



Clinical Outcomes of Diabetic Patients at a Student-Run Free Clinic Project

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OBJECTIVES: Our objective was to determine if the quality of care of diabetic patients at a Student-Run Free Clinic Project (SRFCP) meets the standard of care, is comparable with other published outcomes, and whether pertinent diabetic clinical indicators improve over time.

METHODS: The authors conducted a retrospective chart review of diabetic patients at three University of California-San Diego (UCSD) SRFCP sites from December 1, 2008 to December 1, 2009 (n=182), calculated the percentage who received recommended screening tests, percent at goal, and compared these to published outcomes using Fisher's exact tests. Baseline measures were compared to most recent values using paired *t* tests.

RESULTS: The percentage of patients who received recommended screening tests (process measures) was blood pressure (BP) 100%, HbA1c 99.5%, creatinine 99.5%, LDL 93%, HDL and triglycerides 88%, microalbumin/creatinine ratio 80%, and ophthalmology exam 32%. Intermediate outcomes included: 70% of patients were at LDL goal <100, 70% had microalbumin/creatinine ratio <30, 61% of males were at HDL goal >40, 47% of females at HDL goal >50, 52% with triglycerides <150, 45% had BP <130/80, and 30% of patients had HbA1c <7. Mean HbA1c, LDL, HDL, triglycerides and blood pressure improved significantly over time.

CONCLUSIONS: Diabetic patients at UCSD SRFCP reached goals for both process measures and intermediate outcomes at rates that meet or exceed published outcomes of insured and uninsured diabetics on nearly all measures, with the exception of ophthalmology screening. Glycemic control, cholesterol levels, and blood pressure improved significantly during care at the UCSD SRFCP.

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Student-Run Free Clinics (SRFCs) have entered the mainstream of medical education. Over half of American Association of Medical Colleges (AAMC) institutions responding to a 2005 survey reported having a SRFC.¹ Recently, more than 300 participants attended the annual conference of

the Society of Student-Run Free Clinics (SSRFC), a student-directed national organization dedicated to establishing best practices in these settings.^{2,3} According to preliminary data from the SSRFC, there are approximately 100 medical schools with a SRFC.⁴

However, research documenting SRFC outcomes has remained relatively sparse until recently.⁵ There is a call in the literature for SRFCs to document outcomes of student involvement, educational value, attitudes toward the underserved, patient demographics, scope of practice, and quality of care provided.^{1,5-6}

Ryskna et al were first to publish SRFC patient outcomes in November 2009 in a study of 24 diabetic patients.⁷ SRFC patient outcome studies have subsequently been published on hypertension (n=60),⁸ depression (n=49),⁹ and preventive care (n=114).¹⁰ Each found that the SRFC provided high-quality care to the patients they serve.

This study examined clinical outcomes of diabetic patients at three University of California San Diego (UCSD) Student-Run Free Clinic Project (SRFCP)¹¹ sites using American Diabetes Association (ADA) Clinical Practice Guidelines¹² and compared outcomes to published data from insured, uninsured, local, state, and national populations to determine if we were meeting the standards of care.^{6,13-22}

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Methods

This was a retrospective medical record review. Patients over 18 years with a clinic visit from December 1, 2008, through December 1, 2009, and a diagnosis of diabetes were included in this study. We obtained study data from a student-designed Microsoft Access (Redmond, WA) clinical electronic database and online electronic laboratory records (Quest Diagnostics, Madison, NJ). Paper charts were consulted for verification when indicated.

Process performance was measured as the percentage of diabetic patients who had received pertinent exams (HbA1c, LDL, triglycerides, HDL, microalbumin/creatinine ratio, blood pressure, and ophthalmology screening) within the year prior to their last visit.

Intermediate outcomes were assessed using means and standard deviations of most recent values for pertinent laboratory studies and blood pressure readings. The percentage of patients at goal was determined by using the number of patients at goal as the numerator and the number of patients who received that test as the denominator. We compared process measures and intermediate outcomes to other published outcomes with Fisher's exact tests using the statistical program "R" (Vienna, Austria). Paired *t* tests in Microsoft Excel (Redmond, WA) compared baseline versus most recent values for intermediate outcomes. Independent sample *t* tests in Microsoft Excel compared outcomes between clinic sites. The first laboratory or blood pressure value recorded for each patient was used as the baseline value, even when the first recorded value occurred before the study period. This study was approved by the University of California Institutional Review Board, project #100543.

Results

Twenty-four percent of the UCSD SRFCP patient population (182/763) was confirmed to be diabetic and included in this study. The study

Figure 1: Process Measures: Percentage of Diabetic Patients Receiving Recommended Testing at the UCSD SRFCP From December 1, 2008 Through December 1, 2009 (n=182)

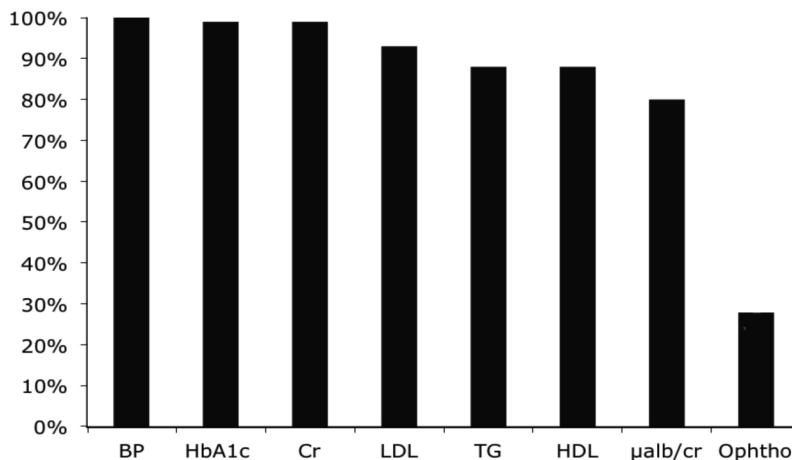


Figure 1a—Percentage of diabetic patients receiving recommended testing at UCSD SRFCP

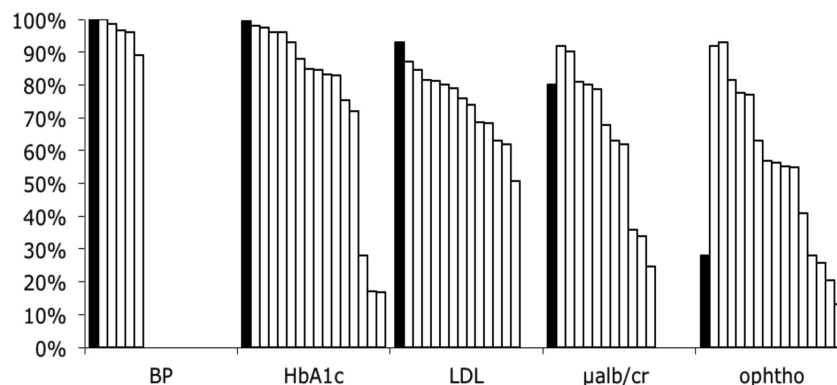


Figure 1B—Percentage of diabetic patients receiving recommended testing at UCSD SRFCP compared with other published outcomes¹³⁻²²

UCSD—University of California San Diego
SRFCP—Student-Run Free Clinic Project

population had been followed by the SRFCP clinic for a mean of 2.64 years prior to the study period (range zero to 10 years, standard deviation [SD]=2.66). The average number of visits during the study year was 5.06 (range 1–19, SD=3.45). Thirty-nine patients (21%) had their initial visit during the study,⁹ (4.6%) of whom had only one visit during the study period. Demographics included: mean age 53 years (range 18–80, SD=11.5); 59% female, 41% male; 75% Latino, 15% Caucasian, 4% Asian, 3% African American, 3% Other; 71% Spanish speaking, 27%

English, 2% Other; and 10% homeless.

The percentage of patients who received recommended diabetic testing (process measures) was: 100% blood pressure, 99.5% HbA1c and serum creatinine, 93% LDL, 88% HDL and TG, 80% urine microalbumin/creatinine ratio, and 32% ophthalmology screening (Figure 1a). Table 1 lists means and SDs for intermediate outcomes measures and the percentage of patients who reached ADA goals.

Table 2 presents the comparison of baseline versus most recent values for intermediate outcomes. HbA1c,

Table 1: Intermediate Outcomes for Diabetic Patients at the UCSD SRFCP December 1, 2008 to December 1, 2009, Including the Percentage Who Met ADA Treatment Goals

Clinical Indicator	Mean (SD)	ADA Goal 2009	% at Goal	# of Patients at Goal	n
HbA1c	8.28 (2.1)	<7.0	30%	54	181
LDL	91 (33)	<100	70%	119	169
Triglycerides	169 (102)	<150	52%	84	161
HDL (male patients)	45.3 (13.9)	>40	61%	37	61
HDL (female patients)	50.5 (12.1)	>50	47%	47	100
Urine microalbumin/creatinine	104 (377)	<30	70%	102	145
Systolic blood pressure	127 (19)	<130	58%	106	182
Diastolic blood pressure	76 (12)	<80	64%	116	182
Blood pressure	127/76	<130/<80	45%	82	182

HbA1c—Hemoglobin A1c
 HDL—High density lipoprotein
 LDL—Low density lipoprotein
 UCSD—University of California San Diego
 SRFCP—Student-Run Free Clinic Project

Table 2: Baseline Versus Most Recent Values in Diabetic Patients Seen at the UCSD SRFCP From December 1, 2008, to December 1, 2009

Clinical Indicator	Baseline Value Mean (SD)	Most Recent Value Mean (SD)	n	P Value
HbA1c	9.15 (2.51)	8.19 (2.15)	157	<.001
LDL	116.34 (43.60)	87.21 (32.19)	152	<.001
Triglycerides	230.18 (191.87)	159.64 (84.28)	151	<.001
HDL	46.11 (13.84)	49.35 (13.00)	150	<.001
Systolic blood pressure	131.89 (18.20)	126.65 (18.77)	174	<.05
Diastolic blood pressure	81.86 (12.08)	75.08 (11.79)	174	<.001
Urine microalbumin/creatinine	91.83 (210.20)	92.66(345.97)	118	.980
Serum creatinine	0.83 (0.26)	0.82 (0.27)	160	.35

HbA1c—Hemoglobin A1c
 HDL—High density lipoprotein
 LDL—Low density lipoprotein
 UCSD—University of California San Diego
 SRFCP—Student-Run Free Clinic Project

LDL, HDL, triglycerides, systolic blood pressure, and diastolic blood pressure showed significant improvements ($P<.001$ for all except systolic blood pressure, $P<.05$). No differences were seen in outcomes between sites, except that mean blood pressure was lower at the Baker Elementary school site (123.4/72.4 versus 129.6/77.3 ($P<.03$). Clinical outcomes of diabetic patients at the UCSD SRFCP were

compared to other published diabetic outcomes (Figure 1b, Tables 3 and 4).

Discussion

The UCSD SRFCP met or exceeded standards of care for diabetes process outcomes and intermediate outcomes in nearly all categories when compared to other published studies. To our knowledge, this is the first publication documenting longitudinal diabetes chronic disease

management outcomes at a SRFC. Our results demonstrated significant improvements in glycemic control, lipid management, and blood pressure.

This study demonstrates that challenging patient populations, including the uninsured, non-English speakers, immigrants, and homeless, can achieve control of chronic disease under the care of a SRFC. A notable exception to meeting quality

Table 3: UCSD SRFCP Diabetic Patient Outcomes From December 2008–December 2009 Compared With Published Outcomes of Diabetic Patients From Varying Practice Types, Locations, and Insurance Status

Insurance Location	Unins. UCSD SRFCP	Insured Medicare FFS, San Diego, CA ¹³	Insured Medicare FFS, CA ¹³	Insured VA, US ¹⁴	Insured Managed Care, US ¹⁴	Insured and Unins, NHANES III US ¹⁵	Insured Managed Care, US ¹⁶	Mixed Rural NC ¹⁷	Insured Resident Clinic VA, NC ¹⁸	Mixed Resident Clinic NC ¹⁸
n	182	17,055	255,897	1,273	6,901	414	8,661	142	249	391
Process measures (patients who received exams)										
BP	100%			96%*	89%*			98.6%†		
HbA1c	99.5%	84.6%*	83.1%*	93%*	83%*		84.8%*	88.0%*	96%*	98%†
LDL	93%	81.2%*	80.2%*	79%*	63%*		68.7%*	68.3%*	87%†	74%*
TG	88%									
HDL	88%									
µalb/cr	80%			92%‡	81%†		78.6%†	62.0%*	63%†	36%*
Ophtho exam	32%	55.2%‡	54.9%‡	57%‡	28%†		77.6%‡	20.4%*	93%‡	77%‡
Intermediate outcomes (percent of patients at goal)										
LDL <100	70%			52%*	36%*				72%†	66%†
LDL <130	86%			86%†	72%*			40.1%*	87%†	86%†
BP <130/80	45%					35.8%*			34%*	38%†
BP <140/90	77%			53%*	52%*	59.6%*		51.4%*	65%*	64%*
BP, HbA1C, and chol	7.8%					7.3%†				
HbA1c <7.0	30%					37%†				
7.0 to 8.0	29%					26%†				
>8.0	41%					37%†				
>9.0	30%					20%‡				
>9.5	24%			8%‡	20%†			37.3%*		
>10%	19%					12.4%†				

UCSD—University of California San Diego

SRFCP—Student-Run Free Clinic Project

* UCSD SRFCP outcome is significantly better than published outcome ($P < .05$)† UCSD SRFCP is not statistically different than published outcome ($P > .05$)‡ UCSD SRFCP outcome is significantly worse than published outcome ($P < .05$)

BP—blood pressure

Chol—cholesterol

CHC—community health center

FFS—fee for service

HbA1c—hemoglobin A1c

HDL—high density lipoprotein

LDL—low density lipoprotein

µalb/cr—urine microalbumin/creatinine ratio

TG—triglycerides

Mixed—uninsured and insured

Unins.—uninsured

VA—Veterans Affairs

**Table 4: UCSD SRFCP Diabetic Patient Outcomes From December 2008–December 2009
Compared With Published Outcomes of Diabetic Patients From National Data Sources**

	Uninsured UCSD SRFCP	Insured and Uninsured (NHANES+BRFSS) ¹⁹ National Survey	Insured and Uninsured (NHANES+BRFSS) ²⁰ National Survey	Insured Medicare Managed Care National (DQIP) ²¹	Uninsured > 1 Year National ²²
Process measures (percent of patients who received exams)					
Blood pressure	100%				
HbA1c	99.5%	28%†		72%†	16.8%†
LDL	93%		84.6%†	62%†	
TG	88%				
HDL	88%		64.2%†		
microalb/cr	80%		67.7%†	34%†	
Ophtho exam	32%	63%		41%	56.4%
Intermediate outcomes (percent of patients at goal)					
LDL <100	70%	11%†	33.8%†		
LDL <130	86%	42%†	30.4%†	38%†	
BP <130/80	45%				
BP<140/90	77%	65.7%†	68.0%†		
HbA1c <7.0	30%	42.9%	47%		
7.0 to 8.0	29%	15.7% (7.0 to 7.9)	21.1 (7.0 to 7.9)		
>9.0	30%	28.0%	20.6%		
>9.5	24%	18.0% 26.9%† in uninsured		35%†	
>10%	19%	14.90%†	14.4%†		

UCSD—University of California San Diego
 SRFCP—Student-Run Free Clinic Project
 BRFSS—Behavioral Risk Factor Surveillance System
 DQIP—Diabetes Quality Improvement Program
 HbA1c—hemoglobin A1c
 HDL—high density lipoprotein
 LDL—low density lipoprotein
 NHANES—National Health and Nutrition Examination Survey
 microalb/cr—urine microalbumin/creatinine ratio
 TG—triglycerides

† UCSD SRFCP percentage is the same or better than the published outcome, without inferring statistical significance. Sample sizes (n) were not reported for these publications, therefore statistical significance in comparison with UCSD SRFCP outcomes can not be made.

standards was the rate of ophthalmology screening.

SRFCs provide a unique opportunity within the medical school curriculum to teach medical students population-based medicine, registries, chronic disease outcomes, and assessment of quality of care. Under close faculty supervision, students have their own “practice” and therefore have the opportunity to identify things that their practice is doing well and areas in need of improvement. We have added additional ophthalmology clinic sites and sessions,

our students have taken a systematic approach to identifying and following all diabetic patients, scheduling their annual ophthalmology visits, making reminder calls, and addressing social barriers. The percentage of diabetic patients receiving a retina ophthalmology exam increased to 46% (108 of 235) for diabetic patients with one or more primary care visits to our general medical clinic in the previous year and 53% (103 of 194) for those with at least two visits.

Most SRFCs strive to meet two main objectives: (1) educate,

empower, and inspire medical students and (2) provide outstanding, humanistic patient care to the uninsured and those who have difficulty accessing or do not qualify for care in traditional settings. Our goal was to demonstrate that care at a SRFC can be equal to or better than a traditional setting. This study adds to the body of literature demonstrating that the quality of care at a SRFC can be equal to or better than a traditional setting. We are not suggesting that patients with access to traditional care begin to seek care in

a SRFC, but rather that SRFCs are capable of and must strive to achieve these standards of care and that patients going to SRFCs are not receiving sub-standard care.

Nonetheless, patients receiving care in these settings continue to face many barriers as SRFCs often have quite limited hours, long wait times, limited capacity, and difficulty accessing imaging, surgeries, and specialty care (including ophthalmology).

In part, the low ophthalmology screening rates likely reflect the many barriers that patients of SRFCs continue to face despite access to caring, enthusiastic, and dedicated student and faculty providers.

There are several limitations of the current study. This was a single institution retrospective medical record review, and prospective multi-institutional studies are needed. The relatively small sample size impacts external validity and generalizability. Additionally, the comparative data analysis may not accurately reflect similarities or differences in outcomes as each study differed in design and data analysis.

In conclusion, the UCSD SRFPC not only provides an opportunity for medical education and service-learning for its students but also provides excellent medical care to diabetic patients who otherwise lack access to medical services. While SRFCs are a very small part of the safety net for the uninsured in our country, we strive to serve our patients well, while inspiring future physicians to become leaders and continue with their passion for caring for the underserved.

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