analyses were based on the exclusion of the NHSC scholarship category and unknown responses to each question, due to very few responses to these questions.**

The length of retention after service completion was known for 89 participants. For those who were still at their sites following their obligation period (n = 50), their length of service ranged from 3 to 59 months, with a mean of 30.0 and median of 31.5 months. Retention of those who subsequently had left their program sites following their obligation periods (n = 39) ranged from -13 months (due to one participant leaving the program site prior to service completion) to 40 months with a mean of 7.3 and median of 3 months at their practice site before leaving.

Seventy-five participants had completed their service obligations at least one year prior to completing the survey, and of those participants, thirty-seven (37) completed their obligation at least three years prior to completing the survey. Of all programs combined, 62.6% (n = 47) were still at their program sites one year post-completion, and this percentage decreased to 46% at three years (Figure 1).

Demographics of healthcare providers. Seventy-three (73) participants completed the phone survey, for a response rate of 65.2%. More than half of the respondents (57.5%, n = 42) were female, between 30 and 39 years (50.7%, n = 37), and had attended professional school out of state (64.4%, n = 47; Table 2). The majority of respondents were white (94.5%, n = 69) and married (82.2%, n = 60).

Factors associated with retention of healthcare providers in Kansas HPSAs. The 73 healthcare providers who completed the phone survey were queried regarding satisfaction with the practice and their family's satisfaction with the community (Table 3). There were 37 participants who stayed in their original program site and 36 participants who left their original program site. Among the 36 survey participants who stayed at their original program sites (and provided responses to the items in

in the survey), 97.2% (n = 35 of 36) reported being "very satisfied" or "somewhat satisfied" with the practice, 91.6% (n = 33 of 36) reported being "very satisfied" or "somewhat satisfied" with their community, and 96.7% (n = 29 of 30) of respondents reported their families were "very satisfied" or "somewhat satisfied" with their community.

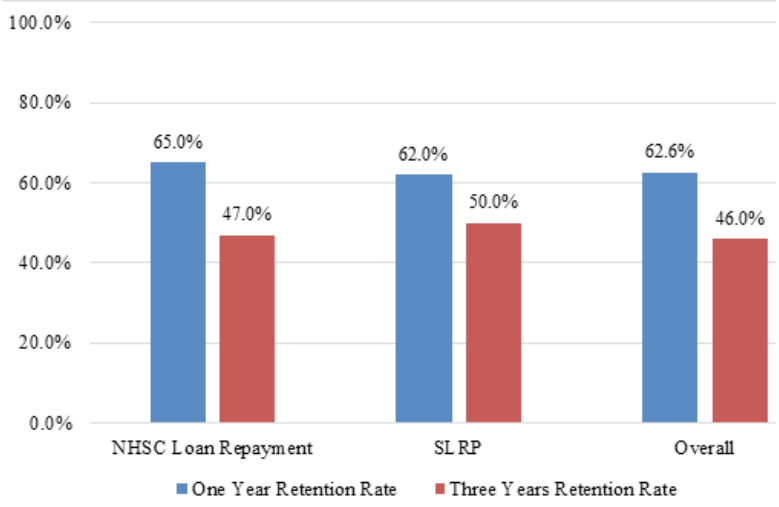

Figure 1. Retention at original Kansas program site at one and three years post-obligation.*
*Due to small total numbers (n = 2), NHSC scholarship program respondents were excluded from figure.

Of the 37 survey participants who had left their original program sites (and provided responses to the items in the survey), 67.5% (n = 25 of 37) reported being "very satisfied" or "somewhat satisfied" with the practice, 83.8% (n = 31 of 37) reported being "very satisfied" or "somewhat satisfied" with their community, and 62.1% (n = 18 of 29) reported their families were "very satisfied" or "somewhat satisfied" with the community. Of the 72 responding providers, 94% (n = 68) reported they would enroll again in the program if they were to do it again. For both groups combined, sex, age, race, and marital status were not associated with whether survey participants left their original program site (Table 3).

Cox proportional hazard analysis was conducted to identify factors associated with retention of healthcare providers in the original program sites. Both attendance of professional school in Kansas and family satisfaction with the community were significant predictors of retention. Those providers who attended professional school somewhere other than Kansas had a hazard ratio of 3.11 (p = 0.0474), suggesting they were more than three times as likely to leave their original program site compared to those who attended professional school in Kansas. Additionally, compared to healthcare providers whose families were very satisfied with their communities, those providers whose families reported being very unsatisfied had a hazard ratio of 6.752 (p = 0.019), suggesting they were nearly seven times as likely to leave their original

Table 2. Demographics of healthcare provider survey respondents (N = 37).*

	SLRP (n = 13)	NHSC Loan Repayment (n = 95)	NHSC Scholarship (n = 4)	Total (N = 73)
Provider				
Physician	3 (37.5%)	11 (17.5%)	0	14 (19.2%)
Nurse Practitioner	2 (25%)	8 (12.7%)	0	10 (13.6%)
Physician Assistant	1 (12.5%)	10 (15.9%)	1 (50%)	12 (16.4%)
Nurse Midwife	0	1 (1.6%)	0	1 (1.4%)
Dentist	0	1 (1.6%)	1 (50%)	2 (2.7%)
Dental Hygienist	2 (25%)	3 (4.8%)	0	5 (6.8%)
Psychologist	0	19 (30.2%)	0	19 (26%)
Therapist	0	4 (6.3%)	0	4 (5.5%)
Social Worker	0	6 (9.5%)	0	6 (8.2%)
Sex				
Male	4 (50%)	26 (41.3%)	1 (50%)	31 (42.5%)
Female	4 (50%)	37 (58.7%)	1 (50%)	42 (57.5%)
Age				
< 30 years	4 (50%)	4 (6.3%)	1 (50%)	9 (12.3%)
30-39 years	3 (37.5%)	33 (52.3%)	1 (50%)	37 (50.7%)
40-49 years	0	15 (23.8%)	0	15 (20.5%)
≥ 50 years	1 (12.5%)	11 (17.5%)	0	12 (16.4%)
Race/Ethnicity				
White, Non-Hispanic	7 (87.5%)	61 (96.8%)	1 (50%)	69 (94.5%)
Black, Non-Hispanic	0	0	1 (50%)	1 (1.4%)
Black, Hispanic	0	1 (1.6%)	0	1 (1.4%)
Hispanic	1 (12.5%)	0	0	1 (1.4%)
Unknown	0	1 (1.6%)	0	1 (1.4%)
Marital Status				
Married	7 (87.5%)	52 (82.5%)	1 (50%)	60 (82.2%)
Not Married	1 (12.5%)	11 (17.5%)	1 (50%)	13 (17.8%)
Medical School				
In State	4 (50%)	22 (34.9%)	0	26 (35.6%)
Out of State	4 (50%)	41 (65.1%)	2 (100%)	47 (64.4%)
Physician Specialty				
Family Medicine	2 (66.7%)	8 (72.7%)	0	10 (71.4%)
Internal Medicine	1 (33.3%)	0	0	1. (7.1%)
OB/GYN	0	1 (9.1%)	0	1. (7.1%)
Pediatrics	0	1 (9.1%)	0	1. (7.1%)
Psychiatry	0	1 (9.1%)	0	1. (7.1%)
Residency				
In State	3 (100%)	5 (45.5%)	0	8 (57.1%)
Out of State	0	6 (54.5%)	0	6 (42.9%)

*The column percentage may not add up to 100 due to rounding.

Table 3. Providers' perceptions of experiences in the programs (N = 73).

	Left original program site (n = 37)	Stayed at original program site (n = 36)	p-value
Sex			**0.7358**
Male	15 (40.5%)	16 (44.4%)	
Female	22 (59.5%)	20 (55.6%)	
Age			**0.8156**
30-39 years	20 (54.1%)	17 (47.2%)	
40 - 49 years	6 (16.2%)	9 (25%)	
< 30 years	5 (13.5%)	4 (11.1%)	
≥ 50 years	6 (16.2%)	6 (16.7%)	
Race/Ethnicity	**Missing = 1**		**0.3894**
White, Non-Hispanic	34 (94.4%)	35 (97.2%)	
Black, Non-Hispanic	1 (2.8%)	0	
Black, Hispanic	0	1 (2.8%)	
Hispanic	1 (2.8%)	0	
Marital Status			**0.3879**
Married	29 (78.4%)	31 (86.1%)	
Not Married	8 (21.6%)	5 (13.9%)	
Satisfaction with Practice			**0.0116**
Very Unsatisfied	1 (2.7%)	0	
Somewhat Unsatisfied	1 (2.7%)	1 (2.8%)	
Neutral	10 (27%)	0	
Somewhat Satisfied	8 (21.6%)	9 (25%)	
Very Satisfied	17 (46%)	26 (72.2%)	
Satisfaction with Community			**0.8082**
Very Unsatisfied	2 (5.4%)	1 (2.8%)	
Somewhat Unsatisfied	1 (2.7%)	0	
Neutral	3 (8.1%)	2 (5.6%)	
Somewhat Satisfied	8 (21.6%)	8 (22.2%)	
Very Satisfied	23 (62.2%)	25 (69.4%)	
Family Satisfaction with Community	**Missing = 14**		**0.0177**
Very Unsatisfied	3 (10.3%)	0	
Somewhat Unsatisfied	2 (6.9%)	0	
Neutral	6 (20.7%)	1 (3.3%)	
Somewhat Satisfied	8 (27.6%)	9 (30%)	
Very Satisfied	10 (34.5%)	20 (66.7%)	
Would Enroll Again	**Missing = 1**		**1**
Yes	34 (94.4%)	34 (94.4%)	
No	2 (5.6%)	2 (5.6%)	

program sites as those who did not report being very unsatisfied. Compared to the very satisfied families, the hazard ratios for those providers whose families were somewhat unsatisfied, neutral, or somewhat satisfied were 4.379 (p = 0.070), 3.378 (p = 0.041), and 2.381 (p = 0.086), respectively.

Healthcare providers' main motivations for changing practice sites. Healthcare providers who had left their original program sites were asked to provide their main motivators for doing so. Through a qualitative analysis of the responses provided, three themes emerged: family reasons, poor fit, and attractive opportunity.

Most providers responded that their main motivator for changing practice sites was due to family reasons, most often desiring to be "closer to family." One provider reported moving to "care for aging parents," and another respondent reported following their spouse with a new job. "Family needs" and "family's desire to move" also were stated by providers as motivators for changing their practice sites.

A second theme that emerged from the providers' responses was that the original program site was not a good fit, and many reported frustrations with the hospital or administration. One provider reported, "The administration was poor at my site in Kansas. It was unorganized, and I didn't agree with some of the policies." Another provider shared that "unethical practices" was the motivation to find new employment. Additional hospital or administrative motivators for leaving included a "lack of support from the hospital and partners," a contract dispute, a practice transitioning through many changes, "hospital administration issues", and decreasing salaries and benefits within a changing administration. Additionally, other 'poor fit' examples included the community not being "very welcoming to outsiders," and that "demand was just overwhelming," and they were "looking for a less-stressful environment."

Finally, many providers left their original practice site because a different job was too attractive to decline. Several reported that they anticipated receiving increased pay at their new job sites, and this was their main motivator for leaving their original practice sites. Others stated they wanted to own their practices; many shared that they believed owning their own practice would lead to increased pay.

DISCUSSION

Retention. At the time this study was conducted, fewer than half of the study participants (45.6%) were retained at their original program sites. Retention rates from prior studies were difficult to compare, as the definition of retention varies considerably from study to study. In the literature, the rate of provider retention has been reported from 12 to 90%.[6] A 2010 study of loan repayment participants in Colorado reported that 55% of providers remained at their original program sites at the time of the study.[10] A 2003 cohort study of family physicians from three family medicine residency programs affiliated with the University of Kansas School

of Medicine-Wichita (KUSM-W) suggested that more than half of the physician graduates (63%) continued to work at their original practice sites.[11]

The current study revealed a similar rate to the Colorado and KUSM-W studies, with 62.6% of the providers who had completed their obligations a year or more prior to taking the survey had remained at their original program sites at one year post-completion. The retention declined at three years post-completion, with 46.0% of participants who had completed their obligations three years or more prior to taking the survey still at their program sites. This differed somewhat from a 2012 retention study conducted by the NHSC which reported that 82% of providers continued to practice in underserved communities up to one year after service completion.[12] Furthermore, the same study reported that 55% of providers were retained 10 years after service completion.[12]

Despite the large proportion of participants who left their program sites in the current study, a slightly greater percentage of participants relocated to a new HPSA site (16.1%) than to a new non-HPSA site (12.5%), which resulted in 60.7% of the total participants continuing to practice in underserved areas. The finding is not supported by a previous study in Kansas, which suggested physicians in underserved rural counties are more likely to move to less-undeserved urban counties than to other rural counties.[11] The current study appeared to support similar findings that participants of financial incentive programs are more likely than non-obligated providers in general to practice in underserved areas in the long-term.[6]

Professional school. The greatest percentage of providers who left their original program sites actually left Kansas altogether (41%, n = 22). This finding may be related to the large proportion of participants who had attended professional school outside of Kansas (nearly two-thirds). This study suggested that providers who attended professional school outside of Kansas were more likely to leave their original program sites. Such participants may have had ties to other communities outside of Kansas and returned to them after their obligations.

Family satisfaction and motivation to leave. In the current study, the majority of the healthcare providers responded that they were satisfied with their practices (88%) and communities (88%) while in the financial incentive programs, and most (80%) reported their families were also satisfied with their communities. Additionally, 94% of participants reported they would enroll in the program if offered the opportunity again. Despite such high indicators of satisfaction, many providers moved from their original program sites.

Family satisfaction with the community was a strong predictor of retention in this study. The majority of providers indicated that they moved for family reasons, in particular to be "closer to family." These findings are consistent with prior studies[10,13] and suggested that an increased effort is needed to support the provider's family, particularly the spouses, to improve retention. Treating the spouse as an equally important team member in providing healthcare to an underserved population may decrease the family's perceived barriers to remaining at the healthcare provider's original program site. One other study suggested that rural roots of the individual practitioners might be an important factor in retaining providers.[14] The current study revealed more support for the primacy of spousal satisfaction and familial fit in retaining providers. This is a new contribution to the literature, and attention to the providers' families should be investigated in future retention studies. An additional consideration for future research is to explore the quality of healthcare providers enrolled in a loan repayment or scholarship program.

Limitations. This study had several potential limitations, including limited geographic scope, small sample size, and the cross-sectional nature of the study. As with any cross-sectional telephone survey conducted at a single point in time, response bias was possible. However, the response rate in this study was relatively high, with 73 of 112 (65.2%) healthcare providers participating in the study, and 54 of 62 (87.1%) of the site contacts participating. Therefore, the risk of response bias in this study was minimized.

Information biases, such as interviewer bias or recall bias, may have played a role in this study. While the risk of this was diminished in this study, as only one interviewer conducted all the phone surveys, it is possible that the interviewer unconsciously influenced the participants. In addition, participants were asked to recall their experiences in the financial incentive programs they had completed. Participants who more recently participated in the financial incentive programs likely would have a better memory of their experiences than participants who had completed their obligations several years prior to completing the survey.[15-16] The current study also combined health practitioner professions together such as nurse practitioners, dentists, and physicians, each of which may exhibit their own retention dynamics independent of other professional classifications.[14,17-18] However, the purpose of this study did not seek to parse out differences between individual healthcare occupations; instead it sought to provide a holistic picture of healthcare providers shortages in general.

Finally, this study was conducted in just one rural state and also had a relatively small sample size, with 112 total participants, which potentially could limit future generalizability. However, other similar studies also have focused on just a single state.[10,11,19] Small sample sizes reduce the power of a study to identify real differences between groups. As such, this study was unable to analyze differences between the financial incentive programs included in the study.

CONCLUSIONS

Participants of financial incentive programs were more likely than non-obligated providers to practice in underserved areas in the long-term. Important dynamics exist within the decisions made by those individual

providers to practice long-term in underserved areas. At the time the study was conducted, fewer than half of the study participants were serving at their original program sites. Despite the large proportion of participants who left their program sites, nearly half had remained and a majority continued to practice in other underserved areas, suggesting serving in any underserved area is not necessarily a factor in individual practitioners' decisions to remain or leave their practice site. Rather, family appeared to be the driving factor in providers' decisions, as not only was the family's satisfaction with the community a strong predictor of provider retention, but so was the desire to be closer to their own extended families. Thus, efforts to support families within their matched communities are important and working to match providers with geographically favorable sites to their families is an important objective to explore.

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Gastrointestinal Stromal Tumor Found Incidentally in a Patient with Multiple Endocrine Neoplasia Type 1 (MEN1)

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INTRODUCTION

Gastrointestinal stromal tumor (GIST) is a rare tumor arising from the mesenchymal tissue of the sub-epithelial mucosal surface of the gastrointestinal tract.[1] It is mainly located in the stomach and proximal intestine, but can be seen in other parts of the gastrointestinal tract. It is characterized by expression of CD117 which is a part of the C-kit proto-oncogene product (KIT) transmembrane receptor tyrosine kinase in more than 80% of cases.[2] Some cases express a mutation in PDGFRA (platelet-derived growth factor receptor, alpha polypeptide). GIST has the potential to become a malignant tumor, which can metastasize to the liver and peritoneum.[3-5]

Multiple endocrine neoplasia type 1 (MEN1) syndrome is an autosomal dominant (AD) disorder, characterized by inactivation of the Menin gene, a tumor suppressor located on the long arm of chromosome 13 (13q11).[6] MEN1 syndrome is associated with pituitary, parathyroid, and pancreatic islet tumors.[7,8] Some non-endocrine benign tumors also are associated with MEN1 syndrome, such as facial angiofibromas, lipomas, meningioma, and leiomyoma.[9] The association between GIST tumors and MEN1 syndrome, however, is unclear. To our knowledge, only five cases had reported GIST tumors in association with MEN1 syndrome.[10-12]

CASE REPORT

A 60-year-old male had a 6 cm mass of the pancreas body and tail discovered on a computed tomography (CT) scan of the abdomen which was done to evaluate recurrent hypercalcemia nephrolithiasis. The diagnosis of a well-differentiated neuroendocrine pancreatic tumor was made by fine needle aspiration (FNA). Following staging, surgical resection was performed (T3N0M0). In addition to that, another 2 cm tumor was attached to the distal body and along the greater curvature of the stomach. Pathology of this new tumor revealed a GIST tumor with positive C-kit proto-oncogene product (CD117) and negative S-100 calcium binding protein.

At the time of surgery, the patient's serum calcium was elevated up to 11.4 mg/dl. His parathyroid hormone was 53 pg/ml and spot urine calcium was 28.4 mg/dl. Pituitary function testing, including levels of follicle-stimulating hormone, thyroid-stimulating hormone, prolactin, insulin-like growth factor, and adrenocorticotropic hormone were within normal range with the exception of a mild elevation of luteinizing hormone. A Sestamibi scan revealed persistent radiotracer uptake in the region of the right inferior parathyroid gland thought to be consistent with a parathyroid adenoma. Magnetic resonance imaging (MRI) of the brain revealed a 0.5 cm pituitary adenoma.

The patient underwent parathyroidectomy. As a result, the diagnosis of MEN1 was made clinically, although a genetic test for MEN1 was negative. As the patient was recovering, another CT scan of the abdomen was taken to investigate the reason of his persistent hematuria and nephrolithiasis. This scan revealed a new 1.9 cm, peripherally enhancing mass on the ventral side of the pancreas head. Endoscopic ultrasound (EUS) revealed another neuroendocrine tumor of the pancreas. At that point, the patient underwent exploratory laparotomy for resection of this neuroendocrine tumor with no residual metastasis. He recovered well after the surgery. His following labs revealed normal calcium as well as vitamin D level.

DISCUSSION

This case of MEN1 syndrome was associated with GIST of the stomach and found incidentally during a surgical removal of a pancreatic neuroendocrine tumor. GIST is the most common non-epithelial tumor of the gastrointestinal tract and may become malignant in 1% of cases.[3-5,13,14] Usually GIST tumors are asymptomatic and discovered incidentally on imaging or endoscopy. However, some patients may experience non-specific symptoms such as early satiety, bloating, and ulceration with bleeding.[1]

Diagnosis of MEN1 is usually established by one of the following three criteria: [9,15]

1. Having two or more of the classical primary three tumors: parathyroid gland, anterior pituitary, or enter-pancreatic cell (such as gastrinoma, insulinoma, vasoactive intestinal polypeptide secreting tumor, and non-hormone secreting).
2. Determination of DNA genetic mutation in an individual who does not have clinical or biochemical features.
3. Having a family member with MEN1 syndrome.

DNA testing is completed to identify any menin mutation at chromosome 11q13 which is found in up to 90% of the cases.[7,9] Usually DNA testing is offered to any index patient with clinical MEN1 (two or more primary MEN1 tumor types), all first-degree relatives of known MEN1 mutation carriers, and to individuals with suspicious or atypical MEN1 (e.g., multiple parathyroid adenomas, gastrinoma, or multiple pancreatic neuroendocrine tumors).[7] In our case, the diagnosis was based on the clinical findings of the classical tumors of MEN1 syndrome.

In addition to the classical findings, non-endocrine tumors have been identified in some MEN1 cases such as carcinoid tumors,

adrenocortical tumors, meningioma, facial angio-fibromas, and lipomas.[9] The MEN1 gene was suggested to act as a recessive tumor suppressor gene due to high rate of heterozygosity which was detected in the primary tumors as well as non-classical tumors.[8,16]

Few previous case reports detected GIST in association with MEN1 syndrome. None detected any loss of heterozygosity (LOH).[10-12] Another case report was unable to detect any LOH in 11q13 area in a MEN1 syndrome associated with GIST using the PYGM microsatellite polymorphism and a MEN-1 intragenic polymorphism localized in exon 9 (D418D).[17] Different mechanisms were suggested to explain this association: (1) an unknown independent mechanism or (2) a loss of the genes located closely to 11q13 gene.

The etiology of our patient's hypercalcemia was likely secondary to hyperparathyroidism as his calcium level trended down after parathyroidectomy. Hypercalcemia has been associated with GIST tumor.[18] The etiology was thought to be due to PTH-related peptide production. However, one recent case reported hypercalcemia associated with GIST tumor in the setting of suppressed PTH and Pro PTH but elevated 1,25(OH)2 vitamin D level.

CONCLUSION

We reported another case in which MEN1 was associated with GIST. Yet, no evidence-based data support or explain the clinical association between GIST and MEN1 syndrome. However, this association should be considered when a GI tumor is associated with clinical features of MEN1 syndrome. Hypercalcemia likely was secondary to hyperparathyroidism. Although GIST induced hypercalcemia caused by converting vitamin D to its active form also should be considered.

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Hydralazine Induced Lupus-Like Syndrome

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INTRODUCTION

Systemic lupus erythematosus (SLE) is an autoimmune disorder with multiorgan involvement and variable manifestations. The etiology of SLE remains unknown. However, a different presentation of lupus erythematosus due to certain drugs such as hydralazine[1], procainamide[1], and minocycline[2] has long been recognized. The first reported case of hydralazine leading to Drug-induced Lupus Erythematosus (DILE) was published in 1953.[3] Since then, this association has been well established in the medical literature. However, as hydralazine is used less frequently, the incidence of DILE due to hydralazine and the recognition of this association among clinicians have diminished. This case report and review revisits this association and reminds the clinicians to consider DILE when evaluating patients with unusual manifestations mimicking a connective tissue disease.

CASE REPORT

A 68-year-old Caucasian male with a past medical history significant for gastroesophageal reflux disease, hypertension, obstructive sleep apnea, obesity, chronic obstructive pulmonary disease (COPD), and hypothyroidism had developed bilateral hand arthralgia intermittently for several years. He presented with myalgia and fatigue in late 2013 and by late January 2014, his symptoms progressed with diffuse myalgia, polyarthralgia, fatigue, poor appetite, nocturnal low grade fevers, as well as unintentional weight loss of about 30 pounds.

Subsequently, he developed pruritic dermatitis and dyspnea out of proportion to his baseline COPD. His wife also noticed onset of poor memory. He experienced two episodes of asymptomatic hematuria without any known history of nephrolithiasis. He was admitted to an outside hospital for progressive dyspnea, fatigue, myalgia, polyarthralgia, hematuria, and the dermatitis on his upper back. Physical examination revealed a rash and splenomegaly. He was evaluated by specialists in hematology, neurology, infectious disease, and rheumatology. Basic labs revealed leukopenia and anemia. He had an elevated erythrocyte sedimentation rate of 97 and C-reactive protein of 212 mg/L with normal creatinine kinase and aldolase. Infectious disease work-up included negative Epstein–Barr virus, lyme disease, human herpesvirus 6, cytomegalovirus, and human immunodeficiency virus. Cerebrospinal fluid analysis was negative including for cryptococcus, toxoplasma, and viral studies.

Computed tomography scan (CT) of the chest, abdomen, and pelvis was negative except for splenomegaly. Bone marrow biopsy was unrevealing with normal cytogenetics. The right upper back skin biopsy was non-diagnostic as it did not identify eosinophils or other specific features of connective tissue disease but the findings were thought to be compatible with a "drug eruption or viral exanthem".

Since a clear diagnosis was not made, he established care at our tertiary institution. He was seen in the outpatient hematology and general internal medicine clinics after which he was referred to the rheumatology clinic. His medication list included hydralazine that was started about four years prior for treatment of hypertension. Prior to being seen by the physicians at University of Kansas Hospital, he developed a new symmetrical erythematous, macular, small, and round dermatitis of hands and anterior thighs bilaterally. His laboratory evaluation was significant for a persistent leukopenia (white blood cells of 2.03 x 10 9/L) and anemia (hemoglobin of 9.8 mg/dL). The renal and liver functions, creatine kinase, and lactate dehydrogenase were normal. The antinuclear antibody (ANA) was elevated at 1:640 in a homogenous pattern. The histone antibody was elevated. The anti-phospholipid antibodies were abnormal including elevated hexagonal lupus, Dilute Russell Viper Venom Test, IgM anti-cardiolipin antibody, and IgM Beta 2-glycoprotein 1. His ds-DNA, Anti-Smith, Anti-SSA, Anti-SSB, Anti-RNP, Rheumatoid Factor, Anti-Centromere, Anti-SCL-70, Anti-CCP IgG, Anti-Jo-1 were normal. His Complement C3 and C4 were within normal limits.

A chest x-ray showed a small left pleural effusion. Joint survey x-rays showed degenerative changes of the cervical spine, right knee, and bilateral hands. A repeat CT showed splenic auto-infarction. He was diagnosed with Drug-induced Lupus Erythematosus (DILE). At that time, he was prescribed a prednisone taper and hydralazine was discontinued. Two months after discontinuation of hydralazine, he had a negative ANA and a decreasing anti-histone antibody. The anti-phospholipid antibody panel was negative.

DISCUSSION

This 68-year-old male patient's symptoms and clinical findings including laboratory abnormalities began several years after he first took hydralazine and resolved following its discontinuation. DILE is a diagnosis of exclusion that is confirmed when the patient improves once the culprit drug is discontinued. A unique aspect of this case was the length of time after which the patient developed DILE while on a low dose of hydralazine. Usually, DILE develops on higher doses of hydralazine (greater than 200 mg/day) and sooner than was seen on our case.[4]

The incidence of the lupus syndrome induced by hydralazine was determined in a longitudinal study of 281 patients starting hydralazine for hypertension over a 51-month period.[4] After three years of treatment with hydralazine, the incidence of the lupus syndrome was 6.7% (95% confidence limits 3.2-10.2%). The incidence was dose dependent, with no cases recorded in patients taking 50 mg daily and incidences of 5.4% with 100 mg daily and of 10.4% with 200 mg daily. Our patient had been prescribed hydralazine 75 mg for hypertension before presenting with lupus-like symptoms. To our knowledge, there have been no published case reports of DILE due to hydralazine at a dose of 75 mg daily.

Risk factors for development of hydralazine DILE include doses greater than 200 mg/day, female gender, slow hepatic acetylation, and immunogenetic factors.[4-7] Clinical manifestations of DILE include fever, fatigue, mylagia, dermatitis, arthralgia, and serositis.[8] DILE is generally less severe without significant systemic involvement, such as nephritis. Both idiopathic systemic lupus erythematosus (SLE) and DILE develop elevated ANA; but anti-Smith antibody (SM), ds-DNA, and hypo-complementemia rarely are observed in DILE as compared to SLE.

Anti-histone antibodies are present in more than 95 percent of patients with DILE.[9] Anti-histone antibodies can also be seen in up to 80% of patients with idiopathic SLE, however, patients with idiopathic SLE also form a variety of other autoantibodies, including anti-Smith antibody or ds-DNA antibody, which are less common in drug-induced lupus. Management of DILE consists of discontinuation of the offending agent along with supportive care and short term therapy of any specific manifestations with medications such as oral prednisone until symptomatic and clinical resolution.

CONCLUSION

Prompt recognition of DILE is important in evaluation of patients with lupus like syndrome while on medications such as hydralazine. Distinguishing idiopathic SLE from DILE is very important as the intensity and duration of therapy and prognosis is different between the two. Hence, patients should be monitored closely when initiating hydralazine.

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COMMENTARY

Student-Run Free Clinics: A Local Solution to Healthcare Disparities

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Socioeconomic disparities affect the structure, function, and welfare of many communities throughout the United States. Low socioeconomic status (SES) correlates with a lack of access to quality healthcare which thereby contributes to higher morbidity and mortality rates.[1,2,3] In actuality, low SES is as large a risk factor for mortality as smoking.[4] We examine how community level solutions, such as student-run clinics (SRCs), can play a part in mitigating the healthcare disparity between the rich and the poor.

Epidemiologically, diseases often are classified by their determinants, incidence, and distribution in their target population.[5] Poor healthcare access is analogous to a disease: low SES serves as a key determinant, increased morbidity and mortality specify the incidence, and the distribution represents the number of people suffering from the outcomes of this "disease". However, very little money is dedicated to the "treatment" of this healthcare disparity. The National Institute of Health (NIH) spends more money funding research on AIDS and diabetes mellitus than any other disease in the United States.[5] Although these are both burdensome diseases that affect a large portion of the population, they are not as prevalent or damaging as the limited access and availability of healthcare received by those of low SES.

Low SES and poor healthcare contribute to a vicious cycle for many individuals. The cycle is sparked by low SES leading to poor access to healthcare, which consequently leads to increased morbidity and mortality. The latter two factors contribute to the cycle's persistence by reinforcing low SES through high healthcare costs and economic hardship. In this way, it becomes difficult for an individual to escape the cycle alone. This necessitates the existence of an outside driving force to cease the cycle.

The cycle can be interrupted by either increasing healthcare access of the underserved population through national programs, such as Medicaid, or subsidizing the lack of healthcare access in these populations through community-driven initiatives. Targeting the specific mechanisms of each community's healthcare access deficiencies allows for the most efficient use of government spending that converts government policies, procedures, and funding into services for the people.[6] The target population includes the uninsured, underinsured, those with government aided public insurance (Medicaid or Medicare), and others having trouble navigating the healthcare delivery system. For example, policies of the Affordable Care Act (ACA 119-124, 1025) such as Community Transformation Grants would not reach individuals without community driven initiatives.[7]

If lack of healthcare access is seen as a disease, one must first identify "interventions" which a potential "treatment" could target. First, understanding the process by which a "treatment" is developed to treat the disease (healthcare access inequality) in Kansas City allows for the use of the same methodology to implement national healthcare policy one community at a time. If this comparison is applied to Kansas City, the counties with the lowest SES will have the poorest access to healthcare and the highest morbidity and mortality rates. Therefore, examining the factors that define SES and healthcare access in Kansas City is the primary step to eradicating the disease in the community.

According to Adler et al.[8], socioeconomic status is measured by income level (economic), education level (social), and employment and occupation quality (social). To assess different counties, we used data from the KC HealthMatters 2014 database, which includes information on all Greater Kansas City counties in both Kansas and Missouri. Information extracted from the database (e.g., median household income, people aged 25+ with a high school degree or higher, and unemployed workers in civilian labor force) was used as a measure of socioeconomic status. It points to associations behind the healthcare access disparity in Kansas City, specifically economic prosperity, knowledge of the healthcare system, and overall employment rate, respectively.[9] For the purpose of simplicity, data are displayed in Table 1 from the two most socioeconomically disparate counties in the database, Johnson County and Wyandotte County.[9] Johnson County had notably higher socioeconomic measures than Wyandotte County for all three classifications.

Table 1. Comparison of socioeconomic status in two disparate counties in Kansas City, Kansas.

	Wyandotte County	Johnson County
Unemployment Rate	7.8%	4.7%
Median Household Income	$39,163	$75,139
People 25 and older with a HS diploma or higher	78.6%	95.7%

The Healthcare Foundation of Greater Kansas City (HCF) is solely responsible for the distribution of funding to safety net organizations in an attempt to lessen healthcare disparities in Kansas City.[9] Their report includes county-based statistics for varying health measures including insurance percentages, Medicaid enrollment, primary care provider rate, high school graduation, college education, unemployment, childhood poverty, and single-parent households.[9] Performance of Wyandotte County in all of these categories was poorer than Johnson County.

Striking differences in healthcare access also exist between communities, thus leading to the perpetuation of their socioeconomic disparity.[10] In Kansas City, the disparity in SES between Wyandotte County and Johnson County correlates to the reflected healthcare access gap between the two counties (Table 2). Information extracted from the KC HealthMatters 2014 database regarding "Percent of Adult Population with Health Insurance", "Number of Preventable Hospital Stays" per 1,000 Medicaid enrollees, and "Number of Primary Care Providers" per 100,000 people in the population allows for comparison between Johnson County and Wyandotte County on the grounds of healthcare access measures.

Table 2. Comparison of healthcare access in two disparate counties in Kansas City, Kansas.

	Wyandotte County	Johnson County
Adults with Health Insurance	69.2%	88.4%
Preventable Hospital Stays (per 1000)	66	55
Primary Care Providers (per 100,000)	61	104

The percentage of adults with health insurance remains a very important measure of healthcare access as it contributes directly to healthcare outcomes.[11,12] This goes hand in hand with the number of "preventable" hospital stays, defined by the KC HealthMatters database as a stay for an ambulatory care sensitive condition. Although regarded as a last resort for insured patients, the emergency room often is overused as a form of primary care by uninsured and underinsured patients with poor access to outpatient care facilities.[13-16] Furthermore, for people who lack health insurance, typically controllable conditions such as diabetes and hypertension often present as medical emergencies.[13-15] Consequently, the uninsured are more likely to seek emergency attention for acute problems because they have a more limited access to primary care medicine services that prevent chronic problems from becoming acute and life-threatening.[20,21] Early detection of diseases through preventive care measures leads to better prognoses for patients while simultaneously reducing medical expenditures.[22,23] For instance, blood pressure screening and dispensary of antihypertensive medications to the appropriate patients is far more advantageous than waiting for the condition to become a hypertensive crisis before treatment. Although this type of care is not complex, nor does it require advanced training, it is nonetheless an essential part of an individual's healthcare.

The primary care provider rate (providers per 100,000 people) is another important measure of healthcare access, because people with access to routine checkups and screenings can prevent many more severe health issues associated with hospital stays and emergency situations.[9,24,25] Therefore, this measure is related inversely to the number of preventable hospital stays.[25–29] Although it is difficult to hire a large number of nurses and doctors to provide care in underserved areas, this is not the only way to give these populations the basic health services they need.

In summary, based on these three quality measures of healthcare access, the Kansas City county with the lowest SES (Wyandotte County) had poorer access to healthcare services compared to the county with the highest SES (Johnson County), which has been associated with disparities in morbidity and mortality. This information supports previous studies which show a strong correlation between poor SES and greater mortality.[2,30]

With reference to morbidity and mortality, the KC HealthMatters 2014 database presents the county-to-county comparison on a discrete ranking scale rather than normal continuous data. According to this scale, the lower the number, the healthier the population is in terms of morbidity or mortality rate. When examining Wyandotte and Johnson Counties, the two most disparate in the Greater Kansas City area, Wyandotte County was ranked 96 for morbidity and 89 for mortality.[9] On the other hand, Johnson County was ranked 14 for morbidity and 1 for mortality.[9] In this example, only morbidity and mortality were examined to represent healthcare outcomes. However, lower SES is associated with many other health problems, including increased asthma in children, greater unintentional pregnancies, and increased cancer in adults.[1]

Kansas City's method of dealing with national healthcare system shortcomings is the safety net, a well-functioning group of organizations dedicated to providing healthcare to all individuals regardless of their ability to pay, that acts as a valuable source of care for the homeless and underserved.[9] There are a total of 40 organizations in Kansas City that comprise the safety net system, all of which receive funding from a variety of local, state, and federal sources.[9] Here, Kansas City, Kansas is used as an example, but other similar systems have been implemented nationwide as well.[31-37]

The Sojourner Health Clinic is one specific example of a community-level solution used to mitigate the health care disparities between individuals of high and low socioeconomic status. Sojourner is a free, student-run safety net clinic operating under the University of Missouri-Kansas City School of Medicine (UMKC SOM) that provides outpatient care to underprivileged populations in downtown Kansas City. These underserved patients reside primarily in counties (including Wyandotte County) consisting of many individuals of lower socioeconomic status.[38] Through primary care screenings and treatment, Sojourner and similar free clinics provide preventive medicine often lacking in the uninsured and underinsured populations. [20,32,35,38] This prevention, in turn, is correlated with a decreased number of expensive

in turn, is correlated with a decreased number of expensive emergency department visits.[25-29]

Student-run clinics are a cost-effective option due to their high-yield use of funding and decreased expenditures due to volunteerism.[32,39] Compared to other institutions receiving safety net funds, such as emergency departments, free clinics are the most cost-effective option because they work towards primary preventive care rather than more costly treatment of acute issues.[28-31] Furthermore, the money that student-run clinics receive in the form of private grants or government subsidies is utilized in an ideal manner on medical supplies and not on employment, as they are staffed entirely by volunteers.[28,40-43]

Sojourner volunteers' line of service is to subsidize underserved populations of the Greater Kansas City area with medical services such as health education, disease management, diagnoses, immunizations, screenings, and medications free of charge, augmenting the number of primary care providers and serving even those without health insurance.[38] Many student-run clinics around the country are established as valuable providers of patient care.[32,35,44-50] In fact, patients report equal trust and quality of care conducted by medical students, in comparison to physicians, in free clinics.[41,51,52] Furthermore, the benefit is not one-sided. As volunteers, medical students in free clinics gain direct clinical experience working with patients and alongside attending physicians to create treatment and prevention plans.

In addition to being an invaluable enrichment to medical education, student-run medical organizations can improve outcomes, such as the number of emergency room admissions, morbidity rate, and mortality rate.[20,32,35] The next step is to assess the effectiveness of individual student-run clinics by examining how specific health management services improve patient general health.

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Keywords: health care quality, access, and evaluation, health disparities, safety-net providers, medical students, socioeconomic status

CLINICAL QUIZ

Periorbital Edema: The Importance of a Thorough Medical History

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A 5-year-old Asian girl presented with right periorbital swelling. She went to a botanical garden with her parents and woke up with swelling the following morning. The physical examination showed a pruritic, erythematous, non-tender, periorbital edema. She had normal pupils, visual acuity, and extraocular eye movements. No conjunctival hyperemia or eye discharge was noted. There was no fever, chills, lip/tongue/throat swelling, shortness of breath, wheezing, coughing, rhinorrhea, nasal congestion, post-nasal drip, dermal pruritus elsewhere, or gastrointestinal symptoms. The mother reported her daughter had mosquito bites the night prior, but no hymenoptera sting. She was asymptomatic prior to going to bed.

What is the most likely diagnosis?

A. Periorbital angioedema
B. Periorbital bacterial cellulitis
C. Nephrotic syndrome
D. Skeeter syndrome
E. Traumatic eye injury
F. Venom hypersensitivity

CORRECT ANSWER: D. Skeeter Syndrome

Skeeter syndrome also is known as a significant local reaction to mosquito bites. It is caused by an immunologic response to proteins in mosquito saliva and it involves IgE, IgG, and T cell mediated hypersensitivity.[1, 2] Many people who are bitten by mosquitoes develop an immune response to these proteins; however, only a small proportion of them develop clinically relevant allergic reactions, most commonly large local reactions.

Typically, the reaction consists of a pruritic or even painful area of redness, warmth, swelling and/or induration that ranges from a few centimeters to more than 10 cm in diameter. Large local reactions develop within hours of the bite, progress over 8 to 12 hours or more, and resolve within 3 to 10 days.[3] Severe large local reactions can be accompanied by low grade fever and malaise. Large local reactions may develop an ecchymotic appearance or are associated with blisters, vesicles, or bullae. Systemic allergic reactions to mosquito bites are very rare. The diagnosis is based on the time of onset of the reaction in relationship to a witnessed or likely mosquito bite, and on the physical finding of an itchy, red, warm swollen area at the site of the bite. Management entails mosquito avoidance, non-sedating H1 antihistamines, such as cetirizine, and topical glucocorticoid.[3] For severe large local reactions that are distressing and/or interfering with normal vision, ingestion of liquid or food, or ambulation, an oral glucocorticoid such as prednisone 1 mg/kg to a maximum of 50 mg once a day may be given for five to seven days. Antibiotic treatment is not indicated for large local reactions. Prevention of large local reactions consists of mosquito avoidance, application of an insect repellent like DEET (N, N-diethyl-3-methylbenzamide, use less than 30% DEET containing compounds and wipe or wash off once indoors), and prophylaxis with an oral, non-sedating H1 antihistamine. Prognosis of Skeeter syndrome is favorable.[4]

In summary, we recommend taking a detailed medical history because if we did not know that our patient had a mosquito bite, we could have missed her diagnosis.

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