EL4. Cost Effectiveness of PET in Oncology

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Despite major advances in diagnostic radiology and nuclear medicine in the past two decades, the pretreatment diagnostic staging of many common malignant tumors is still inadequate. This results in unnecessary treatment, including major surgery. For example, patients presenting with solitary pulmonary nodule, usually require thoracotomy for a definitive diagnosis. However, in the United States only about 50% of these lesions are actually malignant. Moreover, only about 25% of lung cancer patients are considered candidates for surgery. This group, however, perhaps as many as half will have undiscovered malignancy which is discovered only at the time of surgery. Also, in patients with esophageal cancers, of those patients considered surgical candidates, as many as 1/3 to 1/2 will recur with tumor within a few months after surgery. Among patients with recurrent colorectal cancer, distinguishing which patients might benefit from surgery resection with conventional diagnostic techniques is a significantly difficult clinical problem, because only about 1/4 of these patients can actually be cured. The remainder run the risk of being treated with unnecessary expensive surgeries that result in considerable morbidity. In other instances, significant surgery is performed for the purposes of better treatment planning. For example, in the case of breast cancer, which is the most common malignancy among women, an axillary lymph node dissection is done to assess the extent of lymph node involvement as a way to plan which patients will benefit from more aggressive adjuvant treatments. This technique has significant complications, including postoperative seroma formation, arm edema, breast edema, nerve injury, and shoulder dysfunction. Improved methods of diagnosing the extent of disease in the axillary lymph nodes would provide very useful clinical information if these diagnostic methods as sufficiently accurate.

With this in mind, a number of retrospective reviews to evaluate the cost effectiveness of PET in oncology have been proposed by the Institute of Clinical PET in the United States. These include: 1) axillary lymph node involvement in breast cancer; 2) the clinical and economic implication of PET in the assessment of colorectal cancer recurrence; and 3) the clinical and economic implications of PET in the assessment of solitary pulmonary nodules. The results of a retrospective analysis has been published for each of these three studies. The range of savings with PET is predicted to be very significant. For example it is predicted that in the U.S., as much as $116,000,000 could be saved per year from the appropriate substitution of PET for a surgical axillary lymph node dissection. The retrospective analysis was based on literature values for sensitivity and specificity of PET detection in the axillary lymph node group. In regard to colorectal cancer, total annual savings of up to $671,000,000 could be anticipated if PET were substituted when appropriate for exploratory laparotomy in patients with suspected resectable recurrence. In regard to solitary pulmonary nodules, savings of up to $230,000,000 could be achieved if PET was used to distinguish benign from malignant tumor, in order to avoid thoracotomy for those benign infectious conditions which could be treated by other means.

Based on these encouraging initial results, prospective studies are now under way. Data is available from the solitary pulmonary nodule task force which confirms the original sensitivities and specificities upon which the economic analysis has been based. Additional studies have started in colorectal and in the breast cancer study groups. Other proposed studies just beginning include an assessment of PET in the evaluation of mediastinal involvement with lung cancer, and the value of PET in malignant melanoma.

In summary, cancer treatments are toxic or carry significant mortality and morbidity, oncology appears to be a fruitful place for PET to show important cost effective advantages when added to the diagnostic evaluation of patients. The basic strategies is to avoid costly but ineffective procedures by proper staging and diagnosis. Thus by taking advantage of the power of positron emission tomography for detecting tumors, the patient management can be made maximally efficient.