

Case study

The role of advanced practitioner radiographers in the Nottingham nodule service

How workforce innovation improved lung nodule care



In Nottingham, the growing use of computed tomography (CT) imaging, a shortage of radiologists and new demands for volumetry-based nodule management were causing delays in nodule management and in the early detection of lung cancer. A decision to train advanced practitioner radiographers to assess nodules – an approach with no established template to follow – changed what the service could do, and for how many people.

Background

From guidelines to action: how Nottingham built a service from the ground up

Late-stage diagnoses in Nottinghamshire reflected a wider pattern of missed chances for earlier detection across England. Between 2012 and 2014, lung cancer incidence and mortality rates in the north and east of Nottingham were higher than the national average.¹ Prior to 2014, almost 40% of lung cancer diagnoses in England were made through the emergency department – a route that almost always meant late-stage diagnosis and poorer outcomes.²

Guidelines published by the British Thoracic Society (BTS) in 2015 raised the bar for nodule assessment, and in doing so created both a challenge and an opportunity for services like Nottingham's. The guidelines recommended that nodules should be assessed volumetrically* to ensure accurate prediction of the risk of malignancy and early identification of nodule growth.^{3,4} This is a more rigorous standard than the diameter measurements used elsewhere, but one that requires additional workforce capacity to deliver.

*Assessing nodules through volumetry calculates the volume of a nodule rather than just using a two-dimensional diameter measurement. This allows for a more accurate measurement and a better assessment of nodule growth during follow-up imaging.³

Clinicians at Nottingham University Hospitals NHS Trust (NUH) used a combination of the BTS guidelines, rising rates of late-stage lung cancer diagnoses, and the increasing number of CT images to make the case for a dedicated lung nodule service (LNS). CT imaging in emergency departments in Nottinghamshire doubled between 2011 and 2014, and the number of CT scans conducted nationally had increased by 10% year on year.^{5,6} In 2015, the lung nodule service was established.^{4,7}

Finding, tracking and managing nodules within the LNS

As demand for the service grew, it became clear that radiologists alone could not keep pace – and that the solution lay in a workforce model that had not been tried before. The LNS initially relied on respiratory clinicians and radiologists to review imaging and provide follow-up advice to referring clinicians.^{8,9} But as referrals increased, it became clear that the radiologists could not volumetrically assess every identified nodule within capacity constraints.^{4,7,9} Advanced practitioner diagnostic radiographers were introduced to carry out a first review of imaging with the service (*Box 1*).⁴ With no existing training programme for this role, radiographers were trained by shadowing radiologists, progressing to independent working after accurately reviewing 50 cases.^{4,7,10}

Box 1. Advanced practitioner radiographers

Diagnostic radiographers are allied healthcare professionals who are responsible for producing scans on a variety of imaging equipment.¹¹

Advanced practitioner radiographers have completed additional training that includes a postgraduate degree. They have greater autonomy in their care delivery and are responsible for complex decision-making.¹² They also provide recommendations on service and quality improvement.¹²

Box 2. Workflow within the LNS in Nottingham**Finding**

- Radiologists note an incidental pulmonary nodule (IPN) on a CT imaging report and may recommend referral to the LNS.¹³
- The clinician who ordered the initial imaging reviews the report and refers the patient to the service.^{4,13}
 - General practitioners (GPs) can also refer their patients if a previous nodule was not actioned, or a nodule was found on a GP Direct Access CT scan.^{4,10}
- **LNS administrators compile a weekly list of referred IPNs for radiographers to triage using the BTS guidelines.**^{4,14}
- LNS radiologists review and approve radiographer recommendations for follow-up care.^{4,8,9}

Tracking

- If triage results in a referral into the LNS, **people are informed via letter of their nodule** and their follow-up monitoring care.^{4,14}
- **People are tracked through the LNS by administrators using pre-existing software** embedded into the NUH's digital infrastructure.¹⁴
 - The software sends alerts when follow-up imaging has not been booked or patients have not attended appointments.¹⁴
 - LNS administrators phone patients directly to ensure adherence to follow-up recommendations.¹⁴

Managing

- Incorrect nodule referrals are reviewed and an addendum added, marked as rejected with an explanation based on the BTS guidelines; this is then sent back to the referring clinician by LNS administrators.¹³
- **People with high-risk nodules are referred directly to the NUH's lung cancer service** for follow-up diagnostics.⁴
- **People with medium-risk nodules are added to a list for discussion at the weekly multidisciplinary team meeting.**⁴
 - Radiographers prepare volumetry prior to the meeting to maximise time for clinical discussion.⁸
 - Radiologists review the patient list collated by radiographers before the meeting to ensure appropriate cases are included.⁹
 - Administrators add clinical data to the list – including referral route, medical history, tobacco use and performance status – to support multidisciplinary discussion.¹⁴ They also update the tracking software with meeting outcomes to inform follow-up care.^{4,14}
- Follow-up imaging is not referred to medical imaging services outside of the health system, to maintain imaging consistency.⁴
- Lung cancer diagnoses made through the LNS are **referred to the NUH's lung cancer service for treatment.**⁸

Crucial elements of the LNS

Ramping up with radiographers

Advanced practitioner radiographers have enabled the LNS to keep pace with the rising amount of imaging without compromising the quality of nodule assessment. The novel use of advanced practitioner radiographers has halved the time radiologists spend reporting on nodules, freeing up capacity for more complex cases.^{8 7 10} In other settings without this model, IPNs are typically only assessed using diameter measurements, which is less accurate than the volumetric assessments radiographers are trained to perform.⁸⁻¹⁰ Audits of the service have confirmed that advanced practitioner radiographers accurately assess nodules at the same rate as thoracic radiologists: in a 12-month period, only 6 in 249 reports made by radiographers were not agreed upon by the consultant radiologist.^{4 7 8 13} Radiographers also tend to remain in post longer than junior clinicians, who rotate out of the service more often – meaning radiographers help provide continuity and consistency in follow-up imaging, and instil confidence that previous assessments are reliable.^{4 7 14} The financial case is equally clear: a 2020 analysis found that using advanced practitioner radiographers (instead of radiologists) for initial reporting saves almost £7,500 per replacement annually.⁷

‘Our advanced practitioner radiographers are fundamental to reporting capacity, the quality of service we’re able to provide and, ultimately, the success of the service [as a whole].’

DR EMMA O'DOWD, CONSULTANT RESPIRATORY PHYSICIAN

Let the team lead the way

Attentive use of workforce feedback has driven the most significant improvements to the service, and created a team that feels genuinely invested in its success. The original LNS design required nodule measurements to be conducted during multidisciplinary meetings, which left little time for clinical discussion and created in long waiting times for patients.⁴ Feedback from staff resulted in a redesign; nodule volumes are now calculated before meeting, freeing up more time to discuss complex cases.⁸ A subsequent triage system reduced the number of inappropriate referrals and routine follow-up cases reaching the multidisciplinary meeting.^{7 13} Between April 2024 and February 2026, 31.5% of referrals received direct follow-up care and did not require discussion at the multidisciplinary meeting, reducing delays and the anxiety that comes with waiting.⁴ Acting quickly on staff feedback has produced a workforce that feels valued and a service that continues to improve.¹⁴

Communication is key

Structured communication, both within the LNS team and with patients, has been central to the service running effectively and patients staying engaged with their care.¹⁴ The LNS operates an open phone policy, allowing patients to contact the service directly at any time to ask questions, seek clarification or rearrange appointments.¹⁴ This open communication has also allowed for informal patient feedback to be generated. This has led, for example, to the patient outreach letter being updated as a direct result of patient input to improve clarity and easy comprehension.¹⁴ Within the LNS, an effective programme coordinator/administrator ensures rigorous systems are in place to escalate concerns and manage capacity across the team.⁹

Key takeaways

Leveraging the use of allied healthcare professionals, such as radiographers, helps increase IPN programme capacity to keep up with increasing imaging demands.

Establishing open communication systems with patients, including direct access to the service, supports person-centred care and improves adherence to follow-up.

The collection and swift action of workforce service feedback by health system leaders helps streamline services and implement quality improvement initiatives.

Embedding a programme coordinator/administrator to manage inter-programme communication helps increase capacity and ensure people are appropriately tracked and managed through an IPN programme.

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