Cost Effectiveness of Screening for Subclinical Hypothyroidism in the Elderly
A Decision-Analytical Model

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Abstract

Objective: The value of early detection of subclinical hypothyroidism is the object of a long lasting debate. In this study, we assessed the cost effectiveness of a policy based upon screening for this condition through thyroid-stimulating hormone (TSH), triiodothyronine (T3) and thyroxine (T4) serum level measurements in the elderly.

Design: A Markov model was developed where hypothetical elderly patients (i.e. ≥60 years of age), who attend general practitioner (GP) clinics for periodic health examinations in a primary-care setting in Italy, made transitions between health states at annual intervals for 15 years, thus allowing an estimation of the average cost and of the expected average number of quality-adjusted life-years (QALY). In this model, patients were assumed to be seen at annual intervals by GPs for clinical examination and serum cholesterol level measurement, to which a TSH, T3 and T4 serum measurement was added. In the base-case analysis, TSH was measured every 5 years and, if abnormal, T3 and T4 serum levels were also determined. Costs were analysed from the perspective of the Italian National Health Service (NHS) and reflected 1996 values.

Main outcome measures and results: In the base-case analysis, the additional benefit estimated from testing a female population for subclinical hypothyroidism every 5 years was 0.36 QALY, with a cost per QALY gained of 668 298 lire (L). The expected gain in QALY for men was 0.20 and the cost per QALY gained was L270 322. In general, the best cost-effectiveness profile was seen with testing every 3 years.

Results were sensitive to variations in the prevalence of disease among the target population, both in men and women.

Conclusions: Our study indicates that a screening policy for subclinical hypothyroidism in the elderly population could be worthwhile. However, as the costs could be significant when applied at the population level, this policy deserves further assessment through well-designed primary research.
Introduction

Subclinical hypothyroidism is defined as an elevated serum thyroid-stimulating hormone (TSH) level, with serum-free thyroxine (T₄) still within the normal range.[1,2] This condition, which has been shown to be relatively common among the elderly and women, is not usually associated with major symptoms or disabilities[3,4] and can be due to chronic autoimmune thyroiditis (the most common cause), or to iatrogenic hypothyroidism (as a consequence of radioiodine treatment or following head or neck surgery and/or radiation). In the former case, subclinical hypothyroidism is related to the presence of antithyroid antibodies.

Despite the relatively benign nature of the disease, it has been documented that patients with laboratory signs of mild thyroid failure are bound to progress to overt hypothyroidism at a rate ranging from 5 to 26% per year.[5-8]

The value of screening the clinically euthyroid population through periodic measurement of TSH, triiodothyronine (T₃) and T₄ serum levels is the object of a long lasting debate in the literature.[2,9-14] Advocates of screening support the view that it allows early identification and treatment, thereby preventing the occurrence of overt hypothyroidism. Early identification and treatment of subclinical hypothyroidism is also assumed to have an impact on reducing total serum cholesterol level, which is often elevated in these patients.[15-17]

The mild nature of the disease, its low incidence rate and the questionable benefit from early thyroxine (levothyroxine) treatment are major arguments against screening and supporting the view that, at best, a policy of systematic case-finding could be a reasonable option.[18]

In principle, screening could indeed be considered in the elderly population in a primary-care setting. As the prevalence and incidence of subclinical hypothyroidism are known to be higher among the elderly and we can assume that they visit their general practitioners (GPs) regularly for a variety of reasons, this could be an area where the benefit (if any) of screening for this condition is more likely to be evident.

In this article, we report on a decision-analytical model aimed at assessing the cost effectiveness of screening for subclinical hypothyroidism in the elderly (i.e. ≥60 years of age) who attend clinics for periodic health examinations in a primary-care setting. In particular, the assumption made was that TSH, T₃ and T₄ serum levels were measured in patients presenting spontaneously to their doctors for other unrelated reasons.

Materials and Methods

A Markov model[19] was developed to estimate the benefit – expressed in the number of quality-adjusted life-years (QALYs) gained – expected from testing for subclinical hypothyroidism versus no testing among a hypothetical cohort of elderly patients in a primary-care setting. With this decision-analytical technique, hypothetical patients make transitions between health states at annual intervals. The states can be either absorbing (patients in such states cannot pass to another state, e.g. death) or transient (patients in such states will pass to other defined states according to transition probabilities), and each state is associated with a cost, a utility [on a scale from 0 (death) to 1 (perfect health)] and a set of transition probabilities to other possible states.

Therefore, the model allows an estimation to be made of the average cost and average number of QALYs for each strategy under examination, assigning costs and quality-of-life (QOL) adjustments for time spent in each state.

Structure and Assumptions of the Model

The structure of the model and the transition probabilities applied are described in figure 1 and table I, respectively. Starting from a euthyroid state at the age of 60 years, hypothetical patients can make annual transitions over time through 6 other states (fig. 1). Not all the patients at the beginning of the process were assumed to be in the euthyroid state because a proportion of them represented the baseline prevalence of the disease. From an unpublished Italian survey on the prevalence of subclinical hypothyroidism, this proportion was estimated.