

Radioiodine Therapy of Hyperthyroidism: Socioeconomic Considerations

Stating that the practice of medicine encompasses more than somatic scientism may be trite, but is still appropriate. The events which precede, or alter, illness are difficult to determine; this makes the search for their occurrence even more challenging. There has been considerable speculation about the potential nervous stimuli which may initiate the process leading to hyperthyroidism. In this issue of the Journal, Stewart and co-workers have reported an analysis of a later step in the handling of such patients, namely their response to radioiodine therapy (1). The conclusion that patients with preceding stress have a potentiated incidence of hypothyroidism suggests an "overresponse" to a standard therapeutic regime. It is now recognized that the nervous system has ample branchings within parts of the lymphoreticular system. There is thus a potential anatomic basis for exploring the effects of the nervous system on "auto-immune diseases."

Iodine-131 (^{131}I) is often considered the treatment of choice for the majority of patients with hyperthyroidism (2). However, the literature also contains references to the use of anti-thyroid and related drugs as the primary treatment of the hyperthyroid state (3). An aspect of the problem that is often overlooked is the cost of each type of therapy. In order to discuss the "cost effectiveness" of these treatments, we have investigated the actual price of medications from a local pharmacy, charges for laboratory work, and the average billing for office visits and radioiodine therapy in this region.

Assuming two populations of 100 hyperthyroid patients, with average age 35 yr and a life expectancy of 40 additional years, the following analysis can be made.

Treatment with radioiodine

The patients will be administered a dose of radioiodine (^{131}I sodium iodide) to produce hypothyroidism. Each will then be given replacement thyroid hormone. Two visits with their physician are assumed to be needed to adjust the dose of replacement thyroid medication. Cost estimates are as follows.

Each radioiodine therapy	\$ 300.00
Thyroid medication (\$30 per yr \times 40 yr)	1,200.00
Two visits to physician (2 \times \$30)	60.00
Per case:	<u>\$1,560.00</u>

For the 100 cases, the total cost would be \$156,000. To this analysis, we should add two further considerations. First, the price of thyroid medication may increase in the future. Second, despite use of a large dose of radioiodine, one or more of the patients might require retreatment.

Treatment with antithyroid drugs

The 100 patients are placed on therapy with propylthiouracil (PTU). To rule out a blood dyscrasia, they have a physician visit and white blood cell count initially and then each 2 mo (for a total of seven visits). We recognize that some centers might handle this differently, instructing the patient to return if symptoms appear. The cost estimate includes the following.

PTU for 1 year	\$151.50
Physician visit & white blood cell count (\$30 + \$4.75) \times 7	243.25
One thyroid hormone determination at the end of PTU therapy	20.50
Per case:	<u>\$415.25</u>

For the 100 cases on PTU, the cost up to this point would be \$41,525. A certain number of the patients will still be hyperthyroid after a year of treatment with PTU. If there were 50 of the 100 individuals remaining hyperthyroid, they would be treated with radioiodine to render them hypothyroid.

Radioiodine therapy	\$ 300.00
Thyroid medication (\$30/yr \times 39 yr)	1,170.00
Two visits to physician (\$30 \times 2)	60.00
	<u>\$1,530.00</u>

For the 50 cases, this would cost \$76,500. There are, as with those initially treated with radioiodine, concerns about the possible increased cost of thyroid hormone in the future as well as the possible retreatment of one or more patients with radioiodine. The sum total for the 100 cases initially treated with PTU is thus \$41,525 + \$76,500 = \$118,025.00. For each of the 100 cases, the average cost would be \$1,180.25. We can compare the final average costs as follows.

Direct radioiodine therapy	\$1,560.00
Antithyroid medication, then radioiodine therapy for noncured individuals	\$1,180.25

To this must be added the following, for the patients who had the PTU therapy.

1. Consideration must be given to the cost of prolonging the time until hyperthyroidism is cured. This ranges from the inconvenience of having to take PTU several times a day, through time lost from work and the effects of exacerbations of hyperthyroidism (4). There are problems with compliance when any prolonged therapy is undertaken. It is probable that some of the "failures" of PTU therapy represent lack of taking the medication on a regular schedule.

2. Of concern is the possible development of complications when patients are taking PTU. Even if infrequent, some of these "side effects" can be economically very significant. A case of dermatitis or agranulocytosis could have an enormous impact in terms of loss of employment or in medical dollars consumed.

We have now to consider therapy with small doses of radioiodine, aimed at avoiding hypothyroidism. It has been demonstrated that such patients are hyperthyroid for longer periods posttherapy and are "at risk" for developing hypothyroidism indefinitely after their treatment. The costs of monitoring such patients therefore are greatly increased. The strategy of deliberately producing hypothyroidism and utilizing thyroid hormone is probably more cost effective. A confounding factor is the heterogeneity of the immune response in hyperthyroidism (5). It has been shown that PTU has extrathyroidal effects, including actions on the immune system (6). Thus PTU may be acting on both the thyroid and the immune response, while radioiodine is potentially only acting on the thyroid gland.

As questions of "cost effectiveness" assume a bigger concentration in decision making, the physician in nuclear medicine will have to ponder more than the "pure" science of his/her field. Management decisions will require socioeconomic input. There is a need for criteria to help preselect patients who will better respond to medications. As we attempt to reduce costs while not adversely affecting the outcome of patient treatment, there is a need, now, to conduct further investigations of this sort and to train physicians in the socioeconomics of the practice of nuclear medicine.

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ACKNOWLEDGMENT

This work was supported by USPHS CA 17802 from the National Cancer Institute.

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