

A Medical Education Model for Collaborative Chronic Disease Management

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Purpose: The purpose of this study was to evaluate the impact of a curriculum enhancement project on physician assistant (PA) students' abilities, attitudes, and preparedness to provide collaborative disease management. **Method:** The authors identified competencies needed for collaborative chronic disease management and developed curriculum interventions. The interventions were piloted with a single cohort of PA students at the Jefferson College of Health Sciences. Full implementation and evaluation was conducted with a separate cohort of students. Students self-reported their (1) previous exposure to chronic disease; (2) abilities related to collaborative disease management; (3) attitudes towards chronic disease patients and collaborative disease management; (4) preparedness to provide chronic disease care; (5) perceptions of the benefit of the community medicine rotation and; (6) self-efficacy to support patient self-management.

Results: Significant improvements ($p < .05$) were noted in all 10 ability areas. Few significant changes in attitudes occurred though many attitudes were positively maintained. Significant changes were found for students' preparedness for chronic disease care. Students also reported a high level of self-efficacy to provide patient self-management support. **Conclusions:** Findings indicate that curriculum interventions can positively affect PA students' collaborative disease management abilities and sense of preparedness to manage patients with chronic disease. While curriculum enhancement may not significantly improve attitudes, the study suggests that interventions may be supportive of already favorable attitudes. Further study is needed to determine the most time- and cost-effective methods for facilitating improvement in both ability and attitude.

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INTRODUCTION

One consequence of individuals living longer is that there will be a rapid increase in the number of older people who are suffering from one or more chronic conditions. The number of Americans who will suffer disability from a chronic condition such as arthritis, stroke, diabetes, coronary artery disease, cancer, or cognitive impairment is expected to increase by 311% between 1993 and 2049.¹ Chronic illness has now surpassed acute illness as the most significant health problem in the United States and accounts for 78% of all health care expenses.²

Significant conceptual and pragmatic differences between the provision of acute care and the management of chronic disease has led to the development of a primary care delivery model called the Chronic Care Model.³ This model is now in use by many community health centers,

Kaiser Permanente, and other managed care institutions across the United States. It involves two overlapping realms: the community and the health care system. Within these realms, the model sets forth essential interdependent components for chronic care: community resources and policies, self-management support as part of routine clinical care, decision support, effective delivery system design, and clinical information systems.⁴ Patient-centered, collaborative care is the foundation of this practice-based model, in which the formation of patient-provider partnerships and community-health care system partnerships is essential for improved outcomes. The effectiveness of this model has been well established for a number of chronic diseases, including diabetes, asthma, congestive heart failure, and depression.⁵

Despite advances in practice mod-

els, medical education has been slow to recognize that the entry-level skills required for the treatment and management of chronic illness differ from those needed in acute care.⁶ The fundamental approach to medical education has been transformed since the days of the 1910 Flexner report.⁷ Research has been viewed as more important than teaching, caring for patients, and addressing broader public health issues. This, along with the narrow focus of American medical education on biological matters, represents a longstanding tradition.⁸ Today, few schools are adequately preparing students for the collaborative roles they will be playing in chronic disease management.⁹

Chronic disease course content and competencies vary widely.¹⁰ In some cases little attention is given to differences between acute and chronic disease care. The training focus leans heavily on the disease entity without much consideration for the person who has the disease¹¹ or the psychological, behavioral, and sociocultural variables that play a role in the development and management of a chronic illness. Unfortunately, most patients with chronic conditions have also been socialized into a medical model that fosters dependence on professionals rather than on the patient-provider partnership model.¹² This situation has been reinforced by the lack of attention given to specific methods for addressing chronic care competencies, especially those that can determine the quality of the patient-provider partnership, such as the communication style of the medical provider and the health literacy of the patient.^{10,13}

Chronic disease management requires clinical practice protocols that take into account the comprehensive nature of disease management. Therefore, a medical curriculum quite different from that used to

treat acute diseases is needed.³ Studies indicate that recent US medical school graduates¹⁴ and practicing physicians³ report their chronic care training to be inadequate. Competency areas related to collaborative disease management in which training was cited as inadequate include: patient follow-up, health care systems, role of community health agencies,¹⁴ management of psychological and social aspects of chronic illness, patient education approaches, interdisciplinary teamwork with nonphysician providers, management of chronic pain, and nutrition in chronic illness.³ Medical graduates need to have acquired specific competencies — knowledge, skills, and attitudes (KSAs) — if they are to effectively manage chronic diseases.¹⁵

Empowering patients to more effectively “self-manage” their conditions has shown improved outcomes in a variety of chronic conditions.¹⁶ The definition of patient self-management support from the Institute of Medicine’s First Annual Crossing the Quality Chasm Summit is “the systematic provision of education and supportive interventions to increase patients’ skills and confidence in managing their health problems, including regular assessment of progress and problems, goal setting, and problem solving support.”¹⁶ Studies of clinicians incorporating even the most basic elements of patient self-management support (education about the chronic condition, how it is to be managed by the patient as well as patient reminders to perform specific tasks related to care for their condition) into routine clinical care have shown significant improvement in disease control for diabetes, depression, asthma, and hypertension.^{17,18}

The patient-provider partnership is the collaborative care instrument

by which self-management support is delivered. It is through the partnership that a host of objectives is met: (1) patients are empowered to know and understand their conditions and treatment options; (2) a plan of care is negotiated; (3) problems and accomplishments are routinely assessed; (4) action plans can be established for specific activities and resources to be utilized; (5) signs and symptoms of the conditions can be monitored; and (6) the impact of the condition on physical function, emotions, and interpersonal relationships can be assessed and managed.¹⁹

Physician assistants (PAs) are educated in a medical model designed to complement physician training for team practice and supervision. Many aspects of PA education mirror the learning experiences offered medical students. While the medical education model serves PA graduates well for addressing acute illness, it falls short in preparing graduates to provide effective care to patients suffering from chronic conditions. PA educators have a role in better preparing entry-level PAs, not only the medical management of chronic disease, but more specifically in developing knowledge, skills, and attitudes (KSA) related to partnerships that can facilitate the patients becoming their own principal caregivers and learning how to manage their illnesses daily.³ Students must gain the KSA competencies necessary to integrate psychological, behavioral, and sociocultural factors into patient care using a biopsychosocial and cross-cultural approach.^{10,20-21} Training in the behavioral and social sciences can develop the competencies needed to effectively respond to patients as individuals, not just to their symptoms.¹¹ Students should learn how to care for patients longitudinally over time⁹ and better understand their role in a collabora-

tive care process of both medical management and patient self-management.

There are more than 68,000 practicing PAs in the United States.²² While most provide care to patients with chronic diseases, few have received formal training in collaborative chronic disease management.²³ Jefferson College of Health Sciences (JCHS) PA Program conducted a project to improve PA education in collaborative chronic disease management. The comprehensive curriculum enhancement project was done over the period of 5 years. The purpose of this project was to incorporate collaborative disease management content and experiences into both the didactic and clinical years. Campus-community partnerships and rural community-based education sites were established to extend the campus's ability to develop competencies.²⁴ Curriculum training interventions addressing specific competencies were founded on behavioral and social theory principles. Strategies were employed to reinforce specific attitudes^{25,26} and develop abilities. The impact of the curricular improvements on PA students' attitudes and abilities for effective collaborative chronic disease management was assessed.

METHODS

The construction of the PA training model for improving medical education in collaborative chronic disease management started with the establishment of a JCHS project team. This team consisted of PA program faculty members, college faculty, consultants, support staff, and external evaluators. The project team established four training project goals:

1. To improve the first-year didactic experience by redesigning the behavioral medicine course to

include educational modules on the chronic care model, disease management, patient self-management, behavior change, prevention/at-risk counseling, health literacy, patient-centered care, culturally appropriate care, and community-oriented primary care.

2. To provide first-year students with community-oriented primary care training so that they can initiate and/or support culturally appropriate clinic-based or community-based disease management interventions.
3. To train first-year students as leaders for the Stanford Chronic Disease Self-Management Program (CDSMP).
4. To provide second-year students opportunities for collaborative work in patient self-management during the required community medicine rotation via linkages within a variety of campus-community partnerships.

Meeting these goals involved modifications to the first-year didactic and second-year clinical phases of the JCHS PA Program curriculum. Educational modules were developed and incorporated within an existing 2-semester behavioral medicine course. Through a local campus-community partnership with a community health center, an experiential learning activity was introduced to the same course. Patients with chronic disease were assigned to student pairs and followed at periodic intervals during the didactic phase of the curriculum. Students were instructed in and taught to use the Stanford Chronic Disease Self-Management Program.

These experiences were followed by participation in a 1-month remote site community medicine rotation. Two rotation sites were maintained

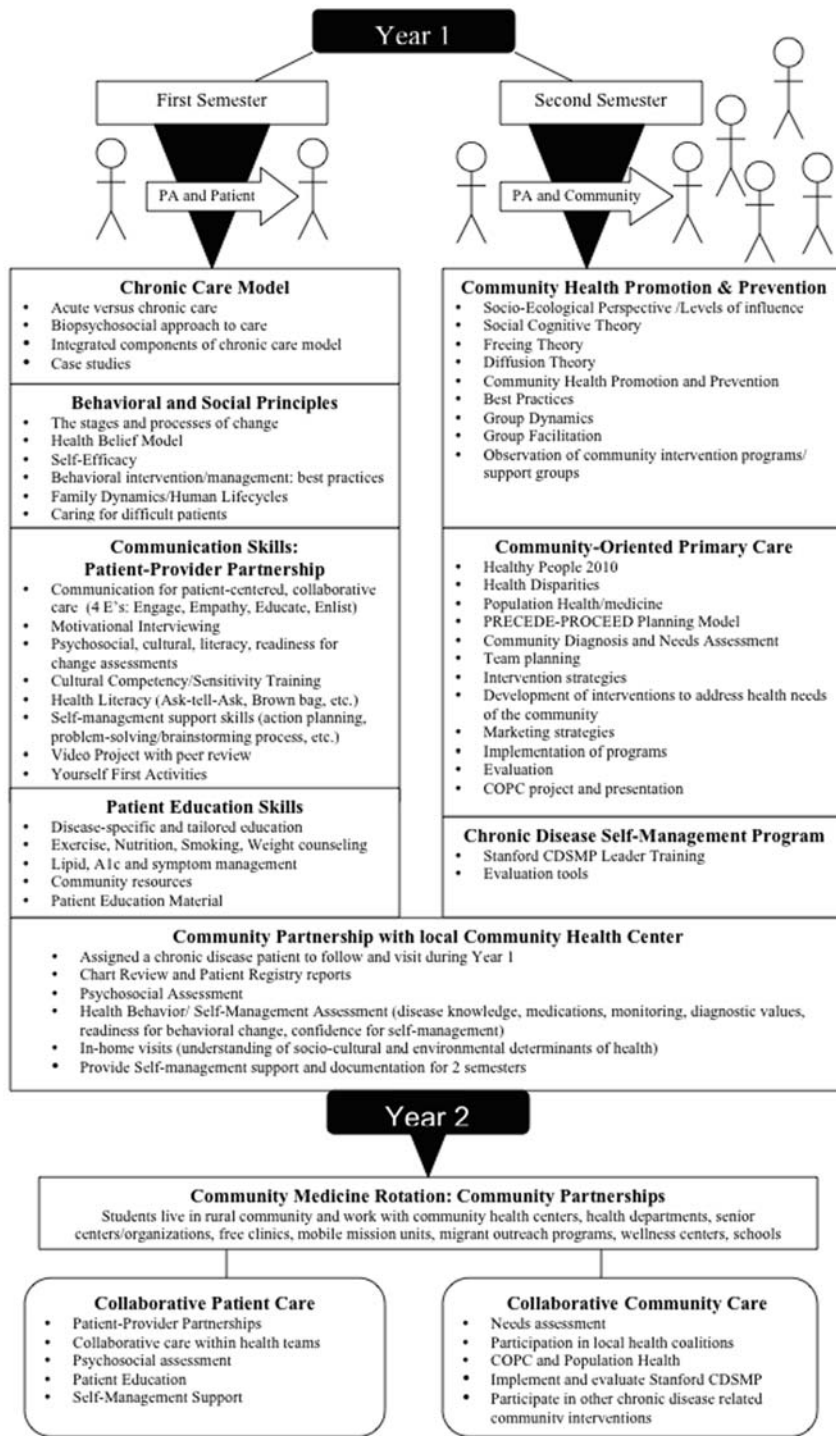
for this training piece. Multiple campus-community partnerships were established with a variety of organizations at each site. While living in the community, students were required to work in collaboration with these organizations to provide education, service, and support related to chronic disease management. This involved assisting with outreach programs, providing patient self-management support during clinic visits, and offering the Stanford CDSMP in their assigned communities. Figure 1 provides an overview of how the identified content was integrated across the 2 years of PA training.

Competency Identification and Selection

Competencies applicable to collaborative chronic disease management were identified in the literature^{3-7,9-15,19-21, 24,26} by the project team. Of these competencies, those for which medical training has been inadequate or nonexistent in traditional medical education and in the JCHS PA curriculum were targeted by the project. The 10 competencies selected were:

- Assess the health of a community
- Assess sociocultural health determinants of disease/health
- Use patient-centered care, cross-cultural care approach
- Conduct a self-management assessment
- Provide patient self-management support
- Collaborate with other health professionals for effective disease management
- Use materials and tools appropriate to the culture(s) and level of health literacy of the community and individual patients
- Participate in the development of community programs and interventions

Figure 1. Medical Education Model for Collaborative Disease Management



disease management pre-, mid-, and posttraining; and (2) attitudes and beliefs towards chronic disease patients and of collaborative chronic care pre-, mid-, and posttraining. Questions were included on the abilities survey to assess the impact of the community medicine rotation on students' perceived preparedness to provide collaborative disease management and their perceived benefit of the community medicine experience on their ability to practice as PAs. Last, students' self-efficacy for assisting patients in action planning and to use a problem solving process was assessed before entering the clinical year.

The survey tools were as follows:

1. *Collaborative Disease Management Ability (CDMA) Survey*. This survey consisted of 10 questions to assess students' perceived abilities related to the selected collaborative disease management competencies. Abilities were assessed on a 5-point scale: 1 indicating no ability and 5 indicating extremely strong ability. Abilities were evaluated three times with this survey over the course of the training, as shown in Figure 2. During the last two evaluation periods a question was included to assess students' preparedness to provide collaborative disease management and their perceptions of the benefit of the community medicine experience to their futures as practicing PAs. A rating scale of 1 to 4 was used: 1 indicating extremely prepared or extremely beneficial and 4 indicating not prepared or not beneficial. Students also provided written comments of their didactic and community medicine rotation training experience.

2. *Collaborative Disease Management Attitudes and Beliefs (CDMA&B) Survey*. This survey presented 10 statements to assess the students' attitudes and beliefs towards chronic disease patients and collaborative chronic

- Provide disease management education and at-risk counseling appropriate to the culture(s) and level of health literacy of patients
- Become involved in community outreach in the future

Evaluation Plan and Instruments

Self-report survey tools were developed by the project team to assess the impact of the curricular improvements on students' (1) abilities related to effective collaborative chronic

care. Five statements presented on the survey were written so that disagreement reflected a favorable attitude towards collaborative chronic disease management. These were:

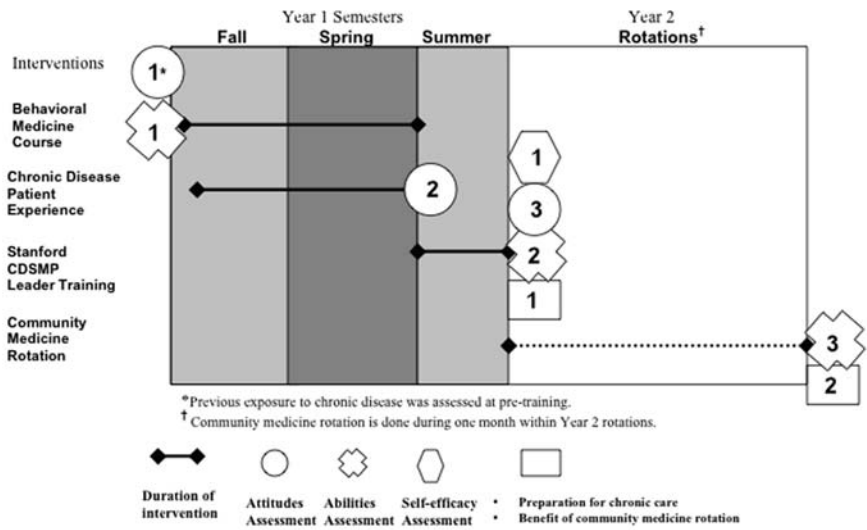
- Acute and chronic conditions can be managed the same or similarly.
- Patients with chronic disease who aren't doing well probably aren't taking their medications.
- Chronic disease patients who only follow the provider's orders do better.
- People with chronic conditions have brought it on themselves.
- Most chronic disease can be cured with proper attention and care.

Four statements were written in such a way that agreement reflected a favorable attitude:

- Pain, fatigue, emotional changes, and decreased physical functioning are normally experienced by those living with chronic conditions.
- Psychosocial assessment questions woven throughout the interview may help patients feel more at ease.
- Providers should teach self-management skills to patients.
- I look forward to working with patients that I can get to know over a long time.

Students responded to the statements on a 5-point scale, with 1 indicating strong disagreement and 5 indicating strong agreement. Student attitudes were assessed three times with this survey over the course of the training, as shown in Figure 2. Previous exposure to persons with chronic conditions was also recorded on this survey, however only at pretraining. Students indicated their previous exposure using a 5-point scale, with 1 indicating no exposure and 5 indicating more extensive exposure. Students also provided written comments

Figure 2. Collaborative Chronic Disease Management PA Student Training and Evaluation Timeline



regarding this training experience.

3. *Self-Efficacy Questions.* Students were asked to complete an evaluation form after receiving their Stanford CDSMP training. Two questions included on this form assessed the students' self-efficacy for assisting patients in action planning and to use a problem solving process. Self-efficacy was measured using a scale from 0 to 10, with 0 representing no confidence and 10 representing totally confident, a scale used by the Stanford CDSMP to measure patient self-efficacy. Students were asked: (1) How confident are you that you can assist patients with making an action plan? and (2) How confident are you that you can assist patients using the problem-solving process? The evaluation period in which students reported their self-efficacy is also illustrated in Figure 2.

Pilot Testing

The training model was piloted with 30 JCHS PA students between July 2002 and August 2005, with evaluation occurring after the didactic year and at the end of the clinical year. In

both June 2004 and July 2005, external evaluators conducted student focus groups and met with faculty charged with the implementation of the project processes. Student focus groups were also conducted specifically to address confusion regarding the wording of survey questions. Based on the evaluators' recommendations, revisions were made to the project goals, intervention plan, survey tools, and evaluation plan. A goal to increase students' actual exposure to both chronic disease patients and the chronic care model during the first-year behavioral medicine course was added. An experiential learning activity was developed to achieve this goal. In partnership with a community health center already participating in both a cardiovascular disease and a diabetes health disparities collaborative, this activity was piloted and reviewed before full implementation of the training model. The evaluation periods were adjusted, adding a pretraining student assessment for abilities and attitudes. Research protocol and student surveys were finalized and approved by the Carilion Medical Center Institutional Review

Board. Full implementation of the training model and evaluation plan began in August 2005 with a new cohort of 29 students.

Data Collection

Students were informed of the educational research purpose, methods, procedures, risks, benefits, confidentiality, and contact persons for the project. They were invited to participate voluntarily with the option to withdraw at any time. Those who agreed to participate were assigned a randomly generated 4-digit identification number. Students provided this number on each survey so that that pre-, mid-, and postsurvey responses could be paired for analysis. The number assignments were maintained on a master list in a secure location. Course instructors did not have access to this database. Students were informed that their participation would not be related to grades given. A designated PA program staff member distributed the student surveys at the designated collection period as presented in Figure 2.

Data Analysis

Survey data were entered into SPSS for the 10 ability domains, nine attitude statements, and the questions regarding preparedness, benefit, and self-efficacy. Survey responses to attitude statements were recoded so that a higher score reflected an improved attitude and a lower score indicated a poorer attitude towards chronic disease. Descriptive statistics consisting of frequencies and percentages were computed for demographic variables. Mean scores and standard deviations were also calculated for each ability and attitude area.

A repeated-measures analysis of variance (ANOVA) was conducted to detect any statistically significant change in ability and attitude across

Table 1. Characteristics of Physician Assistant Students

Characteristic	Description	Number (percentage)
Subjects	JCHS PA students	28 (96.6)
Age in years	Mean; range (at time of admission)	28.2; 21-44*
Gender	Male	15 (53.6)
	Female	13 (46.4)
Race/ethnicity	White/non-Hispanic	23 (82.1)
	Asian/Asian American	3 (10.7)
	Latino/Hispanic	0 (0)
	Black/non-Hispanic	1 (3.6)
	American Indian/Alaskan	1 (3.6)
Exposure/experience with chronic disease	Mean; range†	3.2; 1.0-5.0

* Values for age are mean and range in years

† Students reported their exposure at pretraining using a scale of 1-5. Items were scored as follows: 1= none, 2= very little, 3 = some, 4 = a lot, 5 = plenty.

time. It was conducted separately for the abilities data and the attitude data since the data collection periods were different, as illustrated in Figure 2. The alpha level for significance was set at .05. After observing a statistically significant F-ratio for the effect of time, pair-wise comparisons were conducted to test the mean difference among the three comparison periods: (1) pre- to midtraining, (2) mid- to posttraining, and (3) pre- to posttraining. P-values were adjusted using the Bonferroni correction for multiple comparisons.

Paired *t* tests (two-tailed) were performed for preparedness and benefit. Mean scores and standard deviations were calculated for self-efficacy. Qualitative data were collected from survey comment sections and from the focus group summaries provided by external evaluators. Comments occurring two or more times addressing the same issue were recorded and categorized as either positive or negative.

RESULTS

Twenty-eight of 29 students (96.6%) in the study cohort self-reported

their abilities related to their collaborative role in chronic disease management at all three evaluation periods. Twenty-eight of the 29 students (96.6%) self-reported their perceived preparedness for chronic care and the benefit of the community medicine rotation for future practice. Twenty-six of the 29 (89.7%) self-reported at all three evaluation periods their attitudes regarding chronic disease patients and chronic care and their self-efficacy for using action planning and problem solving processes with patients. Demographic characteristics of the participating students (Table 1) indicate that the PA cohort studied had a more equal distribution of gender than is seen in national trends (the average across all programs is 28% male to 72% female).²⁷ Twenty-two of the 29 students reported having at least some exposure to or experience with chronic disease when they entered the PA program. Fifty-two percent of the respondents reported the exposure as being through patients, 42.4% through family members, 3% through friends, and 3% through themselves.

Table 2. PA Student Self-Report of Perceived Collaborative Disease Management Abilities*

	Pretraining	Midtraining	Posttraining
Assess the health of a community	2.75 ± .20	3.61 ± .14 [†]	4.29 ± .16 ^{†,‡}
Assess the sociocultural determinants of disease/health of individual patient	3.36 ± .19	3.89 ± .10 [†]	4.61 ± .19 ^{†,‡}
Use a patient-centered, crosscultural care approach	3.11 ± .22	3.68 ± .15 [†]	4.36 ± .22 ^{†,‡}
Conduct a self-management assessment	3.07 ± .22	3.82 ± .19 [†]	4.46 ± .26 ^{†,‡}
Provide self-management support	3.14 ± .21	4.04 ± .15 [†]	4.54 ± .27 ^{†,‡}
Collaborate with other health professionals for effective disease management	3.32 ± .25	3.96 ± .18	4.71 ± .24 ^{†,‡}
Use of cultural and literacy appropriate materials/tools	3.07 ± .19	3.96 ± .13 [†]	4.61 ± .22 ^{†,‡}
Participate in the development of community programs/interventions	2.61 ± .22	3.54 ± .15 [†]	4.29 ± .22 ^{†,‡}
Provide cultural and literacy appropriate disease management education and at-risk counseling	3.18 ± .21	4.07 ± .13 [†]	4.64 ± .23 ^{†,‡}
Become involved in community outreach in the future	3.68 ± .19	3.75 ± .17	4.64 ± 1.9 ^{†,‡}

*Values are expressed as mean ± SE, n = 28. “Pretraining” is before training, “Midtraining” is after the didactic year, and “Posttraining” is after a community medicine rotation. Items were scored as follows: 1 = no ability, 2 = minimal ability, 3 = some ability, 4 = moderate ability, 5 = extremely strong ability.

[†] Significant differences in self-reported ability compared with baseline ($p < .05$ with Bonferroni correction).

[‡] Significant differences in self-reported ability compared with midpoint measurement ($p < .05$ with Bonferroni correction).

Collaborative Disease Management Abilities Results

Significant change was made from pre- to posttraining in all 10 ability areas. At the midevaluation periods the PA students reported significant improvements in their abilities related to collaborative disease management in 8 of the 10 areas listed in Table 2. Although their ability to collaborate with other health professionals for effective disease management and to become involved in community outreach in the future did not increase between the pretraining and midtraining evaluation periods, there was a significant increase in ability after completing the community medicine rotation.

Chronic Disease and Chronic Care Attitudes

Few significant attitude improvements were found (see Table 3). At pretraining, students reported attitudes in an unfavorable range (< 4)

for these statements: (1) *Pain, fatigue, emotional changes, and decreased physical functioning are normally experienced by those living with chronic conditions;* (2) *Acute and chronic conditions can be managed the same or similarly;* (3) *Patients with chronic disease who aren't doing well probably aren't taking their medications;* (4) *Chronic disease patients who only follow the provider's orders do better;* and (5) *Most chronic disease can be cured with proper attention and care.* Significant improvement in attitude occurred at midtraining for statement 2 and at posttraining for statements 1 and 3 listed above.

An unfavorable shift from disagreement to agreement occurred at posttraining (completion of CDSMP training) for the statement, *Chronic disease patients who only follow the provider's orders do better.* For the statement, *Acute and chronic conditions can be managed the same or similarly,* a favorable attitudinal shift occurred from agreement to disagreement at midtraining (completion of behavioral medicine course

and chronic disease patient experience); however, by posttraining (after the CDSMP training) the attitude shifted back to a level of agreement similar to the pretraining report. Students maintained favorable attitudes across all time periods for the statements:

- *Psychosocial assessment questions woven throughout the interview may help patients feel more at ease.* (agree)
- *Providers should teach self-management skills to patients.* (agree)
- *I look forward to working with patients that I can get to know over a long time.* (agree)
- *People with chronic conditions have brought it on themselves.* (disagree)
- *Most chronic disease can be cured with proper attention and care.* (disagree)

Table 3. PA Student Self-Report of Perceived Collaborative Disease Management Attitudes*

	Pretraining	Midtraining	Posttraining
Pain, fatigue, and emotional changes are normally experienced by those living with chronic disease.	3.58 ± .25	3.73 ± .20	4.62 ± .23 ^{†,‡}
Psychosocial assessment questions woven throughout the interview may help patient feel more at ease.	4.19 ± .18	4.00 ± .16	3.96 ± .18
Providers should teach self-management skills to patients.	4.65 ± .15	4.62 ± .14	4.73 ± .16
I look forward to working with patients that I can get to know over a long period of time.	4.04 ± .14	3.81 ± .16	3.96 ± .17
Acute and chronic conditions can be managed the same or similarly.	3.88 ± .15	4.46 ± .23 [†]	3.77 ± .22 [†]
Patients with chronic disease who aren't doing well probably aren't taking their medications.	3.00 ± .21	3.31 ± .24	3.88 ± .24 [†]
Chronic disease patients who only follow the provider's orders do better.	3.46 ± .17	3.50 ± .19	2.08 ± .23 ^{†,‡}
People with chronic conditions have brought it upon themselves.	4.50 ± .16	4.42 ± .16	4.15 ± .21
Most chronic disease can be cured with proper attention and care.	3.65 ± .16	3.85 ± .20	3.85 ± .24

*Values are expressed as mean ± SE, n = 26. "Pretraining" is before training, "Midtraining" is after receiving Year 1 behavioral medicine courses and the long-term chronic disease patient experience, and "Posttraining" is after Stanford CDSMP Leader Training. Desired attitude range is 4-5.

[†] Significant differences in self-reported ability compared with baseline ($p < .05$ with Bonferroni correction).

[‡] Significant differences in self-reported ability compared with midpoint measurement ($p < .05$ with Bonferroni correction).

Table 4. PA Student Self-Report of Preparation for Rural Practice and the Benefit of Community Medicine Rotation*

Statement/Desired attitude	Midtraining mean (SD)	Posttraining mean (SD)	p [†]
How prepared do you feel for caring for patients with chronic conditions/disease?	2.96 (.59)	3.44 (.58)	<.01
How beneficial do you feel the community medicine experience will be to you as a practicing PA?	2.11 (.58)	3.11 (.85)	<.01

*Values are expressed as mean (SD), n = 26. "Midtraining" is after Year 1 training, and "Posttraining" indicates after community medicine rotation. Preparedness was scored as follows: 1= not prepared, 2 = somewhat prepared, 3 = prepared, 4 = extremely prepared; benefit was scored as follows: 1 = not beneficial, 2 = somewhat beneficial, 3 = beneficial, 4 = extremely beneficial.

[†] Significant differences in preparedness and benefit were compared with baseline ($p < .05$, two tailed).

Preparation for Chronic Care and Benefit of Community Medicine Rotation

PA students reported a significant increase between the mid- and post-evaluation periods in their feeling of preparedness to care for patients with chronic conditions. Students also reported a significant increase in their perception of the benefit the community medicine rotation will

have on them as future practicing PAs (Table 4).

Self-Efficacy

Twenty-eight of the 29 students reported self-efficacy measures regarding their confidence in using the patient-self management support techniques of action planning and problem solving. Measures were

reported only once at post-Year 1 and pre-Year 2 training (Figure 2). Student self-efficacy scores for both assisting patients with making action plans and using the problem solving process with patients ranged from 6-10 on a 1-10 scale with a mean score of 9.36.

Student Feedback

Students provided comments on surveys and discussed strengths and weaknesses of each intervention in a focus group held by an external evaluator. A summary list of student feedback regarding the strengths and weaknesses of each intervention is presented in Table 5.

DISCUSSION

This study was designed to determine the impact of curriculum enhancement for collaborative disease management on PA students' perceived abilities, attitudes, and preparedness regarding chronic care. We hypothesized that students would self-report increased collaborative disease management abilities and favorable attitudes across time. We further postu-

Table 5. Student Feedback regarding Strengths and Weaknesses of Curriculum Interventions

	Year 1 Training		Year 2 Training
Behavioral Medicine Course	Long-term Follow-up of Chronic Disease Patient	Stanford CDSMP Leader Training	Community Medicine Rotation
STRENGTHS			
<ul style="list-style-type: none"> • Patient-provider partnerships/ communication • Art of medicine • Collaborative approach • Chronic care model • Biopsychosocial model • Patient education • Follow-up care • Behavior modification • Smoking cessation • Disease management • Program development • Underserved populations • Community medicine • Critical thinking • Culturally sensitive care 	<ul style="list-style-type: none"> • Contact with patient with a chronic disease during first year • Disease management not just medical management of a disease • Patient’s perspective versus clinic’s perspective • Getting to know a patient over a period of time • Frustration/hardship of having a chronic disease • Plan of care to meet the needs of the patient • Seeing the patient in their world 	<ul style="list-style-type: none"> • Goal setting • Action planning • Problem solving process • Teaching the lessons • Learning how to work with difficult participants • Gaining skills to support patients to self-manage 	<ul style="list-style-type: none"> • Community outreach work • Health disparities • Cultural groups • Community assessment • Seeing patients outside of the clinical environment • Challenges of rural communities • Community resources • Providers that really care • Providers that spend time with their patients • Disease management plans with patients
WEAKNESSES			
<ul style="list-style-type: none"> • Information/assignment overload • Time intensive • Communication/patient interaction skills taught in classroom setting 	<ul style="list-style-type: none"> • Being paired with another student for patient visits • Time consuming • Number of home visits done versus clinic visits • Process for scheduling the visits • Having to document visits 	<ul style="list-style-type: none"> • Having to follow a script • Trainers reading scripted lessons • Too many training sessions • Long and redundant • Repeat of things already covered in behavioral medicine 	<ul style="list-style-type: none"> • Time away from practicing critical clinical skills • Unrelated to PANCE exam • Paperwork • Short rotation • CDSMP administrative work

lated that students would report increased preparedness to care for patients with chronic conditions and increased benefit of community rotation at the completion of all training. We also expected that students’ self-efficacy reports would indicate high levels of confidence (7-10) to use the self-management support techniques of action planning and problem-solving with patients (before beginning their clinical year).

The study findings show (1) statistically significant improvements in student self-reported ability for collaborative chronic disease manage-

ment from pretraining to posttraining in all 10 areas; (2) significant improvements in some attitudes and maintenance of already favorable attitudes in most areas; (3) an improved sense of value of the community medicine rotation; (4) significant increase in their sense of overall preparedness to care for patients with chronic disease; and (5) an appropriate level of self-efficacy (7 or greater) for self-management support before entering their clinical year. Analysis of student feedback and logistical problems emphasized the need to provide collaborative disease manage-

ment training interventions, but in a more time-efficient manner.

The study findings suggest that the curriculum enhancement interventions had value in building students’ collaborative disease management abilities. Improvement in student ability was self-reported for all areas after receiving only the Year 1 interventions except in two areas: (1) collaborating with other health professions for effective disease management, and (2) being involved in community outreach in the future. By posttraining, however, students reported significant improvement in

both these areas, suggesting that the community medicine rotation was a valuable intervention for building these competencies. The diversity of training interventions used to increase students' ability across time appear necessary since students did not always have a precepting role model or established practice norms for collaborative disease management during the community medicine rotation.

The study findings suggest that the curriculum interventions had only modest value specific to attitude improvement. The favorable attitudes that students had in five areas when they entered the program were favorably maintained throughout the Year 1 training. Student scores were already at or near the maximum possible at pretraining for the statement, *Providers should teach self-management skills to patients*, indicating a possible ceiling effect for this statement. At pretraining over half of the study cohort reported already having some exposure to chronic disease and/or persons with chronic disease (see Table 1). Previous exposure could have contributed to the positive attitudes reported at pretraining.

Several attitudes moved in an unfavorable direction over the course of the Year 1 training interventions. In the case of the statement, *Acute and chronic conditions can be managed the same or similarly*, the attitudinal improvement that occurred at midevaluation was reversed at post-Stanford CDSMP training similar to the pretraining level. Since the educational sessions in both the behavioral medicine course and the CDSMP training reinforced disagreement with this statement, this shift is left unexplained. It is important however to note that the significant favorable movement for this statement occurred at midtraining (after the behavioral medicine course didactic

and chronic disease patient experience).

The statement, *Chronic disease patients who only follow the provider's orders do better*, deemphasizes the role of patient self-management and patient-provider partnership. Student attitudes remained the same for this statement at midtraining as at pretraining but then significantly changed, worsening after the Stanford CDSMP. A possible explanation is the poor wording of this statement and the likelihood that the significance of the word *only* was not understood by a majority of the students. Also, even though the Stanford CDSMP leader training is specifically focused on patient self-management it is designed for lay leaders to implement as a community-based intervention. It was not designed to reinforce that providers give orders in the chronic care model but instead work collaboratively in partnership with the patient to improve quality of life. The instruction in the clinical medicine coursework, taken during the same semester as the CDSMP training, could have had a more influential effect on student perception of this statement.

Limitations

The limitations of this study include the small study population and the fact that there was no control or comparison population. A change made in the evaluation plan after pilot testing prevented any direct comparison between the pilot and study group. There have been no formal analyses made of the psychometric qualities (reliability and validity) of the surveys used. The core competency areas from which the questions and statements on survey abilities and attitudes questions/statements were derived from published literature by JCHS faculty. At the time the project began there was no established set of core competencies for collaborative

disease management for medical education or more specifically for PA education. In addition, the generalizability of these results is somewhat limited since the study was confined to a student population that may have chosen to attend JCHS due to their interest in community medicine. Additional studies are needed at other PA educational settings to confirm our findings.

Recommendations

The authors recommend that future studies use an experimental design with a control group. A component analysis evaluation plan would be useful in determining the effectiveness of each intervention on both student abilities and attitudes. A recent study has suggested that negative role modeling by residents and attending physicians caring for patients with chronic illness have been cited as a major factor that affects student attitudes toward caring for chronically ill patients.²⁶

Therefore it is also recommended that future studies include an attitude evaluation plan to assess students' attitudes not just between didactic interventions but also after the community medicine rotation to ensure a more effective assessment of the impact across all curriculum training components. Postgraduation follow-up to evaluate the usefulness of the acquired collaborative disease management abilities in their clinical practice settings is also suggested.

Faculty feedback identified several logistical problems in administering components of this educational model. First, the use of the Stanford CDSMP leader training was problematic in several ways. It was designed to train lay leaders of a community to offer the CDSMP, not PA students. The pace and structure of the training is not a good fit for the time-intensive curriculum of PA

school. Significant adjustments had to be made to add the CDSMP training into the students' schedule. Training concepts had to be incorporated into the behavioral medicine course and students given a chronic disease patient experience in order to get the approval from Stanford for trainers to shorten the training from approximately 28 hours to 24 hours. In addition, offering the training proved to be costly, time-consuming, and limiting. An interactive clinical training program specifically designed for developing skills and confidence of PAs to provide self-management support to individual patients with chronic diseases and for in-clinic group care would be more appropriate for a collaborative disease management education model. As Stanford's CDSMP becomes institutionalized in nearby communities, students would benefit more from observing group sessions as part of their training rather than being trained as leaders of the CDSMP and being expected to offer Stanford's CDSMP at the community rotation site.

Second, the long-term follow-up of a chronic disease patient intervention was time consuming for students and the supervising faculty. This intervention required a large amount of administrative work to maintain consistency of experience for both students and patients. Since clinical experiences with patients are required in a separate clinical skills course, it is recommended that the chronic disease patient experience goals be integrated into the clinical skills course. This first-year training could be coordinated jointly by the clinical skills faculty and the behavioral medicine faculty.

Despite the study limitations and logistical problems encountered in this study, the results support curriculum enhancement in which

didactic training is linked with a community medicine rotation. Student perceptions of their collaborative disease management abilities and preparedness for caring for chronic disease patients can be affected with this type of educational model. Students are able to also achieve levels of self-efficacy needed to feel confident in using patient self-management support techniques. The authors further recommend that (1) PA competencies be expanded to include collaborative disease management and patient self-management support in an effort to establish collaborative practice norms and facilitate attitudinal change; (2) collaborative disease management training be done not only in the didactic year but also integrated into a focused rotation; (3) that PA educators continue to explore areas in PA curriculum where collaborative disease management interventions can be offered in a time-efficient and cost-effective manner.

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