

# Introduction of the chronic care model into an academic rheumatology clinic

S Ranatunga,<sup>1</sup> S Myers,<sup>1</sup> S Redding,<sup>1</sup> S L Scaife,<sup>1</sup> M D Francis,<sup>2</sup> M L Francis<sup>1</sup>

<sup>1</sup>Division of Rheumatology, Southern Illinois University School of Medicine, Springfield, Illinois, USA

<sup>2</sup>Division of General Internal Medicine, Southern Illinois University School of Medicine, Springfield, Illinois, USA

## Correspondence to

Dr Mark L Francis, Division of Rheumatology, Southern Illinois University School of Medicine, PO Box 19636, Springfield, IL 62794-9636, USA; mfrancis@siu.edu

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## ABSTRACT

**Background** While the chronic care model has been extensively used for the management of patients with diabetes in non-academic, primary care settings, it is not clear whether this model can be used effectively in academic, specialty clinics for other chronic disorders.

**Methods** Through the Academic Chronic Care Collaborative, the chronic care model was introduced to help manage patients with osteoarthritis in an academic rheumatology service with seven prespecified goals. These goals included measurements of Western Ontario MacMaster (WOMAC) osteoarthritis scores, self-efficacy scores and exercise time.

**Results** Five a priori goals were achieved in this study: average WOMAC scores less than 1000 mm as measured on a visual analogue scale, average self-efficacy score of less than 5 mm, average exercise time greater than 90 min, more than 40% of patients exercising at least 60 min per week and a 20% improvement in self-efficacy scores. However, a 20% improvement in WOMAC scores and a 60% completion of documented self-management goals in our patients were not achieved. Our inability to achieve our self-management goal underscores the fact that we have not yet fully implemented the chronic care model into our practice. The inability to detect a 20% improvement in WOMAC scores in the context of having reached our absolute WOMAC goal at baseline suggests a probable ceiling effect for this measure.

**Conclusions** The chronic care model can be effectively introduced into an academic specialty service and can be used effectively in the management of patients with non-diabetic disorders, in this case osteoarthritis.

Osteoarthritis is a common chronic medical condition. The number of people in the USA affected with this disorder is expected to increase from 40 million in 1995 (15% of the population) to 59 million in 2020 (18% of the population).<sup>1</sup> It is associated with substantial costs to the individual (pain, functional impairment and reduced quality of life) and to society (disability and loss of productivity). Despite its high prevalence and social burden, there are no disease-modifying medications for osteoarthritis.<sup>2</sup>

There are, fortunately, effective pharmacologic and non-pharmacologic treatments that can help patients with osteoarthritis. Weight reduction and exercise are two of the more important non-pharmacologic treatments that motivated patients can use to help ameliorate their problems.<sup>3</sup> There are significant barriers, however, to the use of pharmacologic (risk of complications with the use of non-steroidal anti-inflammatory agents in older persons) and non-pharmacologic treatments

(reluctance to exercise a joint affected with osteoarthritis<sup>4</sup>).

The chronic care model may be useful in such a setting. According to this model, optimal care can be achieved when a prepared practice team interacts with an activated patient.<sup>5</sup> There are six key elements to the chronic care model. Self-management support is, for example, one of these elements that can effectively empower patients to overcome obstacles and deal with their healthcare needs.<sup>5</sup>

Our goal was to introduce the chronic care model to improve quality of care for patients with osteoarthritis in an academic rheumatology service. To assess the effect of this quality improvement project, we evaluated our patients with three preintervention and postintervention end points: the Western Ontario MacMaster (WOMAC) osteoarthritis questionnaire,<sup>6</sup> the Stanford self-efficacy for managing chronic disease scale<sup>7</sup> and the Stanford exercise behaviour questionnaire.<sup>8</sup>

## METHODS

### Setting and function

In 2005, the Southern Illinois University School of Medicine Division of Rheumatology joined the Academic Chronic Care Collaborative (ACCC) to develop a strategy that would introduce the chronic care model into our clinic to improve care for our patients with osteoarthritis. At the time of the initial phase of this collaborative, our division had two rheumatologists. Our change team members included one clinician, one nurse, a computer information specialist and two general internal medicine residents. Our cohort consisted of 148 patients diagnosed as having osteoarthritis 18 months before the initiation of our collaborative.

### Intervention

The chronic care model has six essential components.<sup>9–11</sup> Four of these (self-management support, delivery system design, decision support and clinical information systems) influence the ability to provide effective care at the clinical practice level. Each clinical practice is part of, and interacts with, two other larger elements: the healthcare system and the community. The patient's role is central in managing their health in a collaborative effort with their provider. This represents a paradigm shift from traditional physician-centric models of care. Self-management support empowers and prepares patients to achieve results through goal setting and action planning. Delivery system design and decision support assure the delivery of effective, efficient clinical care based

on evidence and patient preference. Clinical information systems can be used to organise patient and population data to facilitate best practices. Healthcare organisations can create a culture that promotes safety and quality, and all healthcare activities occur within a community where resources can be mobilised to meet the needs of patients.<sup>9–11</sup>

During the collaborative, we introduced the following changes into our practice: self-management support (asked patients what they wanted to learn from us to help themselves; use of motivational interviewing; introduction of the arthritis self-management course), delivery system design (used the closing-the-loop strategy, in which patients are asked to state their understanding of the assessment and plan to make sure that they understood correctly), decision support (developed practice guidelines based on the literature for treatment of osteoarthritis) and clinical information systems (developed a registry of patients with osteoarthritis in our clinic; developed a data entry system for our questionnaires; used outliers from our questionnaire to identify patients who may benefit from the arthritis self-management course), healthcare system (weekly rheumatology meetings that include physicians, nurses, medical assistants, secretary and occasionally residents; reviewed who should perform what job in the clinic) and the community (developed a community resource guide for exercise; worked with our local chapter of the Arthritis Foundation and the Illinois Department of Public Health).

## Measures

We used the WOMAC questionnaire to assess clinical outcomes. This instrument has been validated in numerous settings and is the primary tool used in clinical studies assessing clinical outcome in patients with osteoarthritis.<sup>6 12 13</sup> Answers to the 24 questions in WOMAC were measured on a visual analogue scale in millimetres (mm), with each question ranging from 0 mm if totally asymptomatic to 100 mm if fully symptomatic. In addition to the global outcome, we assessed, as secondary analyses, pain (five questions), stiffness (two questions) and functional domains (17 questions). Past studies have suggested that a minimal clinical importance difference with WOMAC is 17–22%,<sup>14</sup> although other studies have suggested lower values.<sup>15</sup> On an absolute scale, we set an arbitrary goal of 1000 mm or less, a level only rarely achieved in randomised clinical trials.

A number of previous studies have demonstrated the importance of self-efficacy as well as exercise in the management of patients with osteoarthritis.<sup>3 4 16–19</sup> Thus, we additionally used the self-efficacy for managing chronic disease scale (six questions similarly measured in millimetre on a visual analogue scale) and the exercise behaviour questionnaire (measured in minutes), both from the Stanford Patient Education Research Center, to assess these two process measures. After obtaining local institutional review board approval, these questionnaires were sent to our patients with osteoarthritis before we introduced any changes and 18 months later. Some additional patients filled out the questionnaire during office visits.

Our project goals included absolute and relative goals that were established before the onset of this quality improvement project. Our goals were to achieve (1) an average WOMAC score of less than 1000 mm, (2) a 20% improvement in WOMAC scores, (3) an average self-management score of greater than 5 mm, (4) a 20% improvement in self-efficacy scores, (5) an average exercise time of 90 min or more per week, (6) more than 40% of patients aerobically exercising more than 60 min per week and (7) more than 60% of patients with at least one documented self-management goal.

## Analytical methods

This is an analysis of a quality improvement project in a convenience sample of a single academic rheumatology clinic. The sample size was, therefore, based on the sole inclusion criterion of being diagnosed by the attending rheumatologist as having osteoarthritis without any exclusion criteria.

After determining that our data had a normal distribution, we used *t* tests to compare preintervention and postintervention scores for all measures. We were unable to use paired *t* tests because we allowed patients to answer their questionnaires anonymously. In anticipation that future providers would want to use a more limited number of questions than we used in the full WOMAC, we assessed which questions had the largest average change from the baseline value and the greatest variance since these questions would likely be the most useful clinically and in subsequent work. We used a two-sided *p* value of less than 0.05 to assess statistical significance. Statistical analysis was performed with SAS V.9.1.

## RESULTS

### Situational Analysis

Before joining the ACCC, the rheumatology division had no experience with quality improvement projects. We joined the ACCC in conjunction with our Division of General Internal Medicine and the Department of Family and Community Medicine, both of which were working on the chronic care model to improve care for diabetes. The ACCC consisted of 23 medical schools that included community-based medical schools and research-intensive academic medical centres. General internal medicine and family medicine clinics comprised the majority of ACCC participants; we were the only rheumatology clinic in this group. All the programmes met and worked together over approximately 18 months to learn how to implement the chronic care model and to share our experiences in an effort to improve quality of care at our home institutions. While we were not able to implement the full chronic care model during this time, we made the most significant improvements in patient self-management.

In general, new patients in the rheumatology clinic are given 40- to 60-min appointments, and follow-up visits are scheduled for 20–30 min, although the actual clinic times can vary because of double-booking and no-shows. Typically, patients with osteoarthritis are seen every 6 to 12 months. Physicians are responsible for the clinical management of their patients and work with residents and students who rotate on the service. While most of the motivational interviewing was done by the physicians, the nurses could also initiate this intervention and were primarily responsible for calling the patients back 2 weeks later to assess the success of the intervention and to work with the patient to modify their goals. The nurses ran the arthritis self-management course and kept track of exercise opportunities in the community. Our computer information specialist set up our patient registry, into which our secretary entered patient data, and queried the registry to identify patients who may benefit by enrolling in our arthritis self-management course. Costs (personnel time, attending ACCC meetings and sending out questionnaires) were borne by the Division of Rheumatology and the Department of Medicine.

### Outcomes

As shown in table 1, we achieved five of our seven *a priori* goals. Two of our absolute goals (total WOMAC score and average exercise time) were achieved with our baseline measures. While our baseline WOMAC score achieved the target level, we did not

**Table 1** Achieving outcome goals

Outcome goal	Pre-ACCC (n = 102)	Post-ACCC (n = 53)	Goal met
WOMAC <1000 mm	933 mm	844 mm	Yes
WOMAC improved by 20%		Improved by 5.5%	No
Self-efficacy score >50 mm	45.4 mm	54.8 mm	Yes
Self-efficacy score improved by 20%		Improved by 20.7%	Yes
Average exercise time >90 min per week	93 min	98 mm	Yes
More than 40% of patients exercising aerobically >60 min per week	36.5%	41.5%	Yes
Documented self-management goals in >60% of patients	0	41%	No

achieve our target improvement of 20%. We also did not achieve our goal of documented self-management goals in 60% of our patients. We achieved all of our self-efficacy and exercise goals.

When comparing patients before and after intervention, we found no significant change in WOMAC scores or in any of its domains (table 2). While we similarly found no significant change in the amount of exercise, we found significant improvement in self-efficacy scores, from 45.4 (23.9) mm pre-ACCC to 54.8 (24.2) mm post-ACCC ( $p=0.02$ ).

The WOMAC questions that showed the largest changes were: (1) What degree of difficulty do you have with going shopping? (SD, 7.9 mm); (2) What degree of difficulty do you have with taking off socks/stockings? (SD, 6.7 mm) and (3) How much pain do you have at night while in bed? (SD, 6.5 mm). None of these changes, however, were statistically significant (data not shown).

## DISCUSSION

### Summary

With the partial introduction of the chronic care model into our academic rheumatology clinic, we found significantly increased self-efficacy scores reported by our patients with osteoarthritis. While we did not find a significant increase in our WOMAC scores or amount of exercise, it was reassuring that our patients nevertheless had already achieved the mean target goals that were established before the introduction of the chronic care model. Qualitatively, the chronic care model was well received by patients, physicians, nurses, ancillary care providers and administrators.

### Context

While most of the work on the chronic care model has centred on care for patients with diabetes in primary care settings, there has been prior work done on components of the chronic care model in patients with osteoarthritis. For patients with osteo-

arthritis, the best studied is the arthritis self-management course that we also gave twice during the collaborative. More generally, the Cochrane Collaborative reviewed 17 trials in which self-management education programmes by lay leaders were used in 7446 patients with a variety of chronic conditions.<sup>19</sup> They found small but statistically significant improvements in health status (such as pain and disability), health behaviour (such as aerobic exercise and cognitive symptom management) and self-efficacy. They found no difference in healthcare use, however.

### Interpretation

Given the fact that we made our most significant improvements in patient self-management during the development of the chronic care model, it is not surprising that our patients had significant improvement in their self-efficacy scores. Qualitatively, self-management was well accepted by patients and healthcare providers. In particular, since this is not a randomised clinical trial, it is important to remember that our results, positive and negative, could be explained by factors other than the intervention.

### Limitations

There are a number of limitations in our study that would reduce our ability to detect significant improvements in WOMAC scores or exercise times in our patients, if they were indeed present, after the introduction of the chronic care model. First, we did not implement the full chronic care model, and other studies have demonstrated that the full model is more effective than its separate components.<sup>20</sup> Second, given our sample size and the number of patients who were actually exposed to the chronic care model during this time, our project had only sufficient power to detect sizeable improvements in our measures; smaller but clinically significant improvements may not be statistically significant for our sample size. In the case of WOMAC, for example, we could only detect an effect that would exceed what is typically achieved in patients who start a non-steroidal anti-inflammatory medication. Third, we likely had a ceiling effect with our patients. Our patients had already undergone a number of therapeutic interventions, to include pharmacologic interventions and recommendations for exercise, which may explain why their mean baseline values already exceeded our predetermined absolute goals. Indeed, our baseline WOMAC scores were better than post-treatment WOMAC scores seen in many clinical trials—likely a reflection of our prior interventions.<sup>21–25</sup> It is possible that a beneficial effect of the chronic care model would be more easily demonstrable in patients newly diagnosed as having osteoarthritis.

### Conclusions

Our study demonstrates improvement in some, but not all, measures after a partial introduction of the chronic care model into an academic subspecialty clinic. Sustainability has been mixed. For instance, despite some early concerns that motivational interviewing would be too time-consuming, in practice this was not a significant problem and was particularly well received by providers and patients. It is still used with good effect, but with less frequency than during the ACCC period. What we have not sustained is the 2-week call-backs to track whether patients achieved their goals.

Using WOMAC during the clinic visit was doable and helped us identify problems in individual patients; however, asking the full set of questions is not sustainable because of clinical time constraints. Our assessment, however, is that the three questions that had the largest change after the introduction of the

**Table 2** Outcome measures

Outcome measure	Pre-ACCC (n = 102)	Post-ACCC (n = 53)	p Value
WOMAC (mm)			
Total	933 (539)	884 (533)	0.59
Pain	207 (111)	189 (110)	0.39
Stiffness	94 (52)	95 (49)	0.87
Function	698 (391)	649 (396)	0.49
Self-efficacy (mm)	45.4 (23.9)	54.8 (24.2)	0.02
Exercise (minutes per week)			
Total	93 (110)	98 (95)	0.78
Stretching	26 (42)	25 (38)	0.80
Aerobic	67 (83)	73 (84)	0.63

Values are mean (SD).

chronic care model would also capture the most useful information for clinical use. These questions cover three domains that are also felt to be important qualitatively: (1) How much pain do you have at night while in bed? (pain domain); (2) What degree of difficulty do you have with taking off socks/stockings? (functional domain) and (3) What degree of difficulty do you have with going shopping? (functional and social domains).

More than any particular intervention, however, our assessment is that our most significant change was to implement weekly meetings to discuss quality improvement and to be willing to test small-scale changes in a Plan, Do, Study, Act (PDSA) format. In addition to working on osteoarthritis, our practice has decided to use the PDSA format and the chronic care model for quality improvement projects in osteoporosis and rheumatoid arthritis.

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**Competing interests** None.

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