



Published in final edited form as:

*Health Educ J.* 2011 March ; 70(1): 39–47. doi:10.1177/0017896910367955.

## Integrating the Chronic Care Model into a Novel Medical Student Course

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### Abstract

**OBJECTIVE**—To determine if integration of the Chronic Care Model into undergraduate medical education is associated with anticipated use of the Model and if student perceptions match actual integration of the Model into their community projects.

**DESIGN**—This was a cross-sectional study using qualitative and quantitative data.

**SETTING**—A novel fourth-year medical student community health improvement course.

**METHOD**—The study included 45 students who had enrolled in the course before introduction of the Model and 32 formally introduced to the Model through a lecture. Perceptions were measured through a survey and a focus group with data analyzed amongst and between cohorts. Projects were reviewed for actual integration of Model elements and these data were compared with reported student perceptions.

**RESULTS**—Although they were in general utilizing most elements of the Model, student perceptions of their use of Model elements significantly differed from actual use of particular elements ( $p < 0.001$ ). For instance, whereas the majority believed that their projects focused on the element of Community Resources, most projects actually focused on Self-Management Support. Students formally introduced to the Model trended toward the belief that it would enhance their ability to care for patients more than students without formal exposure to it ( $p = 0.0516$ ).

**CONCLUSIONS**—Although medical students may not recognize it, they may already focus their actions and thinking regarding health improvement toward patient self-management of their chronic disease. Although students require education and training if the Model is to be widely used, they may be naturally attracted to it.

### INTRODUCTION

The success of health care in any nation relies on the ability of medical educators to prepare future physicians to address impending societal health care needs. Although we teach medical students that quality medical care must be grounded in a solid evidence base, knowledge without a contemporary framework through which they can apply this knowledge will not provide them with the tools necessary to effectively care for patients. These issues become particularly important when caring for the rapidly growing elderly

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Conflicts of Interest: None

population living with chronic illness and a cadre of physicians who feel unprepared to meet patient needs due to limited training in chronic care<sup>1, 2</sup>. The importance of education in chronic care becomes even more significant when one realizes that 133 million Americans have at least one chronic condition and that treatment for those patients accounts for nearly 75% of all medical expenditures<sup>2</sup>. Moreover, surveys have shown that less than one half of U.S. patients with hypertension, depression, diabetes, and asthma are receiving appropriate treatment<sup>3</sup>. These facts should alert us to not only enhance undergraduate and graduate clinical training regarding individuals with chronic disease but also, in parallel, to provide students with an effective framework within which to use their clinical skills.

A framework that has been proven to both improve quality of care and reduce health costs in chronic disease care is called the Chronic Care Model<sup>4</sup>. Inspired from efforts to improve chronic illness management at the Group Health Cooperative of Puget Sound in Washington State, the model was developed by Dr. Edward H. Wagner at the MacColl Institute for Health Care Innovation<sup>3-5</sup>. In brief, the Chronic Care Model is comprised of six elements that provide a conceptual framework for care that integrates chronic care management through incorporation of interdisciplinary teams. The aim is to improve care by educating, empowering, and building confidence in patients and their families in the self management of their chronic conditions<sup>3</sup>. The six core elements involved are: Community Resources, Self-Management Support, The Healthcare Organization, Delivery System Design, Decision Support, and Clinical Information Systems. Although no one element supercedes another, they work in tandem to help fulfill the primary goal of improved chronic care. Hence, its aim is to provide a multidimensional solution to the complex problem of addressing chronic care<sup>4</sup>.

Success of the Model in a variety of health care settings has sparked interest in applying the model to residency training in order to enhance the relevance and excellence of clinical education<sup>6</sup>. In fact, implementation of the Model in this context has been shown to improve the quality of care provided by primary care residents while functioning as a vehicle to achieve the six core competencies set forth by the Accreditation Council of Graduate Medical Education<sup>7</sup>. Trainees using the Model have indicated benefits including an appreciation of multidisciplinary learning from team members and patients and increased collaboration with patients to identify areas of change. Moreover, a study conducted by Greene<sup>8</sup> has shown that resident access to a chronic care training intervention led to greater use of Model elements and a 43% reduction in asthma related emergency department use.

We integrated the Model into a novel fourth-year medical school community health improvement course and studied student perceptions regarding the integration of Model elements into their course projects.

## METHODS

### Study Population and Intervention

This study was approved by the University of Rochester's Institutional Review Board. All 77 subjects were fourth-year medical students at the University of Rochester enrolled in the Community Health Improvement Course (CHIC). This is a novel required course which has been described in detail elsewhere<sup>9, 10</sup>. In 2005, the didactic portion of CHIC did not include a formal lecture and discussion regarding the Chronic Care Model. In 2006, a formal one hour lecture on the Model was introduced along with suggestions for students to integrate elements of the Model into course projects. As required by the course, each student subsequently chose a community health improvement project and spent the remainder of the 4 week course designing and implementing it. All students were asked to complete an email survey at the conclusion of the course and nine volunteered for a focus group.

### **Data Collection: Survey**

All students were sent at least 2 requests to complete the survey which was developed prior to the focus group. The cohort of students who completed the course before incorporation of the lecture was provided with a short summary of the Model. The survey asked students: which of the 6 elements of the Chronic Care Model was best incorporated into their CHIC experience, which of the 6 elements was least incorporated into their CHIC experience and, if they thought that experience with any of the elements of the Model during their CHIC experience improved their ability to care for patients. In order to validate the data obtained from these three questions, we also asked students the question: “How well do you think that your CHIC experience incorporated (each Chronic Care Model Component)?” The responses were formatted in a Likert scale of: “very well”, “well”, “not very well”, or “not well at all”.

### **Data Collection: Focus group**

Nine student volunteers participated in a focus group. The participants were enrolled in 2006 and the lecture regarding the Model was presented to them one week prior. It was 90 minutes in duration, a semi-structured approach was used, a facilitator led the discussion, and it was audiotaped to allow for data analysis. Data from the focus group were collected and interpreted through a content analysis methodology in addition to a simple descriptive summarization. Trends in conversation and repeated themes were noted.

### **Data Collection: The incorporation of Model elements into course projects**

The distribution of projects completed by the students enrolled in the Community Health Improvement Course, according to their exposure to the Model and focus on the six Chronic Care Model domains, was determined. This analysis was completed by a research assistant with no prior knowledge of the clerkship. The assistant was provided with a summary article describing the Chronic Care Model and its elements<sup>4</sup>. In order to limit any misclassification bias, the investigators purposely limited their contact with the assistant to an elaboration of the major constructs of each Model element. The assistant was blinded to the results of the course student survey results and independently assigned projects to Model elements by reading each student paper abstract, determining the means through which the student intended to improve community health, and determining the primary and secondary Chronic Care Model elements that were used to accomplish the goal(s).

### **Statistical Analyses**

We estimated, assuming statistical power of 0.80 and an alpha of 0.05, that 27 subjects per year would be required to find a 40% increase in the proportion of students from 2005 to 2006 who reported that experience with any elements of the Model during their course had improved their ability to care for patients. The Fisher’s Exact Test was used for all data analyses as all variables were categorical in nature and the sample size was relatively small. Due to the fact that the formats of the Likert scale questions and the questions focusing on each Model component differed, a statistical test was not used to verify the consistency in answers to these questions.

## **RESULTS**

### **Survey**

According to a survey administered in 2004 across twelve medical schools<sup>11</sup>, 21% of graduating medical students at the University of Rochester had plans to pursue a career in primary care. The response rate to our survey was 49% in 2005 and 38% in 2006 with a total of 77 responses. The responses from the first set of questions and the validating question

were consistent for each Model component. Students enrolled before (2005) and those enrolled after (2006) the Model was incorporated into the curriculum reported that the Community Resources element of the Model was by far the best incorporated into their projects (Table 1). The results of this question did not significantly differ between these CHIC cohorts ( $p=0.69$ ). Students enrolled in both cohorts reported that the Clinical Information Systems Model element was least incorporated into their projects (Table 2) and this did not significantly differ between cohorts ( $p=0.65$ ). The majority of students in both years reported that experience with any of the elements of the Chronic Care Model during their CHIC experience improved their ability to care for patients. A higher proportion of students who had been formally exposed to the Model via a lecture reported this outcome (78%) compared to those not exposed to the Model (55%) through a lecture, with this difference nearly significant ( $p=0.0516$ ).

The distribution of the focus of individual student projects undertaken by students before and after the introduction of the lecture regarding the Model is in Table 3. Seventy-four percent of projects in both student cohorts focused primarily (the primary domain) on Self-Management support with Community Resources being the second most common (31%) area of focus of projects for both cohorts. The Community Resources element was the most commonly applied element for the projects that leveraged a second element. The other Model elements were much less utilized. When comparison is made between student perceptions and the actual focus of their projects before (Table 4) and after (Table 5) the introduction of the Model lecture, significant discrepancies exist ( $p<0.0001$  for both cohorts). Students thought that their projects focused on Community Resources but they actually tended to focus on Self-Management Support. The actual focus of student projects did not significantly differ between cohorts ( $p=0.34$ ).

### Chronic Care Model Focus Group After Lecture Incorporation

**Question 1: What are your impressions of the Chronic Care Model?**—First the discussion focused on students' overall thoughts regarding the Chronic Care Model. Initial impressions were that the Model was primarily an electronic medical record system. This impression appeared to be reflected in the idea that primary care physicians and subspecialists would have very dichotomous uses for it. For example, a future orthopedist saw little use for the Model given no anticipated need to know a patient's HgbA1C or other chronic disease severity indicators. In contrast, a future primary care doctor expressed the view that orthopedists need to be responsible for knowing the chronic disease status of each of their patients. These different views led to a dynamic discussion among several of the students focusing on whose responsibility it is to address chronic healthcare issues.

Another major point expressed by the future orthopedist was that responsibility for adherence to treatment recommendations ultimately belongs to the patient, not the doctor. It was pointed out by this student that, if a patient is not adherent, that this must mean that the patient has failed. Other students completely disagreed, noting that patients have a variety of reasons for not adhering, and only one is that they have "failed" (mental health issues, discrimination, not understanding recommendations, stress, etc, are other important factors). Most of the students (5 of 6) made generally positive comments about the Model whereas the future orthopedist had primarily negative comments.

**Question 2: Do you believe that future subspecialists will find the Model to be useful in their future practices?**—Five of the six students planning to pursue a subspecialty believed that the Model would be useful in their future practices. However, the discussion centered around the misconception that the Model constituted an electronic

medical record and that access to clinical data was important. Other aspects of the Model were not discussed amongst the students.

**Question 3: What do you think about the usefulness of elements of the Model other than clinical information systems?**—Students immediately distinguished between subspecialists such as surgeons who tend to have very short relationships with patients as opposed to medical oncologists who tend to have longer-term relationships. Again, the point was made by the future orthopedist that patients own the responsibility for their own care and that the Model's usefulness in improving care is limited. This particular student appeared to have strongly held beliefs regarding medical care that transcend issues that pertain to the Model. Another future surgeon was much more open to the idea that a variety of issues interact to affect adherence rates. A discussion then ensued that made it evident that some of the students were very open to the use of the Model due its focus on empowering patients.

One future radiation oncologist suggested that providing web-based tools for patients may improve adherence.

**Question 4: Do you think that your introduction to the Chronic Care Model at this stage of your career will provide benefit?**—The point was made that quite early in medical school they were introduced to the Biopsychosocial Model<sup>12</sup>. Some students mentioned that this model provides a very useful construct within which to provide patient-oriented care. At least one student mentioned that the Chronic Care Model and the Biopsychosocial Model provide very similar constructs. However, they understood that the Biopsychosocial Model does not enlist the same elements as the Chronic Care Model and, thus, the two are quite different. Despite their realization of differences in the models, the students believed a great deal of overlap was present. This gave the impression that the students did not understand that the Chronic Care Model was a distinct framework intended for use in caring for patients with chronic disease.

**Question 5: Are you planning to integrate elements of the Chronic Care Model into your student projects?**—Students mentioned that they were not sure how they could use the Model in their projects. It also appeared that all of the students had already chosen their projects by that time in the course. One student who was very interested in the Model asked why the Model has not been implemented widely in medical practices. Another student mentioned that the Model appears to be a very useful construct but that too many barriers currently exist for it to be implemented, including insurance company reimbursements. This comment led to another dynamic discussion regarding different philosophies of medicine. A third student then mentioned that the paternalistic culture of medicine serves as a barrier to widespread Model implementation.

## DISCUSSION

This is the first investigation, to our knowledge, of the effects of integrating the Chronic Care Model into undergraduate medical education. It demonstrates a mismatch between student perceptions of their application of Model elements and their actual implementation in community health improvement projects. Seventy three percent of students believed that their projects focused on applying the Community Resources component of the Model. However, 74% of the projects actually focused on improving Self-Management Support. In addition, of those projects identified as integrating the element of Self-Management Support, 88% used it primarily while only 47% integrating the Community Resources element used it as the primary focus.

These data suggest that both students with and without formal exposure to the Model believed that their projects focused on creating community resources while they were actually leveraging patient and family self management. The fact that students overwhelmingly relied on self-management support suggests that, although community resources are crucial for the success of community health improvement projects, 4<sup>th</sup>-year medical students are attracted to interventions that assist patients and their families in managing their own diseases. This may also suggest that most medical students believe that the best way to help their community is by patient education and empowerment, a major focus of the Chronic Care Model. This study also documented a trend toward students perceiving greater utility in the Model after formal introduction to it despite the fact that statistical significance was not achieved ( $p=0.0516$ ).

Seventy-eight percent of students that were formally introduced to the Model felt that it enhanced their ability to care for patients. These findings further support the findings of Hoffman<sup>2</sup> and Darer<sup>1</sup> that most physicians feel unprepared to meet the needs of chronic care due to the lack of training in the use of an effective framework to achieve positive outcomes. Considering the fact that many US medical graduates do not pursue primary care careers, a practice framework such as the Chronic Care Model may be the spark needed to regain a sense of optimism once shared by many primary care practitioners.

Information gathered from a focus group provided insights into students' understanding and perceptions of the Chronic Care Model's practicality in different medical specialties. While students interested in primary care expressed more interest and anticipated usefulness of the Model, students interested in more specialized fields such as orthopedics, found the model less helpful. Although such variation in Model acceptance was not entirely unexpected, these findings may reflect our historically designed medical system's focus on acute rather than chronic care<sup>3</sup>. The view that chronic care is solely the responsibility of primary care physicians has the potential to limit students' abilities to view healthcare as a multidisciplinary endeavor and ultimately leads to the perpetuation of disjointed care. Moreover, the observation that students perceive the Model as primarily an electronic medical record system and not as a comprehensive framework suggests that students may be very naive to the complexities of chronic care management.

Although training medical students in the use of the Chronic Care Model faces philosophical and practical barriers, students may naturally be attracted to the Model's patient-centered focus. Students' innate and extensive use of self-management support in health improvement projects suggests that fuller use of this patient-centered Model may be promising. Future research should investigate when and through which teaching modalities the Model should be taught as well as practical ways that future physicians can finance Model element incorporation into their medical practices.

## STRENGTHS AND LIMITATIONS

This study was conducted within a single institution with a relatively small sample and thus the results cannot be generalized. The email survey was not conducted anonymously and thus could have biased student responses. However, the survey did not address issues of sensitivity to medical student's grades and participation was voluntary. A major strength was the ability to study the integration of Chronic Care Model elements into health improvement projects in the midst of a novel required course.



## Acknowledgments

We thank Jelina Pagano for her assistance in reviewing and categorizing student projects, Gabrielle Kapsak, BA, for her role as Coordinator for the Community Health Improvement Course, and Paul Winters, MS, for his assistance with data management and analyses.

Funding: The project described was supported by Grant Number KL2 RR 024136 from the National Center for Research Resources (NCRR), a component of the National Institutes of Health (NIH) and the NIH Roadmap for Medical Research, and its contents are solely the responsibility of the authors and do not necessarily represent the official view of NCRR or NIH. Information on NCRR is available at <http://www.ncrr.nih.gov/>. Information on Re-engineering the Clinical Research Enterprise can be obtained from <http://nihroadmap.nih.gov/clinicalresearch/overview-translational.asp>.

Funding was also provided, in part, by a grant from the New York State Department of Health (W. Varade, PI).

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**TABLE 1**

Answer to: "Experience with which of the 6 elements was best incorporated into your CHIC experience?"

Chronic Care Model Component	2005	2006	Total
Community Resources	33	23	56
The Spectrum of the Health Care Organization	3	0	3
Redesign of the Health Delivery System	4	4	8
Decision Support	2	1	3
Clinical Information Systems	1	1	2
Self-Management Support	2	3	5
Total	n=45	n=32	n=77

Values represent the number of students who chose each element



**TABLE 2**

Answer to: "Experience with which of the 6 elements was least incorporated into your CHIC experience?"

Chronic Care Model Component	2005	2006	Total
Community Resources	4	0	4
The Spectrum of the Health Care Organization	10	7	17
Redesign of the Health Delivery System	9	7	16
Decision Support	3	1	4
Clinical Information Systems	14	13	27
Self-Management Support	5	4	9
Total	n=45	n=32	n=77

Values represent the number of students who chose each element

**TABLE 3**

Distribution of Projects by the Model Exposure of Students

<b>Projects Prior to Model Lecture Introduction (n=91)</b>			
<b>Chronic Care Model Component</b>	<b>Total Listed</b>	<b>Primary Domain</b>	<b>Secondary Domain</b>
Community Resources	27	15	9
Spectrum of Health Care Organization	7	5	2
Redesign of Health Delivery System	11	7	4
Decision Support	11	3	5
Clinical Information Systems	3	1	2
Self-Management Support	67	58	8
<b>Projects After Model Lecture Introduction (n=73)</b>			
Community Resources	24	9	15
Spectrum of Health Care Organization	11	11	0
Redesign of Health Delivery System	8	5	3
Decision Support	4	1	3
Clinical Information Systems	1	0	1
Self-Management Support	54	47	6
<b>All Projects (n=164)</b>			
Community Resources	51	24	24
Spectrum of Health Care Organization	18	16	2
Redesign of Health Delivery System	19	12	7
Decision Support	15	4	8
Clinical Information Systems	4	1	3
Self-Management Support	121	105	14

Each project was categorized by its major focus. Each project may have focused on the use of one or more Chronic Care Model elements with all having a primary element domain used but some also having a secondary element that was integrated. The reported values are the total number of projects that utilized each element.

**TABLE 4**

2005–2006 CHIC Projects

<b>Chronic Care Model Component</b>	<b>Number of projects listed by students with element best incorporated</b>	<b>Number of projects found to have element as primary domain</b>
Community Resources	33	15
Spectrum of Health Care Organization	3	5
Redesign of Health Delivery System	4	7
Decision Support	2	3
Clinical Information Systems	1	1
Self-Management Support	2	58

**TABLE 5**

2006–2007 CHIC Projects

<b>Chronic Care Model Component</b>	<b>Number of projects listed by students with element best incorporated</b>	<b>Number of projects found to have element as primary domain</b>
Community Resources	23	9
Spectrum of Health Care Organization	0	11
Redesign of Health Delivery System	4	5
Decision Support	1	1
Clinical Information Systems	1	0
Self-Management Support	3	47