

Brief Research Report

Dan Med J 2023;70(6):A12220769

Decision support to general practice in choice of chest imaging for patients with pulmonary symptoms

Lise Bolander Malvang¹, Christian Trolle², Torben Riis Rasmussen³ & Charlotte Hyldgaard²

1) Diagnostic Center Silkeborg, Department of Radiology, Regional Hospital Central Jutland, 2) Diagnostic Center Silkeborg, Department of Medicine, Regional Hospital Central Jutland, 3) Department of Respiratory Medicine and Allergy, Aarhus University Hospital, Denmark

Dan Med J 2023;70(6):A12220769

ABSTRACT

INTRODUCTION. The choice of chest imaging for patients with respiratory problems is based on risk profile and symptoms. In 2018-2020, GPs in the catchment area of Silkeborg Regional Hospital, Denmark, were offered direct referral for either X-ray or low-dose computed tomography (LDCT) of the chest for patients with respiratory symptoms who did not meet the criteria for a contrast-enhanced CT (CECT) of the chest and upper abdomen as part of the lung cancer referral pathway. The aim of this study was 1) to estimate the percentage of patients referred for LDCT or chest X-ray who met CECT criteria based on the clinical information in the referral letters, and 2) to assess the GPs' response to standard questions regarding the active feedback provided.

METHODS. The study was conducted from April to October 2019. Radiographers initially assessed all referrals for X-ray or LDCT, and contacted the GPs if they assessed that symptoms and clinical characteristics justified CECT.

RESULTS. In the study period, 1,112 referrals for chest imaging from GPs were received; in 97 cases (9%), the referral information warranted CECT as part of a lung cancer referral package. In 71% (69/97) of these cases, the GP accepted the conversion to CECT; 55 of 73 LDCTs and 14 of 24 X-rays. In 15 cases, the GP adhered to the requested imaging owing to clinical assessment or their agreement with the patient, and in the remaining 13 cases no specific reason was given.

CONCLUSION. The feedback provided was well received by GPs and the approach adopted may be a step towards structured decision support to facilitate the choice of chest imaging.

FUNDING. None.

TRIAL REGISTRATION. Not relevant.

Patients who present with respiratory symptoms are challenging for general practitioners (GPs) and hospital-based physicians alike because the spectrum of underlying disease ranges from mild, self-limiting disease to severe conditions for which timely diagnosis is essential.

It is important to identify patients at a high risk of underlying lung cancer and to offer the appropriate imaging in accordance with recommendations by the Danish Health Authority [1].

A high risk of lung cancer with requirement of contrast-enhanced computed tomography (CECT) of the chest and upper abdomen is defined as follows:

- Haemoptysis regardless of age and smoking status
- Patients > 40 years of age with relevant tobacco history and
- New/changed cough for more than 4-6 weeks
- Stridor of unknown cause
- Hoarseness for more than 3-4 weeks
- New dyspnoea with abnormal spirometry
- Shoulder or chest pain
- Fatigue, loss of appetite and weight loss.

Approximately 4,900 annual lung cancer cases are diagnosed in Denmark, resulting in an average of 1-2 patients annually for each GP among a large number of patients with respiratory symptoms. Furthermore, respiratory symptoms are highly unspecific for lung cancer [2], contributing to the diagnostic difficulties.

The common approach to radiological investigations is:

- Direct referral to CECT if the patient meets the criteria for the Lung Cancer Referral Pathway
- Chest X-ray if lung cancer is not suspected.

During the study period, GPs in the catchment area of Silkeborg Regional Hospital had the additional choice of direct referral for low-dose CT (LDCT) of the chest for patients who did not meet criteria for the Lung Cancer Referral Pathway.

All referral letters were assessed by radiographers to ensure that the requested X-ray or LDCT was the appropriate imaging modality for the symptoms and risk factors presented. In some cases, they assessed that symptoms and patient characteristics justified CECT rather than LDCT or chest X-ray.

The aim of the present study was 1) to estimate the percentage of patients referred for LDCT or chest X-ray who meet the criteria for CECT in the Lung Cancer Referral Package based on the clinical information in the referral letters and 2) to assess the GPs' response to active feedback regarding their choice of imaging using responses to standard questions.

METHODS

The study was a quality assurance study conducted at the Department of Radiology, Silkeborg Regional Hospital, Denmark, from April to October 2019.

Ethics

The project was approved by the Institutional Review Board at Silkeborg Regional Hospital. Patient consent was not required.

Study cohort and data collection

The study cohort consisted of patients referred from their GP for LDCT or chest X-ray. Patients were eligible for the study if above 40 years of age. The catchment population comprised 98,488 persons. The total number of referrals for X-ray or LDCT from GPs was retrieved from Carestream RIS, excluding patients with contacts in the

previous year.

The GP was contacted when the computed tomography (CT) radiographer assessed that the referral information warranted a CECT as part of the lung cancer referral pathway [1]. The GP was contacted via electronic correspondence and asked if they wanted to maintain the original request or follow the recommendation made by the CT radiographer, and by phone if no answer was received. Clinical data were retrieved from the GPs' radiology referrals in Carestream RIS.

Statistics

A Gwet's agreement coefficient was calculated to assess agreement between the GP's choice of imaging and the radiographer's assessment [3].

Data availability

Deidentified participant data may be obtained from the Danish National Archives and are not publicly available. Data are available upon reasonable request to the website of the Danish National Archives [4].

RESULTS

Overall, a high agreement was observed between the GPs' choice of imaging and the radiographers' assessment based on the clinical information provided (91%, corresponding to a Gwet's agreement coefficient (AC) of 0.90 (very good) (95% confidence interval (CI): 0.89-0.92)). However, in 9% of all referrals (97/1,112), the radiographer assessed that CECT was warranted based on the clinical information. In 75% (55/73) of requested LDCTs and 58% (14/24) of requested X-rays with suggested conversion to CECT, the conversion was accepted, corresponding to a 71% acceptance (69/97) of all suggested conversions (the degree of agreement on conversion was good; Gwet's AC 0.62 (95% CI: 0.46-0.77)).

In 28% (19/69) of the cases with acceptance of conversion, the GP agreed that the patient was eligible for CECT in accordance with guidelines. In 72% (50/69) of the cases, the GP did not comment on accordance with lung cancer referral guidelines but consented to the recommended image upgrade.

In cases where the GPs adhered to the originally requested imaging, this was because of clinical assessment in 43% (12/28) and joined decision with the patient in 11% (3/28); and in 46%, no specific reason was given (13/28) (Table 1). The symptoms described in the referral letters are shown in Table 2.

TABLE 1 Reasons why the suggested conversion was accepted or declined.

	n/N (%)
<i>Reason for accepting the suggested conversion to CECT, n/N_{acc}</i>	
Agree that the patient is eligible for CECT in the lung cancer referral pathway	19/69 (28)
Do not comment on accordance with guidelines regarding lung cancer referral pathway but consent to CECT	50/69 (72)
<i>Reason for declining the suggested conversion to CECT, n/N_{dec}</i>	
Adhere to originally requested imaging due to clinical assessment	12/28 (43)
Adhere to originally requested imaging according to joint decision with patient	3/28 (11)
Adhere to originally requested imaging with no additional information given	13/28 (46)
<i>Conversions accepted</i>	
X-ray, n/N _{request}	14/24 (58)
LDCT, n/N _{request}	55/73 (75)
Total, n/N _{tot}	69/97 (71)

CECT = contrast-enhanced CT; LDCT = low-dose CT.

TABLE 2 Clinical information from referral information.

	Yes, n	No, n	No information available, n
Age > 40 yrs with relevant tobacco history	88	2	7
Haemoptysis	16	28	53
Cough	83	1	13
Hoarseness	6	1	90
Dyspnoea	21	14	62
Pain in shoulder or chest	11	4	82
Weight loss and/or fatigue	11	24	62

DISCUSSION

This study showed high agreement between the GPs' choice of imaging and the radiographers' secondary assessment based on the clinical information provided. Disagreement between the GPs' choice of imaging and the radiographers' assessment was observed in only nine percent of the referrals. In the majority of the 97 discordant cases, the suggested CECT was accepted. In the remaining discordant cases, the disagreement seemed to be based on additional information not included in the referral.

The increasing demands with regards to healthcare standards and waiting times, and the increasing complexity

of the healthcare system, may raise the need for decision support, e.g., in the form of structured radiology referral forms. The active feedback in our study was well received by the GPs and may potentially be a step towards structured decision support to facilitate the most appropriate chest imaging possible.

A study from New Zealand described how the introduction of access criteria developed in collaboration between GPs and hospital-based specialists may be used to streamline referral processes [5]. An international study has shown that experienced radiographers have a high degree of compliance with guidelines [6]. Both of these studies thus support the use of active feedback as in our study.

Few studies have focused on automated referral assessment, e.g., by using a clinical decision aid or standardised referral form [7]. We have not been able to identify any relevant studies in chest imaging.

In the setting described in the present study, the purpose was to ensure the use of the lung cancer referral pathway when the patient presents with symptoms and risk factors that justifies this. The approach was to provide safety netting by upgrading the imaging modality. The resulting 97 cases selected among 1,112 imaging referrals during a six-month period suggests a well-functioning referral practice and collaboration between the GPs and the Department of Radiology. It may be considered an acceptable margin of error although it does indicate that a potential exists for further improvement. Studies in other clinical areas [8, 9] have assessed how the use of magnetic resonance imaging may be optimised by ensuring that referral criteria are met, mainly to restrict the use of time-consuming investigations. This is a major difference to the setting and purpose of the present study, but results support the use of a structured referral procedure.

CONCLUSION

Although good agreement was recorded between the imaging requested by the GPs and secondary radiographer assessment, the study indicated a potential for improvement. The active feedback to the GPs used in the study was well received.

Correspondence *Charlotte Hylgaard*. E-mail: Charhyld@rm.dk.

Accepted 19 April 2023

Conflicts of interest Potential conflicts of interest have been declared. Disclosure forms provided by the authors are available with the article at ugeskriftet.dk/dmj

Acknowledgements The authors take this opportunity to express their gratitude to the participating GPs.

Cite this as Dan Med J 2023;70(6):A12220769

REFERENCES

1. Danish Health Authority. Lung cancer referral package. www.sst.dk/da/udgivelser/2018/pakkeforloeb-for-lungekraeft (Feb 2023).
2. Hamilton W, Peters TJ, Round A, Sharp D. What are the clinical features of lung cancer before the diagnosis is made? A population based case-control study. *Thorax*. 2005;60(12):1059-65.
3. Gwet KL. Computing inter-rater reliability and its variance in the presence of high agreement. *Br J Math Stat Psychol*. 2008;61(Pt 1):29-48.
4. Danish National Archives. www.sa.dk/en/research-researchers-research-service-the-danish-national-archives/use-the-danish-national-archives-survey-data/ (Feb 2023).
5. Holland K, McGeoch G, Gullery C. A multifaceted intervention to improve primary care radiology referral quality and value in

- Canterbury. *N Z Med J*. 2017;130(1454):55-64.
6. Chilanga CC, Lysdahl KB, Olerud HM et al. Radiographers' assessment of referrals for CT and MR imaging using a web-based data collection tool. *Radiography (Lond)*. 2020;26(4):e277-e283.
 7. Ip IK, Gershanik EF, Schneider LI et al. Impact of IT-enabled intervention on MRI use for back pain. *Am J Med*. 2014;127(6):512-8.e1.
 8. Krogh SB, Jensen TS, Rolving N et al. Appropriateness of referrals from primary care for lumbar MRI. *Chiropr Man Therap*. 2022;30(1):9.
 9. Kara S, Smart A, Officer T et al. Guidelines, training and quality assurance: influence on general practitioner MRI referral quality. *J Prim Health Care*. 2019;11(3):235-42.