Debate & Analysis

Early diagnosis of lung cancer:

is rapid access CT scanning the answer?

INTRODUCTION

Lung cancer remains the most common cause of cancer mortality in Britain. The 10-year survival rate from the disease is in the order of 5%, because the majority of patients present with advanced disease. Five-year survival rates for lung cancer in the UK from 2000–2014 are only 13%, lagging far behind most other EU nations. These findings, which were published in the *Lancet* in January 2018, have also been widely reported in many national newspapers.[1]

Currently, the US, Canada, and a number of European countries have implemented screening programmes for lung cancer with low-dose computed tomography (CT). Early diagnosis by low-dose CT (LDCT) screening has been shown to lead to a reduction in lung cancer mortality by 20% in the National Lung Screening Trial (NLST), a large randomised clinical trial from the US.[2] The final results from the Dutch-Belgian NELSON trial, the only other clinical study powered to detect a reduction in mortality, are still awaited.[3]

The Accelerate, Coordinate, Evaluate (ACE) Programme was funded by Cancer Research UK and Macmillan Cancer Support, and took place between 2014 and 2017. The final ACE report was published in April 2017.[4] Although not funding local screening programmes as such, the ACE programme was an important early diagnostic cancer initiative focused on evaluating a wide variety of innovations designed to either streamline diagnostic pathways or identify individuals at an increased risk of cancer.[5]

One strand of ACE was the lung cancer cluster, which aimed to explore the most effective and efficient pathways from referral to diagnosis, including access to CT arrangements.[4]

The findings showed several themes of how the diagnosis of lung cancer can be expedited from primary to secondary care. One is a proactive approach where individuals at high risk of lung cancer (mostly asymptomatic) can be referred for a CT scan directly if they have been assessed as being at high risk.

CT SCANNING FOR INDIVIDUALS AT HIGH RISK

The Manchester Lung Health Check Pilot scheme, funded by the Manchester CCGs, Macmillan Cancer Improvement Partnership, and Macmillan Cancer Support, was a novel community-based lung cancer screening project, transposing CT scanning into the community.[6] This pilot study sited mobile CT scanners in supermarket car parks within three deprived areas of Manchester. Patients aged between 55 and 74 years with a history of smoking were invited to attend for 'lung health checks' (LHCs) with immediate access to low-dose CT. Overall, 2541 people agreed to participate in the LHC, with 56% deemed to be high risk on the basis of the LHC questionnaire (6-year risk ≥1.51%). The overall prevalence of lung cancer in this cohort was 3%, with 46 cases being diagnosed. Most of the screen-detected cancers were early stage (80.4%), with 65% being suitable for surgical resection.

Lung cancer screening, however, is not without morbidity, particularly in terms of potential overinvestigation and overdiagnosis. In a study of lung cancer screening of veterans in the US, 2106 patients met the criteria for lung cancer screening with low-dose CT.[7] Over a 2-year period from 2013 to 2015, 1257 of these patients were diagnosed with pulmonary nodules, but only 31 (1.5% of the total screened) had lung cancer. The rate of false-positive test performance for lung cancer was 97.5% during the follow-up period. Additionally, 40.7% of patients screened with CT had incidental findings unrelated to lung cancer, the most common being emphysema, other pulmonary abnormalities, and coronary artery calcification. A sub-study in the NLST estimated an overdiagnosis rate of 18.5%.[2] Clearly, any screening programme for lung malignancy needs to provide clear and understandable information to patients about both the benefits and risks of screening. Overdiagnosis due to false-positive imaging, with associated patient anxiety and unnecessary investigation, remains a significant risk.

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STRAIGHT TO CT ESCALATION PATHWAYS FROM RADIOLOGY

Straight to CT pathways, in which the interpreter of an abnormal chest X-ray (CXR) triggers further investigation and onward referral, have been widely reported and have been efficient in reducing the time to a definitive diagnosis for the patient. About 60% of these abnormal reports are subsequently shown to have a diagnosed intrathoracic malignancy. This type of escalation pathway, although not diagnosing early disease, may increase the efficiency of lung cancer clinics, as the conversion factor (that is, percentage of patients subsequently confirmed to have lung cancer) improves. This decreases the time to first treatment and improves patient experience, as do both perception and actual length of the pathway.[8,9] However, it has never been demonstrated that these quality improvements translate to better curative rates. Dunican *et al* have shown that treatment rates of lung cancer are far higher using a dedicated rapid-access

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lung cancer service,[10] and this may provide surrogate evidence of overall better lung cancer survival. For lung cancer, it has been demonstrated that any shift to a lower stage at diagnosis brings substantial benefit in patients' 1-year survival. Patients had a modelled excess mortality ratio (MEMR) of 0.08 (95% confidence interval [CI] = 0.07 to 0.08) for stage 1, 0.16 (95% CI = 0.15 to 0.18) for stage 2, 0.39 (95% CI = 0.37 to 0.40) for stage 3, and 1.0 for stage 4.[11]

If patients have an understanding of what may happen in a straight to CT pathway, they can move to a CT after the initial CXR more rapidly, and may find the process less stressful. For example, the ACE initiative at Sussex and Surrey Healthcare NHS Trust consisted of a novel CXR referral form, which had integrated a patient information leaflet to enable a patient to be referred directly to CT. In this example, the CXR to CT time was reduced from 27 days to 14 days, the rate of patients having received a CT prior to outpatient appointment increased from 16% to 50%, and the 62-day performance target for lung cancer improved from 59% to 94%.[4]

DIRECT-ACCESS CT SCANNING

The ACE initiative also demonstrated that for patients who had a normal CXR result, but where the GP remained concerned about the possibility of lung cancer, a direct access to CT pathway outside the 2-week referral pathway could provide a timely, helpful alternative. For example, in Nottingham, a GP direct-access pathway to CT provided a method of direct access to a second diagnostic test if the CXR was normal but cancer risk was considered high. This led to a 2.4% lung cancer pick-up rate, with patient and GP satisfaction scores reported as 'very good'.

Any direct-access pathway needs to be seen in the context of the specific purpose it serves, for example, reassurance about the normality of findings for the patient and GP, or perhaps clarification of symptoms from an alternative non-malignant diagnosis. A direct access to CT pathway may potentially result in a longer wait for the patient for a CT scan than a 2-week outpatient referral route, but this may be appropriate if the patient's symptoms are thought to reflect a low risk of malignancy at clinical assessment.

The role of radiology and its interface with primary care is a core theme of the ACE lung cancer pathways. A variety of solutions and innovations are proposed as part of the ACE initiative. Underpinning this initiative is the need for high levels of communication between primary care and radiology departments, with collaborative working practices to ensure patients with symptoms of concern can access CT scanning and secondary care services efficiently.

Demetris Tsiakkis,
Specialist Registrar Clinical Radiology, Newcastle University Teaching Hospitals, Department of Radiology, Freeman Hospital, Newcastle upon Tyne.

Yitka Graham,
Senior Lecturer in Health Services and NHS Engagement and Honorary Specialty Lead, Health Services Research, City Hospitals Sunderland Foundation Trust, Sunderland; Faculty of Health Sciences and Wellbeing, University of Sunderland, Sunderland.

Julie Cox,
Consultant Radiologist, City Hospitals Sunderland Foundation Trust, Sunderland; Visiting Professor, University of Sunderland, Sunderland.

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ADDRESS FOR CORRESPONDENCE

Julie Cox
Department of Radiology, City Hospitals Sunderland Foundation Trust, Kayll Road, Sunderland SR4 7PT, UK.

Email: julie.cox@chsft.nhs.uk

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