Pain management classes to reduce health care utilization and cost among low-income chronic pain patients

By

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A Master's Thesis presented to the
Department of Public Health and Preventive Medicine at
Oregon Health Sciences University School of Medicine
in partial fulfillment of the requirements for the
degree of Master's in Public Health in
Epidemiology and Biostatistics

June 2004

Department of Public Health and Preventive Medicine
at
Oregon Health & Sciences University

CERTIFICATE OF APPROVAL

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Acknowledgements

I'd like to thank Dr. Matthew Carlson for chairing my thesis committee and appreciate all the time and effort he has put into helping me at all stages of this project. I'd also like to thank Dr. Bentson McFarland for assisting with the statistical analysis as well as doing a wonderful job helping me with multiple permutations of the analytical design. I appreciate Dr. David Labby's support in allowing me to conduct this study at Care Oregon and allocating resources and staff time to help me complete this project. Beth Gandara helped immensely with researching the history of the pain management program, connecting me with all those who have been involved with it and for taking on extra work to help me gather data. Lynn McCammet provided indispensable help working out problems with the statistical analysis. I'd also like to thank Dr. Jenny Gibson and Rick Ralston with the Legacy Health System for all the information and enthusiasm they've provided for this project.

Finally, I'd like to thank my wife Heidi for all her love, help and support these past two years.

Abstract

Care for chronic pain patients poses significant challenges to providers and is often frustrating to treat. Opioids, which have long been the mainstay of treating chronic pain, are effective in providing symptomatic relief, but have rarely been shown to improve physical or emotional functioning. Over the past ten years, studies have consistently shown that Cognitive Behavioral Therapy involving group self-management of chronic pain is effective in improving quality of life and reducing patients' perception of pain. However, to date there is a paucity of information regarding their effectiveness in low income populations with limited access to health care. This is a retrospective quasi-experimental study that examined the differences in health care services utilization and expenditures in two groups of Care Oregon patients with chronic pain. The first group consisted of a convenience sample of approximately 35 subjects who completed at least half of the 7 week pain management class. The second group consisted of chronic pain patients identified through billing data who were not enrolled in the course and received standard treatment. This study found no statistically significant differences in health care costs or expenditures for emergency department visits, hospitalizations, primary care provider visits, opiate prescriptions or total cost of care. At the same time, there is a compelling trend towards decreased claims and expenditures for almost all measures and patients subjectively reported improvements in pain and the extent to which it interferes with their daily lives. The lack of significant findings is possibly due to the small sample size and non-specific measures of this study. Therefore, a larger, randomized clinical trial is needed to better understand the economic and treatment benefits of a pain management class in this population.

Introduction

Persistent pain is a significant health problem in the United States that affects a large number of people and is often difficult to treat. Chronic pain is defined as pain lasting greater than three months and beyond the normal time of healing[1, 2]. The National Center for Health Statistics estimates that 33 percent of the US population has persistent or chronic pain symptoms that annually cost approximately $90 billion in reduced work productivity, sick time, and direct medical costs[3]. It is estimated that the average cost of medical treatment for chronic pain is between $9,000 and $19,000 per person per year[4]. Patients with chronic pain account for 15-22 percent of primary care visits and 64 percent of all chronic pain patients are still in pain two years after initiating treatment [5,6,7]. Greater pain severity is also correlated with lower socioeconomic status[8]. Care for chronic pain patients poses significant challenges to providers and is often frustrating to treat. Among primary care physicians, 85 percent do not like treating chronic pain patients[9].

Opioids, which have long been the mainstay of treating chronic pain, are effective in providing symptomatic relief, but have rarely been shown to improve physical or emotional functioning[10]. Opioid therapy can also be costly over the long term. One study found that the costs of treating refractory chronic low back pain with Oxycontin alone can exceed $4,600 per year[11]. De Lissovoy et al calculated that the total cost of medical care for a patient with back pain that failed to resolve with surgery was $1,574 per month excluding the cost of further surgical intervention[12]. Consequently over the past decade there has been rapid growth in multi-modal therapies to treat chronic pain more effectively. Multiple studies indicate that multidisciplinary and active

psychological techniques are successful in reducing pain, increasing daily function and decreasing health care costs[13,14]. A systematic review of meta-analyses found that patients undergoing multidisciplinary treatment that includes cognitive-behavioral therapy are more likely to regain function, find employment and return to working in comparison to those receiving traditional opioid therapy[15].

Cognitive-behavioral therapy (CBT) is aimed at decreasing pain related behavior and improving coping skills and psychosocial functioning. This approach involves cognitive and behavioral techniques that include operant conditioning and assertiveness, stress management, relaxation training, goal setting and pacing activities. Over the past ten years, studies have consistently shown that CBT involving group self-management of chronic pain is effective in improving quality of life and reducing patients' perception of pain[16]. In a study of 489 Kaiser Permanente patients, Lorig et al found that a 7 week self-management program directed at patients with different chronic conditions produced significant improvements in cognitive symptom management and physician-patient communication in the 6 months following the intervention[17]. In addition to improving quality of life for patients, the goal of these techniques is to reduce inappropriate use of health care services. In a follow up study, Lorig et al found significant reductions in the number of outpatient and emergency department visits among patients who had participated in the Kaiser Permanente program ($P = .04$)[18]. This resulted in a mean cost reduction of $590 per patient which offset the $70-$200 cost of the chronic disease self management program .

Chronic disease self-management programs in general have been shown to improve qualitative elements of health care while lowering social costs[19]. In a

randomized clinical trial involving 255 participants, patients undergoing a four-session self-management class for back pain had Roland Disability Questionnaire Scores that were significantly lower ($P = 0.007$) than usual care controls 6 months after the intervention. These patients were also less worried about back pain, expressed more confidence in self-care and had less symptomatic interference with daily activities[20]. Similarly, in a nurse-led group program involving 154 chronic pain patients, there were significant decreases in self reported pain intensity, self-efficacy, disability and depression at the end the 10 week intervention[21]. A meta-analysis of 65 studies of multi-disciplinary pain management programs involving 3,089 patients consistently found that patients receiving multi-disciplinary treatment were twice as likely as untreated or those receiving unimodal treatment to return to work[22]. The authors of this study concluded that, given the relatively high prevalence of disability in the populations in these studies, the greater numbers of patients returning to work should result in substantial economic impacts due to decreased disability payments, increased worker productivity and increased revenue from taxes paid by successfully treated patients.

Overall, studies examining the cost effectiveness of CBT pain management programs consistently found direct reductions in health care expenditures, although the extent of these reductions varied. One study in a pain clinic setting found that patients decreased clinic visits by 36 percent during the year following the course[23]. Caudill et al. estimated that for the 50 patients for which there was follow up data, decreased visits saved $12,000 in the first year and $23,000 in the second year following the intervention. At a military outpatient facility, Peters et al. found an 87% reduction in outpatient clinic visits in the first 3 months after treatment[24]. For the 61 non-malignant pain patients in this

study, this reduction was projected to have a net annual saving of $78,960 in the first year after the behavioral medicine intervention. In contrast, a European study found a significant decrease in social costs, such as welfare benefits, disability payments and government assistance, but an insignificant decrease in direct health care expenditures for the 9-month period following a similar psychosocial intervention[25]. However, according to the authors of this study the insignificant reduction in health costs may have been attributable to a greater degree of pain severity among the cohort studied in comparison to subjects in other studies.

Although multidisciplinary CBT interventions such as pain management classes have been found to have positive outcomes in the domains of pain experience, coping skills, and reduced behavioral expression of pain, there is still limited data that they are effective in reducing health care expenditures in all settings. Multidisciplinary pain management services are often not available to low income or uninsured patients who receive health care from public health organizations with finite resources. To date there is a paucity of information regarding how pain management classes affect health care resource utilization and costs in this population. Therefore, understanding the efficacy of a pain management program in terms of decreased resource use is of great importance in formulating policy decisions that finance public health care services.

In 2001 administrators at CareOregon convened a Pain Management Advisory Council to address clinician concerns that traditional management for chronic pain patients was inadequate and expensive. Care providers were frustrated by their economic limitations that do not allow patients in the health plan to be referred to pain specialists or alternative treatments and opioid therapy was consuming a larger proportion of

CareOregon's financial resources. Pharmacy expenses with Oxycontin alone accounted for 10 percent of all drug costs. At the same time, most CareOregon providers lacked formal training in pain management and chronic pain patients posed significant treatment challenges. In addition, pain clinics were excluded from coverage in the Oregon Health Plan (OHP) and providers had few options to refer patients to alternative treatments.

As a result of the 2001 meeting and consultations with pain management specialists at Northwest Kaiser Permanente of Portland, a chronic pain management program was developed by nurses, social workers and physicians from CareOregon and the Legacy Health System. Using Kaiser Permanente's model, this program is designed to offer additional treatment support to chronic pain patients covered by CareOregon. The aim is to improve management of pain symptoms, provide additional treatment options to patients and physicians, and to control health care and pharmacy costs. The program is organized as a class rather than a support group and uses discussions, readings and exercises to emphasize learning CBT techniques to cope with chronic pain, promote self-management skills, control symptoms and increase daily function (Table 1).

Thus far classes have been conducted with patients at the Multnomah County Clinics (MCC), the Legacy Health System (LHS) and Oregon Health and Sciences University's (OHSU) Emma Jones Family Medicine Out-patient Clinics. Classes meet once a week for two hours, consist of 7-15 patients and are facilitated by a behavioral health nurse, a social worker and other CareOregon employees. Each patient is given a three ring binder containing introductory materials that outline the goals of the class and the syllabus for each week of the class. A physician facilitates at least one class during the program to provide patients with a better understanding of physicians' perspectives

regarding the treatment of chronic pain. The final class concludes with patients developing their own treatment plan and reviewing it individually with one of the course facilitators. Classes administered by LHS for CareOregon patients cost $380 per patient for a 7-week course, which patients attend once a week for 2 hours[26]. Class participants fill out pre and post intervention surveys as well as a 3 month follow-up survey to evaluate changes in their level of pain and ability to cope with it.

Table 1. Summary of the Pain Management Multidisciplinary Program Syllabus.

Week 1: Chronic pain and combination therapy:

- Why is a combination of therapies often needed?
- Why does pain become a chronic problem?
- What can you do about it?
- Roadblocks that stop people from getting pain relief.
- Therapies that reduce pain: relaxation response and trigger point therapy.

Week 2: Turning down the intensity of the pain message.

- Positioning, cushioning, aids, anesthetic sprays, stretching, increasing oxygenation, reduction of muscle tension/spasm, transcutaneous electrical nerve stimulation (TENS), ice and heat.

Week 3: Being an effective partner in your care.

- Communication as an active partner.
- How to help the system help you.
- Resources available within and outside of your primary care clinic.

Week 4: Use of medications

- Tips on prevention and treatment of side effects.

Week 5: Identifying and eliminating pain "triggers"

- Diet, improving sleep, time management and pacing, etc.

Week 6: Restoring/increasing the body's ability to block pain messages.

- Treatment of depression/fear/anxiety
- Effective coping strategies,
- Ways to reduce muscle tension/spasm: relaxation response, distraction, biofeedback.

Week 7: Individualized treatment plan.

- Meet one-on-one with a member of the treatment team to develop a treatment plan.

A study of Kaiser Permanente's Self Management Program for Patients with Chronic Disease, the model from which CareOregon's class originated, found that patients experienced statistically significant improvements in self reported health status, health behaviors and had decreased emergency department visits[27]. For the first 7 patients who participated in the initial pilot class, CareOregon measured the health care services utilization for the 6-month period before and after the class. Among these patients primary care provider visits were reduced by 45%, emergency department visits by 43%, pharmacy costs by 92%, and pain symptoms by 62%[28]. Data for a group of LHS patients in one of the early classes showed that for the 6 months following the first class, nurse triage calls declined 49% among class participants[29].

The goal of CareOregon's pain management program is to improve the management of patients' pain symptoms while reducing costs and the unnecessary use of clinical services. The purpose of this study is twofold. First, it will provide CareOregon with an initial evaluation of the classes' potential effects for improving chronic pain outcomes in patients and will determine whether this intervention reduces the cost of patient care. Second, it is designed to provide baseline data for a grant application to conduct a larger randomized clinical trial to gain a more objective understanding of whether patients' pain symptoms improve as a result of this program as well as to determine which patients are more likely to benefit from participation.

This study focuses on changes in health care utilization and expenditures through CareOregon's medical claims records. Specifically, it compares the mean differences in claims expenditures and the number of claims for the 3 month time period before and after the intervention among those who enrolled and completed the class and similar

chronic pain patients who did not. This time period was decided upon in accordance with the definition of chronic pain as pain lasting longer than 3 months. To provide context, this study also reviewed the results of subjective self-evaluations of pain filled out by patients before and after the completion of the 7-week pain management class.

Methods

Research Design

This is a retrospective quasi-experimental study that examined the differences in health care services utilization and expenditures in two groups of Care Oregon patients with chronic pain. The first group consisted of a convenience sample of approximately 35 subjects who have completed at least half of the 7 week pain management class. The majority of this group was identified as chronic pain patients through billing data and clinical staff. The second group consisted of chronic pain patients identified through billing data who have not been enrolled in the course. These patients were matched to class participants by age, sex, time period of the class and clinical site. For class participants and their matched non- participants, health care resource utilization and expenditures of the three-month period prior to the seven-week class were compared with the three months following its completion to see if they were different. Utilization was determined through billing claims data stored at CareOregon on a Medical Benefits Tracker program.

Research setting: CareOregon of Portland

CareOregon is a not-for-profit health plan serving over 83,000 Oregon Health Plan beneficiaries. Patients participating in the study are drawn from three clinical sites:

Multnomah County Clinics, the Legacy Health System and Oregon Health & Sciences Family Medicine clinics. The Multnomah County Clinics are federally funded clinics operated by the county to provide health care to uninsured and Oregon Health Plan patients. The classes administered by the Multnomah County Clinics involved the Southeast, Westside, Mid-county and Eastside clinics located in the Portland metropolitan area. The Legacy Health System is a private not-for-profit health care management and hospital organization that serves private payers and patients from multiple health plans including OHP patients from Care Oregon. OHSU is a publicly funded teaching and research hospital system. Patients were drawn from the Emma Jones Clinic in the Department of Family Medicine.

Study subjects

All patients in this study received their primary care from Multnomah County, Legacy or OHSU and are covered by the Oregon Health Plan. Chronic pain patients in this study were identified and defined in one of two ways. Patients were initially selected through an opioid use registry of CareOregon members who received opioid pain medication for 60 of the 90 days prior to the beginning of the class. A needs assessment of CareOregon's chronic pain patients performed by the Center for Health Care Strategies in 2002 verified the accuracy of these lists and found that 54 of 57 chronic opioid users selected from the list were identified by clinical staff as patients who suffered from chronic pain and were likely to benefit from a chronic pain intervention[30]. The baseline characteristics of the subpopulation identified in this list were also similar to the first 21

patients selected to participate in the pain management classes in regards to gender, English as a primary language, white race and age (Table 2).

Table 2. Characteristics of Opioid Registry Patients and Participants Pain Program Pilot Study

Baseline Characteristics	CareOregon Opioid Registry (N = 2,074)	Pain Program Participants (N = 21)
Female gender	64%	71%
English language	97%	100%
White race	85%	86%
Age (mean)	49	47

Other factors were also involved in the selection of study participants. For example, some patients were excluded if their pattern of opioid use was indicative of a terminal or malignant condition requiring palliative pain therapy. If a patient's prescription for oral Morphine Sulfate increased from 60mg to 100mg to 200mg per day over the 90 day period listed on the registry, this patient was not included in the study. Also, a patient whose opiate use was more indicative of short-term acute care was not included in the study. For example, if patients had only a single prescription that did not extend through the length of the study period, they were not included in the analysis. Due to the small sample size and relative homogeneity of the population, some variables such as disability, race and English language were not included in the data analysis.

For this study class participants were defined as adults between the ages of 35-64 who had completed at least 4 of the 7 classes. Although the classes were also attended by patients who were either uninsured or had other insurance, all participants included in the results of this study were CareOregon patients with no gaps in coverage greater than 14 days during the 3 month study periods before or after the class. Patients were initially

selected to participate in the class from the opioid registry, however after the first classes they were also selected by their primary care providers and clinical staff at the site where they received care.

Class participants were compared to patients selected entirely from CareOregon's registry of patients who had received opioids for at least 60 of the previous 90 days and did not participate in the class. To ensure that a 1:4 ratio of eligible class participants to eligible non-participants was achieved, all patients who matched a class participant by age within five years, sex, clinical site and the time period of the class were entered into the database for non-participants. The time period refers to the 3 month periods before and after the class. However, data for class participants in the final class ending in January 2004 was not received until after controls had already been selected for the database. Consequently, participants from this class were not matched to non-participants by the time period for eligibility, but rather were drawn from the excess number of non-participants who matched these subjects by age, gender and the clinical site. To ensure that time period was not a confounder or significantly associated with differences in cost and utilization, the final analysis was adjusted for this variable.

Similar to class participants, non-participants were all CareOregon patients and were excluded if they had 14 or more days for which they were not enrolled as members during the 3 month study period before and after the class. Finally, if there were more than four eligible non-participants assigned to a single class participant, the extra non-participants were eliminated according to the greatest difference in age with their matched participant in comparison with other matched non-participants, or randomly if ages were equivalent.

Data sources and Measures

Data for this study was drawn from CareOregon's medical claims data-base stored on a Medical Benefits Tracker program. A claim was defined as monetary dispersement by CareOregon to pay for health services provided to patient members. After selecting all subjects, a data-base of medical claims and demographic variables was created. Demographic characteristics included age, sex, clinical site and eligibility during the 3 month period before and after the class. The predictor variable for this study is participation vs. non-participation in the 7 week pain management class. The outcome variables are the mean number of health care services claims and total claims expenditures for specific variables during the 3 month periods before and after the class. These include hospital admissions, emergency department visits, primary care provider visits and opioid prescriptions (Table 3).

Table 3. Data Measures.

Subject ID	subid
Case Number	casenum
Clinical Site	site
1 = Multnomah County Clinic	
2 = Legacy Health System	
3 = OHSU	
Sex	sex
1 = Female	
2 = Male	
Age (years)	age
Class Number (by date)	class
1 = 10/18/02 to 12/4/02	
2 = 1/17/03 to 2/26/03	
3 = 2/7/03 to 3/19/03	
4 = 4/14/03 to 5/14/03	
5 = 5/23/03 to 7/2/03	
6 = 8/15/03 to 9/24/03	
7 = 8/22/03 to 10/1/03	
8 = 11/3/03 to 1/5/04	
Predictor Variable	
Participant/Non-participant	casecon
1 = Class participant	
2 = Non-participant	
Outcome Variables	
Pre-Class Hospitalizations	prehnum
Pre-Class Hospitalization Cost	prehco
Pre-Class ED Visits	preednum
Pre-Class ED Costs	preedcos
Pre-Class PCP Visits	prepcnum
Pre-Class PCP Costs	prepcco
Pre-Class Opiate Prescriptions	preopnum
Pre-Class Opiate Costs	preopco
Post-Class Hospitalizations	pohnum
Post-Class Hospitalization Cost	pohosco
Post-Class ED Visits	poednum
Post-Class ED Costs	poedcos
Post-Class PCP Visits	popcnum
Post-Class PCP Costs	popccos
Post-Class Opiate Prescriptions	poopnum
Post-Class Opiate Costs	poopcos
Pre-Class Total Costs	precost
Post-Class Total Costs	postcost
Difference Pre to Post Class Cost	difprepo
Adjusted Difference in Pre to Post Class Cost	adjdifprpo

To determine the effect of the class on the number of claims and claims expenditures, the mean difference between pre-class variables and post-class variables were compared for participants and non-participants (Table 4). The mean difference for total expenditures before and after the class was measured to determine the effect on the total expenditures per patient. Measures with relatively few claims were converted from continuous to categorical variables. Expenditures for measures with relatively few claims were aggregated into the total pre and cost class costs rather than analyzed as discrete variables. Medical costs and claims incurred during the class were not included in this study.

Table 4. Variable measures performed for the mean number of claims and expenditures.

Categorical Variables	**Persons with Pre-class Claims**	**Persons with Post Class Claims**	**OR**
Hospital Admissions			
Participants	a	b	OR (95% Confidence Interval)
Non-participants	c	d	
Emergency Department Visits			
Participants	a	b	OR (95% Confidence Interval)
Non-participants	c	d	
Continuous Variables	**3 month Pre-Class Period**	**3 month Post-Class Period**	**Mean Difference** ($\Delta = \mu_1 - \mu_2 = d$)
Primary Care Provider Visits			
Participants	μ_1	μ_2	d1
Non-participants	μ_1	μ_2	d2
Opiate Prescriptions			
Participants	μ_1	μ_2	d1
Non-participants	μ_1	μ_2	d2
Total Expenditures			
Participants	μ_1	μ_2	d1
Non-participants	μ_1	μ_2	d2

To provide greater context for understanding the impact of the 7 week pain management program, selected questions from pre and post class survey questionnaires are also included in the results of this study. Survey results were obtained from MCC and LHS sites, but results from OHSU were not included due to small numbers and poor consistency in obtaining both pre and post class surveys for the same subjects. The questionnaires evaluated multiple aspects of perceived pain, patients' ability to cope with pain, satisfaction with health care providers and treatment, and the effectiveness of the intervention (Table 5). Patients were asked to rate their responses on a scale of 1-10 to gauge their subjective self evaluation of the effect of the intervention on their pain symptoms. This data was gathered improvement by social workers and behavioral health nurses who administer the pain management classes for the purpose of quality.

Table 5. Selected Questions from Pre and Post Class Survey Questionnaires Administered to Patients Participating in the 7 Week Pain Management Program.

Chronic Pain Management Program Evaluation	**Scale (1-10)**
What was your average pain in the past 4 weeks?	10 = Worst
Level of pain you are willing to have?	10 = Worst
Are you satisfied with the efforts of your health care providers?	10=Very satisfied
Are you satisfied with the effects of this treatment?	10=Very satisfied
Are you satisfied with the pain management sessions ?	10=Very satisfied
During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?	10 = Strongly Interfered
Sleep?	10 = Strongly Interfered
Mood ?	10 = Strongly Interfered
Enjoyment of life?	10 = Strongly Interfered

Data Collection

Data collection was performed by the author and CareOregon employees and consisted of a review of previously collected computer billing records and survey questionnaires for study subjects.

Analyses

Data were analyzed using SPSS v12. The frequency distributions of the utilization and claims expenditures variables were analyzed graphically to evaluate departures from normality. Medical utilization data frequently have non-normal distributions that include many zero values or small proportions of extremely high values. For data that showed a non-continuous distribution, some variables were converted to categorical variables.

Next, baseline characteristics of the study groups were measured to determine if there were differences between subjects by age, sex, clinical site or the timing of the class. Categorical variables were compared using chi-square statistics and logistic regression to evaluate the significance of odds ratios. For continuous outcome variables, two-way analysis of variance (ANOVA) F-tests and t-tests were used to evaluate mean differences between class participants and non-participants. These analyses were used to determine potential differences between and within groups and identify possible confounders.

Finally, categorical variables were stratified by case number and analyzed using conditional logistic regression to account for matching of class participants and non-participants. Continuous variables were examined using a multivariate linear model. To

increase the normality of the distributions in this analysis, variables were log transformed. The effects of potential outliers were evaluated graphically using histograms or by plotting predicted values vs. Cook's values.

Results

Initially 71 patients were identified who have participated in the 8 classes offered between October 2002 and January 2004. Out of the 71 patients, 50 completed at least 4 of 7 classes; of those 15 were ineligible due to disenrollment from CareOregon coverage for 14 or more days during the study periods. There were 35 eligible patients who had completed at least 4 of 7 classes in the final analysis (Figure 1).

All patients on the opioid use registry who matched the 35 class participants by age, sex and clinical site were selected as controls. For the 225 patients selected, 26 were eliminated because they were disenrolled for more than 14 days during the study period. Finally, to achieve 1:4 ratio of class participants to non-participants, excess non-participants were eliminated if they differed by a greater number of years than other matched non-participants or, if ages were equal, they were randomly eliminated until each participant was assigned 4 matched non-participants. Although this procedure should then leave a sample of 140 non-participants to 35 class participants, only two matches were found for one of the class participants leaving the final number of controls at 138.

Figure 1a. Selection of Class Participants.

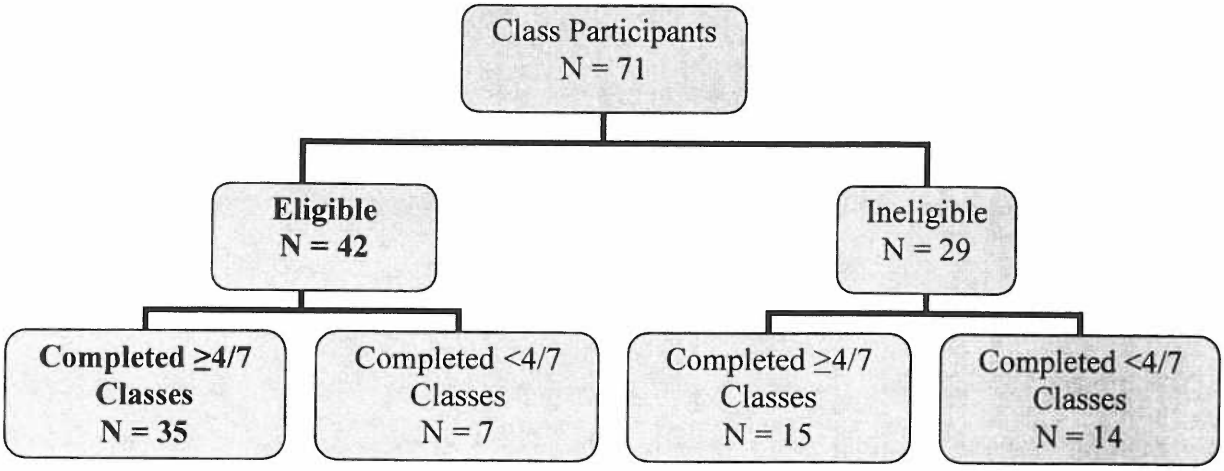
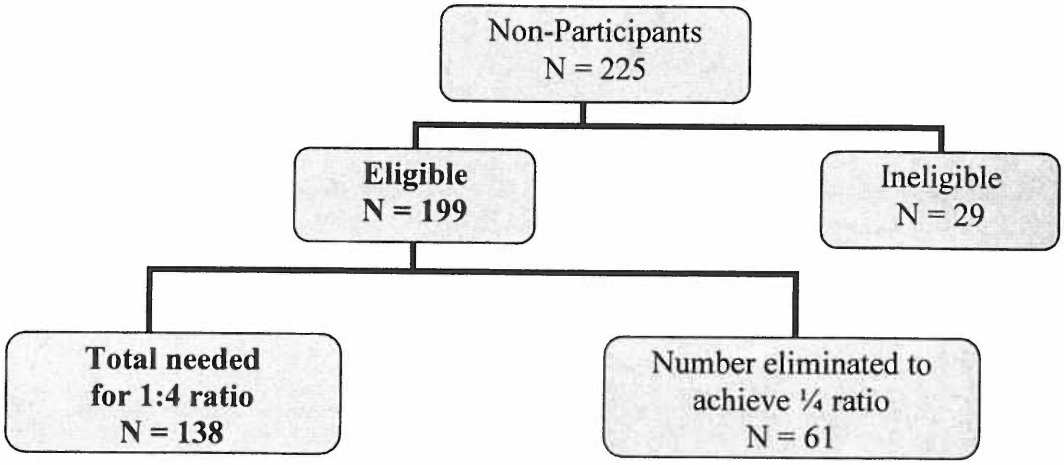


Figure1b. Selection of Non-participants drawn from Care Oregon's Opiate User Registry



Baseline Characteristics

The average age of class participants and non-participants did not differ from that of the original registry of chronic opioid users (Table 6).

Table 6. Age and Sex of Study Subjects vs. Opioid Registry Patients

	Class Participants N = 35	Non Participants N = 173	Opioid Registry Patients N = 2,074
Age in Years	49.9 ±7.0	50.3 ±7.3	49
Sex	60% Female	60% Female	64% Female

The average age of participants was 49.9 years compared with an average age of 50.3 for non-participants and followed an approximately normal distribution. The mean age of study subjects resembles the average age of 49 years for patients in the opioid use registry with a normal distribution of age for the total sample. Study subjects also closely resembled patients in the original opioid registry by sex and 60% of study participants were female compared to 64% in the registry. This indicates that matching of participants and non-participants was successful in terms of age and gender.

Using univariate logistic regression, age was significantly associated with differences in the probability of pre-period emergency room visit claims (OR = .96, 95%CI: .91-1.00 at p = 0.06) and post period emergency room visit claims (OR = .93, 95%CI: .89-.98 at p = 0.01). Using a univariate general linear model, age was also significantly associated with differences in the probability of pre-period primary care provider visit claims (F value = 4.65 at p = 0.03). Age was not significantly associated with differences in claims expenditures. Gender was not significantly associated with differences in any variable with the exception of the probability of post period emergency room visit claims (OR = .43, 95%CI: .21-.87 at p = 0.02).

The number of participants at each site varied due to the size and number of classes offered. The MCCs held 4 classes with 18 eligible participants, LHS had 3 classes with 11 eligible participants and OHSU held 1 class with 6 eligible participants (Table 7).

Table 7. Pain Management Classes by Clinical Site and Time Period.

		MCC		LHS		OHSU		Total
Class Number	Date	Class Participant	Non-Participant	Class Participant	Non-Participant	Class Participant	Non-Participant	
1	Oct-Dec 2002			4	16			20
2	Jan-Feb 2003			2	8			10
3	Feb-Mar 2003	8	42					50
4	Apr-May 2003	2	12					14
5	May-Jul 2003			5	20			25
6	Aug-Sep 2003	2	16					18
7	Aug-Oct 2003					6	24	30
8	Nov-Dec 2003	6	0					6
	Total	**18**	**70**	**11**	**44**	**6**	**24**	**173**
	Total for Site	**88**		**55**		**30**		

Some irregularities in the ratios of class participants and non-participants are apparent for MCC patients. The last 6 patients in class 8 were added after the selection of controls so excess controls for other participants who matched by age, sex and clinical site were used as comparable controls. For this reason it appears that participants from classes 3, 4 and 6 are assigned excess controls. Examining the time period for classes using logistic regression for hospital admissions and emergency department claims and two-way ANOVA for primary care provider and opiate claims variables found that the time period of the class was not significantly associated with the number of claims or mean expenditures for any variable. Therefore changing the assignment of non-participants did not have an effect on the results. There were also no significant differences in claims by clinical site.

Survey Data

Survey data collected from 31 participants in the first 8 classes with CareOregon patients at LHS and MCC patients also measured changes in pain symptoms at the beginning and end of the 7 week classes. In this survey patients reported a slight decrease in pain symptoms interference with daily functioning and impact on quality of life (Table 8). Both the LHS and the MCC groups reported small increases in their satisfaction with the treatment they are receiving and in the amount of pain they feel they can tolerate indicating an increased ability to cope with chronic pain.

Table 8. Chronic Pain Management Program Evaluation Survey Results

Chronic Pain Management Program Evaluation				
N = 31	**Legacy**		**Multnomah**	
	Pre-Session	**Post-Session**	**Pre-Session**	**Post-Session**
Members completing survey	n = 12	n = 11	n = 19	n = 18
Your average pain in the past 4 weeks:	6	5.5	7.6	6.5
Your pain right now while filling out this form:	6.2	4.8	6.5	5.6
Level of pain you are willing to have:	3.5	4.9	5	5
With the efforts of my health care providers (10=Very satisfied):	8.2	8.3	6.6	6.6
With the effects of treatment (10=Very satisfied):	5.8	6.7	6	6.9
With the pain management sessions (10=Very satisfied)	NA	8.3	NA	8.7
During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?	6.4	6.3	4.3	4.1
Sleep	6.2	6.4	7.2	6.8
Mood	6.1	6.1	7.2	6.7
Enjoyment of Life	7.9	6.2	7.4	7.2

Overall, nurses, social workers and patients participating in the classes had positive assessments of the classes in terms of their ability to assist patients with their ability to cope with their pain. One class continued to meet weekly as a support group after completion of the class. Anecdotally, both patients and care providers report positive improvements in pain symptoms and satisfaction with treatment outcomes. However, to gain a more complete understanding of the effects of this class, it is important to have more objective measures to determine the importance of these initial reports.

Data Measures

This study examined the crude means for the number of expenditures and claims separately by hospital admissions, emergency room visits, primary care visits and opiate prescriptions followed by the total cost of claims (Table 9a and 9b).

Table 9a. Mean Expenditures by Class Participation

Total Claims in Dollars	Mean Pre-Class Expenditures		Mean Post-Class Expenditures	
	Class Participant n = 35	Non-participant n = 138	Class Participant n = 35	Non-participant n = 138
Hospital Admissions	$306.34	$446.94	$40.64	$458.51
Emergency Department Visits	$46.29	$48.92	$58.16	$50.60
Primary Care Provider Visits	$29.68	$31.72	$33.71	$28.25
Opiate Prescriptions	$147.71	$182.21	$161.08	$210.24

Table 9b. Percent of Subjects with Claims and the Mean Claims per Subject.

Claims and Mean Claims	Pre-Class Claims				Post-Class Claims			
	Class Participant n = 35		Non-participant n = 138		Class Participant n = 35		Non-participant n = 138	
	With	Mean	With	Mean	With	Mean	With	Mean
Hospital Admissions	8.6%	.09	8.7%	.09	5.8%	.06	10.1%	.10
Emergency Department Visits	34%	.91	28%	.81	31%	.60	30%	.73
Primary Care Provider Visits	88.6%	1.17	78.3%	1.11	88.6%	1.06	79.7%	1.30
Opiate Prescriptions	80.0%	4.51	97.8%	4.96	82.9%	4.60	99.3%	5.12
Total	94.3%	6.69	98.6%	6.97	100%	6.31	100%	7.26

Hospitalizations

There were few hospitalizations during the study periods and no more than one claim for any study subject (Table 10). The number of admits declined from 3 to 2 for participants, and increased from 12 to 14 admissions for non-participants. Although the total cost of hospitalizations decreased by $9,299.55 for participants, compared to a gain of $1,595.67 for non-participants, these changes were mostly attributable to a few large hospitalization expenditures. Consequently, the numbers of hospitalization claims were examined as a dichotomous categorical variable using conditional logistic regression. Hospitalization expenditures were examined as part of total claims expenditures rather than as a separate variable.

Table 10. Total number of Hospitalizations

Study Subjects	Pre-Class Hospitalizations	Post-Class Hospitalizations
Class Participant N = 35	3	2
Non-Participant N = 138	12	14
Total	15	16

Using univariate logistic regression, there were no significant differences in the number of hospitalizations between class participants and non-participants in the pre or post class periods while controlling for age, sex, clinical site and the time period of the class. To determine whether pre-period claims were a predictor of post period claims, pre-period claims were included as a predictor in the model with class participation. However, the significance was unchanged in the full and partial models of these variables as well as with the inclusion interaction effects between class participation and age or sex.

To account for matching of participants and non-participants, conditional logistic analysis was used by stratifying the data by the case numbers of the participants and regressing post period claims against class participation, pre-period claims and an interaction between class participation and the pre-period claims indicator (Table 11). At $p = 0.33$, there was still no association between class participation and changes in hospitalization claims. However given the small number of claims it is difficult to assess the validity of this result given the high likelihood of a type I error.

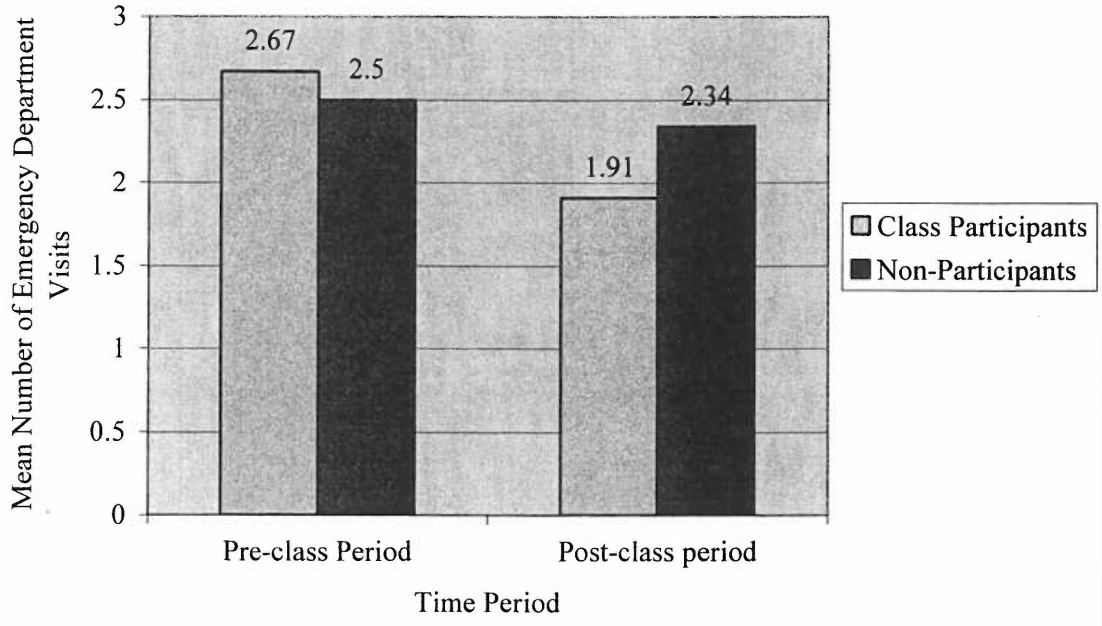
Table 11. Conditional logistic regression for Hospitalizations in the Post Period.

Dependent Variable	Independent Variable	Wald Significance	OR	95.0% C.I. OR	
				Lower	Upper
Post Period Hospitalizations	Class Participation	0.33	2.79	.35	21.92
	Pre-Period Claims	0.11	16.63	.52	528.91
	Class * Pre Period Claims	0.35	.18	.01	6.51

Emergency Department (ED) Visits

Similar to hospital admissions, there were relatively few patient claims for emergency department visits, which did not follow a normal distribution. Therefore, emergency department visits were analyzed as a dichotomous categorical variable for no visits versus 1 or more visits. The range of visits for participants decreased from a maximum of 6 in the pre- period to 4 in the post period, while the total number with no visit claims increased slightly from 23 to 24. The range of visits for non-participants increased slightly from a maximum of 12 to 13, while the total number of claims decreased slightly from 123 to 121. The total number of emergency department visits decreased by 34 percent from 32 to 21 among participants from the pre to post class period and by only 10 percent from 112 to 101 for non-participants. This change translated into a 28 percent decrease in the visit rate among participants and a 6 percent decrease among non-participants who went to the ED in the pre-class period and post class periods (Figure 2). Also, because the majority of participants and non-participants had no claims, emergency department expenditures were aggregated into the total medical expenditures and not examined as a separate variable.

Figure 2. Mean Number of Emergency Department Visits Among Subjects Who Went to the Emergency Department



In the pre-class period, no single variable is significant using univariate logistic regression analysis (Table 12). In full and partial models including class participation, age, sex, clinical site and the time period of the class, only age approaches significance with a Wald Value = 3.61 at p = .057.

Table 12. Univariate Logistic Regression Analysis of Selected Variables for the Pre and Post Periods.

				95.0% C.I. OR	
Variable	**Time Period**	**Wald Sig.**	**OR**	**Lower**	**Upper**
Class Participation	Pre-Class	.433	.728	.330	1.607
	Post Class	.843	.922	.414	2.056
Age	Pre-Class	.057	.955	.910	1.001
	Post Class	**.006**	**.933**	**.888**	**.980**
Sex(1)	Pre-Class	.446	.768	.389	1.515
	Post Class	**.019**	**.428**	**.210**	**.869**

In the post-class period age and sex are significant in univariate logistic regression analysis at p = .006 and .019 respectively. For both the pre and post class periods, class participation was insignificant using conditional logistic regression analysis to account for the matching by age, sex, site and class. After controlling for these variables in a model with class participation, the differences in the probability of emergency department claims in the pre and post class periods were not significantly different from one another.

Similar to hospitalization data, the matching of participants and non-participants was accounted for by using conditional logistic analysis and stratifying the data by subject's case numbers and testing post period claims against class participation, pre-period claims and an interaction between class participation and the pre-period (Table 13). At p = 0.82, there was still no association between class participation and changes in emergency department visit probability.

Despite the relatively larger decrease in the number of emergency room visits among class participants in comparison to non-participants, this difference was not statistically significant. Similar to hospitalizations, this result may have been due to the relatively small sample size and the limited power of this study.

Table 13. Conditional Logistic Regression for Emergency Department Visits in the Post Period.

Dependent Variable	Independent Variable	Wald Significance	OR	95.0% C.I. OR	
				Lower	Upper
Post Period Emergency Department Visits	Class Participation	.82	.93	.47	1.83
	Pre-Period Claims	.04	1.99	1.05	3.78
	Class* Pre Period Claims	.84	1.12	.38	3.29

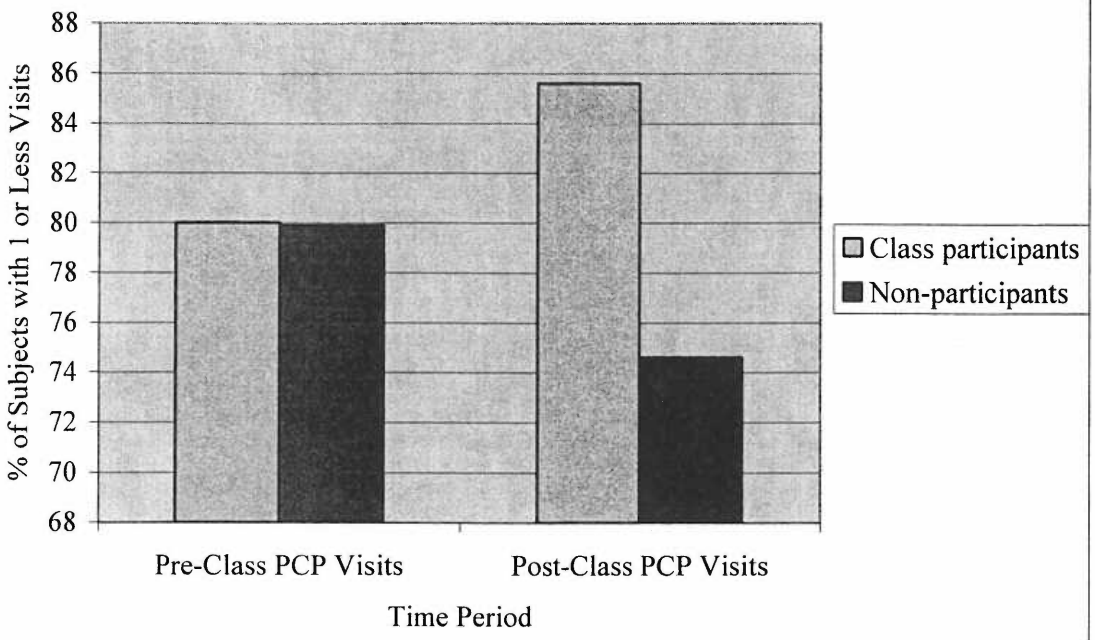
Primary Care Provider (PCP) Visit Claims and Expenditures

The distribution of PCP visits was approximately normal and continuous for both the pre and post periods. The number of visits by class participants decreased from 41 to 37 from the pre to post period, while it increased from 153 to 180 for non-participants (Table 14). The proportion of patients with zero or one primary care provider visit increased among class participants from 80.0 to 85.6 percent, but decreased slightly for non-participants from 79.9 to 74.6 percent (Figure 3). The unadjusted mean number of PCP visit claims decreased slightly among class participants from 1.17 to 1.06 visits per patient from the pre to post period. For non-participants, the unadjusted mean increased slightly from 1.11 to 1.30 visit claims. Conversely, the average cost of claims slightly increased for class participants from a mean of $29.68 to $33.71, but decreased for non-participants from $31.72 to $28.25. PCP visit claims and the costs of these claims were analyzed using two-way ANOVA in a general linear model.

Table 14. Total Number of PCP Visit Claims for Class Participants and Non-participants During the Study Period.

Class Participation	Pre-Class PCP Visits	Post-Class PCP Visits
Class Participant	41	37
Non-Participant	153	180
Total	194	217

Figure 3. Percentage of Study Subjects with Zero or One PCP Visits



In a two-way general linear model, participation in the class, sex, clinical site and time period of the class were not significantly associated with differences in the mean number or cost of PCP claims, however age was significant in the pre-period ($F = 4.65$ at $p = .032$). However all variables including age were insignificant in the post period. Considering that no variable was significant and that age was not consistently significant across the pre and post periods, it is possible that the association with age in the pre-class period was a chance occurrence. Upon further analysis, adjusting for age or including it as an interaction did not produce a significant association between class participation and changes in PCP visits or expenditures. In the final model the difference in the mean number of PCP visit claims was insignificant for class participants compared with non-participants ($F = 1.49$ at $p = .22$) (Table 15). Models that adjusted for age and pre-period pcp costs also did not reveal a significant association.

Table 15:Comparison of Differences in the Mean Number of Primary Care Visit Claims.

Primary Care Visit Claims	Mean Difference and Std. Error	F Value	Significance (Two –sided)
Class participants	0.11 ±0.18	1.49	0.23
Non-participants	-0.20 ±0.12		

Opiate Prescription claims and expenditures

The distributions for opiate prescription claims and expenditures were approximately normal for both class participants and non-participants in the pre and post class periods. The total number of opiate prescription claims for class participants increased slightly from the pre to post period from 158 to 161 with a mean of 4.51 to 4.60 claims respectively per person (Figure 4). This was accompanied by an 8 percent increase in costs. For non-participants the number of claims increased from 685 to 707 with a mean of 4.96 to 5.12 claims per person. This was accompanied by a 13 percent increase in expenditures (Table 16). However, histographic analysis of the data revealed a number of expenditures outliers that most likely affected the means. Therefore, the data were analyzed in a multivariate ANOVA model using all and trimmed expenditure values. In the pre and post periods, there were no significant associations between the number of opiate claims and expenditures with age, sex, clinical site, time period of the class or participation in the class. A comparison of the pre and post period opiate prescription data for class participants and non-participants was also insignificant for mean change in claims ($F = .08$ at $p = .77$) and the cost of claims ($F = 0.02$ at $p = 0.89$) (Table 17).

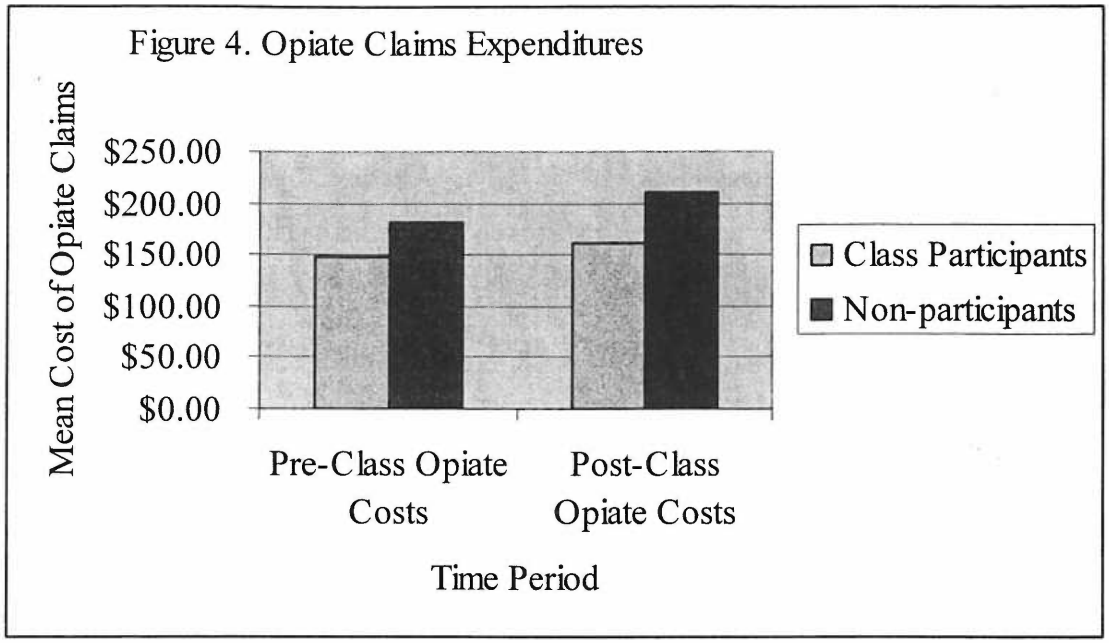


Table 16. Mean Changes in Opiate Claims and Expenditures During the Study Period.

Study Subjects	Mean Pre-class Opiate Claims and Std Error	Mean Post-class Opiate Claims and Std Error	Mean Difference and Std. Error	F Value	Sig. (Two –sided)
Class Participants	4.51 ±.68	4.60 ±.81	.09 ±.44	0.02	0.79
Non-Participants	4.96 ±.24	5.12 ±.24	.16 ±.25		

Study Subjects	Mean Pre-class Opiate Cost and Std Error	Mean Post-class Opiate Cost and Std Error	Mean Difference and Std. Error	F Value	Sig. (Two –sided)
Class Participants	$147.71 ±40.38	$161. 08 ±53.29	$13.37 ± 21.58	0.08	0.77
Non-Participants	$182.21 ±31.64	$210.24 ±49.24	$28.03 ±24.94		

Data was then trimmed by eliminating outliers of greater than $1000 in the pre and post periods. The trimmed mean cost of opiate expenditures from the pre-class period to the post-class period then slightly decreased from $97.54 to $93.51 for class participants and almost unchanged for non-participants at $125.79 to $125.27. After

adjusting for the presence of outliers, expenditure differences were still not significant with an F value = .021 at p = .884.

Table 17. Trimmed Mean: Eliminating Outliers for Opiate Expenditures > $1000.

Study Subjects	Mean Adjusted Pre-class Opiate Cost	Mean Adjusted Post-class Opiate Cost	Mean Difference and Std. Error	F Value	Sig. (Two – sided)
Class Participants	$97.54±21.41	$93.51±25.07	$4.03 ±15.89	0.02	0.88
Non-Participants	$125.79±16.54	$125.27±15.46	$0.52 ±11.33		

Finally, the model was tested including pre-class costs as an additional predictor. Although the difference in cost was not significant, this approach did show a significant difference in the total number of claims (F value = 5.79 at p = .03).

Total Costs

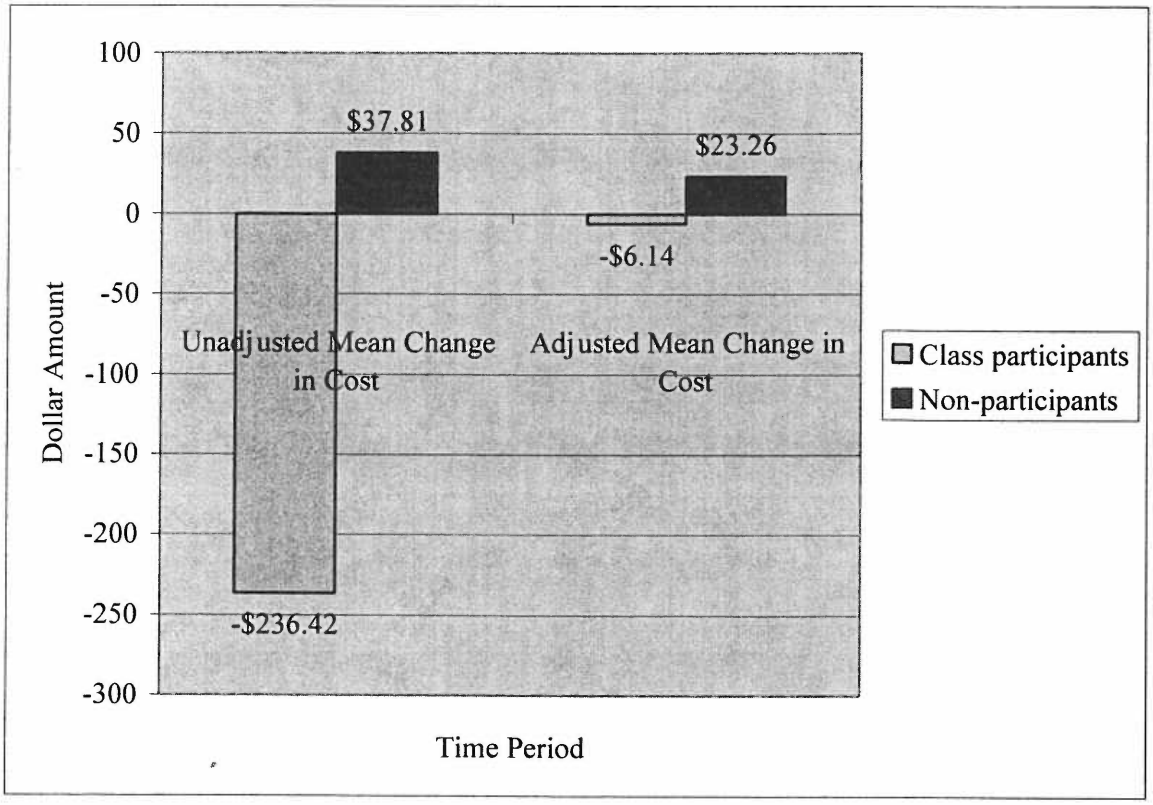
The distribution for total costs was skewed away from zero due to outliers with large values and assumed a more normal distribution after removing them. The unadjusted mean difference in claims from the pre to post class period for class participants was a decrease of 44.6 percent or $236.42. For non-participants there was a mean increase of 5 percent or $37.81 from the pre to post class period (Table 18). Univariate analysis in a general linear model found that age, sex, clinical site and the time period of the class were not associated with differences in cost in the pre versus post class periods. Despite large disparity between the mean differences for class participants and non-participants between the pre and post class periods, the means were not significantly with an F value = 0.21 at p = 0.65. This result is most likely attributable to a wide

variation in values indicated by the relatively large standard errors for both participants and non-participants.

Table 18. Mean Difference in Claims Expenditures.

Study Subjects	Mean Pre-class Cost	Mean Post-class Cost	Mean Difference and Std. Error	F Value	Sig. (Two –sided)
Class Participants	$530.02 ±201.51	$293.60±73.47	-236.42 ±171.99	0.21	0.65
Non-Participants	$709.79 ±259.35	$747.60±162.47	37.81±299.13		

Figure 5. Unadjusted and Adjusted Mean Differences in the Total Cost of Claims



Adjusting total costs for outliers by eliminating subjects with mean differences greater than $1,000 resulted in the exclusion of 2 class participants and 16 non-participants. Once outliers were excluded, the mean difference in claims expenditures was decreased by only $6.14 from the pre to post class period for participants, but

increased by $23.26 for non-participants (Table 23). This narrowed the disparity between the mean differences for participants and non-participants and participation in the class was still not significantly associated with the decrease in cost either alone or after adjusting for age, sex, site or the time period of the class. Although pre-class cost was significantly related to the mean difference (F value = 6.32 at p = 0.02), adjusting for this variable in the model did not change the effect of class participation.

Discussion

Changes in claims and expenditures for hospital admissions, emergency department visits, primary care provider visits, opiate prescriptions and total costs were not statistically significantly different. Despite the lack of significance, the overall trend towards decreased health care services utilization and cost among class participants compared to non-participants was compelling. Costs and utilization decreased by a greater degree for class participants in all categories with the exception of primary care provider visits and the number of opiate prescription claims and expenditures which increased for both participants and non-participants. However, the increase for participant opiate expenditures was smaller than for non-participants.

The lack of significance of the findings did not change after adjusting for age, sex, the institutional site that provided care or the timing of the class. Although the total cost of care for class participants decreased by 60 percent, this change was almost entirely due to a single hospitalization claim for a class participant.

The results of survey questionnaires were similar to objective outcomes in that decreases were relatively small, but consistent across all variables. Although patients

reported slightly lower levels of recent and current pain and were satisfied with their care, there was no change in their satisfaction with their care provider. The extent to which their pain symptoms interfered with their daily lives in terms of work, household activities, sleep, mood or enjoyment of life all improved slightly, however the sample size was too small for this to be provide more than preliminary data for a larger data analysis.

Many limitations in this study could account for the lack of significant study associations. One of the most important limitations is the small size of the study, which limited the power of the study to detect a difference. Numerous outcomes showed improvement among class participants in comparison to non-participants and the lack of significance for some variables could have resulted from low power. The rate of emergency department visits among class participants who went to the emergency room decreased by 28 percent from the pre to post class period and the total number of emergency room visits decreased by 34 percent. In contrast, there was only a 6 percent decrease in the emergency department visit rate among non-participants who had emergency department visit claims and a 10 percent decrease in the total number of non-participant emergency department claims. Similarly, the proportion of patients with one or less primary care provider visits increased from the pre to post class period among class participants from 80.0 to 85.6 percent, but decreased slightly for non-participants from 79.9 to 74.6 percent. Also, after eliminating outliers, mean expenditures declined slightly for class participants but increased for non-participants. Therefore, the small size of the study could have masked significant decreases in all variables measured.

The relatively small sample size of this study also limited its ability to control for some potential confounders. The potential dose-response effect of the class was not examined because there were only 7 eligible patients who completed less than 4 of the 7 classes. Also, because the population was relatively homogeneous in that approximately 85 percent of opioid users were white and 97 percent were English speakers, race and ethnicity were not measured. Disability is another potential confounder that was not included. In the initial pilot study for the pain management program, 66 percent of patients were disabled compared with only 4 percent of patients on the opioid registry. Finally, pain itself is a potential confounder because it is a non-specific and general symptom with multiple unrelated etiologies that may have very different characteristics and outcomes. This study was too small to compare different types of pain by subgroup.

Many potential sources of bias could account for the lack of association found in this study. Non-random, differential participation could have biased the results away from an association. Of the original 71 patients who participated in the class, half were either not eligible or did not complete the class. It is unknown whether patients who were not eligible differed from study subjects and may have received more benefit from the class than patients who remained in the study. For example, patients who completed the class but were not eligible for the study due to gaps in Care Oregon coverage could have lost eligibility as a result of increased income if they had sufficient clinical improvement to find employment. In such a scenario, the most improved patients would not be included in the results. Similarly, if more severe patients were more likely to remain in the class, they may be less likely to receive as much benefit from the class.

Selection bias could also have played a role in the results of this study. Patients were all self selected to participate in the class and may not be representative of the chronic pain population. It is plausible that patients with more severe symptoms would be more frustrated with tradition pain therapy and their care providers. This frustration may have increased providers' motivation to refer more challenging chronic pain patients to the program. If patients have had years of severe chronic pain, it is unlikely that it would appreciably improve in the relatively short 3 month follow up period. Also, nurses and social workers reported that some patients were required by their primary care providers to participate in the program in order to continue receiving their pain medication. Facilitators agreed that patients obligated by their care providers to attend were less likely to view the program or its effect on their pain as positive. Such differential selection bias could have shifted the results away from a significantly different outcome.

Misclassification could also have played a role in this study. Chronic pain was defined solely by opioid use. Although this criterion showed a high degree of accuracy in identifying chronic pain patients in a needs assessment of CareOregon's patients prior to the study, there was no chart review or verification of patient diagnoses in this study. While it is highly likely that all class participants suffered from chronic pain, no diagnostic codes or direct classifications for types of pain were used for verification. Therefore, there is no way to determine if patients with different types of pain receive benefit from this program or whether non-participants were truly comparable to participants.

Conclusion

This study was limited by its small size, potential for selection bias, non-specific measures and inability to examine subgroups. Despite the lack of significant findings in this study, there is a compelling trend towards decreased claims and expenditures for some measures and patients subjectively reported improvements in pain and the extent to which it interferes with their daily lives. Nonetheless, the analysis was unable to demonstrate the effectiveness of the 7 week pain management program in reducing health care utilization and costs among CareOregon's chronic pain patients.

Chronic pain continues to have a high prevalence in the general population and is difficult and expensive to treat. As health care costs continue to rise and public health resources become scarce, there is a need to find more clinically effective and low cost ways to treat chronic medical conditions. The trend found in this data is consistent with other studies and provides evidence that a non-pharmacological pain management program may be effective in reducing health care costs while decreasing the extent to which pain interferes with daily activities in this population. More reliable data is still needed to understand the impacts of CareOregon's pain management program for the patients it serves. However, this study provides important baseline information regarding the need for a larger, randomized clinical trial with a more specific study design directed towards the needs of this population.

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