

Establishing a Pulmonary Nodule Clinic Service for Early Diagnosis of Lung Cancer – Review of International Options and Considerations for Greece

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Abstract: Early diagnosis of lung cancer in pulmonary nodules identified by computed tomography (CT) may be critical in reducing the epidemiological burden of the disease, particularly in countries where such a burden is considerably high and risk factors for lung cancer very prevalent. The establishment and operation of pulmonary nodule clinics (PNCs), ie, multidisciplinary services that watch and evaluate nodules found through deliberate screening efforts or as incidental findings, is increasingly becoming a key tool to implement such early-intervention, cancer-risk management policies elsewhere in the world. This review aims to research and present in a structured manner findings from published sources on options and considerations for setting up a PNC in a country such as Greece. These refer to the type of services a PNC would provide to optimize diagnosis of suspect pulmonary nodules, its structure and organization, including processes, human resources and technology infrastructure, its target audience, ie, who would be eligible to use its services, and the expected outcomes of its operation, in terms of a set of key performance indicators. Our review also revealed critical key success factors that should be considered when designing the introduction of a PNC in a health care setting, including optimal referral pathways, aligned clinical decision making and patient preferences and participation/empowerment. Our findings may inform health care systems with a high lung cancer burden and no available PNC service on options and considerations before introducing such a service in their respective settings.

Keywords: pulmonary nodules, screening, risk-mitigation in lung cancer, health policy, health care services organization, decision making in health care

Introduction

Early diagnosis of lung cancer by computed tomography (CT) screening has been shown to reduce lung cancer mortality.^{1,2} The latest USPSTF Recommendations³ recommend annual screening for lung cancer with low dose CT (LDCT) in adults aged 50–80 years who have a 20 pack-year smoking history and currently smoke or have quit within the past 15 years. In Europe, there is no organized nationwide lung cancer screening (LCS). Opportunistic screening is available as a private service in some countries and in some cases is even covered by insurance.⁴ The European Cancer Organization Essential Requirements for Quality Cancer Care (ERQCC) underline that caution is required in defining the at-risk population, the CT method and how to deal with false-positive screening findings, which are mostly referred to in the literature as “key concerns” in developing a cost-effective LCS program.⁵

At the heart of such concerns lies the diagnosis and management of identified pulmonary nodules. The incidental finding of pulmonary nodules in asymptomatic individuals is an increasingly common dilemma. The accurate identification and characterization of malignant lung nodules and the development of clear algorithms for their management would permit cure of early-stage lung cancer while averting the increased morbidity, deterioration in quality of life and additional expenditure associated with more invasive disease.⁶ In the US, a health system report revealed that approximately 25–30% of all chest CT scans between 2006 and 2012 reported positive findings. This corresponds to an estimated 1.57 million new lung nodules identified annually – nonetheless, false-positives were also high, with only about 5% of identified nodules receiving a lung cancer diagnosis within 2 years.⁷

Overall, the introduction of new generation CT scanners and computer-aided detection systems increased the number of incidentally detected pulmonary nodules. Appropriate management strategies should now be employed to select and manage only those patients with, or at relative increased risk of, lung cancer while minimizing the burden of over-radiation in the affected population.⁸

This challenge is increasingly addressed through the establishment of multidisciplinary pulmonary nodule clinics (PNCs) that watch and evaluate nodules found through deliberate screening efforts or as incidental findings on radiography and scans done for other reasons.⁹ Although evidence-based guidelines exist for the management of these lesions, they are not in complete agreement and are often not followed, resulting in inconsistent management. A dedicated program or clinic for the management of lung nodules would enable the delivery of evidence-based, standardized care for patients with indeterminate nodules, and should include multidisciplinary care, state-of-the-art technology and expertise, and a patient navigation system to provide a user-friendly service for both patients and referring physicians.¹⁰

Setting up a PNC has been associated with achieving the following goals: (a) establishing a reliable screening program, (b) timely identification of incidental lung nodules, (c) integrated care between physicians, (d) streamlined referrals, and (e) a multidisciplinary virtual clinic with a coordinator of care across specialties.¹¹ Such a multidisciplinary PNC would ensure shorter times to diagnosis and avoidance of unnecessary tests and procedures, both of which impact negatively on clinical outcomes and overall health system costs.

In Greece, lung cancer is the number 1 cancer in terms of incidence and mortality, with a 5-year prevalence of 100.25 per 100,000 population.¹² Despite this high burden of lung cancer, there is currently no structured PNC established, either as a stand-alone center or a department or even a separate service within the national health system (NHS). Though guidance on management of lung nodules was recently reviewed,⁶ there is no organized, nationwide lung cancer screening nor a detailed structured process or protocol with regards to referring, assessing, and providing guidance for follow up on incidentally identified pulmonary nodules, that would help manage or mitigate risk of lung cancer through early intervention.

This review aims to present how PNCs are organized in other health care systems and how they provide their services, to inform a paradigm for development of such a service within the Greek NHS, as appropriate.

Methods

We conducted a targeted literature review to identify available literature on the following research questions:

- (a) What: what are the services that a PNC would provide to optimize diagnosis of suspect pulmonary nodules?
- (b) How: how would such a PNC be organized to provide such services? What would the organization of a PNC look like, including the definition of processes, algorithms and decision support tools, human resources and technology infrastructure that would be required to optimize its operation.
- (c) To whom: who would be eligible to use the services of the PNC?
- (d) With what outcomes: what are the expected key performance indicators of a PNC?

We organized our findings according to these headings, per country of reference. We then identified a series of key success factors that may impact on the outcome of such an endeavor, and which should be considered when designing such a health policy intervention.

Results

We identified two countries with well-established PNCs, namely, the USA and the UK.

PNCs are well-established in the US. This may be related to (a) the introduction of lung cancer screening across the US and (b) the reimbursement of LDCT and consultations to evaluate eligibility for LDCT as part of a screening program by Medicare.¹³ Furthermore, PNCs are increasingly being established and operate within the NHS in the UK. These operate mostly in a setting of virtual consultations that confirm a proposed treatment plan amongst a multidisciplinary team of experts and ensure there is a referral system to support patients with follow up, though primary responsibility for next steps sits with their general practitioner (GP) or referring physician. Findings for each of the two systems are presented below.

USA

What Services Do PNCs Provide?

PNCs operate as one-stop, integrated stops for the provision of lung cancer screening and pulmonary nodule management in high-risk individuals who may be referred to them by a physician or through self-referral. Services include lung cancer screening and tobacco smoking cessation support services, assessment of suspect pulmonary nodules by a multidisciplinary team of experts and definition of the optimal follow up and management approach to:

- (a) Expedite access to appropriate care,
- (b) Facilitate its seamless scheduling across several specialties and services, and
- (c) Improve compliance with proposed schedule and, ultimately, clinical outcomes.

How are These Services Provided by PNCs?

Across most PNCs, multidisciplinary teams consisting of radiation oncologists, medical oncologists, thoracic surgeons, thoracic radiologists, and pulmonologists, supported by specialized nurse coordinators and/or project managers, review cases scheduled for the day's clinic. The team develops a customized care plan, after reviewing patient scans and medical history. The team follows a standardized pathway for evaluation according to established quality assurance protocols and utilizes local or national registries to share knowledge within the hospital and across the health system, where possible.¹

To Whom are PNC Services Available?

A PNC accepts patients with imaging findings that meet the following criteria:¹⁴

- A lung cancer screening CT of the chest with a finding of Lung-RADS 4,
- Any pulmonary nodule (subsoid, mixed, or solid) 6 mm in diameter or greater found incidentally on a CT scan of the chest or a screen-detected nodule that warrants further evaluation in the opinion of the referring provider and a member of the PNC staff.

What May an Indicative Patient Pathway/Flow in a PNC Look Like?

An indicative patient flow through the PNC would normally include:¹⁴

- Coordination of incoming referrals, through either a referring physician or self-referral, by a specialized nurse or clinic coordinator.
- Scheduling of appointments – including for a face-to-face evaluation by a specialized nurse, where appropriate.
- Recording of medical history, most usually by phone before first appointment.
- Collection of past imaging and other tests, if not performed in the hospital and not available on patient electronic medical record (EMR), and uploading on relevant platforms to support decision making during team meetings.
- Early review of available medical evidence. Prior to the patient appointment, the team of specialists meets to review current and any prior scans as well as medical history. The team agrees on a plan that may include, for example, follow-up scans at a 3-, 6- or 12-month interval or discuss further diagnostic interventions. The plan is then matched to a specialist that can best carry out that plan and the patient comes in for an appointment with that specialist, during which it is critical to discuss options and promote patient involvement, access to information and transparency.⁵
- Smoking cessation counselling. All patients with a history of smoking are offered smoking cessation counseling either on-site or virtual.
- A follow-up plan, which is presented to the patient at the conclusion of the appointment.
- Implementation and/or monitoring of the follow-up plan. Patients are followed within the clinic until a final treatment plan is recommended (additional imaging, biopsy, surgery, radiation, or ablation) or it is agreed that imaging findings are stable, and the patient can return to routine follow up under the guidance of their referring physician.

A typical patient flow through the PNC is depicted in [Table 1](#), adapted from Roberts et al.¹⁴

How is PNC Performance Monitored?

KPIs used to monitor and report on PNC performance include time before first appointment, time to integrated care plan, number of clinic visits per patient, number of high-end x-rays (CT, MRI, PET) per patient, physician time per referral, number of patient slots freed up for every 100 pulmonary nodules referred.⁹ Equally, another set of metrics is frequently used to assess impact of PNC on improved patient clinical outcomes, such as:

- Stage shift to earlier lung cancer diagnosis,¹¹ ie, improvement in survival.²
- Treatment initiation within 30 days of first nodule detection.¹¹
- Percentage increase in screening rates and follow-up compliance.¹¹
- Percentage of patients who underwent interventions/surgical procedures and were found to have no evidence of malignancy on pathology.

UK

In the UK, within and across the NHS, lung nodules are managed according to NHS – National Cancer Program Guidance on Targeted Screening for Lung Cancer with Low Radiation Dose Computed Tomography,¹⁵ which underlines that the protocol for management of participants with significant findings should follow the British Thoracic Surgery (BTS) 2015 pulmonary nodule guidelines and National Institute for Health and Care Excellence (NICE) guidelines for the management of lung cancer. More specifically, the guidance refers to two multidisciplinary team (MDT) meetings which are relevant to lung nodule assessment and management: (a) the LDCT review MDT, which may also include the pulmonary nodule MDT. This team discusses the management of all findings other than those previously identified as requiring urgent referral. Pulmonary nodules may also be managed by or referred to a separate pulmonary nodule MDT (where available), and (b) the lung cancer MDT, which discusses the outcome of investigation of higher risk nodules and suspected lung cancer, and plans treatment.

Table 1 Patient Flow Through the PNC

Pre-Visit	
Step 1	Specialized nurse or navigator collects focused history, gathers images and communicates with referring medical doctor (MD)
Step 2	Multidisciplinary team reviews images, decides which MDs will see patient at first appointment
Initial Appointment	
Step 3	Designated MDs see patient
Step 4	Images are reviewed with patient
Step 5	MDs offer tobacco cessation program
Step 6	Recommended procedures are planned
Follow up	
Step 7	Navigator ensures scan follow up and scheduling of all procedures
Step 8	Navigator schedules all follow-up visits
Step 9	If no procedures need to be planned, patient consults with specialized nurse
Discharge	
Step 10	Criteria: no further scans are required, >2 years stable, future procedures are planned
Step 11	Navigator documents discharge in medical record and updates referring physician

Notes: Data from Roberts TJ, Lennes IT, Hawari S, et al. Integrated, multidisciplinary management of pulmonary nodules can streamline care and improve adherence to recommendations. *Oncologist*. 2020;25(5):431-437. doi: 10.1634/theoncologist.2019-0519.14

Across the NHS, all programs should have access to both MDTs. Particularly within the LDCT review MDT, all pulmonary nodules that are suspicious should be discussed; these include nodules that are ≥ 300 mm or ≥ 8 mm diameter with a $\geq 10\%$ chance of malignancy by Brock score (these usually require a PET-CT for further evaluation) and nodules that show significant growth after interval LDCT. Nodules that only require repeat CT as a further test are to be managed by radiologists directly and do not require discussion at MDTs. LDCT suspicious for lung cancer receive a consultant upgrade into the suspected lung cancer rapid assessment and diagnosis pathway. This is done immediately by the responsible radiologist, who passes the information to the responsible clinician, copying patient's GP. Incidental findings are reviewed by the LDCT review MDT and clear recommendations are made to the relevant clinicians and to the participant. The NHS Guidance¹⁵ requests a policy be agreed between the targeted lung cancer screening service and primary care about management of LDCT findings, including the referral process.

There may be some exceptions where the GP may be asked to undertake the initial follow-up scan. For example, if a small nodule is thought most likely to represent infection and, therefore, is likely to resolve at follow up, it is recommended that the GP performs the initial 3-month CT, to avoid the need for referral.¹⁶

Our review revealed two published organizational “paradigms” for PNCs within the NHS, namely, at the King's College Hospital in London and the Glenfield Hospital in Leicester. This may not be representative of the breadth of PNCs currently operating across the NHS, yet it is assumed that these published paradigms cover the outline of the structure and organization of services, ie, the patient pathway, in the PNCs in the UK. Each is presented in brief below.

King's College Hospital

What May an Indicative Patient Pathway/Flow in a PNC Look Like?

The King's set up¹⁷ comprises a nodule MDT, a virtual clinic, and a dedicated proforma referral system. There are no requirements for patients to physically attend clinics, only scans; instead, all referrals are received electronically from within the Trust, allied Trusts or GPs and are triaged by the service. Referrals are received from:

- Trust respiratory teams, inpatients/outpatients, etc.
- GPs
- Abnormal radiology tests requested by non-respiratory teams, eg, coronary angio, chest CT scans, PET CT, etc.
- Other trusts
- Non lung MDTs
- Smoking cessation services

Referrals are managed by the pulmonary nodule MDT coordinator and forwarded to a pulmonary nodule consultant to triage them. If referral is not appropriate, referrals are returned to referring teams and they in turn update the patient. If referral is appropriate, the pulmonary nodule service MDT decides on (a) discharge, (b) virtual clinic follow up, including any follow-up scans and plans, and (c) referral to lung or other MDT.¹⁸

Hardavella et al¹⁷ assessed this virtual clinical service for patients with incidental pulmonary nodules over 6 months, from January to July 2015. The novel pulmonary nodules service comprised an MDT led by a chest physician and thoracic radiologist, a linked “virtual” clinic and a dedicated electronic referral system. In 18 MDTs, 319 cases were discussed; 48.3% were new referrals. Based on the new British Thoracic Society guidelines, 40.3% of new patients were discharged following pulmonary nodules service review; each patient was reassured through the “virtual” clinic, without recourse to an outpatient appointment. Only 8.5% of patients had nodules suspicious for lung cancer and were referred to the main lung cancer MDT for further investigations and assessment.

Glenfield Hospital

The Nodule Virtual Clinic (NVC) in the Glenfield Hospital in Leicester¹⁹ has been operating for at least 5 years. The aim of this clinic is to review patients under follow up for surveillance of their pulmonary nodule(s) and plan ongoing management without the patient having to endure the inconvenience of face-to-face outpatient clinic attendance.

What May an Indicative Patient Pathway/Flow in a PNC Look Like?

During an initial virtual or face-to-face meeting, clinic staff discuss what nodules are and what possible pathologies may be

underlying them. This is followed by an assessment of clinical performance status, lung function (spirometry), co-morbidities and patient and family wishes regarding potential outcomes. For some patients with poor performance status and/or significant life-limiting co-morbidities, ongoing imaging and/or clinical follow up of their incidental nodule(s) may be inappropriate. In these cases, this is explained to the patient and relatives, and patients are discharged. For those with better performance status and functionality who would be suitable for potential intervention, eg, surgery or radical radiotherapy, should the nodule turn out to be malignant, the BTS guidelines are followed. Most patients prefer the convenience of the NVC.

The NVC is formally registered on the hospital information (HISS) system and patients are booked into the next clinic following their follow-up CT scan. It comprises one respiratory physician and one chest radiologist. The NVC discusses images from sequential CT scans, in the context of the previous clinical history, and agrees on a clinical management strategy. An outcome letter is generated, and appropriate imaging is requested and verified. A follow-up outcome is then generated on the HISS system. The outcome letter is sent to the (referring) GP and copied to the patient. The NVC has an average of 8–12 patients booked in per month and usually takes no more than one hour to complete. The NVC is funded through a local tariff agreed with NHS commissioners to support this innovative outpatient strategy.

Discussion

This review aims at identifying and structuring key elements of the organization, structure and services provided by a PNC to inform a decision on establishing such a service in countries with a high burden of lung cancer and no organized lung cancer screening programs, such as Greece. Overall, establishing a robust, adequately supported PNC in the NHS of a country with a high burden of lung cancer may critically impact the effectiveness and cost-effectiveness of future lung cancer screening efforts. A single health care system retrospective review by Melton et al,² which compared staging of cancers detected through a PNC and the rest of the general lung cancer population in a community health care system in Central Pennsylvania revealed significant earlier stages of lung cancer at diagnosis in the PNC, coupled with higher five-year survival rates for patients so diagnosed.

Furthermore, in the Massachusetts General Hospital PNC, one of the first PNCs to be established in the US, a recent review of the experience of over 1000 patients seen at the clinic revealed that nearly 20% of the high-risk population screened at the clinic were ultimately diagnosed with malignancy – and nearly 95% of them had NSCLC Stage I or Stage II disease at the time of diagnosis, whilst the median time interval before intervention for patients was less than 50 days.¹⁴ The rate of adherence to recommendations was approximately 95% across all patients seen at the clinic. Because of high rates of early-stage diagnoses, high adherence rates, and reduced intervals to initiation of treatment, few PNC patients were lost to follow-up or experienced unnecessary treatment delays.

Yet, the decision on the choice of elements of a potential PNC service is very much dependent on the overall structure of the health system, including patient pathways to care, distribution of service provision amongst the various levels of care provision (ie, primary, secondary, and tertiary) and decision-making processes within the NHS. The current review of the organization and operation of PNCs in the US and the UK revealed that the systems share a common set of services that are provided by the PNCs, including multidisciplinary assessment of imaging results and definition of a follow-up plan based on best practice or quality guidelines. Nonetheless, PNCs in the US appear to offer additional services, such as linkage to additional investigational or treatment services, that in the UK are reserved for other parts of the health care system outside the PNC. This is largely due to the structure of access to care in the NHS, which stipulates that the primary care professional (ie, the GP) is the main point of contact for the navigation of the patient within the health care system. This is illustrated in information provided by the NHS Liverpool Clinical Commissioning Group²⁰ to patients with pulmonary nodules. It highlights that any questions or concerns should be directed to the GP, who will be kept “fully informed about your progress”.

Table 2 provides a comparative overview of services provided by the PNCs in the US and the UK. As can be seen from Table 2, the greatest divergence in the organization of PNCs in the US and the UK is the communication of imaging results and follow-up recommendations to patients and primary care providers (referring physicians), which is mainly attributed to the difference in the structure of the health system. Nonetheless, ensuring timely communication of results and accelerated access to follow up tests is a critical component of successful implementation of PNCs, in terms of outcomes.

Table 2 Comparison of PNCs in the US and the UK

Parameter/Service	US	UK
Scheduling initial appointment	Coordinator/Nurse	Referral by Trust/GP
Medical history (call/virtual/F2F)	Call/virtual/F2F	Call/virtual/rarely F2F
Compilation of past imaging results	Coordinator/Nurse	Coordinator/Nurse
Review of results	MDT	MDT
Follow-up plan	MDT	MDT
Follow-up meeting with patient	Specialist	Nurse/letter to GP/patient
Tobacco cessation services	Within PNC	Referral to specialized service within NHS through GP
Scheduling of additional tests, etc.	Coordinator/Nurse	GP

The review also highlights some critical success factors that should be considered, when designing a PNC, if to ensure such a service achieves its goal, ie, increase early detection of lung cancer and improve outcomes for patients and the health system. These are related to (a) how patients reach PNCs and where they go after them, (b) how decisions are made within the PNC, and (c) whether patients' and carers' opinions are sought and respected. These success factors are described below.

(a) Well-defined referral system to ensure comprehensive and equitable access to care

Several health care systems, including the Greek NHS, are highly dependent on specialist opinion and care. Therefore, networks for primary care provision, including gatekeeping, navigation in the health system and follow up are notoriously underdeveloped.²¹ This understandably impacts the potential of a patient to access the PNC. In this light, it is essential that any PNC to be developed in such systems operates within a framework of well-defined processes for referrals to the PNC and from the PNC to other specialist care, eg, for additional scans, surgery, radiology, etc. As such, a PNC would operate as the center and the main coordination point for the navigation of the patient through the complex pathway that is management of suspect and/or confirmed lung cancer. Further to the previous point, one of the most critical parts of the successful organization and operation of a PNC is the ability to accelerate access to services for any identified/suspect nodules that require further investigation or care. It is critical that the implementation of a PNC is coupled with a referrals system/IT infrastructure and map that can provide real-time information on the availability of investigational or treatment facilities, to which the patient can be immediately referred. This one-stop point for management of follow up would be critical also in the context of the Greek NHS that lacks a strong and integrated primary health care system. It may equally be expected to increase compliance with follow-up guidance and thus ensure improved clinical outcomes.

(b) Optimizing clinical decision making within the PNC

Additionally, and particularly in health care systems where diagnostic and therapeutic protocols and a clear definition of roles and responsibilities in the patient management process may not be fully elaborated or embedded in daily clinical practice, potential decision-making conflicts should be addressed upfront, through a clear diagnosis and evaluation protocol that should be adhered to, both at the PNC level and beyond, within the NHS, to ensure standardization of management, audit of outcomes and, thus, quality assurance. There is an increasingly variable evaluation of lung nodules which may lead to divergent recommendations as to their management. A recent survey in an international cohort of radiologists found that the overall agreement for nodule composition was good but was lowest for part-solid nodules. Significant variation was noted, particularly in diameter measurement at important thresholds. Because of this,

radiologists are inconsistent in characterizing or measuring pulmonary nodules.²² This may be particularly relevant in Greece, where standards of care are underdeveloped and not officially audited in the NHS.²³

To address this divergence in opinion and optimize decision making within the PNC, artificial intelligence (AI)-powered decision support tools are used to increase the credibility of detection and minimize the risk and cost involved in follow-up procedures. With the growing use of chest CT, there is an increase in frequency of detection of suspect lung nodules. Noninvasive methods to distinguish malignant from benign nodules have the potential to decrease the clinical burden, risk, and cost involved in follow-up procedures on the large number of false-positive lesions. Recently, a study examined the benefit of including perinodular parenchymal features in machine learning (ML) tools for pulmonary nodule assessment. The study achieved an ML validation performance of 100% sensitivity and 96% specificity.²⁴

This approach was also recently applied in a screening program in Moscow, the first of its kind in Russia. This program of selective lung cancer screening with unique ultra-low-dose protocols (ultra-LDCT, effective dose of less than 1 mSv) proved the possibility of using neural networks (“artificial intelligence”) for quality control of screening results.²⁵

(c) Patient perceptions of care and knowledge

Patient participation in decision making is considered a critical issue for patient-centered care²⁶ and has been shown to impact on acceptance of care pathway and adherence to therapeutic guidance.²⁷ The association between medical decision-making roles and patients’ perceptions of their care while undergoing pulmonary nodule surveillance is a critical input in assuring quality of care and responsiveness to patient needs. Literature reveals a gap from what may be considered best practice in both areas. For example, a study in an academically affiliated Veterans Affairs hospital network in which 121 participants had 319 decision-making encounters assessed patients’ decision-making practices during longitudinal pulmonary nodule surveillance. Associations between decision making, shared decision making (SDM), and perceptions of care and knowledge were assessed using logistic regression and generalized estimating equations. Participants had a preferred role in 98% of encounters, and most desired an active role (shared or patient controlled). Role concordance was associated with greater satisfaction with medical care and higher quality of patient-reported care. Overall, most study participants preferred having active roles in decision making. The study underlined that patient participation in decision making may influence perceptions of care and clinicians may need to invest time and effort to improve patient knowledge and, ultimately, health outcomes.²⁸

Patient preferences have been shown to not be routinely taken into consideration in another survey using semi-structured qualitative interviews with 14 pulmonologists who managed patients with pulmonary nodules at four clinical sites.²⁹ The survey confirmed that, although pulmonologists routinely personalize their evaluation strategies according to individual patient’s risk–benefit tradeoffs, they may not consistently take patient preferences into account during the decision-making process. Indeed, other factors, including convenience, physician preferences, physician anxiety, mal-practice concerns, and physician experience, appear to drive decision making as much as, if not more than, patient preferences.

Additionally, patient participation in decision making may also impact on compliance with follow-up guidelines. In a retrospective cohort study of patients diagnosed with a pulmonary nodule between 2011 and 2014 at Boston Medical Center, patients with guideline-concordant follow up were compared to those with delayed or absent follow up in a primary analysis. In secondary analysis, the study compared those with any follow-up to those without follow-up, as well as the rate of guideline-concordant follow up in patients seen by a pulmonologist. Overall, 53.5% of patients received guideline-concordant follow up. Higher rates of guideline concordance were seen in patients with nodules 7–8 mm or >8 mm. A history of COPD and being seen by a pulmonologist were also associated with guideline concordance.³⁰

In Greece, patient participation in decision making regarding their health choices is notoriously low and dependent almost exclusively on physician initiative and/or personality.³¹ Should a PNC be introduced as a service in the NHS, it would be critical to its endorsement, adoption and uptake to not only inform patients of its existence, but also to encourage and empower them to participate in the choices around the management of their health, including through requesting a potential referral to the PNC.

Conclusion

This review identified key aspects of design, planning and implementation of a PNC, based on available literature and practice from the US and the UK. Given the lack of a strong and integrated primary care system, it may appear that the US model for the set up and organization of a PNC may be more appropriate for the Greek health care setting, as it currently stands. Nonetheless, when deciding on a prototype of a PNC in Greece, it would be critical to take into consideration additional key success factors, as indicated by the literature, such as the referrals process, the introduction of appropriate and adequate IT infrastructure to support acceleration of access to services and decision making, as well as processes and milestones for eliciting patient preferences and patient agreement to the proposed management pathway.

Disclosure

This review was funded by an unrestricted grant from Astra Zeneca. The funding body had no role in designing, performing, and reporting on this review. Kyriakos Souliotis reports personal fees from BMS, grants from Pfizer Hellas, grants from Sanofi Hellas, grants from Roche Hellas, outside the submitted work. The authors report no other conflicts of interest in this work.

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