accurately delivered with steep dose gradients and lower doses to areas deemed to be at lower risk and minimal dose to other organs. The ability of IMRT to deliver doses with a high degree of conformality has led to interest in the use of IMRT to successfully eliminate sites of tumour involvement whilst sparing normal tissues [10, 11]. Appropriate patient selection and accurate target definition are critical to the success of attempts to spare normal tissues, with the potential for the risk of increased nodal recurrence associated with the steep dose gradients in IMRT [12]. Indeed, quality of radiotherapy has been identified as a major factor in determining outcome of nonsurgical treatment for HNSCC [13]. Reliable localisation of sites of tumour involvement is essential to the success of treatment protocols aimed at limiting late tissue toxicity.

The radiation oncologist frequently has to make difficult judgements based on anatomical imaging to include or otherwise equivocal lymph nodes in the high-dose target volume. Functional imaging techniques offer the potential to provide complementary information to anatomical imaging with CT and MRI to aid in these decisions. ^{18}Fluoride-fluorodeoxyglucose positron emission tomography (FDG PET) is a widely used functional imaging technique in oncology. Tumour cells exhibit differential glucose uptake (the "Warburg effect") as a basis of the identification of cancer [14]. Increased glucose uptake by nonmalignant tissue, commonly in the presence of infection or inflammation, leads to false positive results. Integrated PET-CT, which combines the complementary techniques of PET and CT in a single study, offers the potential to improve upon the inherent size limitations in terms of accurate lymph node identification with MRI and CT, not being limited by formal size criteria [15]. Limitations of PET include issues with regard to scanner resolution, partial volume effects, and the need for accurate coregistration with the CT scan. FDG PET-CT imaging in HNSCC has multiple potential applications including staging, radiotherapy planning, treatment adaptation, response assessment, and recurrence detection [9, 15, 16]. The site of recurrence has been shown to correlate with the baseline sites of FDG-avid disease [17]. FDG PET-CT has been demonstrated to be able to identify metastatic head and neck malignancy in cases where MRI and CT fail to demonstrate disease [18, 19]. The use of FDG PET-CT for staging HNSCC (other than in the setting of cervical lymph node metastases of unknown primary origin) remains controversial, with some authorities not recommending its use in routine staging [9], whilst others support the role of FDG PET-CT for staging locoregional and distant disease [20]. Some studies have suggested that the addition of FDG PET-CT to conventional staging methods improves the accuracy of nodal assessment [21–23]. At the heart of any debate regarding the utility of FDG PET-CT in addition to conventional anatomical imaging is the assessment of the potential impact of the investigation upon patient management. This impact may vary depending upon the patient population, tumour stage, and treatment under consideration.

The aim of this study was to assess the utility of FDG PET-CT as an adjunct to conventional staging methods in patients with locally advanced HNSCC due to undergo primary nonsurgical treatment. The value of FDG PET-CT on identification of levels of nodal involvement was determined to assess whether FDG PET-CT can influence process of defining the radiotherapy target volume.

2. Methods

2.1. Inclusion Criteria. Formal institutional review board approval was waived for this retrospective study. Consecutive patients between August 2008 and April 2011 who underwent a FDG PET-CT scan for head and neck cancer were obtained from an institutional database. Electronic case notes were used to identify patients who fulfilled the eligibility criteria for the study.

Eligible patients fulfilled all of the following criteria.

(1) Histologically confirmed squamous cell carcinoma of the oropharynx, oral cavity, hypopharynx, larynx, or paranasal sinuses.

(2) Nasopharyngeal cancer was excluded.

(3) Reviewed by specialist head and neck multidisciplinary meeting.

(4) TNM stage III or IV prior to FDG PET-CT scan.

(5) Decision made prior to FDG PET-CT to proceed with radical nonsurgical treatment (radiotherapy alone or chemoradiotherapy).

(6) FDG PET-CT performed prior to commencement of treatment for staging and/or as a baseline for future response assessment.

Baseline demographics were obtained from review of electronic case notes (Patient Pathway Manager, Leeds).

2.2. Staging. Conventional staging of locally advanced HNSCC was routinely performed by physical examination and neck palpation, fiberoptic endoscopy, examination under anaesthetic with biopsy where indicated, MRI or contrast-enhanced CT of head and neck region depending upon local protocols, and CT of the thorax. Results were routinely reviewed in a specialist head and neck MDT meeting and a TNM classification, based on all available clinical and radiological data, according to the American Joint Committee on Cancer TNM staging was assigned prior to the FDG PET-CT scan [24]. The method of conventional crosssectional imaging used for staging was recorded from radiology records.

2.3. CT Protocol. Contrast-enhanced CT was most commonly performed at our institution after referral from the regional oncology team on a 64-slice CT (Siemens Sensation, Siemens Healthcare, Erlangen, Germany) using a contiguous 1 mm reconstruction following a bolus of 100 mL of iodinated contrast or a 16-slice CT (Siemens 16, Siemens Healthcare) using the same acquisition parameters. The remaining contrast-enhanced CT scans were acquired at one of several referring hospitals on multislice CT systems using similar acquisition parameters.