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Comparison of the Health Status of Uninsured Diabetic Patients Presenting for an Initial Visit to an Urban Free Clinic to Diabetic Patients from the National Health and Nutrition Examination Survey

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Abstract

Background: We compare the health status of uninsured diabetic patients presenting for their initial visit at the Cooper Rowan Clinic (CRC) to insured and uninsured diabetic respondents of the National Health and Nutrition Examination Survey (NHANES). By establishing a baseline health status of CRC patients and comparing to NHANES respondents, we aim to identify how insurance status may be associated with health outcomes of this at-risk population.
Methods: CRC patients with diabetes and insured and uninsured NHANES respondents with diabetes were compared based on health indicator goals established by the American Diabetes Association (ADA). Specifically, we used chi-squared tests to compare the proportion of individuals in each group that met ADA health indicator goals for hemoglobin A1c (HbA1c), blood pressure, low-density lipoprotein (LDL), and high-density lipoprotein (HDL). Then, we used post hoc one-way ANOVA to identify significant differences in the mean measurements of each of the health indicators.
Results: CRC patients presenting at their initial visit have higher mean HbA1c than insured NHANES respondents ($p<0.001$) but similar mean HbA1c to uninsured NHANES respondents. CRC patients at their initial visit have higher blood pressures compared to insured and uninsured NHANES respondents ($p<0.001$). There were no significant differences in HDL and LDL between groups.
Conclusions: This study adds to the literature describing the health status of uninsured diabetics. We show a positive association between insurance status and the control of HbA1c and blood pressure but no effect on HDL or LDL. CRC patients at their initial visit are less likely to be at blood pressure goal than both insured and uninsured NHANES respondents.

Introduction

The availability of quality and affordable health insurance remains a significant barrier to healthcare in the United States.[1] Although the Affordable Care Act has helped bridge the gap between the insured and uninsured, the Center for Disease Control (CDC) reports that 9.1% of Americans still remain uninsured in 2015.[2] Lack of insurance has been associated with fewer healthcare visits, decreased awareness of medical conditions, poorer diet quality, and higher mortality from cancer and chronic diseases.[1,3] In a time where the future of the healthcare system is uncertain, it is essential to have robust literature documenting the health status of uninsured patients.

The National Health and Nutrition Examination Survey (NHANES) is a program designed to assess the health and nutritional status of adults and children across the United States and includes insured and uninsured individuals. It is an annual survey which began in 1960 and has been used through the years in epidemiologic studies and health science research. The survey is conducted through the use of equipped mobile

centers which allow for the collection of interviews and physical examinations of approximately 5,000 persons each year.[4] Although information gathered from NHANES is valuable, data on uninsured diabetic populations, as described by Decker, et al., is sparse.[3] The goal of this study is to compare the health status of uninsured diabetic patients at the Cooper Rowan Clinic (CRC) at their initial visit to the insured and uninsured diabetic respondents of the NHANES survey.

Methods

The Cooper Rowan Clinic (CRC) is a student-run free clinic founded by Cooper Medical School of Rowan University (CMSRU) in 2012 with the goal of providing care to uninsured residents of the city of Camden, New Jersey. The clinic sees about 300 patients per academic year. The CRC is located in a demographically diverse urban area where 19% of residents are without health insurance and 39.9% of the population live below the poverty line with a median income of $25,000, all of which may negatively impact the control of chronic conditions.[5] CRC patient demographic information is summarized in Table 1.

CRC patient data were collected through retrospective chart review using the Epic electronic medical record (EMR) from July 28, 2015 to April 13, 2016. Data were deidentified and entered into a central database. The database includes a collection of patient demographics, medical history, laboratory values, and physical exam findings and is maintained by a team of medical students. Patients' identifying information is only available to researchers involved and is encrypted in accordance with Cooper University Hospital's Institutional Review Board protocol.

Patients included in this study were diabetics who had a medical visit at the CRC between July 28, 2015 and April 13, 2016, had documented age and gender, and student provider notes. The CRC limits its treatment to adult patients—defined as greater than the age of 16 years—therefore, no pediatric patients were included in this study. A diagnosis of diabetes was defined as having a documented diagnosis of type 1 or type 2 diabetes in the EMR, or by receipt of one of CRC's formulary diabetes medications. CRC patients receive their prescriptions on site utilizing a formulary that includes the following diabetes medications: metformin, glipizide, Humulin 70/30, and Humulin N. Data from the patient's first visit at the CRC was collected to use as their baseline.

We collected data on low-density lipoprotein (LDL), high-density lipoprotein (HDL), systolic blood pressure (SBP), diastolic blood pressure (DBP), and hemoglobin A1c (HbA1C). Patients were then classified as at goal based on guidelines outlined in the American Diabetes Association (ADA) Standards of Medical Care in Diabetes 2017: HbA1c <7%, SBP <140 mmHg, DBP <90 mmHg, LDL <100 mg/dL, and HDL >40 mg/dL.[6]

NHANES datasets from 2013-2014—the most current data available at the time of the study—were downloaded from the CDC website and filtered to match the inclusion criteria and health status indicators described above. The NHANES data were also stratified by insurance status. Demographic data from NHANES is summarized in Table 2.

Data from CRC and the NHANES were then used to calculate the percentage of individuals who were at goal according to the ADA guidelines. The percentages provided a benchmark to compare CRC and national data. Comparisons were made between groups using chi-squared tests. Data were further analyzed through a post hoc one-way analysis of variance (ANOVA) to identify significant differences in the mean measurements of each of the health indicators between insured NHANES respondents, uninsured NHANES respondents, and CRC patients. Finally, all significant findings were controlled for age and gender.

Results

A total of 655 CRC database entries were reviewed revealing 226 entries with the diagnosis of type 1 or type 2 diabetes on initial and follow-up visits to the CRC. From those 226 entries, a total of 79 CRC patients met the inclusion criteria.

From the NHANES data, 53 uninsured diabetic respondents and 396 insured diabetic respondents met inclusion criteria.

As summarized in Table 3, significantly fewer CRC patients met HbA1c goals than insured NHANES respondents (26.2% versus 52.3%;

Table 1. CRC patient demographics

Characteristic	%
Age, mean years (SD)	45.6±13.7
Age	
>65	6.4%
<65	90.8%
Gender	
Male	45.0%
Female	52.0%
Race/Ethnicity	
White, non-Hispanic/Latino	4.0%
Black, non-Hispanic/Latino	11.0%
Hispanic/Latino	61.8%
Asian/Pacific Islander/East Indian	3.4%
American Indian/Alaskan	0.6%
Other	4.9%
Language	
Spanish	52.6%
English	40.4%
Other	2.5%

CRC: Cooper Rowan Clinic; SD: standard deviation

Table 2. NHANES 2013-2014 patient demographics

Characteristic	%
Age	
>80	3.5%
18-79	96.5%
Gender	
Male	49.2%
Female	50.8%
Race/Ethnicity	
White, non-Hispanic/Latino	33.3%
Black, non-Hispanic/Latino	25.0%
Hispanic/Latino	25.8%
Asian/Pacific Islander/East Indian	11.7%
Other	4.3%
Language	
Spanish	10.6%
English	89.4%

NHANES: National Health and Nutrition Examination Survey

p<0.001). However, there was no significant difference between CRC patients and uninsured NHANES respondents meeting HbA1c goals (26.2% versus 39.6%; p=0.128). In terms of blood pressure, 73.4% of CRC patients were at goal at the initial visit compared to 93.9% and 92.2% insured (p<0.001) and uninsured (p=0.001) NHANES respondents, respectively. There were no significant differences when comparing CRC patients' HDL and LDL to either the insured NHANES or uninsured NHANES respondents.

CRC patients had a higher mean HbA1c than insured NHANES respondents (p<0.001) but a similar mean HbA1c as uninsured NHANES respondents (p=0.788). CRC patients also had a higher mean diastolic blood pressure than insured and uninsured NHANES respondents (p<0.001). However, mean systolic blood pressures were only significantly different between CRC patients and insured NHANES respondents (p<0.001). HDL and LDL levels showed no significant difference between the groups. After controlling for age and gender, differences between groups in HbA1c, systolic blood pressure, and diastolic blood pressure remained (Table 4).

Discussion

We found significant differences in mean HbA1c and proportion of individuals at ADA health status goals between CRC patients and insured NHANES respondents. Our findings support the notion that insurance status is associated with the severity and control of diabetes. Insurance status in diabetic patients has been linked with increased medication adherence, consistency with routine visits and better education about the condition.[7] Access to care is an important aspect of diabetes management since diabetics often require coordinated care from multiple specialties. Additionally, prevention is essential, since modifiable risk factors can be mitigated with proper lifestyle change and education about management. Notably, there was no significant difference in mean HbA1c between uninsured NHANES respondents and the CRC patients at their initial visit.

In addition, our findings support prior studies that demonstrate that insurance status is associated with improved blood pressure control.[8,9] Only 73.5% of CRC patients had their blood pressure at goal at their initial visit versus 94.8%

Table 3. Comparison of patients at goal according to ADA guidelines between CRC patients and insured and uninsured NHANES respondents with diabetes

	CRC			NHANES Uninsured				NHANES Insured			
	N	**n**	**% at goal**	**N**	**n**	**% at goal**	**p value***	**N**	**n**	**% at goal**	**p value***
HbA1c	61	16	26.2%	53	21	39.6%	0.128	396	207	52.3%	<0.001
Systolic BP	79	49	62.0%	51	36	70.6%	0.314	368	271	73.6%	0.038
Diastolic BP	79	58	73.4%	51	47	92.2%	0.008	361	339	93.9%	<0.001
LDL	64	37	57.8%	15	8	53.3%	0.752	162	93	57.4%	0.956
HDL	66	42	63.6%	53	35	66.0%	0.785	391	266	68.0%	0.481

ADA: American Diabetes Association; CRC: Cooper Rowan Clinic; NHANES: National Health and Nutrition Examination Survey; N: total number of patients meeting inclusion criteria; n: Number of patients at goal; BP: blood pressure; LDL: low-density lipoprotein; HDL: high-density lipoprotein
**compared to CRC patients using chi-squared tests*

Table 4. Comparison of mean health indicator values between CRC patients and insured and uninsured NHANES respondents with diabetes adjusted for age and gender

	CRC			NHANES Uninsured				NHANES Insured			
	N	**Mean**	**SD**	**N**	**Mean**	**SD**	**p value***	**N**	**Mean**	**SD**	**p value***
HbA1c, %	61	8.5	2.3	53	8.3	2.5	0.788	396	7.3	1.6	<0.001
Systolic BP, mmHg	79	136.2	19.5	51	131.8	22.2	.453	368	130.1	19.7	<0.001
Diastolic BP, mmHg	79	82.7	9.2	51	72.1	11.7	<0.001	361	68.3	13.1	<0.001

CRC: Cooper Rowan Clinic; NHANES: National Health and Nutrition Examination Survey; SD: standard deviation; HbA1c: hemoglobin A1c; BP: blood pressure
**compared to CRC patients using post hoc one-way ANOVA*

of insured NHANES respondents. The cause cannot be directly determined from this study but is likely multifactorial. Additionally, it was found that there were no significant differences when comparing CRC patients' HDL and LDL to that of the insured and uninsured NHANES respondents, which is consistent with other studies.[8]

In a time where the health insurance of millions is uncertain, it is important to understand the effect of insurance on patient health. This study adds to the literature describing the health status of uninsured diabetics and demonstrates that insurance has a positive association with both the control of HbA1c and blood pressure. Comparison between insured and uninsured individuals within the framework of ADA guidelines supports this association. Insurance improves access to care for diabetics and provides a multitude of resources at a lower cost.[9,10] Additionally, having insurance has been shown to improve clinical awareness of patients and subsequently decreases the rates of long-term complications and reduces overall health expenditures.[1,3]

Limitations

Patient's diagnosis of diabetes from NHANES is self-reported which makes it subject to recall bias and may not accurately reflect the correct categorization. The sample sizes used for each population and for each set of health indicators varied greatly. The sample from the NHANES database ranged from 29-85 in the uninsured group and 280-687 in the insured group, while the CRC

ranged from 67-83. The most up-to-date NHANES data was from 2013-2014, and the data gathered from the CRC was from 2015-2016. This slight discrepancy could affect the accuracy of some results as populations from two different time periods are being compared. We were able to control our data for age and gender; however, we were unable to control for socioeconomic or education level due to lack of data from the CRC. This is an area that could lead to confounders, which could affect the accuracy of our results. Additionally, NHANES reports multiple different levels of insurance status, and we made the decision to broadly compare the insured and uninsured groups to simplify our analysis and make the case for more detailed studies. Finally, this study is cross-sectional, which prevents us from making any causal claims about insurance status and diabetes quality measures, but simply allows us to state associations.

Future Studies

An important next step would be assessing the health status of additional regions (i.e. suburban, rural settings) to provide further insight on factors that affect the health of diabetics. Gathering a more detailed picture in future studies by obtaining a comprehensive laboratory evaluation (i.e. liver function tests, urinary albumin-to-creatinine ratio) would provide a more detailed view of the health of this patient population. Additionally, longitudinal data could determine the effect of our student-run clinic (SRC) on its diabetic patients and add to the literature on the effectiveness of SRCs as a safety net for health care of the underserved and uninsured. Further studies and data would allow for quality improvement projects to provide more efficient care in SRCs nationwide.

Conclusions

We found that uninsured diabetic patients presenting for an initial visit at the Cooper Rowan Clinic in Camden, New Jersey have a higher percentage of uncontrolled diabetes and hypertension when compared with a national sample of insured diabetics. Thorough care for these conditions is essential as it reduces severity, complications and the cost to the American healthcare system. Student-run free clinics are an important part of the safety net for access to healthcare for uninsured patients. We hope this study will serve as additional evidence to the importance of accessible and affordable healthcare for all patients regardless of their socioeconomic status.

Disclosures

The authors have no conflicts of interest to disclose.

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