Reduced specialist time with direct computed tomography for suspected lung cancer in primary care

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ABSTRACT

INTRODUCTION: Lung cancer (LC) is the most common cause of cancer death in Denmark, and triaging patients through fast-track diagnostic pathways is recommended to improve patient outcome. Data on the most efficient triage organisation of such pathways are limited. The aim of this study was to test a strategy of a straight-to-test model for patients referred to the fast-track pathway. Outcomes were number of computed tomographies (CT) performed, use of specialist time and staff acceptability.

MATERIAL AND METHODS: We performed a randomised controlled study enrolling 493 patients who were referred from general practice to fast-track LC evaluation (1 January-1 December 2012). Half of the patients were randomly assigned to the intervention and went straight to a chest CT before chest-physician evaluation. Time was measured for patients at random days. Acceptability was examined in a focus group interview.

RESULTS: In the intervention group, 95.5% of patients had a CT performed compared with 97.2% in the control group. There was no difference in the number of CTs between the groups (risk difference (RD) = −1.3% (95% confidence interval (CI): −4.4-2.0; p = 0.454)). In the intervention group, chest-physician time was 13.3 min. (min.-max.: 7.7-19.5 min.) lower per referred patient than in the control group.

CONCLUSION: Giving general practitioners direct access to a CT did not change the number of CTs performed and significantly reduced chest-physician time per patient. In addition, the strategy was associated with high levels of staff acceptability.

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Earlier detection and easier access to relevant investigations from primary care are key focus areas to improve cancer outcome. However, this requires more efficient delivery of specialised investigations. But how do we ensure timeliness and coherence of cancer treatment? In Denmark, the current solution is a cancer care pathway which was introduced in 2008 [1]. The pathway concerns every stage from suspicion of cancer through diagnosis and treatment to palliation or rehabilitation. One of the political and administrative requirements to the new scheme was that a specialist should see the patient before initiation of basic investigations. However, as general practitioners (GPs) are already gatekeepers to specialised care, this could be considered a "double gatekeeping system" which may cause inefficiency and delay. Thus, the remaining question is whether patients should go straight to investigation or first pass a specialist on their way.

In Denmark, lung cancer comprises approx. 12% of all new cancer cases [2]. Mortality from lung cancer is largely determined by the stage at diagnosis. If a GP has "reasonable suspicion" that the patient has cancer, the GP can refer the patient through the fast-track system. For lung cancer, "reasonable suspicion" would be based on either a chest X-ray or alarm symptoms (e.g. haemoptysis). In general practice, these symptoms have a low positive predictive value [3], and many patients therefore need evaluation if the cancers are to be diagnosed at an earlier stage with a better prognosis. The increasing demands for urgent referral and lower thresholds for referral of patients question the efficiency of the "double gatekeeping" system compared with a straight-to-test approach.

A common argument is that a straight-to-test model would generate unnecessary tests. However, a study from the Netherlands in 2011 with open access colonoscopy through GP referral found only a slight increase in the number of requested diagnostic colonoscopies, but a marked decrease in median time from first diagnostic test to surgical treatment [4].

In a randomised unblinded study, we aimed to test and measure a diagnostic strategy involving a straight-to-test model for patients referred to the lung cancer fast-track diagnostic pathway. Outcome measures were number of computed tomographies (CTs) performed, use of specialist time and staff acceptability.

MATERIAL AND METHODS

Design

We performed a randomised, two-arm (1:1) controlled study testing CTs before evaluation by chest physician compared with usual practice.

Participants

Patients referred exclusively from general practice to

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fast-track evaluation during the period from 1 January to 1 December 2012 were enrolled in the study. There were no exclusion criteria.

Study setting

The study was performed in a single setting at the Department of Pulmonary Medicine, Aarhus University Hospital. The department is highly specialised in lung cancer detection and engages in close teamwork with specialists from Radiology, Clinical Oncology and Thoracic Surgery. The department covers approx. 140 general practices with 400 GPs. On average, the department evaluates 650 fast-track referrals from general practice annually. After reading the referral note, a chest physician triages the patient to an outpatient evaluation within three working days. If the chest physician shares the GP's suspicion of lung cancer, a CT of chest and upper abdomen (with intravenous contrast) is performed. Such CTs are reviewed by a chest physician and a radiologist on daily meetings. The initial diagnostic work-up (**Table 1**) is scheduled for three working days (not including visitation). In the intervention group, the patients were allocated a direct CT including information provided by a nurse prior to the CT (Table 1), unless at visitation the chest physician had reasons to see the patients prior to the CT (e.g. low cancer suspicion).

Outcomes

The proportion of patients who had a CT performed was measured. Data were obtained from the electronic patient record.

Chest-physician time per patient: We measured the consultation time for a three-week period (November 2012). All types of consultations in the period were measured by a scientific assistant blinded to the patient's allocation in the project. The physicians were unaware of the time measurement. Time was measured as minutes from the point at which the patient went into the physician consultation room until the patient left the room.

Staff acceptability was studied by a focus group interview made on the basis of a structured interview guide.

Randomisation

For practical feasibility, we chose to perform the randomisation prior to the study period in one procedure in which all potential patients born in even months (February, April, June, August, October and December) were allocated to the intervention group and patients born in odd month were controls. Technically speaking, this could be termed a block randomisation. However, as the allocation according to birth (odd or even month) must be considered at least quasi-random, we regard such distinction superfluous for the present purpose.

Data

Patients referred to fast-track evaluation for lung cancer are coded DZ 031.B (lung cancer observation). Patients with this code and a GP ID number were identified. The Danish civil registration number (CRN), a unique ten-digit personal identification number, was used to link registers [5].

We used the Danish Lung Cancer Register (DLCR) to gain information on any subsequent diagnosis of lung cancer (International Classification of Diseases (ICD) 10 34.0-9). The DLCR was established in 2001 as a national database. Since 2003, the registered data have covered more than 90% of all lung cancer cases in Denmark [6]. During the study period, the registration of patients in the DLCR was also checked against the hospital information system used to record registered diagnoses to ensure that no patients were missed.

We performed a focus group interview to clarify the feasibility of the new organisation. The interview was conducted by the principal investigators (LMG and PV) after the study had concluded. The informants were two consultants (chest physicians) and one pulmonary nurse engaged in the organisation of the fast-track diagnosis. The interview was recorded with the informant's consent. The interview guide included open-ended questions focusing on the positive/negative characteristics of the traditional organisation in comparison to the new organisation. The informants were encouraged to provide details on changes seen from a health care professional's perspective and to assess the medical quality of the services.

The interview lasted 45 min., and a summary was compiled at the end to obtain an immediate validation of the presentation of the themes identified by the researchers.

TABLE 1

Description of diagnostic work-up in fast track (usual and intervention).

	Usual work-up	Intervention work-up
Visitation	By chest physician	By chest physician[a]
Outpatient visit		
Patient history-taking	By chest physician	–
Lung function test	By nurse	By nurse
Blood tests	By laboratory	By laboratory
Scan		
CT	Chest, upper abdomen	Chest, upper abdomen
Outpatient visit	Patient information and additional diagnostic work-up (by chest physician)	Patient history-taking, information and additional diagnostic work-up (by chest physician)

CT = computed tomography.
a) At visitation some patients are allocated an outpatient visit before CT.

Statistical methods

Patient groups were compared using the Wilcoxon's rank-sum test for ordinal or continuous data or Pearson's χ^2-test for unordered or dichotomous categorical data.

The proportion of referred patients who did not receive a CT and the difference between groups were calculated and associated 95% confidence intervals (95% CIs) were assessed using a standard normal approximation. Patients were allocated to randomisation groups according to the intention-to-treat principle. For the mean difference of consumed consultant time, 95% CIs were computed using bias-corrected bootstrapping. Analyses were made using Stata 12.0.

Ethics

The study was approved by the Danish Data Protection Agency (No: 2011-41-6872) and the Danish Health and Medicines Authority (No: 7-604-04-2/357/KWH). According to the Research Ethics Committee of the Central Denmark Region, the Danish Act on Research Ethics Review of Health Research Projects did not apply to this project. (No: 118/2011).

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RESULTS

Study population

A total of 508 patients were eligible. Before visitation, 15 controls received a CT and were therefore excluded. This group of patients did not differ from the remaining cohort according to age, gender or cancer incidence). Of the cohort, 246 (49.9%) were born in even months and formed the intervention group (**Figure 1**). The baseline data of the cohort are shown in **Table 2**. There were no statistically significant differences between the controls and the intervention group.

Outcomes

Computed tomography

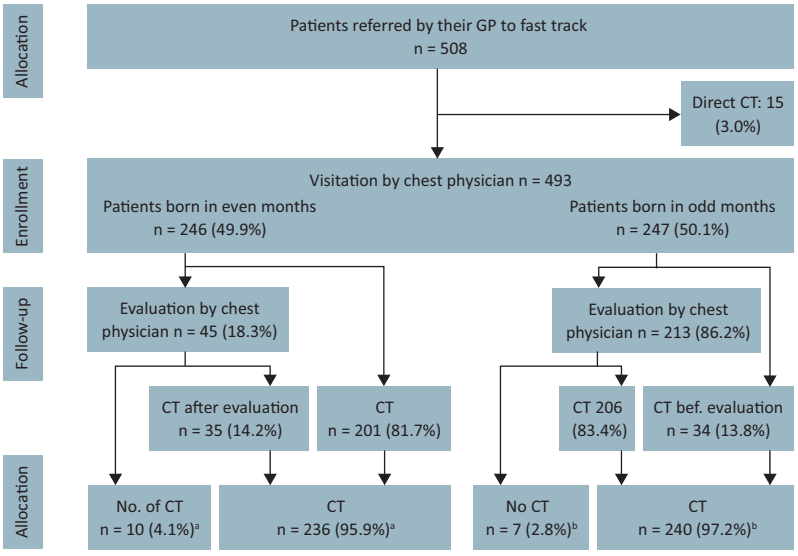
In the intervention group, 236 (95.9%) patients had a CT. In total and regardless of the randomisation, 45 (18.3%) patients were triaged at visitation to the chest physician instead of a direct CT on the basis of the GP referral notes. After this evaluation, 35 (77.8%) patients had a CT and ten (22.2%) patients did not.

In the control group, 240 (97.2%) patients had a CT. A total of 34 (13.8%) patients had a CT before the evaluation, regardless of the randomisation.

These 34 patients in the control group and the 45 intervention group patients who did not have a direct CT did not differ from the remaining cohort according to age, gender or cancer incidence (data not shown).

FIGURE 1

Participants' flow for patients referred from primary care to fast-track evaluation, randomised by birth month. The intervention group (patients born in even months) is shaded.



CT = computed tomography; GP = general practitioner.
a) Percentage of all patients in the intervention group. b) Percentage of all patients in the control group.

In the control group, seven patients (2.8%) had no CT after evaluation by chest physician (95% CI: 1.1-5.8%). For the intervention group, the number was ten (4.1%, 95% CI: 2.0-7.3%). The difference in CTs between the two groups was –1.3% (95% CI: –4.4-2.0%; p = 0.454).

Chest-physician time per patient

Time was measured at 48 consultations (**Table 3**) and the difference in time spent per patient was 13.3 min. (min.-max.: 7.7-19.5 min.) between the intervention group (one visit) and the control group (two visits). For every 100 patients evaluated in the fast track with direct CT, the department would save 22.2 h (min.-max.: 12.9-32.4 h) in comparison with the previous organisation.

Acceptance and possible side effects

The focus group interview identified one definite disadvantage of the new organisation:

"The former programme implied an open-minded approach to our patients. Now we have the result of the CT already before we see the patient and patients with non-malignant CT images will promptly be referred to treatment by their GP" (physician 2).

The interview also identified advantages of the new organisation:

"The patients are very satisfied. They understand the logic behind first receiving the scan and subsequently seeing the doctor. This is a good thing for the patients" (nurse).

TABLE 2

Descriptive data of the 493 patients in the cohort, according to groups.

	Intervention group	Control group	p-value
All, n (%)	246 (49.9)	247 (50.1)	
Gender, n (%)			0.554
Male	137 (55.7)	131 (53.0)	
Female	109 (44.3)	116 (47.0)	
Age			
Mean, yrs	64.2	63.1	0.386
0-39 yrs, n (%)	12 (4.9)	9 (3.6)	
40-59 yrs, n (%)	77 (31.3)	85 (34.4)	0.832
60-79 yrs, n (%)	122 (49.6)	119 (48.2)	
≥ 80 yrs, n (%)	35 (14.2)	34 (13.8)	
CT, n (%)	236 (95.9)	240 (97.2)	0.921
Lung cancers, n (%)	22 (8.9)	15 (6.1)	0.227

CT = computed tomography.

TABLE 3

Time measurements (min.) for chest-physician consultations in fast track. Visit 1 and 2 are the times for the first and second outpatient visit.

	Intervention	Control	
	visit 1	visit 1	visit 2
	(n = 19)	(n = 14)	(n = 15)
Mean (median)	16.8 (17)	17.4 (13.5)	12.7 (10)
Range (min.-max.)	5-25	10-33	4-35
IQI	13-22	12-24	8-17

IQI = interquartile interval.

"The new organization has reduced the number of medical consultation hours involving a doctor; hours that we can spend on the patients in need of care" (physician 1).

"The new organization provides greater flexibility for the unit when scheduling the daily programme. Patients can be seen by a nurse while the doctor is engaged elsewhere" (physician 2).

DISCUSSION

Main findings

No differences were found in use of CTs between the new straight-to-CT scheme and the traditional organisation in which a chest physician saw the patient before the CT was performed. There was a decrease in time spent per patient. The new organisation was highly accepted and also, according to the staff, improved the patient experience.

By reading the referral notes from the GPs, the chest physicians were able to select only 3-4% of patients for whom a CT was not found necessary. This implies that the GPs were, indeed, able to select patients properly for CTs.

Strengths and limitations

The strength of this study was the randomised design that resulted in two comparable groups with no statistically significant differences between the intervention and the control group. We were able to measure outcomes during one time period for two different organisations rather than making e.g. before-after-comparisons or comparisons between two settings.

A potential weakness is the randomisation (based on birth month) of patients before study inclusion. If GPs had been aware of this, they may have used the diagnostic system differently according to the patient randomisation. However, the GPs were unaware of the study.

A limitation was that we measured only time for a sample of the patients. We chose this approach to approximate the time spent per patient in a period in which the two different organisations had been running for some time, and we believe that this time per consultation was stable throughout the entire study period.

This study did not aim to measure time intervals in the diagnostic process. However, we found that the new organisation caused no additional treatment delay.

Generalisability

The findings should be interpreted carefully since outpatient clinics are organised differently around the world. Still, the decrease in use of specialist time may be generalised to other settings.

Comparison with other studies

A few studies have analysed the effect of straight-to-test versus traditional referral to secondary care. A British retrospective comparative study from 2011 found that straight access to CT after abnormal X-ray reduced the diagnostic delay without significantly increasing the overall proportion of patients undergoing CT (from 87% before to 92% after) [7]. Similar results were found in a study from the Netherlands in 2011 [4], where open access to colonoscopy from primary care was found to reduce the diagnostic interval with only a minor increase in number of endoscopies.

A British study from 2009 rejected a straight-to-test system. This prospective study on patients referred through a fast-track route for colorectal cancer found that the requested test types, which were based on the GP referral letter, were changed after an outpatient visit in 31% of the cases [8].

CONCLUSION

We demonstrated that a straight-to-test approach for handling fast-track lung cancer investigation was possible without causing an increase in the number of CTs performed. The strategy led to a reduction in chest

Straight-to-test computed tomography from primary care to fast-track reduces chest-physician time.

physician time spent per patient. This was accomplished with a high acceptability and provided a better patient experience according to the staff.

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