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Original Study

Improving Education and Care in Student-Run Clinics: A Didactic Intervention for Pre-Clinical Medical Students

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Abstract

Background: Merging education with clinical care is essential at student-run clinics.
Methods: First year medical students participated in 15-minute small-group didactic sessions monthly from January through May 2011. Topics included diabetes, hypertension, mood disorders, and back pain. After the intervention, a 10-question survey comprised of eight 7-point Likert items and two narrative response questions was made available online to all eligible students. Patient encounter times during the intervention period were recorded and compared to the year prior to intervention.
Results: Fourteen of 26 students (54%) responded to the survey. All students found the intervention to offer more information about standards of practice than their courses. Of respondents, 64.3% agreed or strongly agreed they provided better patient care with the intervention. Students reported a higher probability of using standards of practice: 57.1% agreed and 21.4% strongly agreed. When accounting for confounders, mean patient encounter time was 69.9 (95%CI, -92.4 to -39.4, p<0.001) minutes shorter with the intervention.
Conclusions: Decreased patient encounter time and survey responses support the intervention's educational and clinical efficacy.

Introduction

Student-run clinics make an important contribution to community care. Recently, educators and clinicians have formally explored the intersection of quality care and education at student-run clinics. To date, curricula have approached individual topics such as screening or depression[1-3] or focused on interprofessional systems education.[4,5] However, there is potential for an all-encompassing curriculum for select, high-yield topics to bridge traditional medical education with the clinical experiences pre-clinical students have at a student-run clinic.

The Community Health Clinic (CHC) in Chicago, Illinois is the largest free health clinic in the United States[6] and is staffed in part by pre-clinical medical students and faculty from the University of Chicago Pritzker School of Medicine one day a week. As part of a more vertical curriculum,[7] an informal course was piloted that sought to use the synergy of classroom lectures and CHC clinic volunteer experience to provide students more applicable patient care knowledge and improve care patients received.

The course design was informed by principles within situated cognition and cognitive apprentice educational theories. Both theories emphasize a mind-body environmental learning approach with cognitively focused experiences to foster learning.[8,9]

Our primary outcome was student perception of the course's impact on their education and ability to care for patients. The secondary outcome was patient encounter time to ensure the didactic intervention during clinic time did not prolong patient time at the clinic.

Methods

Study Setting and Participants

We conducted a prospective observational trial. Pre-clinical medical student volunteers from the

University of Chicago who volunteered at the CHC were eligible to participate in the intervention and study. The clinic was staffed each week by a different group of 5-6 students from the school who each volunteered monthly (i.e. the clinic had a different group of 5-6 students each week, but it was the same 26 students each month).

As a pilot intervention, the course was voluntary and posted no grades or formal credit hours. Participation was anonymous, and participants received no compensation. Informed consent was obtained. Study protocols were granted exemption status by the staffing medical center's institutional review board and approved by the clinic's executive director. Students received pre-notification by email and during a monthly board meeting. The survey was emailed to the potential respondents, and they were given two email reminders.

Study Design

Monthly topics were presented by a fourth year medical student teaching assistant (AP) to preclinical medical students from January to May 2011. The topics (diabetes, hypertension—sympathetic control, hypertension—renal control, mood disorders, and low back pain/outpatient analgesia) were chosen based on clinic prevalence.

In June 2011 a 10-question survey comprised of eight 7-point Likert items (Table 1) and two narrative response questions was made available online to all eligible students (Appendix 1). The survey was piloted by former student volunteers of the clinic and evaluated for content validity by education and internal medicine experts (AP, KB).

Patient encounter times for patients seen by students were recorded and compared to encounter time in 2010 before the intervention was initiated. Thus, the prior year (2010) served as a relative control group against which to measure encounter times when the intervention was taking place.

Instruction Methods

When possible, topics discussed during the lessons overlapped with current topics in students' formal basic science courses. Each lesson was 15 minutes long and included a handout (Appendix 2) 2-5 pages long with high-yield outlines, tables, and figures. January through April topics were presented onsite at the clinic in a small group each week just before clinic began and included near-peer teaching[10] for students who had to leave the lesson early to see a patient. Students were only permitted to participate in the lesson and peer teaching if they did not have patient care obligations. The May topic was presented to the aggregate student volunteer group at their campus in a standard lecture format that also included a handout.

Each lesson focused on making explicit connections between physiology/biochemistry, pathophysiology, patient presentation, and common therapeutics. The lessons provided an overview of each of these disease aspects and the relationships between them. For example, down-regulation of the serotonin production pathway during a major depressive episode was discussed with respect to the classical clinical presentation that screens positively for SIGECAPS[1]. Handouts intentionally contained much more detail than could be discussed in 15 minutes, and students were encouraged to explore the handouts further between seeing patients and at home. Additionally, lesson handouts and signs posted during clinic contained society guidelines and HEDIS[2] measure[11] tables. Standards of practice were discussed with respect to the underlying mechanisms of disease. Each lesson was intended to provide information in the context of students' basic science knowledge that would help them care for patients in clinic that same evening to reinforce the didactic and practical knowledge. Three of the lessons were delivered at the clinic when students first arrived and were eating dinner before seeing patients, and two of the lessons were delivered during the monthly board meeting to evaluate which setting students preferred.

Data Analysis

Likert questions were analyzed with descriptive statistics including means and frequencies. Patient encounter time was analyzed by multivariate linear regression to account for other theoretical influences including the attending physician, number of attending physicians, month, year, number of residents, number of students, and number of patients. Narrative response question analysis is not included in this paper.

Notes:

[1] SIGECAPS is a screening tool for depression that stands for Sleep, Interest, Guilt, Energy, Concentration, Appetite, Psychomotor, and Suicidal.

[2] The Healthcare Effectiveness Data and Information Set is a tool to measure performance on key patient care measures.

Participants entered survey data online (Google Forms, Google Corporation, Mountain View, California), and patient encounter data was maintained by the clinic in Excel 2007 (Microsoft Corporation, Seattle, Washington). Authors had no role in recording encounter times and were blinded to them until after the study. All statistical analyses were calculated with SPSS version 18 (Statistical Package for the Social Sciences Corporation, Chicago, Illinois).

Results

Fourteen of 26 (54%) eligible students responded (American Association for Public Opinion Research Response Rate Definition 6).[12,13] Survey items were reduced from 7- to 5-point responses to account for narrow response distributions. Please see Table 1 for response distributions and means. All but one of 14 respondents (93%) agreed or strongly/very strongly agreed that the new curriculum provided unique information to their education. All respondents thought the course material provided more information about standards of practice than their current pre-clinical courses. Twelve respondents (85.7%) agreed or strongly/very strongly agreed that the intervention course helped them understand their patients' conditions and reported directly using information taught during the course in a mean 2.4 times over the 5 clinic evenings worked during the study period. Importantly, 78.5% of the 14 learners reported that the course made them more likely to use standards of practice with their patients when possible.

Total encounter time (patient check-in to check-out from the clinic front desk) was recorded to evaluate the pace of the clinic when dedicated teaching time was added. The encounter time mean ± standard deviation (SD) was 101.5 ± 42.3 and 79.3 ± 36.5 minutes in 2010 and 2011, respectively, for 158 total patient encounters. The year the intervention was implemented, 2011, was associated with a 69.9 minute shorter mean patient encounter time when adjusted for confounders in the model (95% CI -92.4, -39.4, p<0.001), (RModel = 0.589, adjusted R2Model = 0.283). See Table 2 for the full model. Other factors that significantly improved the model were the month; the attending; and the number of patients, attendings, residents, and students. Only some months, attendings, year, and number of residents were significant within the model, however (Table 2).

Table 1. Responses to Likert-style Survey Questions

	Likert Item Distribution, n (%)					
Question	**1-2**	**3**	**4**	**5**	**6-7**	**Mean ± SD**
CHC didactic sessions contributed unique information not otherwise presented in formal courses.	0 (0)	1 (7.1)	0 (0)	6 (42.9)	7 (50.0)	5.43 ± 0.94
CHC didactic sessions provided more information on standards of practice care than formal courses thus far.	0 (0)	0 (0)	0 (0)	3 (21.4)	11 (78.6)	6.07 ± 0.73
CHC didactic sessions helped me understand the physiology presented in my basic science courses.	0 (0)	1 (7.1)	0 (0)	7 (50.0)	6 (42.9)	5.43 ± 1.0
CHC didactic sessions helped me understand the disease processes of and therapies for my patients' conditions.	0 (0)	0 (0)	2 (14.3)	7 (50.0)	5 (35.7)	5.36 ± 0.93
CHC didactic sessions allowed me to provide better patient care.	0 (0)	0 (0)	5 (35.7)	7 (50.0)	2 (14.3)	4.79 ± 0.70
Integrating physiology, pathophysiology, and therapeutics helped me understand the rationale behind the standards of practice care.	0 (0)	0 (0)	1 (7.1)	8 (57.1)	5 (35.7)	5.50 ± 0.94
CHC didactic sessions made me more likely to use standards of practice care when possible.	0 (0)	0 (0)	3 (21.4)	8 (57.1)	3 (21.4)	5.0 ± 0.68
I preferred receiving the CHC didactic lessons onsite at clinic rather than as a campus lecture.	0 (0)	2 (14.3)	1 (7.1)	1 (7.1)	10 (71.5)	5.79 ± 1.47

SD, standard deviation; CHC, Community Health Clinic; ACE, angiotensin converting enzyme. For 7-point Likert items, 1 = very strongly disagree, 4 = neutral, 7 = very strongly agree.

Table 2. Total Encounter Time Model

Factor	B	SE B	β
Constant	154.01	28.79	-
Jan vs May	47.11	14.32	0.48**
Feb vs May	15.79	11.93	0.14
Mar vs May	43.21	14.74	0.426**
Apr vs May	13.51	10.83	0.14
Attending A	-42.39	10.42	-0.5***
Attending B	-62.17	15.34	-0.56***
Attending C	-93.31	13.24	-0.55***
Attending D	-76.74	19.47	-0.47***
Attending E	-60.44	14.65	-0.49***
2011 vs 2010	-65.93	13.4	-0.78***
Number of patients	-4.56	4.1	-0.11
Number of attendings	-9.75	16	-0.06
Number of residents	-30.76	11.83	-0.3*
Number of students	4.59	2.83	0.138

*B, unstandardized coefficient; SE B, standard error of B; β, standard coefficient. *p<0.05, **p<0.01, ***p<0.001. R^2 = 0.347. Encounter time in minutes, calculated from patient check-in to check-out.*

Discussion

Students generally found the intervention to be helpful for both their own education and caring for patients, defined by both direct questions to the students and the fact that they used the didactic material to care for patients. The vast majority of students preferred the didactic sessions held at the clinic location, anecdotally because it provided motivation for learning the material and helped integrate medical knowledge with care.

Additionally, the total encounter time dropped precipitously year-to-year when the students received the educational intervention. Rather than slowing clinic, the extra, dedicated teaching time reduced the time patients spent in clinic, which was likely well received by patients. (Anecdotally patients complained of the long total time spent in clinic). The reduction is likely because students were more familiar with clinically relevant information and did not have to research diseases and medications outside the room as much prior to presenting the patients, which is supported by the reported frequent use of the information presented in our intervention. Although faster clinic time is not directly indicative of better care, it reflects a more efficient experience that is likely explained by better care.

Our findings are consistent with other studies that demonstrate the educational value of medical students volunteering at clinics.[5,14,15] They further suggest that the educational intervention improved the patient experience, which has also been previously demonstrated.[16] This educational intervention is unique compared to prior literature because it covers broad educational topics and impacts both education and perception of patient care.

In a practical sense, the didactic sessions were relatively simple to enact. Fourth year medical students or faculty can easily lead the small group didactic sessions without more than a few minutes of preparation time, and the total session time is a mere 15 minutes. Yet, the impact appears quite clinically and educationally significant.

There are several limitations to our study, most notably the relatively small sample size and unique characteristics of students from a single school at a specific clinic. Additionally, there is an association between year-to-year change in patient encounter time, but no cause/effect conclusions can be drawn. Different staff, different patients, and different students are a few of the potential contributors to the time difference. Nonetheless, the time change is drastic and likely multifactorial, including an educational intervention that should streamline student-patient interactions.

Future studies should evaluate measurable patient care outcomes, such as percentage of HEDIS measures met, hemoglobin A1c, and patient perceptions of care. It would also be informative to compare student grades with and without the CHC didactic intervention.

Conclusion

This simple intervention is a model upon which other short, high-yield didactic interventions can be developed for student-run clinics across the country. It effectively bridges physiology, pathophysiology, and therapeutics in a clinical context that students found helpful for both their own education and for the care of their patients.

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Disclosures

The authors have no conflicts of interest to disclose.

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Appendix 1. Community Health Clinic (CHC) Didactic Experience Survey

Thank you for participating in this course survey. By submitting this form, you express that you have read and agree to the following: 1) This is an optional, anonymous survey. 2) The survey is only to be completed ONCE by each participant. 3) The responses are to be your personal opinion based on personal experience only. 4) No identifiable patient information is to be shared in the survey. 5) Any questions or concerns may be addressed to Andrew Phillips at warejko@uchicago.edu. Thank you for your participation!

Note: Please use the "Additional Comments" fields liberally.

Part 1: Required Questions

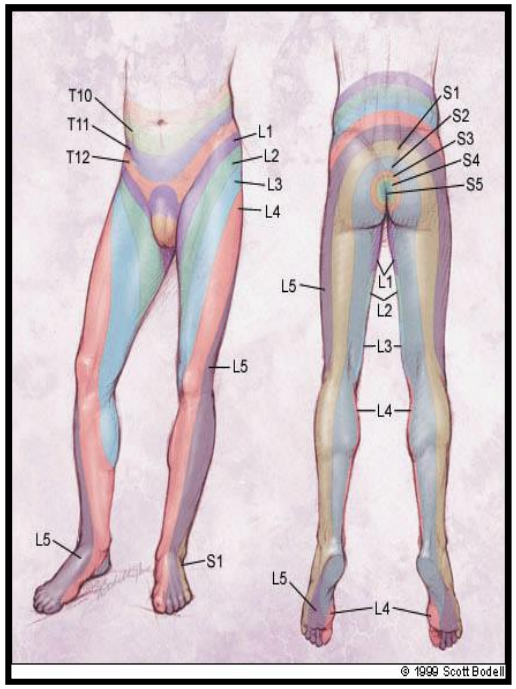
1.	Overall, the information presented during the CHC didactic sessions contributed unique information not otherwise presented in my formal classes.	very strongly disagree 1 2 3 4 5 6 7 very strongly agree
2.	Please describe how the CHC didactic session information was similar or different to information presented in your formal classes.	
3.	The CHC didactic sessions provided more information on standards of practice care (e.g., an ACE inhibitor for a diabetic with hypertension, NSAID as first-line back pain therapy) than any other formal education I have received in medical school thus far.	very strongly disagree 1 2 3 4 5 6 7 very strongly agree
	(Additional Comments for Question 3)	
4a.	Integrating physiology, pathophysiology, and therapeutics during the CHC didactic sessions helped me understand the physiology presented in my basic science courses. (When topics overlapped).	very strongly disagree 1 2 3 4 5 6 7 very strongly agree
4b.	Please describe why or why not.	
5.	Information I learned from the CHC didactic sessions helped me understand the disease processes of and therapies for my patients' conditions.	very strongly disagree 1 2 3 4 5 6 7 very strongly agree
	(Additional Comments for Question 5)	
6.	How many times have you used information presented during the CHC didactic sessions during patient care since January? * If you do not remember exactly how many times, please estimate and write "guess" afterwards.	
	(Additional Comments for Question 6)	
7a.	Information I learned from the CHC didactic sessions allowed me to provide better patient care.	very strongly disagree 1 2 3 4 5 6 7 very strongly agree
7b.	Please describe why or why not, specifically.	
8.	Integrating physiology, pathophysiology, and therapeutics helped me understand the reasonings behind the standards of practice care.	very strongly disagree 1 2 3 4 5 6 7 very strongly agree
	(Additional Comments for Question 8)	
9.	Understanding the physiology, pathophysiology, and therapeutics of the topics presented at the CHC didactic sessions made me more likely to use standards of practice care when possible.	very strongly disagree 1 2 3 4 5 6 7 very strongly agree
	(Additional Comments for Question 9)	
10a.	I preferred receiving the CHC didactic lessons at clinic rather than separate at the monthly board meeting. (If you did not receive the musculoskeletal lecture at the April board meeting, please leave blank).	very strongly disagree 1 2 3 4 5 6 7 very strongly agree
10b.	Why did you prefer one over the other? (If you did not receive the musculoskeletal lecture at the April board meeting, please leave blank).	

Part 2: Optional Questions

1.	I would feel comfortable being the student teaching the CHC didactic material to the MS1 students next year.	very strongly disagree 1 2 3 4 5 6 7 very strongly agree
	(Additional Comments for Optional Question 1)	
2.	I would prefer the time length of the CHC didactic sessions to be:	Select ONE please. __ much shorter __ shorter __ unchanged __ longer __ much longer __ other _____
3.	I would prefer the amount of information presented at the CHC didactic sessions to be:	Select ONE please. __ much less __ less __ unchanged __ more __ much more __ other _____
4.	What other topics would you like presented?	
5.	Was teaching and learning from fellow MS 1 classmates during clinic a good way for you to learn? Why or why not?	
6.	Any additional thoughts you would like to share:	

Appendix 2. Sample Handout – Low Back Pain

Low Back Pain: Physiology



(Humphreys, 1999); Copyright, Scott Bodell, used with permission

TABLE 2. Location of Pain and Motor Deficits in Association with Nerve Root Involvement at Each Lumbar Disc Level

Disc level	Location of pain	Motor deficit
T12-L1	Pain in inguinal region and medial thigh	None
L1-2	Pain in anterior and medial aspect of upper thigh	Slight weakness in quadriceps; slightly diminshed suprapatellar reflex
L2-3	Pain in anterolateral thigh	Weakened quadriceps; diminished patellar or suprapatellar reflex
L3-4	Pain in posterolateral thigh and anterior tibial area	Weakened quadriceps; diminished patellar reflex
L4-5	Pain in dorsum of foot	Extensor weakness of big toe and foot
L5-S1	Pain in lateral aspect of foot	Diminished or absent Achilles reflex

NERVES OF INTEREST FOR LOWER BACK PAIN

NERVE NAME	ROOTS
Sciatic n.	L4-S2
Tibial n.(sciatic branch)	L4-S3
Common fibular n. (sciatic branch)	L4-S2
Obturator n.	L2-L4

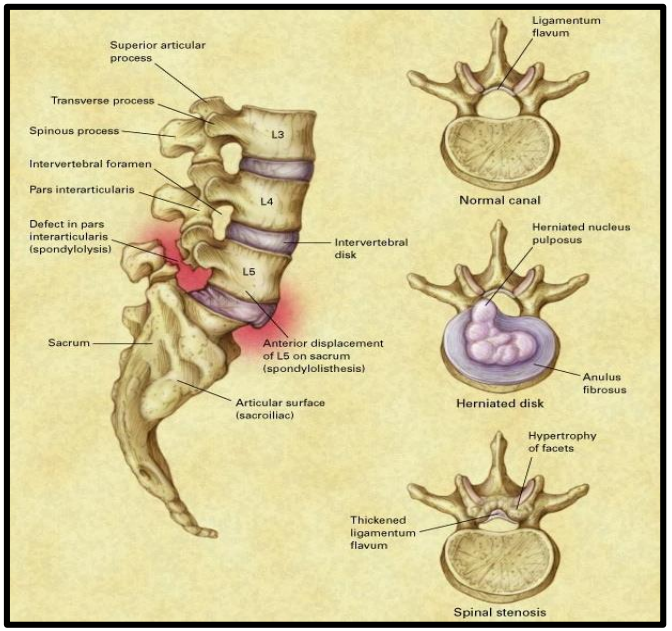
(Drake, 2005)
Note that the tibial and common fibular nerves are branches of the sciatic nerve. This is the reason that sciatic nerve pathology causes the classic pain "down my butt, behind my leg."

Psychosocial factors associated with an increased likelihood of developing chronic back pain (Last, 2009)

-Disputed compensation claims
-Fear avoidance (exaggerated pain or fear that activity will cause permanent damage)
-Job dissatisfaction
-Pending or past litigation related to the back pain
-Psychological distress and depression
-Reliance on passive treatments rather than active patient participation
-Somatization

The psychosocial factors are included in physiology because they very clearly play a role in disease outcome. Patients described by these "yellow flags" are not malingerers—that would be another category—but rather patients with disease presentations complicated by psychosocial factors. Though the mechanism of the physiology is not clearly understood, the outcomes are real. See Last, 2009 for good supportive references.

Common Pathoanatomical Conditions of the Lumbar Spine.



(Devo, 2001)

Highest Level Recommendations for Practice	**Evidence**
Clinical approach	
Acetaminophen and NSAIDs first-line medications for treating chronic low back pain	A
Evaluation of psychosocial problems and "yellow flags" are useful in identifying patient with chronic low back pain who have a poor prognosis	B
Therapeutics	
Analgesics (acetaminophen, tramadol)	A
NSAIDs	A
Acupuncture	A
Multidisciplinary rehab	A
Herbal medications (devil's claw, white willow bark, topical cayenne)	B
Tricyclic antidepressants	B
Exercise therapy	B
Behavior therapy	B
Massage	B
Spinal manipulation	B
Muscle relaxants (short-term)	B
Opioids	B

Adapted from Last, 2009. A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence

Low Back Pain: Therapies

-Multidisciplinary approaches (physician + one additional psychological, social or vocational intervention) returns patients to work an average of 5 weeks earlier (Last, 2009).

Common Anti-inflammatory Drugs

NSAIDs
-aspirin (Bayer)
-diclofenac
-ibuprofen (Motrin)
-indomethacin
-ketorolac (IM/IV)
-meloxicam
-methyl salicylate (Bengay)
-nabumetone
-naproxen (Aleve)

COX-2 INHIBITORS
-celecoxib (Celebrex)

OTHER
-acetaminophen (Tylenol)

Acupuncture: Berman et al. 2010 NEJM Review Article

- Bottom Line: Acupuncture outcomes same as sham outcomes, but both acupuncture and sham are significantly better than "conventional" pharmacotherapy and physical therapy. (Supported by 3 major meta-analyses and studies including Cochrane Back Review Group.)
- Used by many pain specialists as part of multidisciplinary approach.
- Major adverse effects rare (2 pneumothorax reports in 760,000 sessions)
- Minor adverse effects in <0.1% of cases: needle site pain, nausea, vomiting, dizziness, and fainting.
- Guidelines: American College of Physicians & American Pain Society recommend consideration as option for refractory pain.

Acupuncture caveat: Different review articles come to different conclusions using the same primary articles… (e.g. every article in this bibliography).

Common Pharmacotherapy

- NSAIDs
- Other analgesics
- Opioids
- Muscle relaxants (short-term only; not covered here)