



# Impact of a Student-Run Clinic on Emergency Department Utilization

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**BACKGROUND AND OBJECTIVES:** Student-run clinics (SRCs) provide primary care access to low-income patients who would otherwise pursue more expensive care, such as visits to emergency departments (ED). Decreasing inappropriate ED utilization offers an opportunity to create value in the health care system. However, to date, no SRC has rigorously studied this. This study examines whether increased access to ambulatory care through an SRC, the Crimson Care Collaborative (CCC), is associated with decreased ED utilization, providing value to payers and providers, and justifying investment in SRCs.

**METHODS:** We conducted a 5-year retrospective analysis of 796 patients to determine if ED utilization changed after patients enrolled in CCC. We used patient-level ED visit data to estimate the average change in ED utilization. A regression analysis examined the impact of demographic and clinical variables on changes in ED utilization.

**RESULTS:** Average per-patient ED utilization significantly ( $P < 0.001$ ) decreased by 23%, 50%, and 48% for patients enrolling in CCC from 2013 to 2015, respectively. Following enrollment in CCC, average ED utilization decreased by 0.39 visits per patient per year. This translates to 62.01 avoided ED visits annually, and estimated payer savings of \$84,148, representing 68% of the clinic's direct operating costs.

**CONCLUSIONS:** CCC created value to payers and providers from 2013-2015 by providing a lower-cost source of care and increasing ED capacity for more emergent and appropriate care. This study suggests that SRCs can create financial value for both payers and providers while also providing an avenue to teach value-based care in medical education.

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each night; for 10 weeks during the summer, the clinic operates at half capacity. We hypothesized that increased outpatient access through CCC would be associated with decreased ED utilization.

## Methods

A retrospective longitudinal analysis was conducted to quantify the change in ED utilization before and after patients enrolled at CCC.

## Study Population

The study population included all 796 adult patients who enrolled at CCC between October 1, 2010 and September 30, 2015. Annual patient cohorts consisting of newly enrolled CCC patients were created for each fiscal year.

## Data Collection

Patient data was obtained from the hospital's clinical data registry.<sup>9</sup> CCC visits were obtained from the clinic's RedCap database. Socioeconomic status was approximated using US census data, which lists the mean per capita income associated with a patient's home zip code. The Deyo adaptation of the Charlson Comorbidity Index (CCI) was used as a proxy for health status.<sup>10</sup>

Student-run clinics (SRCs) provide primary care access to patients who would otherwise pursue expensive avenues of care, such as visits to emergency departments (EDs).<sup>1,2</sup> Decreasing inappropriate ED utilization is a major opportunity to generate health care value. However, the impact of SRCs on ED utilization is unknown.<sup>3-8</sup> To address this gap,

we studied the value created by the Crimson Care Collaborative (CCC), a Harvard Medical School-affiliated network of seven SRCs providing after-hours primary care in the Boston area. Established in 2011, the CCC clinic at Massachusetts General Hospital-Internal Medicine Associates operates from 5:30 pm to 7:30 pm on Tuesdays for 49 weeks each year. For 39 weeks, 7 to 10 patients are seen

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### Data Analysis

The primary outcome—change in per patient ED utilization—was calculated using annualized ED utilization in the 18 months before and after CCC enrollment. Independent variables included gender, age, language, race, distance to clinic, marital status, insurance type, socioeconomic status, smoking status, body-mass index, CCI, and annual CCC utilization.

Descriptive analyses characterized the cohorts. Two-sided Wilcoxon signed-rank tests estimated if changes in ED utilization were significant. Regression analysis assessed the influence of the named demographic and clinical covariates on changes in ED utilization. SAS v 9.4 software was used for statistical analysis.<sup>11</sup>

Cost savings were calculated using the median ED charge of \$1,233.<sup>12</sup> The 2015 inflation adjusted charge of \$1,357 was multiplied by the average number of avoided visits per year to compute annual cost savings. Avoided visits were calculated by multiplying the average annual cohort size by the observed average annual per patient reduction in ED utilization. The Partners Healthcare Institutional Review Board approved this study.

### Results

Patients were predominantly under age 65 years, white, English-speaking, commercially-insured, lived within 10 miles of CCC, and had annual per capita incomes between \$15,000 and \$40,000 (Table 1).

### ED Utilization

In the 2012 cohort, average per patient ED utilization increased by 80% ( $P<0.03$ ) after CCC enrollment. For the three subsequent cohorts, average per patient ED utilization decreased by 23%, 50%, and 48% ( $P<0.001$ ) respectively. During these 3 years, ED utilization decreased by an average 0.39 visits per year per patient (Figure 1).

Regression analysis revealed that for each additional CCC visit, ED

utilization decreased by 0.41 visits per patient ( $P<0.0001$ ). Although age and smoking were correlated with ED utilization ( $r=-0.09$ , 0.11;  $P=0.008$ , 0.003, respectively), they were not significant in the final model. No other characteristics were related to change in ED utilization.

### Financial Impact

Assuming a 5-year annual cohort size of 159 patients and an annual reduction of 0.39 visits per patient, 62.01 ED visits were avoided each year, amounting to \$84,148 in annual savings—68% of the clinic's direct operating costs.

### Discussion

In the 2013, 2014, and 2015 cohorts, the observed decrease in ED utilization following CCC enrollment suggests that patients will seek after-hours outpatient care, if available. The increase in ED utilization in the 2012 cohort is likely due to low patient engagement, fragmented staffing, and leadership turnover during the clinic's pilot period. From 2013 onwards, clinic staffing and leadership stabilized and a sustained decrease in ED utilization was observed.

Our results are notable for three reasons: (1) quantifying the clinic's impact on ED utilization can guide QI initiatives, (2) quantification of value provides justification for the SRC model, and (3) it is proof-of-concept that SRCs can train future health care professionals in value-based care.

### Quality Improvement

QI initiatives can educate patients around appropriate ED use and incentivize longitudinal use of CCC. A key next step is understanding the drivers for ED and CCC utilization. This could drive disease-specific initiatives to shift care to appropriate settings.

Although the financial implications of reduced utilization do not directly impact CCC's operating budget, shifting care to a lower-cost

setting benefits the host hospital and can justify budget increases for CCC QI initiatives.

### Value for Society

Our study suggests SRCs create value to payers and providers by providing alternative, more appropriate sources of care. We assume reductions in ED visits reflect shifts of nonurgent care from the ED to the outpatient clinic, freeing up ED capacity for higher-acuity cases. CCC likely creates value for patients by providing social and behavioral health services in the clinic, helping patients establish primary care relationships, and offering after-hours care.<sup>13</sup>

### Value-Based Care in Medical Curriculum

Medical school is the ideal time to educate young physicians about payment models, and the value of care they deliver. The nearly 100 medical schools hosting SRCs provide an ideal opportunity to apply theoretical knowledge around value-based care.<sup>14</sup>

### Limitations

Although we only examined ED utilization within the Partners Healthcare system, given Partners' broad network, we believe our results account for the majority of patients' ED usage. Because we did not classify ED visits as urgent or nonurgent, we are unable to draw conclusions about the acuity of avoided ED visits. Lastly, given that our study looks at a snapshot in time, it is possible that as time progresses and the SRC helps high-ED utilizers access primary care, cost savings may diminish.

### Conclusion

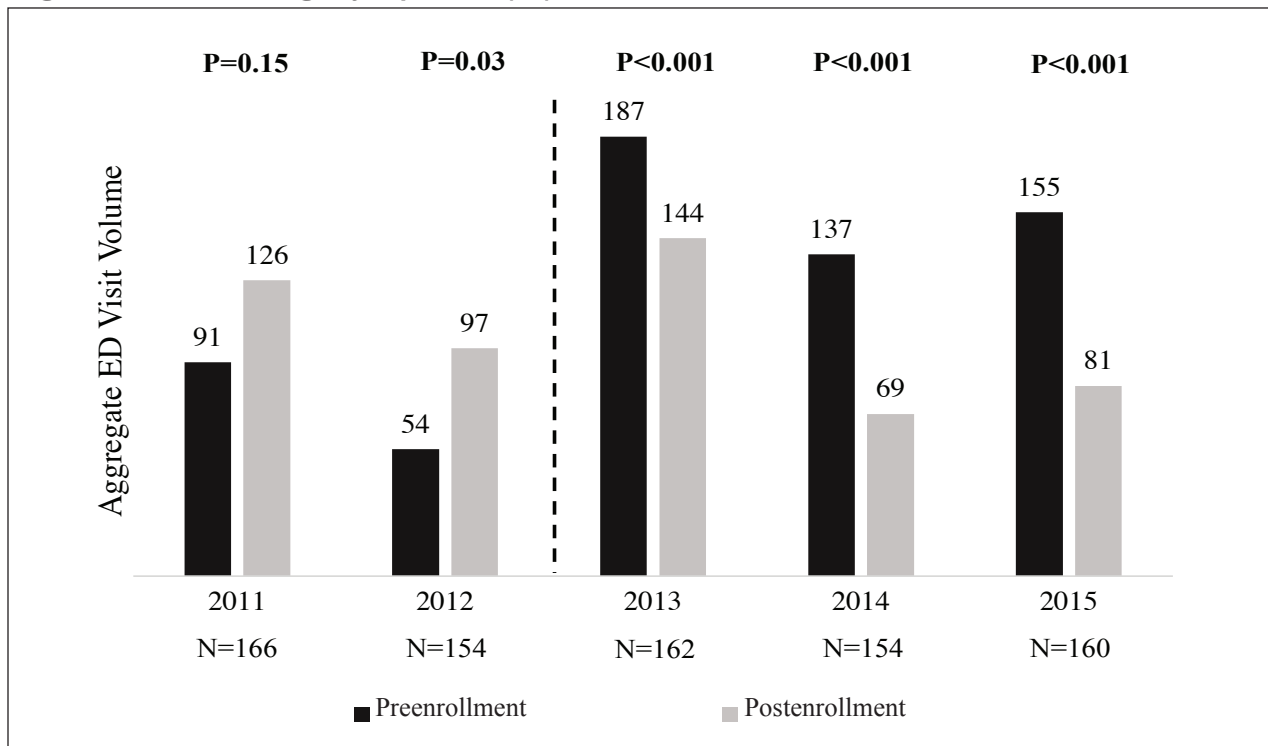
This study is the first to examine the impact of SRCs on ED utilization. Our approach is a proof of concept that SRCs can be positioned as a platform for teaching students about value in health care delivery.

**Table 1: Demographic Characteristics of Annual Crimson Care Collaborative (CCC) Patient Cohorts Enrolling Between 2011 and 2015**

	CCC Enrollment Fiscal Year											
	Total		2011		2012		2013		2014		2015	
	#	%	#	%	#	%	#	%	#	%	#	%
<b>Number of Patients</b>	<b>796</b>	<b>100</b>	<b>166</b>	<b>21</b>	<b>154</b>	<b>19</b>	<b>162</b>	<b>20</b>	<b>154</b>	<b>19</b>	<b>160</b>	<b>20</b>
<b>Male</b>	380	48	74	45	71	46	77	48	75	49	83	52
<b>Age</b>												
>65	199	25	48	29	50	32	35	22	35	23	31	19
55-64	130	16	33	20	20	13	27	17	29	19	21	13
45-54	141	18	27	16	29	19	26	16	27	18	32	20
35-44	131	16	25	15	28	18	29	18	20	13	29	18
25-34	174	22	33	20	27	18	40	25	39	25	35	22
18-24	21	3	0	0	0	0	5	3	4	3	12	8
<b>Race/Ethnicity</b>												
White	510	64	110	66	102	66	105	65	89	58	104	65
Black	104	13	2	12	18	12	21	13	25	16	20	13
Hispanic	69	9	17	10	14	9	17	10	11	7	10	6
Asian	56	7	13	8	14	9	7	4	11	7	11	7
Other	57	7	6	4	6	4	12	7	18	12	15	9
<b>Primary Language</b>												
English	679	85	143	86	126	82	136	84	135	88	139	87
<b>Distance From Home to Clinic (Radius)</b>												
≤1 mile	57	7	12	7	8	5	15	9	15	10	17	11
>1 mile; ≤2.5 miles	79	10	13	8	19	12	17	10	20	13	19	12
>2.5 miles; ≤5 miles	181	23	43	26	37	24	43	27	43	28	44	28
>5 miles; ≤10 miles	175	22	45	27	40	26	38	23	32	21	43	27
>10 miles; ≤25 miles	127	16	29	17	37	24	26	16	27	18	22	14
>25 miles; ≤50 miles	44	6	18	11	6	4	9	6	9	6	7	4
>50 miles; ≤216 miles	17	2	3	2	2	1	8	5	6	4	3	2
Incorrect address*	17	2	3	2	5	3	6	4	2	1	5	3
<b>Payer</b>												
Medicare	136	17	40	24	28	18	16	10	28	18	24	15
Medicaid, MassHealth, NHP	224	28	40	24	36	23	55	34	45	29	48	30
Commercial	393	49	73	44	83	54	83	51	73	47	81	51
Uninsured, self-pay	43	5	13	8	7	5	8	5	8	5	7	4
<b>Socioeconomic Status</b>												
<\$10,000	4	1	0	0	1	1	0	0	3	2	0	0
<\$15,000	100	13	19	11	21	14	28	17	18	12	25	16
\$15,001-\$25,000	220	28	54	33	40	26	56	35	54	35	52	33
\$25,001-\$40,000	240	30	57	34	60	39	56	35	52	34	51	32
\$40,001-\$75,000	104	13	28	17	25	16	16	10	22	14	23	14
≥\$75,001	16	2	5	3	2	1	2	1	3	2	4	3
Unknown	17	2	3	2	5	3	4	2	2	1	5	3

\*Patients living within a radius greater than 216 miles were no longer in Massachusetts. Therefore, it was hypothesized that the wrong address was on file for these patients and this field was left blank.

Figure 1: Annualized Emergency Department (ED) Utilization Pre- and Postenrollment in CCC for Each Annual Cohort



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**PRESENTATIONS:** Preliminary findings from these data were presented as a poster at the National Society for General Internal Medicine Conference in April 2017 in Washington, DC, and at the New England Society for General Internal Medicine Conference in March 2017 in Boston, MA. The findings were also presented as an oral presentation at the Society for Student-Run Free Clinics Conference in February 2017, in Los Angeles, CA.

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