Subject: Low-Dose Helical (Spiral) Computed Tomography for Lung Cancer Screening CPT-71271	Original Effective Date: 6/26/2013
Policy Number: MCR-658	**Revision Date(s):** 5/13/2015, 12/12/18, 3/15/21
Review Date: (re: MCP-137) 12/16/15, 12/14/16, 6/22/17, 12/19/18, 12/10/19, 12/9/20, 4/5/21, 9/15/21	

DISCLAIMER

This Molina Clinical Policy (MCP) is intended to facilitate the Utilization Management process. It expresses Molina's determination as to whether certain services or supplies are medically necessary, experimental, investigational, or cosmetic for purposes of determining appropriateness of payment. The conclusion that a particular service or supply is medically necessary does not constitute a representation or warranty that this service or supply is covered (i.e., will be paid for by Molina) for a particular member. The member's benefit plan determines coverage. Each benefit plan defines which services are covered, which are excluded, and which are subject to dollar caps or other limits. Members and their providers will need to consult the member's benefit plan to determine if there are any exclusion(s) or other benefit limitations applicable to this service or supply. If there is a discrepancy between this policy and a member's plan of benefits, the benefits plan will govern. In addition, coverage may be mandated by applicable legal requirements of a State, the Federal government or CMS for Medicare and Medicaid members. CMS's Coverage Database can be found on the CMS website. The coverage directive(s) and criteria from an existing National Coverage Determination (NCD) or Local Coverage Determination (LCD) will supersede the contents of this Molina Clinical Policy (MCP) document and provide the directive for all Medicare members.[1]

DESCRIPTION OF PROCEDURE/SERVICE/PHARMACEUTICAL

Helical (spiral) computed tomography (CT) is a radiographic technique that can provide high-quality, 3-dimensional images of the lungs during a single breath-hold with less radiation exposure than conventional high-resolution CT scanning. This imaging technique has been proposed for screening asymptomatic, high-risk individuals for early lung cancer lesions. During a helical computed tomography (CT) lung scan, the patient lies in a supine position on the examination table while the table moves through the scanner framework. The patient is asked to lie quietly during the scan and to hold his or her breath for a short period of time, usually 10 to 25 seconds. Low-dose scans are often used for screening purposes to minimize the amount of radiation exposure the patient receives. If a suspicious lesion is detected, a higher dose helical CT scan is performed to provide a higher resolution image. Although the images obtained with helical CT are more detailed when patients undergo scanning following intravenous administration of a contrast agent, a lung scan does not require use of contrast material or other preparation, and no sedation is necessary. Helical CT scans are performed in the out-patient setting. [24]

Helical computed tomography (CT) scanners are regulated by the FDA as Class II devices, and more than 200 different instruments have met all requirements of the 510(k) approval process.

The complete list of commercially available helical CT scanners may be found on the FDA [3] website using search Product Code JAK. [3]

RECOMMENDATION [2 4-25]

Low-dose Helical (spiral) Computed tomography (CT) for lung cancer screening is considered medically necessary and may be authorized when all of the following criteria are met: [ALL]

- Age 50 to 80
- Smoking history ≥ 20 pack-years; and
- Currently smoking or quit within the past 15 years; and
- Testing must be part of a structured, comprehensive screening and care program

SUMMARY OF MEDICAL EVIDENCE [5-19]

The largest available randomized controlled trial (RCT) of helical computed tomography (CT) for lung cancer screening (the National Lung Screening Trial [NLST]) [4], provides evidence that, compared with screening with chest x-ray, helical CT improves detection of early-stage lung cancer by 91%, reduces lung cancer mortality by 20%, and reduces overall mortality by 6% in patients who have been heavy smokers. The most relevant trial outcomes are outlined below:

The National Lung Screening Trial (NLST) was conducted to determine whether screening with low-dose CT could reduce mortality from lung cancer. 53,454 participants were enrolled from August 2002 through April 2004 who were at high risk for lung cancer at 33 U.S. medical centers. Participants were randomly assigned to undergo three annual screenings with either low-dose CT (26,722 participants) or single-view posteroanterior chest radiography (26,732). Data were collected on cases of lung cancer and deaths from lung cancer that occurred through December 31, 2009. The rate of adherence to screening was more than 90%. The rate of positive screening tests was 24.2% with low-dose CT and 6.9% with radiography over all three rounds. A total of 96.4% of the positive screening results in the low-dose CT group and 94.5% in the radiography group were false positive results. The incidence of lung cancer was 645 cases per 100,000 person-years (1060 cancers) in the low-dose CT group, as compared with 572 cases per 100,000 person-years (941 cancers) in the radiography group (rate ratio, 1.13; 95% confidence interval [CI], 1.03 to 1.23). There were 247 deaths from lung cancer per 100,000 person-years in the low-dose CT group and 309 deaths per 100,000 person-years in the radiography group, representing a relative reduction in mortality from lung cancer with low-dose CT screening of 20.0% (95% CI, 6.8 to 26.7; P = 0.004). The rate of death from any cause was reduced in the low-dose CT group, as compared with the radiography group, by 6.7% (95% CI, 1.2 to 13.6; P = 0.02). The trial found that screening with the use of low-dose CT reduces mortality from lung cancer. [5]

The COSMOS study investigated whether estimation of the volume doubling time (VDT) or growth rate of tumors detected by low-dose CT scans could be used to determine which tumors may represent indolent cancers and thus potential over diagnosis. This study was a

nonrandomized, single-center screening study involving 175 individuals with primary lung cancer enrolled between 2004 and 2005 who received LDCT annually for 5 years. Fifty-five cases of cancer were diagnosed at baseline, and 120 were diagnosed subsequently. VDT was estimated on the basis of change in tumor size with serial scans; a tumor with a VDT <400 days was considered to be fast-growing; 400 to 599 days as slow growing and >600 days as indolent. VDT correlated with lung cancer mortality rates (9.2 percent per year for fast-growing and 0.9 percent per year for slow-growing or indolent cancers). Ten percent of the cancers identified in the COSMOS cohort had a VDT of 600 days or more, and 25 percent a VDT of 400 or more days, and thus might represent over diagnosis. The study results concluded that slow-growing or indolent cancer comprised approximately 25% of incident cases, many of which may have been over diagnosed. To limit overtreatment in these cases, minimally invasive limited resection and nonsurgical treatments should be investigated. [19]

A 2014 analysis of data from the NELSON trial aimed to quantify how nodule diameter, volume, and volume doubling time affect the probability of developing lung cancer within 2 years of a CT scan, and to propose and evaluate thresholds for management protocols. Eligible participants in the NELSON trial were those aged 50-75 years, who have smoked 15 cigarettes or more per day for more than 25 years, or ten cigarettes or more for more than 30 years and were still smoking, or had stopped smoking less than 10 years ago. Participants were randomly assigned to low-dose CT screening at increasing intervals, or no screening. Findings showed that small nodules (those with a volume <100 mm(3) or diameter <5 mm) are not predictive for lung cancer. Immediate diagnostic evaluation is necessary for large nodules (≥300 mm(3) or ≥10 mm). Volume doubling time assessment is advocated only for intermediate-sized nodules (with a volume ranging between 100-300 mm(3) or diameter of 5-10 mm). [12]

Bach PB et al (2012) conducted a systematic review of the evidence regarding the benefits and harms of lung cancer screening using low-dose computed tomography (LDCT). A multisociety collaborative initiative (involving the American Cancer Society, American College of Chest Physicians, American Society of Clinical Oncology, and National Comprehensive Cancer Network) was undertaken to create the foundation for development of an evidence-based clinical guideline. Of 591 citations identified and reviewed, 8 randomized trials and 13 cohort studies of LDCT screening met criteria for inclusion. Primary outcomes were lung cancer mortality and all-cause mortality, and secondary outcomes included nodule detection, invasive procedures, follow-up tests, and smoking cessation. Critical appraisal using predefined criteria was conducted on individual studies and the overall body of evidence. Differences in data extracted by reviewers were adjudicated by consensus. Three randomized studies provided evidence on the effect of LDCT screening on lung cancer mortality, of which the National Lung Screening Trial was the most informative, demonstrating that among 53,454 participants enrolled, screening resulted in significantly fewer lung cancer deaths (356 vs 443 deaths; lung cancer–specific mortality, 274 vs 309 events per 100,000 person-years for LDCT and control groups, respectively; relative risk, 0.80; 95% CI, 0.73-0.93; absolute risk reduction, 0.33%; P = .004). The other 2 smaller studies

showed no such benefit. In terms of potential harms of LDCT screening, across all trials and cohorts, approximately 20% of individuals in each round of screening had positive results requiring some degree of follow-up, while approximately 1% had lung cancer. There was marked heterogeneity in this finding and in the frequency of follow-up investigations, biopsies, and percentage of surgical procedures performed in patients with benign lesions. Major complications in those with benign conditions were rare. The reviewers concluded that low-dose computed tomography screening may benefit individuals at an increased risk for lung cancer, but uncertainty exists about the potential harms of screening and the generalizability of results. [6]

Sighir et al (2012) performed a randomized controlled trial to report lung cancer findings and mortality rates at the end of screening in the Danish Lung Cancer Screening Trial. 4104 men and women, healthy heavy smokers/former smokers were randomized to five annual low-dose CT screenings or no screening. Two experienced chest radiologists read all CT scans and registered the location, size and morphology of nodules. Nodules between 5 and 15 mm without benign characteristics were rescanned after 3 months. Growing nodules (>25% volume increase and/or volume doubling time<400 days) and nodules >15 mm were referred for diagnostic workup. In the control group, lung cancers were diagnosed and treated outside the study by the usual clinical practice. Participation rates were high in both groups (screening: 95.5%; control: 93.0%; p<0.001). Lung cancer detection rate was 0.83% at baseline and mean annual detection rate was 0.67% at incidence rounds (p=0.535). More lung cancers were diagnosed in the screening group (69 vs. 24, p<0.001), and more were low stage (48 vs 21 stage I-IIB non-small cell lung cancer (NSCLC) and limited stage small cell lung cancer (SCLC), p=0.002), whereas frequencies of high-stage lung cancer were the same (21 vs 16 stage IIIA-IV NSCLC and extensive stage SCLC, p=0.509). At the end of screening, 61 patients died in the screening group and 42 in the control group (p=0.059). 15 and 11 died of lung cancer, respectively (p=0.428). The authors concluded that CT screening for lung cancer brings forward early disease, and at this point no stage shift or reduction in mortality was observed. More lung cancers were diagnosed in the screening group, indicating some degree of over diagnosis and need for longer follow-up. [18]

Pasterino et al reported five year results from the MILD trial. The screening program started with a pilot study on 1035 volunteers in Milan in 2000 and was followed up in 2005 by a randomized trial comparing annual or biennial LDCT with observation, named Multicentric Italian Lung Detection. This included 4099 participants, 1723 randomized to the control group, 1186 to biennial LDCT screening, and 1190 to annual LDCT screening. Follow-up was stopped in November 2011, with 9901 person-years for the pilot study and 17 621 person-years for Multicentric Italian Lung Detection. Forty-nine lung cancers were detected by LDCT (20 in biennial and 29 in the annual arm), of which 17 were identified at baseline examination; 63% were of stage I and 84% were surgically resectable. Stage distribution and resection rates were similar in the two LDCT arms. The cumulative 5-year lung cancer incidence rate was 311/100 000 in the control group, 457 in the biennial, and 620 in the annual LDCT group (P=0.036); lung cancer mortality rates were 109, 109, and 216/100 000 (P=0.21), and total mortality rates were

310, 363, and 558/100 000, respectively (P=0.13). Total mortality in the pilot study was similar to that observed in the annual LDCT arm at 5 years. The results showed that there was no evidence of a protective effect of annual or biennial LDCT screening. Furthermore, a meta-analysis of the four published randomized trials showed similar overall mortality in the LDCT arms compared with the control arm. [17]

Croswell et al (2010) conducted a randomized, controlled trial of low-dose CT versus chest radiography for the ongoing National Lung Screening Trial to quantify the cumulative risk that a person who participated in a 1- or 2-year lung cancer screening examination would receive at least 1 false-positive result, as well as rates of unnecessary diagnostic procedures. Participants included current or former smokers, aged 55 to 74 years, with a smoking history of 30 pack-years or more and no history of lung cancer (n = 3190). Random assignment to low-dose CT or chest radiography with baseline and 1 repeated annual screening and 1-year follow-up after the final screening were included. Randomization was centralized and stratified by age, sex, and study center. False-positive screenings, defined as a positive screening with a completed negative work-up or 12 months or more of follow-up with no lung cancer diagnosis. By using a Kaplan-Meier analysis, a person's cumulative probability of 1 or more false-positive low-dose CT examinations was 21% (95% CI, 19% to 23%) after 1 screening and 33% (CI, 31% to 35%) after 2. The rates for chest radiography were 9% (CI, 8% to 11%) and 15% (CI, 13% to 16%), respectively. A total of 7% of participants with a false-positive low-dose CT examination and 4% with false-positive chest radiography had a resulting invasive procedure. Screening was limited to 2 rounds. Follow-up after the second screening was limited to 12 months. The false-negative rate is probably an underestimate. The authors concluded that risks for false-positive results on lung cancer screening tests are substantial after only 2 annual examinations, particularly for low-dose CT. Further study of resulting economic, psychosocial, and physical burdens of these methods is warranted. National Cancer Institute. [9]

Another randomized controlled trial called the DANTE trial (2009) was performed to explore the effect of screening with low-dose spiral computed tomography (LDCT) on lung cancer mortality. Secondary endpoints are incidence, stage at diagnosis, and resectability. Male subjects, aged 60 to 75 years, smokers of 20 or more pack-years, were randomized to screening with LDCT or control groups. All participants underwent a baseline, once-only chest X-ray and sputum cytology examination. Screening-arm subjects had LDCT upon accrual to be repeated every year for 4 years, whereas controls had a yearly medical examination only. A total of 2,811 subjects were randomized and 2,472 were enrolled (LDCT, 1,276; control, 1,196). After a median follow-up of 33 months, lung cancer was detected in 60 (4.7%) patients receiving LDCT and 34 (2.8%) control subjects (P = 0.016). Resectability rates were similar in both groups. The results showed that more patients with stage I disease were detected by LDCT (54 vs. 34%; P = 0.06) and fewer cases were detected in the screening arm due to intercurrent symptoms. However, the number of advanced lung cancer cases was the same as in the control arm. Twenty patients in the LDCT group (1.6%) and 20 controls (1.7%) died of lung cancer, whereas 26 and 25 died of other causes,

respectively. The mortality benefit from lung cancer screening by LDCT might be far smaller than anticipated. [14]

Long term follow-up of the DANTE Trail published by Infante et al (2015) was conducted to explore the effect of LDCT screening on lung cancer mortality compared with no screening. Secondary endpoints included incidence, stage, and resectability rates. Male smokers of 20+ pack-years, aged 60-74 years, underwent a baseline CXR and sputum cytology examination and received 5 screening rounds with LDCT or a yearly clinical review only in a randomized fashion. Measurements and Main Results 1264 subjects were enrolled in the LDCT arm and 1186 in the control arm. Their median age was 64.0 years (IQR:5), and median smoking exposure was 45.0 pack-years. The median follow-up was 8.35 years. One-hundred and four patients (8.23%) were diagnosed with lung cancer in the screening arm (66 by CT), 47 of whom (3.71%) had Stage 1 disease; 72 control patients (6.07%) were diagnosed with lung cancer, with 16 (1.35%) being Stage 1 cases. Lung cancer mortality was 543x100,000 [95% CI 413-700] in the LDCT arm vs. 544x100000 [410-709] in the control arm (hazard ratio=0.993). Due to its limited statistical power, the results of the DANTE trial do not allow making a definitive statement about the efficacy of LDCT screening. However, they underline the importance of obtaining additional data from randomized trials with intervention-free reference arms before the implementation of population screening. [15]

CostEffectiveness

Goulart et al (2012) performed an economic analysis of LDCT screening using data from the 2009 National Health Interview Survey, CMS, and the National Lung Screening Trial (NLST). The analysis included a budget impact model, an estimate of additional costs per lung cancer death avoided attributed to screening, and a literature search of cost-effectiveness analyses of LDCT screening. They conducted a one-way sensitivity analysis, reporting expenditures in 2011 U.S. dollars, and took the health care payer and patient perspectives. LDCT screening will add $1.3 to $2.0 billion in annual national health care expenditures for screening uptake rates of 50% to 75%, respectively. However, LDCT screening will avoid up to 8100 premature lung cancer deaths at a 75% screening rate. The prevalence of smokers who qualify for screening, screening uptake rates, and cost of LDCT scan were the most influential parameters on health care expenditures. The additional cost of screening to avoid one lung cancer death is $240,000. Previous cost-effectiveness analyses have not conclusively shown that LDCT is cost-effective. The authors concluded that LDCT screening may add substantially to the national health care expenditures. Although LDCT screening can avoid more than 8000 lung cancer deaths per year, a cost-effectiveness analysis of the NLST will be critical to determine the value of this intervention and to guide decisions about its adoption. [11]

Black et al (2014) performed an analysis of cost-effectiveness of CT screening in the national lung screening trial that reported the following: As compared with no screening, screening with low-dose CT cost an additional $1,631 per person (95% confidence interval [CI], 1,557 to 1,709)

and provided an additional 0.0316 life-years per person (95% CI, 0.0154 to 0.0478) and 0.0201 QALYs per person (95% CI, 0.0088 to 0.0314). The corresponding ICERs were $52,000 per life- year gained (95% CI, 34,000 to 106,000) and $81,000 per QALY gained (95% CI, 52,000 to 186,000). [7-8]

Professional Society Guidelines: Several professional society organizations have endorsed lung cancer screening with Low Dose Computed Tomography (LDCT). [19-23]

CODING INFORMATION THE CODES LISTED IN THIS POLICY ARE FOR REFERENCE PURPOSES ONLY. LISTING OF A SERVICE OR DEVICE CODE IN THIS POLICY DOES NOT IMPLY THAT THE SERVICE DESCRIBED BY THIS CODE IS COVERED OR NON-COVERED. COVERAGE IS DETERMINED BY THE BENEFIT DOCUMENT. THIS LIST OF CODES MAY NOT BE ALL INCLUSIVE.

CPT	Description
CPT-71271	Low Dose Computed Tomography

RESOURCE REFERENCES

Government Agency

1. Centers for Medicare & Medicaid Services (CMS). Medicare Coverage Database. National coverage determination (NCD) Search.
2. Centers for Medicare & Medicaid Services (CMS) Decision Memo for Screening for LUNG CANCER with Low Dose Computed Tomography (LDCT) (CAG-00439N). Feb 5, 2015.
3. Center for Devices and Radiological Health (CDRH). Premarket Approval Database [search: Product Code JAK]. Updated March 1, 2013. Food and Drug Administration [website].
4. U.S. Preventive Services Task Force (USPSTF). Lung Cancer Screening. 3.9.2021.

Peer Reviewed Publications

5. Aberle DR, Adams AM, Berg CD, et al.; National Lung Screening Trial Research Team. Reduced lung-cancer mortality with low-dose computed tomographic screening. N Engl J Med. 2011;365(5):395-409.
6. Bach PB, Mirkin JN, Oliver TK, et al. Benefits and harms of CT screening for lung cancer: a systematic review. JAMA. 2012;307(22):2418-2429.
7. Black WC. Computed tomography screening for lung cancer in the National Lung Screening Trial: a cost-effectiveness analysis. J Thorac Imaging. 2015 Mar;30(2):79-87.
8. Black WC(1), Gareen IF, Soneji SS, Sicks JD et al. Cost-effectiveness of CT screening in the National Lung Screening Trial. N Engl J Med. 2014 Nov 6;371(19):1793-802.
9. Croswell JM, Baker SG, Marcus PM et al. Cumulative incidence of false-positive test

results in lung cancer screening: a randomized trial. Ann. Intern. Med. - Apr 2010; 152(8); 505-12, W176-80

10. Fu C(1), Liu Z, Zhu F, Li S, Jiang L. A meta-analysis: is low-dose computed tomography a superior method for risky lung cancers screening population? Clin Respir J. 2014 Oct 13. doi: 10.1111/crj.12222. [Epub ahead of print]
11. Goulart BH, Bensink ME, Mummy DG, Ramsey SD. Lung cancer screening with low-dose computed tomography: costs, national expenditures, and cost-effectiveness. J Natl Compr Canc Netw. 2012;10(2):267-275.
12. Horeweg N, van Rosmalen J, Heuvelmans MA et al. Lung cancer probability in patients with CT-detected pulmonary nodules: a prespecified analysis of data from the NELSON trial of low-dose CT screening. Lancet Oncol. 2014 Nov;15(12):1332-41. doi: 10.1016/S1470-2045(14)70389-4. Epub 2014 Oct 1.
13. Humphrey LL, Deffebach M, Pappas M et al. Screening for lung cancer with low-dose computed tomography: a systematic review to update the US Preventive services task force recommendation. Ann Intern Med. 2013 Sep 17;159(6):411-20. doi: 10.7326/0003-4819-159-6-201309170-00690.
14. Infante M, Cavuto S, Lutman FR, Brambilla G et al. A randomized study of lung cancer screening with spiral computed tomography: three-year results from the DANTE trial. Am. J. Respir. Crit. Care Med. - Sep 2009; 180(5); 445-53
15. Infante M, Cavuto S, Lutman FR, Passera E et al. Long-term Follow-up Results of the DANTE Trial, a Randomized Study of Lung Cancer Screening with Spiral Computed Tomography. Am J Respir Crit Care Med. 2015 Mar 11. [Epub ahead of print]
16. Manser RL, Irving LB, Stone C et al. Screening for lung cancer. Cochrane Database Syst Rev. 2004;(1):CD001991.
17. Pastorino U, Rossi M, Rosato V, et al. Annual or biennial CT screening versus observation in heavy smokers: 5-year results of the MILD trial. Eur J Cancer Prev. 2012;21(3):308-315
18. Saghir Z, Dirksen A, Ashraf H, Bach KS, Brodersen J et al. CT screening for lung cancer brings forward early disease. The randomised Danish Lung Cancer Screening Trial: status

after five annual screening rounds with low-dose CT. JH - Thorax - Apr 2012; 67(4); 296-301
19. Veronesi G, Maisonneuve P, Bellomi M, et al. Estimating overdiagnosis in low-dose computed tomography screening for lung cancer: a cohort study. Ann Intern Med 2012; 157:776.

Professional Society Guidelines

20. National Comprehensive Cancer Network (NCCN) Clinical Practice Guidelines. Lung Cancer Screening. v.1.2021
21. Jaklitsch MT, Jacobson FL, Austin JH, et al. The American Association for Thoracic Surgery guidelines for lung cancer screening using low-dose computed tomography scans for lung cancer survivors and other high-risk groups. J Thorac Cardiovasc Surg. 2012;144(1):33-38.
22. American Lung Association Guidance on CT Lung Cancer Screening. March 2021
23. Wender R, Fontham E et al. American Cancer Society Lung Cancer Screening Guidelines. CA Cancer J Clin 2013; 63(2):106-117

Other Resources

24. UpToDate [website]: Deffebach ME, Humphrey L. Screening for Lung Cancer. 3.22.2021.

CENTERS FOR MEDICARE AND MEDICAID SERVICES (CMS)

The coverage directive(s) and criteria from an existing National Coverage Determination (NCD) or Local Coverage Determination (LCD) will supersede the contents of this Molina Clinical Policy (MCP) document and provide the directive for all Medicare members.

The Centers for Medicare & Medicaid Services (CMS) has determined that the evidence is sufficient to add a lung cancer screening counseling and shared decision making visit, and for appropriate beneficiaries, annual screening for lung cancer with low dose computed tomography (LDCT), as an additional preventive service benefit under the Medicare program only when specific criteria are met. Please see the Feb 5, 2015 Decision Memo for Screening for Lung Cancer with Low Dose Computed Tomography (LDCT) (CAG-00439N). [2]