Medical Care Output and Productivity

Edited by **David M. Cutler and Ernst R. Berndt**

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Hedonic Analysis of Arthritis Drugs

Iain M. Cockburn and Aslam H. Anis

11.1 Introduction

This study examines the market for a group of drugs used to treat rheumatoid arthritis (RA) during the period 1980–92. Rheumatoid arthritis is a painful, debilitating, and progressive disease which affects millions of people worldwide, with very substantial effects on health and the economy. Regrettably, in contrast to some other major health problems such as heart disease, depression, ulcers, and bacterial infections, this is an area where therapeutic innovations have thus far had comparatively little impact on physicians' ability to reverse the disease. RA currently has no "cure" and the effectiveness of available treatments is limited. Compared to other drug classes the rate of new product introductions has been slow, and, at the time of writing, there have been no breakthroughs of the same order of significance as the discovery and development of SSRIs for treatment of depression, H_2 antagonists for ulcers, or ACE inhibitors for hypertension.

Nonetheless, the market for RA drugs is far from static. There have been significant changes over the past fifteen years in the market shares of competing products. Interestingly, relative prices have changed relatively

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little, and these market dynamics appear to be driven primarily by other factors. Here we focus on the role played by publication of clinical research findings. In contrast to traditional hedonic analysis where product characteristics are fixed but new products incorporating different quality levels appear over time, here the set of products is fixed while their measured quality changes over time. New information about the relative efficacy and toxicity of existing drugs accumulates through the publication of clinical trial results, and this information appears to have had a significant impact on the pattern of drug use.

A number of clinical aspects of rheumatoid arthritis are important structural features of the market for drugs used to treat the disease. We therefore begin with a brief review of the nature of RA and its treatment. We then discuss issues related to the measurement of the relative efficacy and toxicity of drug treatments for RA. Next, we present economic data on the market for a specific set of drugs used in the treatment of severe RA and consider them in the context of models of demand for differentiated products. We then report the results of estimating price and market share equations. In the concluding section, we suggest alternative approaches that may provide some additional insight, in particular analysis of the role of advertising and promotional expenditures.

11.2 Rheumatoid Arthritis

RA is one of the most prevalent diseases affecting joints and connective tissue. RA is an autoimmune disease: For reasons that are still poorly understood, the body's immune system begins to malfunction, attacking healthy tissue. Like related conditions such as lupus erythematosus, psoriatic arthritis, and scleroderma, the disease is *systemic* and *chronic*. Tissues are affected throughout the body, and although some patients experience prolonged periods of remission, most are affected for a lifetime.[1]

RA is characterized by inflammation of the synovium (a membrane which lines the joints) resulting in stiffness, pain, warmth, and swelling in joints. As the disease progresses, inflamed cells release an enzyme which erodes surrounding bone and cartilage, resulting in increased pain, loss of movement, and eventually destruction of the joint.[2] Patients experience greater and greater pain and loss of mobility. Fatigue often accompanies the "classical" joint symptoms. In late stages of the disease, skin and vascular problems (such as leg ulcers) may develop, along with damage to eyes and nerves and inflammation of lymph nodes, heart, and lungs.

1. Brewerton (1994) gives a comprehensive and readable overview of arthritis and its treatment. See also Cash and Klippel (1994), Wolfe (1990) and Steinman (1993).

2. Establishing a conclusive diagnosis of RA can be difficult, especially in its early stages, since it shares many symptoms with other autoimmune diseases. Note that RA should not be confused with osteoarthritis, an even more prevalent disease, which has a distinct clinical profile and disease process.

Research into the fundamental causes of the disease has inconclusively investigated many factors ranging from endocrine disorders to nutrition, geography, psychological conditions, and occupational hazards. Current thinking suggests that some infectious agent may trigger the damaging autoimmune response in persons who have a genetic predisposition. However, while a specific genetic marker (HLA-DR4) has been found to be present in a large fraction of RA patients, not all patients have the marker, and only a small fraction of people who have the marker go on to develop RA. Neither has the proposed infectious agent (possibly an unknown virus) been identified, though various other arthritic and rheumatic conditions have been associated with infection by a number of organisms such as *borellia* (the Lyme disease spirochete) and some streptococcal bacteria.

RA affects between 1 and 2 percent of the population of OECD countries. Women are two to three times more likely than men to develop disease. In adults the onset of the disease is typically between ages forty and sixty, though significant numbers of people experience severe symptoms in their thirties and forties, and the disease can occur at any age. In some patients deterioration is rapid, while in others the disease progresses very slowly. Once affected, the outlook for most patients is poor. In many cases patients experience temporary relief of symptoms, but only very few have a complete remission of the disease. Chronic severe pain and restricted mobility have a very significant impact on the quality of life of RA patients. Even with aggressive drug therapy, 7 percent of RA patients are significantly disabled within five years, and 50 percent are too disabled to work ten years after the onset of the disease. In addition to the morbidity effects of RA, Pincus and Callahan (1993) estimate that life expectancy is reduced among patients with RA by at least ten years.

By any measure the total burden of the disease is substantial. Quality-adjusted life years (QALYs) lost may be as many as seven million per year in the United States.[3] The combination of severe health impact, widespread incidence, and relatively early onset mean that very substantial economic losses are attributable to RA. For example, in 1997 the Arthritis Foundation reported that musculoskeletal conditions such as RA cost the U.S. economy approximately $65 billion per year in direct expenses and lost output.

11.2.1 Treatment Options for Rheumatoid Arthritis

Over the course of the disease, medical treatment of RA patients consists of physical intervention and drug therapy. Counseling or othe. psy-

3. In Canada, RA occurs in approximately 1 percent of the population, or about 270,000 people. It has been estimated that the average Canadian has significant pain and/or disability from arthritis resulting in an average of 2.5 quality-adjusted life years (QALYs) lost. See Torrance and Feeny (1989) and Reynolds et al. (1993). Since RA tends to be more frequently disabling than osteoarthritis, a conservative estimate of the total disability among Canadians from RA would hence be 675,000 QALYs lost.

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