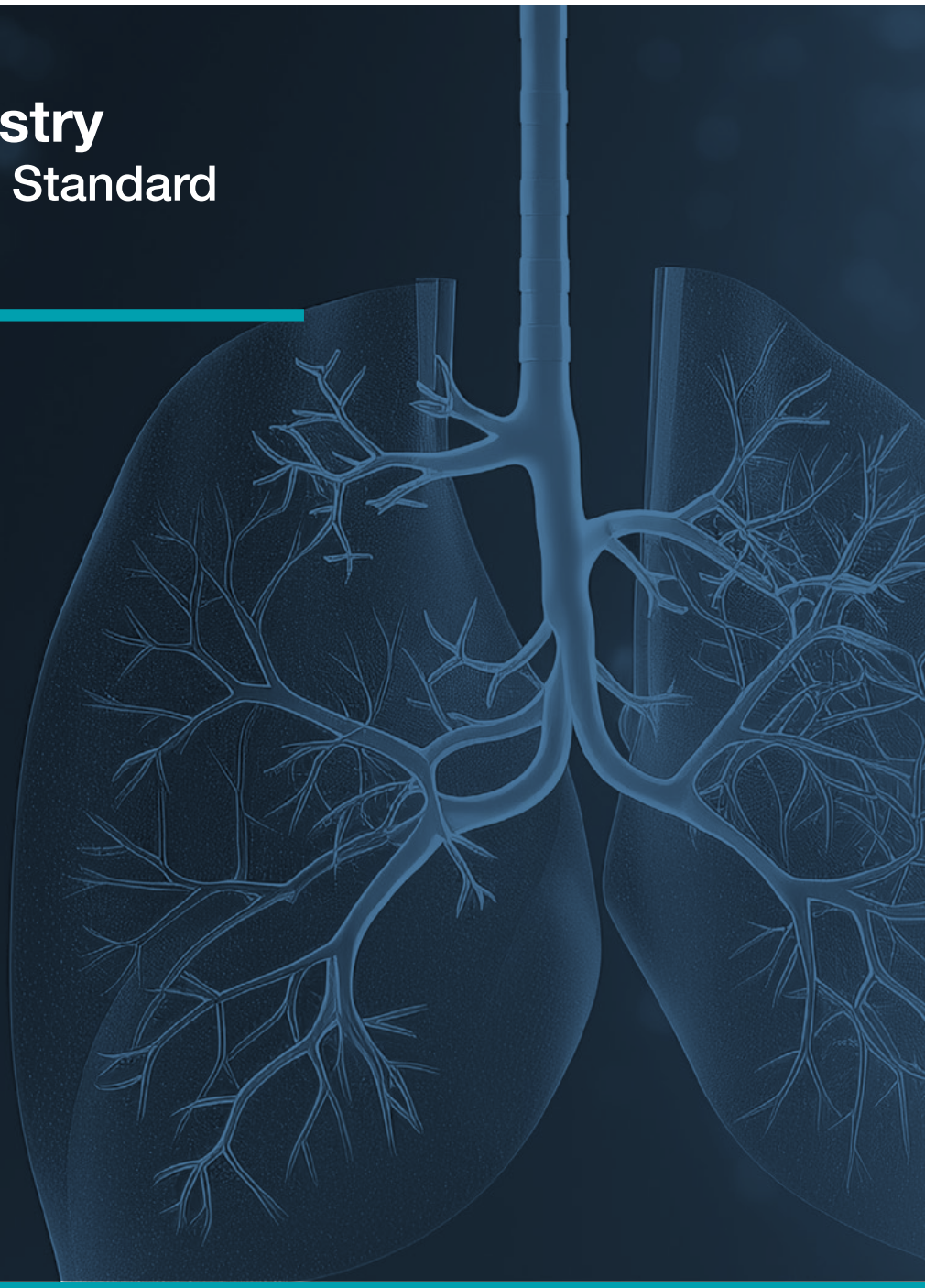
CS Health

NSW Coal Industry
Respiratory Health Standard

Second Edition 2025



NSW Coal Industry Respiratory Health Standard

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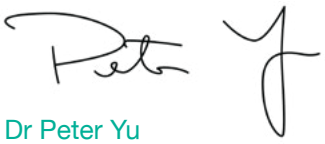
Foreword

The New South Wales (NSW) health surveillance scheme for coal mine workers supports the health and safety of those working in the industry by identifying occupational, environmental and other health issues that may affect a coal mine worker's ability to carry out their work safely and effectively.

The Respiratory Health Standard, initially released in 2024, was the first in a series of health standards developed specifically for the NSW coal industry. Health standards are designed to ensure coal mine workers with identified health conditions receive the necessary monitoring and support to maintain their health. Further, health standards clarify the roles and responsibilities of coal mine workers, employers and clinicians in maintaining a system for protecting occupational and environmental health.

Now in its second edition, the Respiratory Health Standard continues to draw on current best practice to support approved medical practitioners to make consistent, evidence-based clinical decisions regarding respiratory health. It instructs them on which respiratory investigations to arrange when assessing the health of a coal mine worker's lungs and provides clear clinical pathways and protocols for managing respiratory impairment. The Respiratory Health Standard has been endorsed by the Coal Services Clinical Governance Committee and an independent Occupational and Environmental Physician.

We are grateful for the valuable contributions of the Coal Services Standing Health Committee and Professor Deborah Yates in developing the Respiratory Health Standard, in conjunction with the Coal Services MSAC Review Implementation Working Group, other industry stakeholders, and relevant medical specialists.



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Abbreviations and acronyms

AHPRA	Australian Health Practitioner Regulation Agency
AMP	Approved medical practitioner
ATS	American Thoracic Society
BA	Breathing apparatus
BRT	Bronchodilator responsiveness testing
CABA	Compressed air breathing apparatus
CIT	Clinical investigation team
CLFT	Complex lung function testing
CMDLD	Coal mine dust lung disease
COPD	Chronic obstructive pulmonary disease
CS Health	Coal Services Health
CWP	Coal Workers' Pneumoconiosis
DLCO	Diffusing capacity of the lung for carbon monoxide
ERS	European Respiratory Society
FeNO	Fractional exhaled nitric oxide
FEV1	Forced expiratory volume in the first second
GINA	Global Initiative for Asthma
GOLD	Global Initiative for Chronic Obstructive Pulmonary Disease
GP	General practitioner
HRCT	High-resolution computed tomography
ICOERD	International Classification of HRCT for Occupational and Environmental Respiratory Diseases
ILO	International Labour Organization
IMD	Inhalable mine dust
NIOSH	National Institute for Occupational Safety & Health
PCBU	Person conducting a business or undertaking
PMF	Progressive massive fibrosis
PPE	Personal protective equipment
RCD	Respirable coal dust
RCS	Respirable crystalline silica
RP	Respiratory physician
SRQ	Standardised respiratory questionnaire
TSANZ	Thoracic Society of Australia and New Zealand
WCRS	Workers' Compensation Regulatory Services

Glossary

Term	Definition
American Thoracic Society (ATS)	The United States' leading medical society dedicated to accelerating the advancement of global respiratory health through multidisciplinary collaboration, education and advocacy.
Approved medical practitioner (AMP)	A medical practitioner who is registered by AHPRA to practice medicine in Australia, complies with the Clinical and Service Standard, and is approved by Coal Services to undertake Order 43 health assessments.
Asthma control questionnaire (ACQ)	A validated tool used to measure how well a person's asthma is controlled.
Australian Health Practitioner Regulation Agency (AHPRA)	Australia's national regulator of registered health professionals. AHPRA works in partnership with the National Boards to ensure that Australia's registered health practitioners are suitably trained, qualified and safe to practise.
Breathing apparatus (BA)	A respiratory device that works to deliver compressed air to the wearer either through a mouthpiece or face mask.
Chest examination	A physical examination of the respiratory system including, but not limited to, a clinical assessment of the lungs and chest wall, performed as part of an Order 43 health assessment.
Chronic obstructive pulmonary disease (COPD)	A group of respiratory diseases that cause airflow obstruction and breathing-related problems.
Clinical investigation team (CIT)	Refers to the CS Health clinical investigation team (CIT). The CIT includes CS Health administration staff and senior CS Health doctors with postgraduate qualification in occupational medicine who review and advise on the investigation and management of cases under investigation for respiratory abnormalities.
Clinical and Service Standard	The Clinical and Service Standard developed and approved by Coal Services, as amended from time to time or replaced. The Clinical and Service Standard outlines the training and requirements for approved health professionals and AMPs to conduct health assessments, health assessment reviews, and retirement health assessments.
Coal mine dust	The mixture of dusts, principally coal and silica, generated by the mining and processing of coal.
Coal mine dust lung disease (CMDLD)	A group of diseases caused by the inhalation of coal mine dust over a prolonged period.
Coal mine worker	A person who carries out work at a coal mine or a coal handling preparation plant for a PCBU. It does not include a person who works in an environment in which they are not exposed to airborne contaminant, hazardous chemicals, and/or occupational noise, unless the person has previously worked in an area of a coal mine or coal handling preparation plant in which they were exposed to airborne contaminant, hazardous chemicals, and/or occupational noise.

Term	Definition
Coal mine worker chest imaging	A radiological image and report of the chest which complies with the Coal Services Clinical and Service Standard.
Coal workers' pneumoconiosis (CWP)	Coal workers' pneumoconiosis is caused by the inhalation of coal mine dust and is commonly referred to as 'black lung disease'.
Complex lung function testing (CLFT)	A series of laboratory tests that measure lung volumes, flow rates and gas diffusion. It is otherwise known as complete or full lung function testing. As a minimum, this testing must include a spirometry and the standardised, calibrated measurement of the diffusion capacity of the lungs for carbon monoxide (DLCO).
Diffusing capacity of the lung for carbon monoxide (DLCO)	Measures the capacity of the lungs to exchange gas, using carbon monoxide. Measurement of DLCO must form part of any CLFT for any Coal Services-related purpose.
European Respiratory Society (ERS)	The leading European medical organisation in the respiratory field. The ERS prioritises science, education and advocacy in order to promote lung health, alleviate suffering from disease, and drive standards for respiratory medicine globally.
Fractional exhaled nitric oxide (FeNO) test	A test of a gas produced in the lungs which is used to assess a particular type of lung inflammation which is activated in asthma.
Functional capacity evaluation (FCE)	Assesses a worker's ability to safely perform specific job tasks that are essential for their role. It is a structured clinical assessment of a worker's ability to use clinically relevant part(s) of their body at and/or for work. Capacity to perform tasks differs from potential associated risk. For example, what a worker is physically capable of doing at work may not align with what they should do due to potential health risks. A functional capacity evaluation informs the clinical assessment of a coal mine worker's capacity to commence, continue, or return to a job role for work.
Fitness for work	Fitness for work means that a person (coal mine worker) is in a physical and psychological state that enables them to perform their work tasks competently and in a manner which does not affect their health, safety or wellbeing, or that of others. A coal mine worker who is deemed fit for work is in a physical and psychological condition to meet their health, safety and work obligations competently.
General practitioner (GP)	A medical doctor who holds specialist registration with AHPRA as a general practitioner and provides primary healthcare services, diagnosing and treating a wide range of conditions. GPs offer preventive care, manage chronic illnesses, and refer patients to other specialists when needed. They are often the first point of contact for medical concerns and play a key role in patient care.
Global Initiative for Asthma (GINA)	An independent organisation that works with health care professionals, patient representatives and public health officials around the world to reduce asthma-related prevalence, morbidity and mortality.
Global Initiative for Chronic Obstructive Pulmonary Disease (GOLD)	An organisation that focuses on raising awareness and improving the prevention and treatment of COPD. GOLD produces an annual report that provides evidence-based guidelines for the prevention, diagnosis, assessment and management of COPD.

Term	Definition
Global Lung function Initiative (GLI)	An international collaboration that aims to improve how lung function tests are interpreted and reported worldwide. The GLI has produced standardised reference equations and tools for spirometry and gas transfer which allows for more accurate and consistent interpretation of lung function test results across different age groups and populations.
Health assessment	The term 'health assessment' replaces the term 'medical assessment' as defined in Order 43. It refers to the health examinations of a coal mine worker or prospective coal mine worker that meets certain criteria. The assessment must have been: > completed within the previous three (3) years > assessed against the position and risk category > completed by an AMP > in the form approved by and provided to Coal Services > approved by Coal Services. The reference to three (3) years means by 31 December of that current calendar year.
Health assessment certificate	A certificate issued by an AMP after the completion of a health assessment, health assessment review, or retirement health assessment. The certificate is provided to the PCBU who requested the health assessment, health assessment review, or retirement health assessment; and is in the form approved by and provided to Coal Services; and is approved by Coal Services.
Health assessment review	A review of a health condition(s) identified in a health assessment or a health assessment review of a coal mine worker as a one off or at defined intervals, or a health examination(s), including a deferred health examination(s) that meets certain criteria. The review must have been: > assessed against the position and risk category > completed by an AMP > in the form approved by and provided to Coal Services.
Health certification	A health determination with limited medical information to support the PCBU to create a safe system of work and is documented on a health assessment certificate by an AMP following the completion of health examinations, and any health assessment reviews which assess the ability of a coal mine worker or prospective coal mine worker to perform the position and risk category.
High-resolution computed tomography (HRCT)	A medical scan that produces a clearer and more detailed image of the chest, lungs and heart than a chest x-ray. It helps to identify early lung disease and checks for other damage, when indicated under the CS Health clinical pathways for coal mine dust lung disease monitoring.
Inhalable mine dust	Inhalable mine dust particles are <100 microns (μ) in diameter and can be seen. Inhalable mine dust is usually breathed in, but is mainly trapped in the mouth, nose and upper respiratory tract.
International Classification of HRCT for Occupational and Environmental Respiratory Diseases (ICOERD)	A standardised method of classification of HRCT abnormalities in occupational and environmental respiratory diseases.

Term	Definition
International Labour Organization (ILO)	A tripartite agency of the United Nations that brings together governments, employers, and workers to set labour standards, develop policies, and devise programs that promote decent work for women and men. The ILO International Classification of Radiographs of Pneumoconioses is a global tool for: > improving the surveillance of worker health > conducting epidemiological research, and > making comparisons of statistical data.
Isocyanates	Compounds containing one or more chemical groups that are denoted as N=C=O. Such groups can combine with other compounds that contain alcohol groups. The largest use of isocyanates is in the production of polyurethane foam and in two-pack spray painting.
Occupational and environmental physician (OEP)	A medical practitioner who has completed the training program of the Faculty of Occupational & Environmental Medicine which is part of the Royal Australasian College of Physicians (RACP) and is registered with AHPRA as a specialist in occupational and environmental medicine.
Order 43	Refers to the Coal Services Health Monitoring Requirements for Coal Mine Workers Order No. 43 under the *Coal Industry Act 2001* (NSW).
Person conducting a business or undertaking (PCBU)	Person conducting a business or undertaking has the same meaning given to that term under the *Work Health and Safety Act 2011* (NSW) s 5 (as amended from time to time or replaced).
Personal protective equipment (PPE)	Anything worn to prevent or minimise exposure to hazards. For example, safety glasses, gloves, steel-cap boots, hard hats, respirators, face masks.
Progressive massive fibrosis (PMF)	Large, mass-like conglomerates of fibrous (or scar) tissue, usually in the upper lobes of the lungs. These only occur in severe disease and develop in the context of certain pneumoconioses, particularly CWP and silicosis.
Prospective coal mine worker	A person who is seeking to commence work for the first time at a NSW coal mine or coal handling preparation plant for a PCBU. It does not include a person who will work in an environment in which they are not exposed to airborne contaminant, hazardous chemicals, and/or occupational noise.
Queensland Workers Compensation Regulatory Services (WCRS)	Regulates the Queensland workers' compensation scheme and is part of the Queensland Office of Industrial Relations.
Remote work	Has the same meaning as defined in NSW Work Health and Safety Regulation 2025 s 48. In relation to a worker, it means a worker that is isolated from the assistance of other persons because of location, time or the nature of the work.
Respirable coal dust (RCD)	A very fine coal dust, with particles measuring <10 microns (μ) in diameter and typically invisible to the naked eye. When inhaled, RCD can reach the lower parts of the lung and potentially lead to the development of coal mine dust lung disease.
Respirable crystalline silica (RCS)	The respirable dust fraction of crystalline free silica. RCS contains very fine dust particles meauring <10 microns (μ) in diameter that, when inhaled, can reach the lower parts of the lung and potentially lead to silicosis, lung cancer and irreversible lung damage.

Term	Definition
Respirator fit test	A quantitative assessment of the fitting of personal respiratory protective equipment to ensure that it fits closely to a person's face to minimise the risk of exposure to airborne contaminants. It must be undertaken by a person who has completed an approved respirator fit test course and complies with the Coal Services Clinical and Service Standard.
Respiratory physician (RP)	A specialist medical practitioner who has successfully completed the examinations and training program of the RACP in Respiratory Medicine and who is then eligible to register with AHPRA as a specialist medical practitioner in this field.
Routine review	Refers to the Order 43 Periodic Health Surveillance interval, which is three (3) yearly.
Similar exposure group (SEG)	A group of coal mine workers who have the similar general exposure to risks, and can include similarity and frequency of tasks performed, types of materials and processes used, as listed on the Coal Services website (as amended from time to time).
Spirometry	A lung function test for assessing lung health, and in the diagnosis and monitoring of respiratory abnormalities. Spirometry used to monitor coal mine workers must strictly adhere to performance specifications set by the TSANZ and international medical societies, which are evidence based.
Standardised respiratory questionnaire (SRQ)	A set of standardised questions that scientific research has validated for the structured clinical inquiry of respiratory symptoms, if any. These were originally based on the Medical Research Council (MRC) (UK) Respiratory Questionnaire.
The National Institute for Occupational Safety and Health (NIOSH)	NIOSH is the United States' (US) federal agency responsible for the prevention of work-related injury and illness. It is part of the Centers for Disease Control and Prevention, under the US Department of Health and Human Services.
The Thoracic Society of Australia and New Zealand (TSANZ)	TSANZ is the peak body representing a range of professions (medical specialists, scientists, researchers, academics, nurses, physiotherapists, students and others) across various disciplines within the respiratory and sleep medicine field in Australia and New Zealand.
This Standard	Refers to the NSW Coal Industry Respiratory Health Standard.
Well-controlled asthma	In this Standard, well-controlled asthma is as defined by the GINA assessment of asthma control in adults.

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Introduction

Coal Services

Coal Services is a Specialised Health and Safety Scheme proudly protecting the NSW coal industry and its workers for over 100 years.

We offer a comprehensive range of critical services designed to minimise workplace injuries and illnesses.

In collaboration with our industry stakeholders, we are committed to safeguarding the health, safety and wellbeing of workers within the sector by focusing on prevention, early detection, enforcement, and educational initiatives.

Our purpose, vision and values are aligned to focus on the continued safety and health of our industry and its workers.

Our purpose: To protect.

Our vision: To be a valued industry partner promoting a healthy workforce and safe workplaces.

Our values: We care. We work together. We make a difference.

Role of Coal Services

Coal Services' preventative and responsive services in the areas of workplace health and safety, workers' compensation, emergency response and training, help to deliver on our purpose, 'to protect'.

Coal Services operates under the provisions set out in the *Coal Industry Act 2001* (NSW) (the Act) s 9 regarding approved companies. We exercise these functions in accordance with s 10(1) of the Act.

Our statutory responsibilities are defined in the Act, and we are responsible for ensuring these and the various Orders pertaining to it are maintained.

Coal Services' unique collaborative model is like no other in the world. With our purpose, 'to protect' at its centre and enabled by collaboration with all industry stakeholders, the model demonstrates our role in supporting industry to comply with the legislative and regulatory framework that exists in NSW, as well as keeping coal mine workers' health, safety and wellbeing at the forefront of decision making.

The collaborative model and the services provided by our Specialised Health and Safety Scheme have delivered proven results in safeguarding against injury and occupational disease.

The health surveillance scheme for NSW coal mine workers

Under the Act, CS Health is responsible for executing health Orders to monitor the health of NSW coal mine workers for any health effects due to occupational exposures to dust, noise, chemicals, and other workplace hazards.

The health assessments detailed in the Order can also identify other health and lifestyle-related conditions that may impact a coal mine worker's ability to work safely and effectively.

Regular screening provides an opportunity for early identification of occupational and non-occupational diseases. This provides greater scope for effective treatments and preventative measures to keep coal mine workers safe.

Many occupational diseases, including respiratory diseases, are difficult to treat once established. Therefore, strategies to address occupational diseases must focus primarily, if not entirely, on prevention. Early detection is crucial so that preventative measures can be implemented to prevent the establishment, and minimise any progression, of identified occupational diseases.

Early detection relies on screening tests which are a vital component of health assessments outlined in the Order. These screening tests aim to identify health issues before symptoms manifest. The detection of health issues in asymptomatic coal mine workers relies heavily on the accuracy of screening tests, which necessitates regular calibration of equipment and ongoing, structured training and verification of competency for test operators and test interpreters.

Spirometry tests, for example, initially serve as screening tools to detect small abnormalities, rather than a diagnostic test. Strict adherence to rigorous testing standards is imperative to ensure accuracy.

The health surveillance scheme also helps NSW coal industry employers to fulfil their health and safety obligations to protect the health and wellbeing of their workforce.

CS Health provides dedicated support to industry and approved medical practitioners (AMPs) for Order compliance through various channels.

Scope

This Standard applies to all AMPs who complete Order 43 health assessments on NSW coal mine workers or prospective coal mine workers. The AMP must comply with all guidelines, policies and standards issued or endorsed by Coal Services.

This Standard can also be used as a resource for coal mine workers and persons conducting a business or undertaking (PCBUs) to understand the management of respiratory conditions and identified lung abnormalities in the NSW coal industry.

This Standard does not include information on the medical management of identified lung abnormalities outside the coal mining environment, which is the role of the workers' general practitioner (GP) or treating specialist.

Background

NSW Coal Industry Health Standards

The NSW Coal Industry Health Standards stipulate the framework that Coal Services requires AMPs to operationalise to ensure consistent and uniform delivery of quality Order 43 health assessments.

Approved medical practitioners are required to assess a coal mine worker's fitness for work.

Coal mine workers work across diverse environmental conditions, with potentially unpredictable workloads, and are exposed to many occupational hazards that are unique to the coal industry. Depending on their position and/or the work environment(s), if a coal mine worker suddenly loses capacity, they may potentially harm not only themselves, but also others. The consequences of this could vary from minor impact to multiple fatalities, and/or major asset damage.

Order 43 health assessments and the criteria used for assessing fitness for work at a coal mine must consider both the coal mine worker's position and the hazards to which they may be exposed.

What are NSW Coal Industry Health Standards?

The NSW Coal Industry Health Standards:

- are practical, risk-based assessment tools designed to facilitate an AMP's evaluation of a coal mine worker's fitness for work for a specific position
- define Coal Services' enterprise tolerance to operational health-related risks, such as the level of medical fitness required for specific positions, by considering a position's physical and psychosocial demands, as well as the foreseeable risks to health and/or safety that correlate with a worker's position tasks and work environment
- help to identify health issues that can foreseeably limit capacity, impair job performance and/or pose a foreseeable risk to health and/or safety in the workplace, leading to incidents, injuries or illness
- cover the aspects of health that are clinically relevant to safety-critical work, including physical and psychological fitness and specific functions like vision, hearing and cardiovascular health
- include health assessment review requirements and medical management plans that are based on internationally-recognised medical best practices.

Benefits of NSW Coal Industry Health Standards

NSW Coal Industry Health Standards:

- assist AMPs to identify job accommodations or adjustments required to ensure coal mine workers can carry out their work safely and effectively
- provide a practical approach via a process of risk stratification. This ensures that positions with similar tasks and perceived risks are grouped, so coal mine workers in similar risk roles undergo consistent and appropriate medical evaluations
- maximise consistency, transparency, and fairness in Order 43 health certification
- reduce ambiguity
- provide clear health certification criteria
- reduce the need for escalation of routine matters.

Evidence base

The medical guidance and health certification criteria outlined in this Standard are based on published evidence and best practice standards regarding the monitoring of respiratory health and the impact of respiratory conditions on fitness for work.

This Standard takes guidance from the Queensland Workers' Compensation Regulatory Services (WCRS) *Returning workers with mine dust lung disease to the workplace (2022) guide and the Coal Services Health Inhalable Mine Dust Restrictions Review (April 2025)*.

It also incorporates recommendations from the Thoracic Society of Australia and New Zealand (TSANZ) *Standards for the Delivery of Spirometry for Resource Sector Workers (2022) and Respiratory surveillance for coal mine dust and artificial stone exposed workers in Australia and New Zealand position statement (2020)*.

Recommendations from relevant health bodies and professional organisations were also considered, including Safe Work Australia, the Global Strategy for Asthma Management and Prevention (GINA) and the Global Initiative for Chronic Obstructive Pulmonary Disease (GOLD).

Where published evidence was lacking, guidance was taken from subject matter experts, including respiratory physicians (RPs) and occupational and environmental physicians (OEPs).

Respiratory Health Standard

Coal mining produces coal dust and dusts from other minerals, including silica. Repeated exposure to coal mine dust can put coal mine workers at risk of developing coal mine dust lung diseases (CMDLD).

The main types of CMDLD include the development and/or worsening of:

- coal workers' pneumoconiosis (CWP), otherwise known as black lung disease, caused by inhalation and accumulation of coal dust in the lungs
- silicosis, from inhalation of silica or quartz from drilling or cutting stone
- mixed dust pneumoconiosis (or mixed dust fibrosis)
- diffuse dust-related fibrosis
- chronic bronchitis
- emphysema
- chronic obstructive pulmonary disease (COPD).

In addition to heavy mineral dust exposure, smoking and vaping increase the risk of developing lung diseases including emphysema, chronic bronchitis and COPD.

Order 43 health assessments monitor lung health and screen for the presence of any lung disease including those with occupational and non-occupational causes.

Other protective measures against the development of lung disease include identification of all potential dust sources, detailed exposure assessments, sufficient ventilation, job rotation, and use of effective personal protective equipment (PPE). To be effective, respirators need to have an adequate seal. This requires coal mine workers to be clean shaven or have facial hair that does not interfere with the respirator seal.

Purpose of the Respiratory Health Standard

The Respiratory Health Standard for the NSW coal industry has several purposes:

- to assess whether a coal mine worker has adequate respiratory reserves to undertake their proposed role within a NSW coal mine
- to ensure that coal mine workers with identified lung abnormalities are restricted from potentially harmful exposures (as appropriate) and are monitored to minimise potential ongoing harm
- to ensure coal mine workers exposed to respiratory hazards, other than coal mine dust, are appropriately managed and monitored according to recognised standards.

Duties and accountabilities

Duties and accountabilities associated with implementing the requirements of this Standard

A clear understanding of duties and accountabilities, along with effective communication, assists in maximising the effectiveness of health protection that this Standard offers, and the health and safety of the NSW coal industry workforce.

Approved medical practitioner

- The AMP must ensure their assessment and health certification of the coal mine worker is in accordance with this Standard.
- The AMP is accountable for assessing fitness for work using their clinical judgement and providing a health certification that is in accordance with this Standard. Where anyone other than the AMP completes any part of any Order 43 health assessment, the AMP retains non-delegable, full accountability for the accuracy and quality of all assessments.
- The AMP must ensure a copy of the coal mine worker's previous spirometry and other relevant investigations are obtained prior to the medical submission to allow for examination of any change from baseline or previous levels.

  For coal mine workers requiring referral to a RP:

  - where the AMP believes that the coal mine worker's lung disease may relate to an occupational exposure, the AMP should organise the referral to the RP directly, and clearly specify to the RP the clinical concerns.

    The RP should be asked to confirm the existence of disease, if any, and to comment on the severity of confirmed disease. The referral must specify the coal mine worker's occupational history, including the average coal mine dust exposure levels whenever known, past work history, or other evidence that underpins those levels.
  - where the lung disease is related to non-occupational causes, the AMP should refer the coal mine worker back to their GP for further appropriate, timely health care.

- The AMP and/or OEP should discuss any assigned dust restrictions with the coal mine worker and requirements for enhanced medical surveillance.
- If the coal mine worker is made permanently unfit or temporarily unfit for their position whilst undergoing further investigations, the AMP should consult with the PCBU to explore the possibility of identifying alternative suitable duties.
- The AMP is not responsible for the management of any identified lung conditions.

Coal mine worker

- The coal mine worker should attend, and fully participate in, each required Order 43 health assessment and/or health assessment reviews and any further respiratory investigations.
- The coal mine worker should provide accurate, complete answers to questions within any health assessment.
- The coal mine worker should declare each medical condition at their Order 43 health assessment that may affect their capacity to perform their position without undue risk to themselves and/or others. Coal mine workers who are not sure about whether a condition might affect their capacity should consult with the AMP and/or their treating doctor about whether a condition may affect their fitness for work.

Coal Services

- Coal Services is responsible for the timely, effective communication of this Standard to the NSW coal industry and to key stakeholders.
- Coal Services is responsible for providing the NSW coal industry with supporting guidelines to assist stakeholder understanding and interpretation of this Standard.
- Coal Services, through the internal and external AMP network, is responsible for providing Order 43 health assessments.

General practitioner

- The coal mine worker's GP is responsible for the management of any identified respiratory conditions.
- The coal mine worker's GP is responsible for the development of an asthma management plan when required.

Person conducting business or undertaking

- The PCBU is responsible for ensuring that the coal mine worker has a health assessment and/or has attended any health assessment reviews and any further respiratory follow up required under Order 43 and other relevant legislation.
- The PCBU must notify the AMP assessing the coal mine worker if any health monitoring requirements in NSW Work Health and Safety Regulation 2025 Sch 14 are required in addition to the standard monitoring under Order 43.
- The PCBU must notify the AMP assessing the coal mine worker if any remote work is undertaken by the coal mine worker.
- The PCBU is responsible for considering and, where appropriate, implementing any recommended workplace remedial measures identified in the health certification provided by the AMP.
- The PCBU is responsible for assessing and monitoring the coal mine dust, isocyanate, welding fumes and any other exposure levels requiring environmental and/or health monitoring for all job roles.
- The PCBU is responsible for ensuring coal mine workers adhere to any required dust level exposure restrictions.

Respiratory physician

- The RP is responsible for diagnosing respiratory conditions that potentially cause respiratory impairments and/or radiological abnormalities, and providing advice about the timely and appropriate medical management of disease and injury.
- The RP is responsible for assessing overall levels of clinical control and asthma stability when initial screening identifies an unacceptable level of asthma control or exacerbation of risk, and conveying such information back to the referring AMP and/or GP.
- The RP is responsible for giving clinical advice regarding the coal mine worker's lung function so that the AMP can assess the worker's suitability to use breathing apparatus (BA).
- The RP is not responsible for determining the worker's fitness for work. This determination remains the responsibility of the AMP.

NSW Coal Industry Health Standard review and feedback process

A comprehensive review process is essential to ensure information detailed in this Standard remains current and maintains best practice standards.

All NSW Coal Industry Health Standards will be reviewed 12 months after their initial publication and then every 5 years thereafter, or sooner, as required.

This Standard will be reviewed by the Coal Services Standing Health Committee, subject matter experts and the Coal Services Clinical Governance Committee.

Any feedback received, including identified changes or required updates to this Standard, will be incorporated into the review process and considered accordingly.

Feedback on this Standard can be provided by email to shc@coalservices.com.au

Health assessment components

Approved medical practitioners must use the following assessments and investigations when determining a coal mine worker's lung function and any other conditions or factors that may affect a coal mine worker's ability, health and/or safety in performing their designated role.

Respiratory health assessments and investigations

All coal mine workers undergo the following respiratory health assessments as part of the Order 43 health assessment, regardless of the position they will be undertaking at a coal mine:

- Standardised Respiratory Questionnaire (SRQ)
  - See Appendix A for complete questionnaire.
  - The SRQ is used in conjunction with the coal mine worker's medical history, chest x-ray and spirometry to assist in the diagnosis of respiratory disorders, and provides a valuable record when comparing results over time.
- Chest examination
- Coal mine worker chest imaging
  - This refers to a chest x-ray and/or high-resolution computed tomography (HRCT)* completed as part of the Order 43 health assessment.
  - The chest imaging must be taken according to the ILO standards for chest imaging (refer to Thoracic Society of Australia and New Zealand (TSANZ) position statement in reference list).
  - The chest imaging must be reported to the ILO International Classification of Radiographs of Pneumoconioses by at least two medical practitioners registered by AHPRA as radiologists, who have achieved B-reader accreditation from NIOSH.

    * If a coal mine worker has completed a HRCT of the chest, this may be accepted in place of a chest x-ray, if not already completed. The requirement for a HRCT should be guided by the *CS Health Clinical pathways for coal mine dust lung disease monitoring* (Appendix D).
- Spirometry
  - The conduct and interpretation of each spirometry must adhere strictly to the current American Thoracic Society (ATS) and European Respiratory Society (ERS) standards, relevant to spirometry.
- Asthma control
  - If a coal mine worker reports a history of asthma, the level of control and risk of exacerbation must be defined by the *2025 GINA assessment of asthma control in adults* (see Appendix B).
  - The GINA guideline also recommends using the Asthma Control Questionnaire to assess recent symptom control.

Secondary investigations

If any of the above standard respiratory assessments and/or investigations highlight a history of lung disease or abnormal results, then the AMP may refer the coal mine worker for any combination of the secondary investigations listed below:

- complex lung function tests (CLFT)
- high-resolution computerised tomography (HRCT)
- fractional exhaled nitric oxide (FeNO) assessment
- Respiratory physician assessment

The AMP or RP's determination of the clinical need, if any, for secondary investigations should refer to the medical management guidelines contained within this Standard for the purposes of structured clinical reasoning, along with:

- CS Health *Clinical pathways for coal mine dust lung disease monitoring* (Appendix C)
- CS Health *Clinical pathways for coal mine dust lung disease monitoring* (roles defined) (Appendix D)
- CS Health *Clinical pathways for coal mine dust lung disease monitoring - supporting clinical guidance notes for medical practitioners* (Appendix E)
- CS Health *Guidelines for managing identified lung disease in the NSW coal industry* (Appendix F).

Guidelines for medical management

Coal mining encompasses many roles, both on the surface and underground, often in close proximity to machinery and tools, and frequently involves exposure to airborne contaminants. In some emergency and routine situations, coal mine workers may need to use different forms of respiratory protection for brief or extended periods. This variability in tasks and environments can demand different levels of lung function, and exposure to airborne contaminants may contribute to or worsen respiratory conditions. Moreover, due to the nature of the work environment, coal mine workers may be located far from emergency medical care, both in terms of time and distance, if they experience a sudden deterioration in lung function.

The guidelines on the following pages outline the various hazards and lung function requirements for coal mine workers in different areas of coal mining.

In addition to standard respiratory investigations completed as part of the Order 43 health assessment, and any required secondary investigations, AMPs must also consider the foreseeable health and/or safety risks to the coal mine worker and/or others. This includes risks arising from both the coal mine worker's capacity to perform the inherent requirements of their job role, and the workplace environments when assessing and/or issuing a health certificate.

The AMP's assessment of health and safety risk to the coal mine worker and/or others should also consider the PCBU's written risk tolerance policy, if any, to determine the likelihood and consequence of potential harm. While AMPs are medically positioned to assess the foreseeable severity of potential harm (i.e. consequences) from a coal mine worker's (potentially limited) capacity at work, a PCBU determines the likelihood of that harm occurring, and the practicability of controlling against that harm at work.

Approved medical practitioners should issue risk-based, outcomes-driven advice about fitness for work. Non-exhaustive examples include: '*if a worker with eosinophilic asthma wishes to work in a role that regularly involves exposure to isocyanates, it is reasonably foreseeable that they could develop sensitisation to isocyanates. Therefore, they may be better advised to work in a different role.*'

Approved medical practitioners should consult an OEP or RP if there is uncertainty about occupational and environmental medical risk.

Remote work

Health conditions that may suddenly deteriorate, placing the person at risk of serious harm or death, should always be considered when the person works in situations where they may be isolated from rapid assistance or medical treatment.

Many factors that can suddenly exacerbate lung conditions are found in coal mining. Strenuous physical exertion is common and may occur in hot, cold, humid and dry environments. Each of these conditions may be present in different parts of the mine depending on the ventilation and work being conducted, and may change suddenly, for example, when passing through a sealed hatch. Dust levels can also vary depending on the coal mine workers' roles and locations in the mine. Those working on the surface may be exposed to the elements, including wind, and sudden changes in weather can significantly worsen underlying asthma.

Efforts should be made to assess whether the coal mine worker's level of asthma control (as defined by the GINA assessment of asthma in adults) adequately minimises this risk. This can be often achieved with changes to treatment.

Use of breathing apparatus

Some roles in coal mining may require the use of breathing apparatus in emergency settings. This is relevant to underground coal mine workers in the event of a fire and/or an irrespirable atmosphere.

In an emergency, underground coal mine workers may be required to use a self-rescuer and/or compressed air breathing apparatus (CABA). Self-rescuers may deliver dry, warm to hot air with increasing flow resistance as time

passes. CABA uses pressurised dry air delivered by a face mask.

It is important to identify any lung conditions that may be exacerbated by these conditions. Consideration must also be given as to whether the coal mine worker's overall respiratory reserve is adequate to cope with the demands associated with the use of breathing apparatus.

Exposure to coal mine dust

The Review of the New South Wales Health Surveillance Scheme for Coal Mine Workers, conducted by the University of Illinois School of Public Health, recommended that coal mine workers with identified lung disease have restrictions on coal mine dust exposure once certain levels of respiratory impairment were reached. This requirement was also extended to cases of non-occupational lung disease.

There is great variability in individual dust exposure profiles for coal mine workers. The AMP is responsible for ensuring the recommended level of dust exposure and follow-up advice is appropriate for the degree of respiratory impairment.

The PCBU is responsible for how that is managed in the workplace.

Isocyanate use

Isocyanates are used in spray painting and strata support roles in coal mining. These chemicals are known sensitisers that may trigger or worsen asthma and dermatitis. It is important that coal mine workers are informed about these risks and are able to use appropriate PPE.

It is not advisable for coal mine workers with asthma that is not well-controlled (as per the GINA guidelines) to work with isocyanates.

The use of these chemicals may also require formal monitoring under Work Health and Safety Regulation 2025 s 368. Any indication of sensitisation or worsening of asthma control during monitoring, should prompt a review and may result in removal from further exposure.

Exposure to other respiratory hazards

Coal mine workers may also be exposed to other airborne contaminants through activities such as welding, using solvents, inspecting cooling towers, spraying cement, exposure to organic antigens, working in the open, and high-pressure cleaning. Many of these tasks require the use of various forms of health protection that follow a reasonably practicable implementation of the hierarchy of controls.

The lowest level of control is PPE. The PCBU should ensure that adequate controls, including health protection policies and procedures, as well as any appropriate PPE, are consistently and effectively applied to each coal mine worker. Any underlying lung conditions should be medically well-controlled.

Underground work

Underground work can place many demands on, and poses many hazards to, lung health. The work area may be up to a one-hour drive from the surface. Coal mine workers' lungs may be exposed to coal mine dust and diesel exhaust emissions, while temperature and humidity can vary significantly throughout different areas of the mine. Tasks may require heavy physical exertion. Many coal mines have restrictions around taking aluminium items underground, which may prevent coal mine workers from carrying their usual asthma inhaler with them. The PCBU should be consulted to determine which inhalers can be safely used underground.

There is also the possibility that a self-rescuer or CABA may need to be used in an irrespirable atmosphere. An irrespirable atmosphere can occur as a result of oxygen depletion caused by the presence of hazardous gases such as methane (CH_4) or carbon dioxide (CO_2) which displace oxygen (O_2). This situation would preclude the use of bronchodilators if symptoms are triggered.

An additional consideration is that coal mine workers working on the longwall, in development panels, injecting strata support, or spraying cement, may need to wear respirators for extended periods. This type of work is not suitable for workers with poor respiratory reserve.

Medical management tables

The medical management tables provide guidance to AMPs on the following categories:

- Position requirements:
  - work conditions that may affect lung health
  - work requirements that may impact a coal mine worker's ability to safely complete their role
- Coal mine worker requirements:
  - specifies the necessary level of lung function and minimum requirements for medical clearance
- Management:
  - outlines steps for further investigation and necessary management when the coal mine worker requirements are not met
  - provides guidance on a coal mine worker's fitness for work, including whether they can continue working while further investigations occur
- Actions required:
  - follow-up requirements
  - frequency of review(s)
  - health certification

Approved medical practitioners should use the tables on the following pages to guide their overall assessment and health certification as to whether a coal mine worker can safely perform their designated position.

If the AMP determines that a coal mine worker is permanently or temporarily unfit for their role as outlined in the table, contact should be initiated with the PCBU to explore the possibility of identifying alternative suitable duties.

Table 1: Medical management – remote work

Position requirements	Coal mine worker requirements	Management	Action required
Remote work* **See glossary definition of remote work* Does the coal mine worker's position require them to undertake any remote work? If yes, the coal mine worker must satisfy conditions under the 'coal mine worker requirements' column. If the 'coal mine worker requirements' are not met, the coal mine worker may not be safe for remote work.	Well-controlled asthma, and no significant concerns about the presence of factors that may increase the risk of exacerbations.* **as defined by the GINA assessment of asthma in adults (Appendix B)*	If these requirements are not met, the AMP should refer the coal mine worker to their GP for review; and to arrange an RP assessment of their asthma to determine whether adequate control can be achieved. The AMP should certify the worker as temporarily unfit or fit for work, until the RP assessment is completed. If certified as temporarily unfit the AMP should discuss with the PCBU whether other suitable duties are available.	If the RP assessment determines unsatisfactory asthma control, the AMP should certify the coal mine worker as unfit for remote work. If the RP assessment determines that satisfactory asthma control can be achieved, the AMP should certify the coal mine worker as fit for work. **Follow-up** If certified as fit for work, the coal mine worker must: > have an annual spirometry review thereafter, if continuing to work remotely; and > adhere to treatment; and > have an adequate asthma management plan.

Table 2: Medical management – use of breathing apparatus (BA)

Position requirements	Coal mine worker requirements	Management	Action required
Use of breathing apparatus (BA) Does the coal mine worker's position require them to use BA? If yes, the coal mine worker must satisfy conditions under the 'coal mine worker requirements' column. If the 'coal mine worker requirements' are not met, the coal mine worker may not be safe for BA use.	Normal spirometry, and none of the conditions listed below.	For abnormal spirometry results, the AMP should identify if the coal mine worker has one of the conditions listed in the 'coal mine worker requirements' column of this table and manage accordingly. If there is no known cause for the abnormal spirometry, the AMP should refer the coal mine worker to an RP for investigation (prior to BA use clearance) and then manage as per the identified cause below.	If assessed as being able to use BA safely (by the AMP if > mild spirometry abnormality), the AMP should certify the coal mine worker as fit for work. If assessed as not being able to use BA safely, the AMP should certify the coal mine worker as temporarily unfit for work. Before the health certification is finalised, the AMP should discuss with the PCBU whether there are other suitable duties the coal mine worker may be able to undertake. **Follow-up** If assessed as being able to use BA safely, coal mine workers with abnormal spirometry will require an annual spirometry review thereafter, if they continue to require BA use.
	No reactive airway symptoms with BA use.	Coal mine workers who have reactive symptoms should be referred to an RP for advice on the cause of symptoms and lung function to assist the AMP to assess the safety for BA use. If the role requires BA use, the AMP should certify the coal mine worker as temporarily unfit until RP investigations are completed and medical information is provided back to the AMP, within 6 months (if possible).	If assessed as being able to use BA safely, the AMP should certify the coal mine worker as fit for work. If assessed as not being able to use BA safely, the coal mine worker should remain temporarily unfit for work. Before the health certification is finalised, the AMP should discuss with the PCBU whether there are other suitable duties the coal mine worker may be able to undertake. **Follow-up** If assessed as being able to use BA safely, the coal mine worker will require an annual spirometry review thereafter, if they continue to require BA use, unless the condition has been stable for some time.

Position requirements	Coal mine worker requirements	Management	Action required
Use of breathing apparatus (BA) Does the coal mine worker's position require them to use BA? If yes, the coal mine worker must satisfy conditions under the 'coal mine worker requirements' column. If the 'coal mine worker requirements' are not met, the coal mine worker may not be safe for BA use.	No asthma, or well-controlled asthma. **as defined by the GINA assessment of asthma in adults (Appendix B).*	If asthma is not well-controlled, the coal mine worker should undergo a FeNO test, if available, and an asthma control questionnaire. If FeNO test is unavailable, or FeNO levels are <40 parts per billion (ppb), or asthma control questionnaire reveals asthma is not well-controlled, the AMP should refer the coal mine worker to GP for review of asthma management. The AMP should review medical information provided back from GP within 6 months.	If asthma is assessed as well-controlled, the AMP should certify the coal mine worker as fit for work. At least annual review with spirometry is required while continuing with the requirement for BA use. If asthma is not assessed as well-controlled, the AMP should certify the coal mine worker as temporarily unfit for work, until completion of the RP review.
		If FeNO levels are >40 ppb, the AMP should refer the coal mine worker to their GP for review and RP referral. RP to provide medical information back to AMP for review within 6 months.	AMP to advise if the coal mine worker is safe for BA use and frequency of follow-up required (based on RP advice).
	Absence of any history of spontaneous pneumothorax without surgical repair.	Coal mine workers with a history of pneumothorax without surgical repair will require AMP advice to determine safety for BA use.	If the AMP determines the coal mine worker is not able to use BA safely, the AMP should certify the coal mine worker as unfit for work. Before the health certification is finalised, the AMP should discuss with the PCBU whether there are other suitable duties the coal mine worker may be able to undertake. If assessed by the AMP as being able to use BA safely, the AMP should certify the coal mine worker as fit for work. **Follow-up** If cleared, routine review.
	No history of COPD, or mild COPD only.* **As defined by GOLD grades and severity of airflow obstruction in COPD (Appendix G).*	Coal mine workers with moderate to severe COPD will require an RP referral.	If assessed as not being able to use BA safely, the AMP should certify the coal mine worker as unfit for work. Before the health certification is finalised, the AMP should discuss with the PCBU whether there are other suitable duties the coal mine worker may be able to undertake. If assessed by the AMP as being able to use BA safely, AMP should certify the coal mine worker as fit for work. **Follow-up** If assessed as being able to use BA safely, the coal mine worker will require annual spirometry review.

Position requirements	Coal mine worker requirements	Management	Action required
Use of breathing apparatus (BA) Does the coal mine worker's position require them to use BA? If yes, the coal mine worker must satisfy conditions under the 'coal mine worker requirements' column. If the 'coal mine worker requirements' are not met, the coal mine worker may not be safe for BA use.	Ability to form an adequate seal wearing a respiratory mask and adequately use mouthpiece when required, as evidenced by: > physical examination, and > a respirator fit test pass result. Significant facial scarring or deformity, lack of dentition, or inability to complete spirometry effectively may negatively impact ability.	Coal mine workers who don't meet these requirements will be unfit for BA use, unless able to be corrected. The AMP should certify the coal mine worker as temporarily unfit for work until further investigation and correction.	If assessed by the AMP as being able to use BA safely, the AMP should certify the coal mine worker as fit for work. **Follow-up** Routine review.
	Absence of evidence of severe chronic sinus obstruction*. **Severe chronic sinus obstruction may be indicated by mouth breathing, trouble breathing through the nose, or inability to get enough air through the nose during exercise or exertion.*	Coal mine workers with evidence of severe sinus obstruction should be referred to their GP for assessment and management with consideration of an Ear, Nose and Throat (ENT) specialist referral. The AMP should certify the coal mine worker as temporarily unfit for work pending GP +/- ENT review, and information is provided back to the AMP within 6 months.	If assessed as being able to use BA safely, the AMP should certify the coal mine worker as fit for work. **Follow-up** Follow-up requirements to be determined by outcome of GP/ ENT referral. If permanently corrected, the coal mine worker will return to routine review, but may require regular monitoring.

Table 3: Medical management – exposure to coal mine dust

Position requirements	Coal mine worker requirements	Management	Action required
Exposure to coal mine dust Does the coal mine worker's role potentially expose them to coal mine dust? If yes, the coal mine worker must satisfy conditions under the 'coal mine worker requirements' column.	Absence of evidence of pneumoconiosis, or other occupational or non-occupational lung disease, **with** lung function and/or investigation results of > ILO >2/1 > HRCT ICOERD >9 > PMF > Pre FEV1 Z-score <-4 > DLCO Z-score <-4	All coal mine workers potentially exposed to coal mine dust should be managed according to the CS Health *Guidelines for managing identified lung disease in the NSW coal industry (Appendix F)*.	When lung disease requiring restrictions is identified, annual spirometry will usually be indicated. CLFT, HRCT and RP assessment may also be required as guided by clinical investigation team (CIT) determinations.

Table 4: Medical management – isocyanate use

Position requirements	Coal mine worker requirements	Management	Action required
Isocyanate use Does the coal mine worker's position require them to work with isocyanates? If yes, the coal mine worker must satisfy conditions under the 'coal mine worker requirements' column.	Absence of any known sensitivity to isocyanates.	Coal mine workers with sensitivity to isocyanates will be certified as unfit for isocyanate use.	All coal mine workers should have assessments consistent with the requirements of the Safe Work Australia *Health Monitoring Guide for Isocyanates* prior to exposure, and at least annually while working with isocyanates.
	Well-controlled asthma	If asthma is not well-controlled, the coal mine worker should have a FeNO test, if available. If a FeNO levels are >40 ppb, the AMP should refer the coal mine worker to their GP for review and an RP referral to assess safety to work with isocyanates. If FeNO test is unavailable or below the cutoff, the AMP should refer the coal mine worker to their GP for review of asthma management. The GP should provide information back to the AMP for review within 3 months.	If the coal mine worker is assessed as being unsafe to work with isocyanates, the AMP should certify the coal mine worker as unfit for work. Before the health certification is finalised, the AMP should discuss with the PCBU whether there are other suitable duties the coal mine worker may be able to undertake that don't require isocyanate use. If assessed as being safe to work with isocyanates, the AMP should certify the coal mine worker as fit for work. **Follow-up** Coal mine workers who are assessed as being safe to work with isocyanates should have assessments consistent with the requirements of the Safe Work Australia *Health Monitoring Guide for Isocyanates* prior to exposure, and at least annually while working with isocyanates.
	Caution with dermatitis	Dermatitis should not affect a coal mine worker's fitness for work with isocyanate use. However, coal mine workers with dermatitis should be advised that they need to be monitored more regularly.	The AMP should certify the coal mine worker as fit for work. **Follow-up** At least annual review.
	Must be able to form an adequate seal and/or use appropriate respiratory protective equipment and other PPE.	If alternative adequate PPE cannot be identified, the AMP should certify the coal mine worker as unfit to work with isocyanates. Before the health certification is finalised, the AMP should discuss with the PCBU whether there are other suitable duties the coal mine worker may be able to undertake that don't require isocyanate use.	If the coal mine worker requirements are satisfied, the AMP should certify the coal mine worker as fit for work. **Follow-up** Annual review.

Table 5: Medical management – exposure to other respiratory hazards

Position requirements	Coal mine worker requirements	Management	Action required
Exposure to other respiratory hazards Does the coal mine worker's role potentially expose them to other respiratory hazards? These include: > welding > infectious agents > organic antigens If yes, the coal mine worker must satisfy conditions under the 'coal mine worker requirements' column.	Must be able to form an adequate seal and/or use appropriate respiratory protective equipment.	In the presence of identified lung disease, refer to the CS Health *Guidelines for managing identified lung disease in the NSW coal industry (Appendix F).*	In the presence of identified lung disease, the CS Health *Guidelines for managing identified lung disease in the NSW coal industry (Appendix F)* should be used to guide any actions and follow-up requirements. The Safe Work Australia *Hazardous chemicals requiring health monitoring guideline* should be used to guide any actions and follow-up requirements for hazardous chemicals, where relevant.
	Well-controlled asthma	If asthma is not well-controlled, the coal mine worker should have a FeNO test if available. If a FeNO levels are >40 ppb, the AMP should refer the coal mine worker to their GP for advice on safety to work with other respiratory hazards. If FeNO test is unavailable or below the cutoff, the AMP should refer the coal mine worker to their GP for review of asthma management. The GP should provide information back to the AMP for review within 3 months.	Annual assessment of asthma control and spirometry, and any other hazardous chemical health monitoring as indicated.
	No history of COPD, or mild COPD only* **As defined by GOLD grades and severity of airflow obstruction in COPD (Appendix G)*	Coal mine workers with moderate to severe COPD should be referred to their GP for review and RP referral and assessment.	If the RP assesses the coal mine worker as likely safe for exposure to other respiratory hazards, the AMP should consider local hazards and certify the coal mine worker as fit for work. **Follow-up** If certified as fit for work, the coal mine worker will require annual review and assessment of COPD, spirometry, and any other hazardous chemical health monitoring as indicated.

Table 6: Medical management – underground work

Position requirements	Coal mine worker requirements	Management	Action required
Underground work	The coal mine worker must satisfy requirements for remote work, breathing apparatus, and coal mine dust exposure.	If these requirements are not met, then follow 'Action required' within respective sections of medical management tables.	Refer to relevant sections of medical management tables and this Standard for follow-up requirements.
	If the coal mine worker has asthma, they must be able to use a dry powder inhaler or other suitable device, or comply with site requirements for the use of pressurised inhalers underground. This information must be included in a current asthma management plan, which should be carried by the coal mine worker.	If the coal mine worker does not have an asthma management plan, the AMP should refer the coal mine worker to GP to develop an asthma management plan. GP to provide evidence back to the AMP that an asthma management plan has been developed. If the coal mine worker already has a current asthma management plan, a copy should be requested by the AMP.	If a coal mine worker with asthma is unable to use a dry powder inhaler, they may not be suitable to work underground, depending on rules at their worksite. The PCBU should be consulted to determine which inhalers can be safely used underground.

Considerations before certifying fitness for work

When assessing coal mine workers with identified lung abnormalities, a health assessment of their fitness for work must consider whether they have the capacity to start or continue in a position with or without restrictions, and whether there are any foreseeable health and safety risks to the coal mine worker and/or others. This must happen even if the outcomes of further investigations are still pending.

This Standard provides guidance on the features to look for to determine whether a condition is likely to be sufficiently stable. Evidence showing a condition has been previously identified and monitored with good control of any relevant risk factors may allow a coal mine worker to be certified fit for work with early review.

The AMP should record the reasons for the coal mine worker's health certification. Those reasons should be based on the clinical evidence that supports the application of this Standard to the coal mine worker, including but not limited to, the clinical information from the RP.

When assessing a coal mine worker's fitness for work, the AMP must consider the following factors:

- The coal mine worker's occupational and environmental history of exposure to dust and other relevant hazards (if any), as correlated against the inherent requirements specified in the relevant job description and/or task analysis issued by the PCBU, and/or as correlated against the information (if any) from the assessor's medical inspection of the coal mine worker's workplace environment(s).
- The overall severity of the changes, if any, in the coal mine worker's health.
  - In most cases the presence of severe abnormalities would require exclusion from dust exposure.
- The duration and stability of the change, if any.
  - Is this the first abnormal result?
  - Has it been present for some time and is it stable or declining?

    The ERS lung tracker is freely available online and provides a helpful way of assessing rate of decline.
- The psychosocial state and psychosocial work environment of the coal mine worker.
- The clinically relevant written risk assessment policy(s) and risk tolerance policy(s), if any, as provided by the PCBU. Policies are clinically relevant only to the extent that they define health and/or safety risk within the PCBU, including, but not limited to, any definitions of terms such as 'high' consequence and/or 'low' likelihood.
- Is it a new role?
  - The PCBU may need an indication of the likely dust restriction to assess suitability for the role.
- In cases where the AMP assesses the coal mine worker as unfit for their designated position, the AMP must advise the coal mine worker of the health certification.
- In cases where the AMP considers the coal mine worker unfit for the designated position, they must contact the PCBU to advise of the health certification. They should also consider, in discussion with the PCBU, if the coal mine worker would be suitable for other duties. This should occur with the worker's consent and before the health certification is finalised.

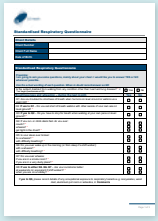
Transitional arrangements

This Standard has been developed to align with the proposed replacement of the Coal Services Health Monitoring Requirements for Coal Mine Workers Order No. 43 (Order 43).

The replacement Order is expected to become operational in 2026 and will be assigned an Order number.

Until the replacement Order is gazetted, this Standard refers to Order 43, after which time it will refer to the replacement Order.

Appendices



Appendix A:
Standardised Respiratory Questionnaire ↗

Appendix B:
GINA criteria for asthma control ↗

Appendix C:
CS Health Clinical pathways for coal mine dust lung disease monitoring ↗

Appendix D:
CS Health Clinical pathways for coal mine dust lung disease monitoring (roles defined) ↗

Appendix E:
CS Health Clinical pathways for coal mine dust lung disease monitoring - supporting clinical guidance notes for medical practitioners ↗

Appendix F:
CS Health Guidelines for managing identified lung disease in the NSW coal industry ↗

Appendix G:
GOLD criteria for COPD control ↗

CS Health

Standardised Respiratory Questionnaire

Client Details	
Client Number	
Client Full Name	
Date of Birth	

Standardised Respiratory Questionnaire

Preamble:
I am going to ask you some questions, mainly about your chest. I would like you to answer YES or NO whenever possible.

Use the actual wording of each question. When in doubt record answer as NO

Is the subject disabled from walking from any condition other than heart and lung disease? * *If 'Yes' begin questionnaire at Q5.*	☐ Yes	☐ No
Breathlessness and wheezing – during the last month	**Yes**	**No**
Q1: Are you troubled by shortness of breath when hurrying on level ground or walking up a slight hill? *	☐	☐
Q2: **If yes to Q1** – Do you get short of breath walking with other people of your own age on level ground? *	☐	☐
Q3: **If yes to Q2** – Do you have to stop for breath when walking at your own pace on level ground? *	☐	☐
Q4: If you run, or climb stairs fast, do you ever: cough? * wheeze? * get tight in the chest? *	☐ ☐ ☐	☐ ☐ ☐
Q5: Is your sleep ever broken: by a wheeze? * with difficulty breathing? *	☐ ☐	☐ ☐
Q6: Do you ever wake up in the morning (or from sleep if a shift worker): with a wheeze? * with difficulty breathing? *	☐ ☐	☐ ☐
Q7: Do you ever wheeze: if you are in a smoky room? * if you are in a very dusty place? *	☐ ☐	☐ ☐
Q8: **If yes to either Q5, Q6, Q7** – Are your symptoms better: at weekends (or equivalent if shift worker)? * when you are on a holiday? *	☐ ☐	☐ ☐

If **yes to Q8,** please record details of any occupational exposure to respiratory hazards e.g. isocyanates, wood dust, aluminium pot room or asbestos, in **Comments**

Cough	Yes	No
Q9: Do you usually cough first thing in the morning in winter? *	☐	☐
Q10: Do you usually cough during the day or at night in winter? *	☐	☐
Q11: **If yes to Q9 or Q10** – Do you cough like this on most days for as much as three months each year? *	☐	☐

Phlegm	Yes	No
Q12: Do you usually bring up phlegm from your chest first thing in the morning in winter? *	☐	☐
Q13: Do you usually bring up phlegm from your chest during the day or at night in winter? *	☐	☐
Q14: **If yes to Q12 or Q13** – Do you bring up phlegm like this on most days for as much as three months of each year? *	☐	☐

Periods of cough and phlegm	Yes	No
Q15: In the past three years, have you had a period of (increased) cough and phlegm lasting for three weeks or more? *	☐	☐
Q16: **If yes to Q15** – Have you had more than one such episode? *	☐	☐

Chest illnesses	Yes	No
Q17: During the past three years, have you had any chest illness that has kept you from your usual activities for as much as a week? *	☐	☐
Q18: **If yes to Q17** – Did you bring up more phlegm than usual in any of these illnesses? *	☐	☐
Q19: **If yes to Q18** – Have you had more than one illness like this in the past three years? *	☐	☐

Past illnesses	Yes	No
Q20: Have you ever had, or been told that you have any of the following:		
a. An injury, or operation affecting your chest? *	☐	☐
b. Heart trouble? *	☐	☐
c. Bronchitis? *	☐	☐
d. Pneumonia? *	☐	☐
e. Pleurisy? *	☐	☐
f. Tuberculosis *	☐	☐
g. Bronchial asthma *	☐	☐
h. Other chest trouble *	☐	☐
i. Hay fever *	☐	☐

Tobacco smoking	Yes	No
Q21: Do you smoke? *	☐	☐
If no to Q21 Q22: Have you ever smoked as much as one cigarette a day for as long as one year? *	☐	☐
Q23: How old were you when you started smoking regularly? *		
Q24: a) Do (did) you smoke manufactured cigarettes? *	☐	☐
If yes to **Q24a** – How many do (did) you usually smoke per day?		
b) on weekdays? *		
c) at weekends? *		
Q25: Do (did) you smoke any other forms of tobacco? *	☐	☐
If **yes to Q25,** record – Details		

Vaping	Yes	No
Do you or have you ever vaped? *	☐	☐
If **yes** record - Vaping Details		

For Ex-smokers	
Q26: When did you give up smoking altogether? *	

Comments

Appendix B: GINA criteria for asthma control

Extract from the Global Initiative for Asthma 'Global Strategy for Asthma Management and Prevention (2025 Update)' (GINA guidelines), page 37

Box 2-2. GINA assessment of asthma control at clinical visits in adults, adolescents and children 6–11 years

A. Recent asthma symptom control (but also ask the patient/caregiver about the whole period since last review*)

In the past 4 weeks, has the patient had:		Well controlled	Partly controlled	Uncontrolled
• Daytime asthma symptoms more than twice/week?	Yes☐ No☐	None of these	1–2 of these	3–4 of these
• Any night waking due to asthma?	Yes☐ No☐			
• SABA† reliever for symptoms more than twice/week?	Yes☐ No☐			
• Any activity limitation due to asthma?	Yes☐ No☐			

B. Risk factors for poor asthma outcomes

Assess risk factors at diagnosis and periodically, including after an exacerbation.

Measure FEV_1 at start of treatment, after 3–6 months of ICS-containing treatment to record the patient's personal best lung function, then periodically for ongoing risk assessment.

i. Risk factors for exacerbations

Uncontrolled asthma symptoms: Having uncontrolled symptoms is an important risk factor for exacerbations.[89]

Factors that increase the risk of exacerbations even if the patient has few asthma symptoms‡:[14,90,91]

- *SABA over-use:* High SABA use (≥3 x 200-dose canisters/year associated with increased risk of exacerbations, increased mortality particularly if ≥1 canister per month)[92-95]
- *Inadequate ICS*: not prescribed ICS, poor adherence,[96] or incorrect inhaler technique[97]
- *Other medical conditions:* Obesity,[14,91,98,99] chronic rhinosinusitis,[14,99] GERD,[99] confirmed food allergy,[100] pregnancy[101]
- *Exposures:* Smoking,[91,102] e-cigarettes,[103] allergen exposure if sensitized,[102,104] air pollution[105-108]
- *Psychosocial*: Major psychological or socioeconomic problems[109,110]
- *Lung function:* Low FEV_1 (especially <60% predicted),[102,111] high bronchodilator responsiveness[99,112,113]
- *Type 2 inflammatory markers:* Raised blood eosinophils,[14,99,114,115] high FeNO[14,116] (see biomarker overview, p.216)
- *Exacerbation history:* Ever intubated or in intensive care unit for asthma,[117] ≥1 severe exacerbation in last year[118,119]

ii. Risk factors for developing persistent airflow limitation

- *History:* Preterm birth, low birth weight and greater infant weight gain,[120] frequent productive cough[121,122]
- *Medications:* Lack of ICS treatment in patient with history of severe exacerbation[123]
- *Exposures:* Tobacco smoke,[121] noxious chemicals; occupational or domestic exposures[65]
- *Investigation findings:* Low initial FEV_1,[122] sputum or blood eosinophilia[122]

iii. Risk factors for medication side-effects

- *Systemic* Frequent OCS, long-term, high-dose and/or potent ICS, cytochrome P450 inhibitors§[124]
- *Local:* High-dose or potent ICS,[124,125] poor inhaler technique[126]

FeNO: fractional exhaled nitric oxide; FEV_1: forced expiratory volume in 1 second; GERD: gastro-esophageal reflux disease; ICS: inhaled corticosteroid; SABA: short-acting $beta_2$-agonist; OCS: oral corticosteroid. *In addition to assessing recent asthma symptom control, also ask the patient about symptom control over the whole period since their last clinical review. There are no validated tools for assessing long-term symptom control (>4 weeks); † Based on SABA (as-needed ICS-formoterol reliever not included); excludes reliever taken before exercise (see Assessing asthma symptom control, p.38); ‡ Independent risk factors after adjustment for the level of symptom control. Some studies have evaluated several of the above risk factors for exacerbations;[14,90,91] § Cytochrome P450 inhibitors such as ritonavir, ketoconazole, itraconazole may increase systemic exposure to some types of ICS and some long-acting $beta_2$-agonists; see drug interaction websites and p.122 for details. For children 6–11 years, also refer to Box 2-3, p.40. See Box 3-5, p.56 for specific risk reduction strategies.

Global Initiative for Asthma. 'Global Strategy for Asthma Management and Prevention, 2025. Updated 2025. Available from https://ginasthma.org/

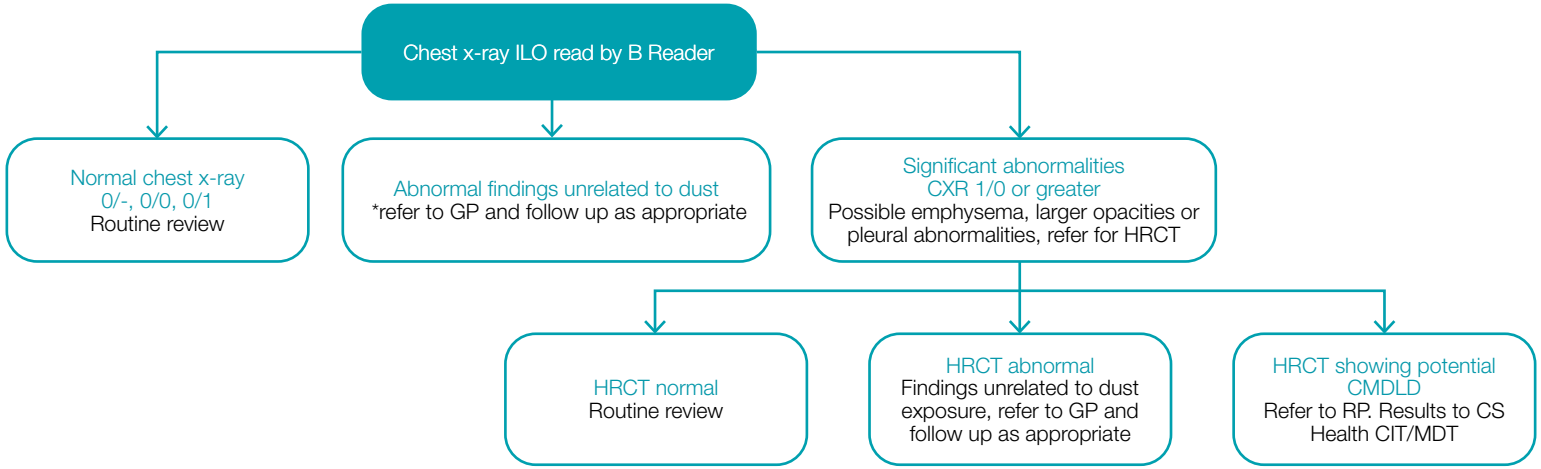
Coal Services

Clinical pathways for coal mine dust lung disease monitoring

These pathways are designed for approved medical practitioners (AMPs) to use with coal mine workers not already known to have coal mine dust lung disease (CMDLD), or currently under investigation for possible disease.

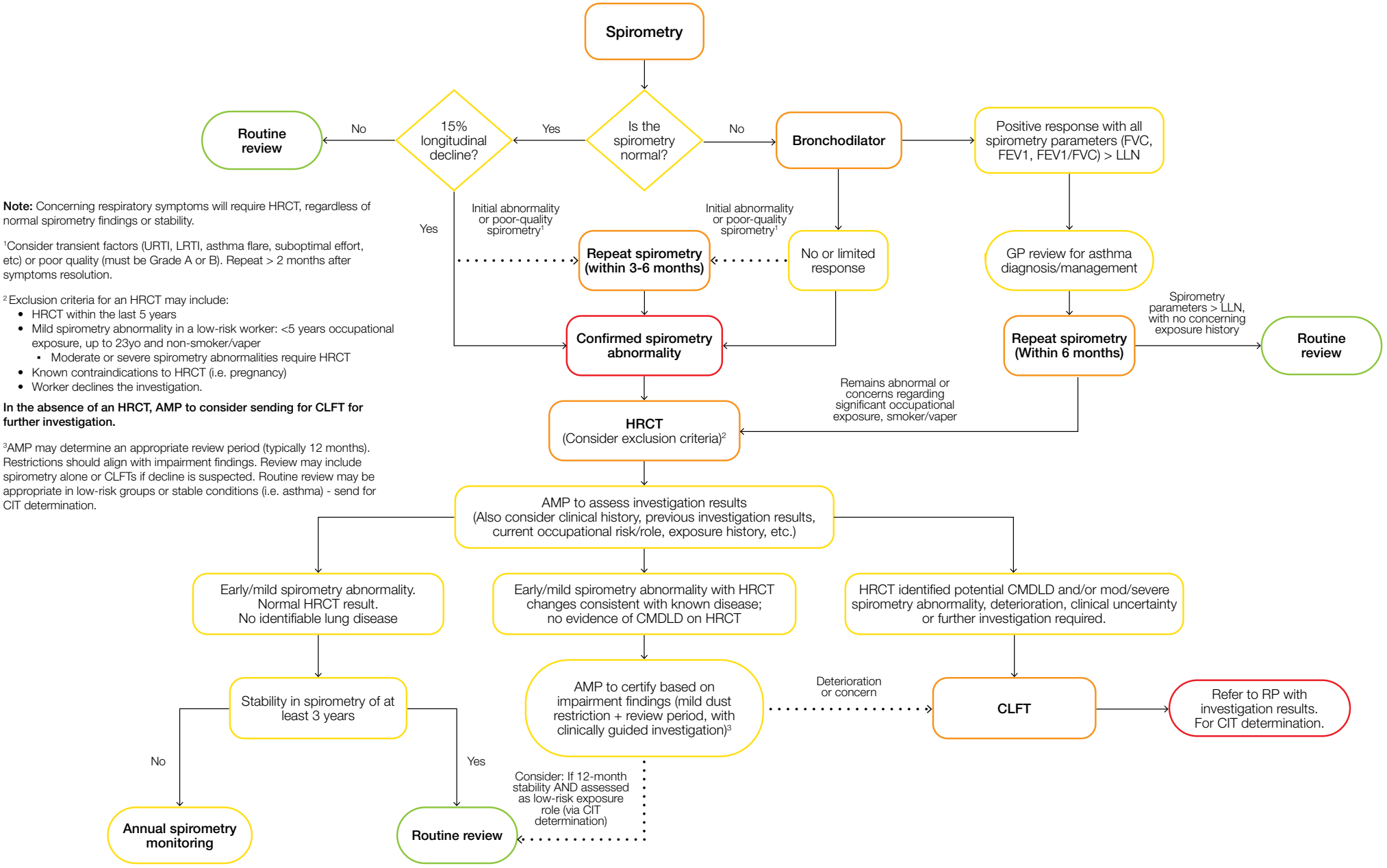
The coal mine worker is assessed under 3 pathways: chest x-ray, clinical findings and symptoms and spirometry. Positive findings under any pathway in isolation, or with others, can result in further investigation.

If an AMP has any doubts in regards to the management of a case, the AMP must contact the CS Health Clinical Investigation Team (CIT) to discuss.



AMP	Approved medical practitioner
CIT	Clinical Investigation Team
CMDLD	Coal mine dust lung disease
GP	General practitioner
HRCT	High-resolution computed tomography scan
MDT	Multi Disciplinary Team
RP	Respiratory physician

Clinical pathways for coal mine dust lung disease monitoring



Note: Concerning respiratory symptoms will require HRCT, regardless of normal spirometry findings or stability.

[1]Consider transient factors (URTI, LRTI, asthma flare, suboptimal effort, etc) or poor quality (must be Grade A or B). Repeat > 2 months after symptoms resolution.

[2] Exclusion criteria for an HRCT may include:

- HRCT within the last 5 years
- Mild spirometry abnormality in a low-risk worker: <5 years occupational exposure, up to 23yo and non-smoker/vaper
  - Moderate or severe spirometry abnormalities require HRCT
- Known contraindications to HRCT (i.e. pregnancy)
- Worker declines the investigation.

In the absence of an HRCT, AMP to consider sending for CLFT for further investigation.

[3]AMP may determine an appropriate review period (typically 12 months). Restrictions should align with impairment findings. Review may include spirometry alone or CLFTs if decline is suspected. Routine review may be appropriate in low-risk groups or stable conditions (i.e. asthma) - send for CIT determination.

Supporting notes

1. Radiology
    a. Radiology must comply with the requirements of Order 43.
    b. The AMP must ensure that incidental findings, mild or serious, are followed up appropriately with consideration given to any effect on work or follow-up.
    c. High-resolution computed tomography scans (HRCT) for existing NSW coal mine workers can be booked through CS Health.
    d. Any indication of potential respiratory disease on radiology must be investigated.
    e. HRCT must be consistent with any requirements under Order 43, as may be updated from time to time.
    f. Results requiring assessment by a respiratory physician should be handled as per note 6 below.

2. Spirometry
    a. Only approved health professionals can complete spirometry testing.
    b. The spirometry must comply with the 2022 Thoracic Society of Australia and New Zealand (TSANZ) Standards for the delivery of Spirometry for Resource Sector Workers.
    c. Bronchodilator responsiveness testing is indicated for FEV1, FVC or FEV1/FVC levels below the lower limit of normal.
    d. Only grade A or B spirometry is suitable for respiratory health monitoring purposes.
    e. Escalation triggers are based on pre-bronchodilator readings.

3. Further clinical investigation
    a. Results must be interpreted in the context of the medical and exposure history. Where there is a history of a recent respiratory illness, consider retesting within 3 to 6 months when there is a new finding of an abnormal result.
    b. A positive bronchodilator responsiveness test does not necessarily exclude disease from coal mine dust or other exposures and must be interpreted in the context of the medical and exposure history.
    c. Further clinical investigation is still indicated for significant respiratory symptoms, even when spirometry is normal.
    d. Complex lung function testing (CLFT) may be organised through CS Health for existing NSW coal mine workers, a TSANZ accredited respiratory function laboratory if available, respiratory physician or other health professional able to demonstrate spirometry and DLCO training suitable to Coal Services. Providers not accredited by TSANZ must provide evidence of currency of calibration for any equipment used.

4. Early or mild lung function impairment – meets all the criteria of one or more of the following:
    a. Rapid decline:
        i. longitudinal decline since baseline in percent predicted FEV1 or FVC ≥ 15% and
        ii. absolute FEV1 ≥ LLN.
    b. Isolated mild diffusion impairment:
        i. DLCO Z-score between -1.65 and -2.5 (approx. ≥ 60% of predicted and < LLN).

c. Early obstructive abnormality:
    i. absolute FEV1/FVC ratio < LLN, and
    ii. absolute FEV1 ≥ LLN, and
    iii. absolute FVC ≥ LLN.
d. Mild obstructive abnormality:
    i. absolute FEV1/FVC ratio < LLN, and
    ii. absolute FEV1 < LLN, and
    iii. FEV1 Z-score between -1.65 and -2.5 (approx. FEV1 ≥ 70% predicted), and
    iv. absolute FVC ≥ LLN.
e. Mild mixed obstructive abnormality/restrictive pattern:
    i. absolute FEV1/FVC ratio < LLN, and
    ii. absolute FEV1 < LLN, and
    iii. FEV1 Z-score between -1.65 and -2.5 (approx. FEV1 ≥ 70% predicted), and
    iv. absolute FVC < LLN.
f. Mild restrictive pattern:
    i. absolute FEV1/FVC ratio ≥ LLN, and
    ii. absolute FVC < LLN, and
    iii. absolute FEV1 normal or < LLN, and
    iv. FEV1 Z-score ≥- 2.5 (approx. FEV1 ≥ 70% predicted).

Notes:

> *confirmed restriction if absolute TLC < LLN*
> *non-specific ventilatory impairment if absolute TLC ≥ LLN*

5. Referral for CLFT is indicated for confirmed abnormalities on quality A or B spirometry that are moderate or severe, or where there are abnormalities on an HRCT that could be consistent with a CMDLD.
6. Cases assessed by external providers involving existing NSW coal mine workers requiring referral to a respiratory physician should be notified to the CS Health Clinical Investigation Team. In other cases, consideration should be given to referring to respiratory physicians on the TSANZ Register of Physicians for Resource Sector Workers' Health (TSANZ Register).
7. Any unexplained significant respiratory symptoms require investigation.
8. Variations to clinical pathways may be made where there are appropriate clinical indications. The reasons must be clearly documented.

Practical considerations and transitional arrangements

> New to NSW coal industry: must complete investigation pathways before medical clearance.
> Availability of CLFT and RP assessments may affect timing of assessments and may require restrictions in some cases before investigations are completed.
> Periodic: possible restrictions during investigation phase will depend on clinical findings and role.
> Existing NSW coal mine workers having pre-placement assessments may need restrictions consistent with published guidelines based on preliminary findings.

Coal Services

Clinical pathways for coal mine dust lung disease monitoring (roles defined)

These pathways are designed for approved medical practitioners (AMPs) to use with coal mine workers not already known to have coal mine dust lung disease (CMDLD) or currently under investigation for possible disease.

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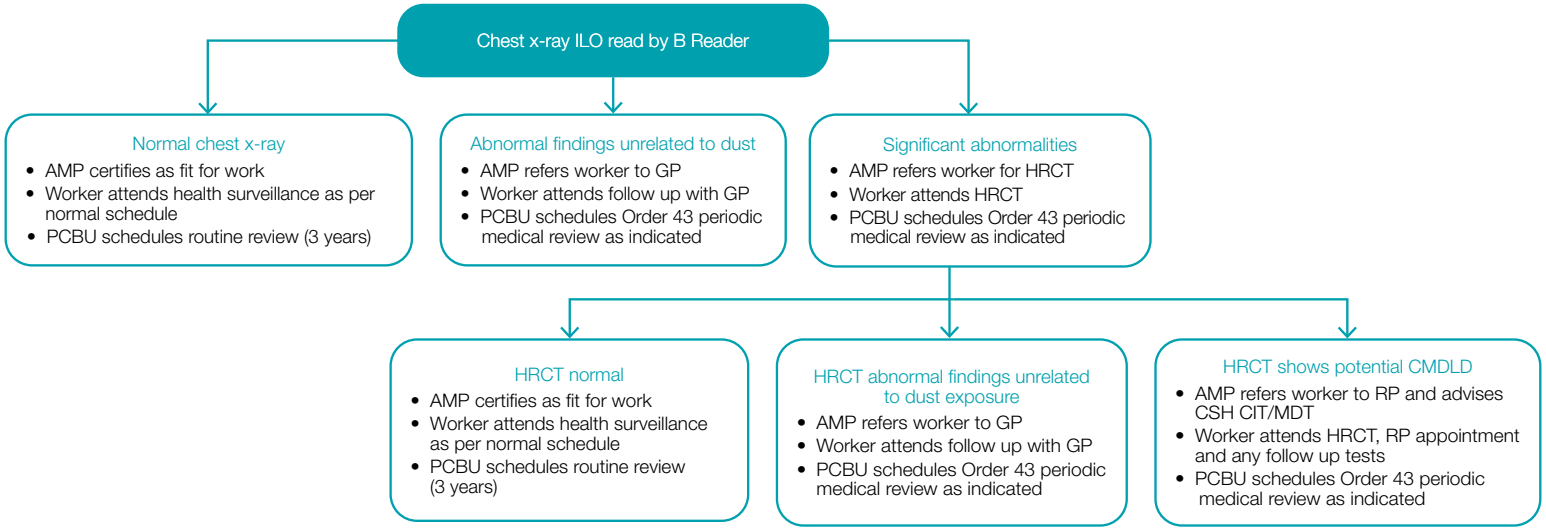

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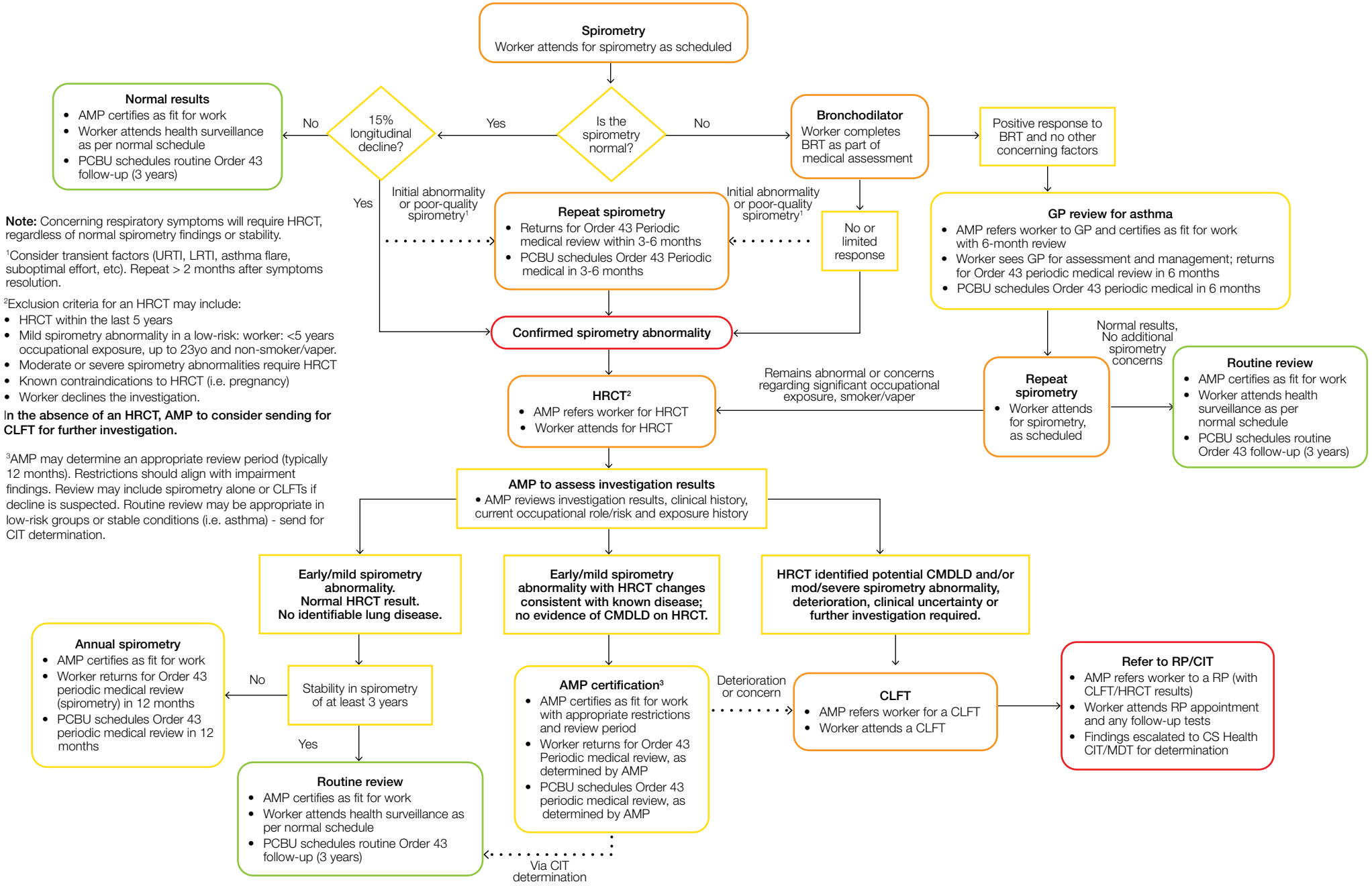
Clinical pathways for coal mine dust lung disease monitoring (roles defined)



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CS Health

Clinical Pathways for Coal Mine Dust Lung Disease Monitoring

Supporting clinical guidance notes for Medical Practitioners

Contents

Clinical pathways for coal mine dust lung disease monitoring – supporting clinical guidance notes for medical practitioners

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Purpose

The Coal Services Health (CS Health) *Clinical Pathways for Coal Mine Dust Lung Disease Monitoring* (the Pathways) are designed for approved medical practitioners (AMPs) to use with coal mine workers not already known to have coal mine dust lung disease (CMDLD), or who are currently under investigation for possible disease. The coal mine worker is assessed under 2 pathways: (i) chest imaging, and (ii) spirometry and symptoms.

This supporting clinical guidance document (clinical guidance notes) is designed to assist and support approved medical practitioners assess and follow up the clinical findings, symptoms, and spirometry components of the Pathways.

Positive findings under any Pathway in isolation, or with others, can result in further investigation. If in doubt at any stage, the approved medical practitioner must contact the CS Health Clinical Investigation Team (CIT) to discuss management of the case.

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TSANZ/CS Health Order 43 spirometry compliance requirements

Compliance with TSANZ Spirometry Standards for CS Health Respiratory Health Monitoring for Order 43 (Order 43) health assessments requires the following:

1. Spirometry report must meet quality assurance (QA) and compliance criteria: patient details, relevant clinical history, findings and medications, and smoking history in pack years, must be correctly recorded on the spirometry report.
2. Bronchodilator responsiveness testing (BRT) must be completed where FEV1, FVC or FEV1/FVC ratio, individually or in combination, are below the lower limit of normal (LLN).
3. Spirometry of at least Grade A or B must be achieved for reliable interpretation and longitudinal monitoring of lung function. This requires:
   - Spirometry with at least three acceptable test manoeuvres, with best FVC and FEV1 values repeatable within 150mls. The best values must be selected from one of the curves displayed on the report.
   - The quality grade for PRE and POST test manoeuvres must be assessed separately and meet A/B grade requirements.
   - Where the results indicate potential abnormality, the AMP must act by arranging further evaluation via the Pathways.
   - Where spirometry results are normal, the AMP must still consider any unexplained significant symptoms, and assess for longitudinal decline (if relevant), as these may trigger escalation via the Pathways.

Clinical guidance notes

Exposure to coal mine dusts and other contaminants can cause several lung diseases, including:

> obstructive lung disease: chronic bronchitis and emphysema (COPD)

> lung fibrosis or pneumoconiosis: coal workers' pneumoconiosis (CWP) or black lung; mixed dust pneumoconiosis; diffuse dust related pulmonary fibrosis; silicosis; and asbestosis.

Other atmospheric contaminants, like isocyanates and diesel exhaust particulate, can cause occupational asthma or exacerbate existing asthma.

Lung cancer may result from exposure to carcinogens in the mine atmosphere, including respirable crystalline silica dust, diesel exhaust emissions and welding fumes.

Decline in lung function can occur without the development of lung fibrosis, and with normal chest imaging findings. Spirometry may be obstructive, restrictive, or mixed pattern and the result may even be in the normal range if baseline values are supra-normal.

Use of Z-Scores for spirometry interpretation and severity classification

The Respiratory Health Standard (this Standard) utilises Z-scores for the interpretation of spirometry results and the classification of lung function impairment severity. This management aligns with current international best practices and technical standards, notably the 2022 European Respiratory Society/American Thoracic Society (ERS/ATS) technical standard on interpretive strategies for routine lung function tests.

The Z-score indicates how many standard deviations an individual's results are from the mean value predicted for them based on age, height, sex, and ethnicity, using the Global Lung Function Initiative (GLI) reference equations.

Using Z-scores provides a more statistically robust method, reduces biases related to age and height (particularly at the extremes), and allows for a more accurate assessment of deviation from the mean across the population distribution. The lower limit of normal (LLN) corresponds to a Z-score of -1.65 (representing the 5th percentile).

The severity of impairment is classified using the following Z-score thresholds:

Lung Function	Z-score
Normal	> -1.645
Mild impairment	Between – 1.65 and -2.5
Moderate impairment	Between -2.5 and -4
Severe impairment	< -4

Spirometry assessment for CS Health clinical pathways

Step 1: Check details on spirometry report

1. Spirometry must be compliant with *TSANZ Standards for the delivery of spirometry for resource sector workers, 2022* (the TSANZ Standard).
2. The GLI model must be used to determine the lower limit of normal (LLN) and predicted values for interpretation and comparison of test results over time. The "GLI Global" race-neutral equations, recommended by the American Thoracic Society (ATS) and the European Respiratory Society (ERS), may be used in preference to ethnicity-based reference models, when the ethnicity is uncertain.
3. The key spirometry parameters for routine screening of workers exposed to coal mine dust are FVC, FEV1 and FEV1/FVC ratio. These values depend on lung size, airway calibre and the driving force of the respiratory muscles. The best FVC, FEV1 values and the FEV1/FVC ratio will be interpreted using GLI reference equations and will be expressed as both Z-scores and % predicted. The LLN is defined as a Z-score of -1.65 (5th percentile).
4. The variables used in the GLI model to predict and adjust for individual and population differences are height, biological sex, ethnicity and age. It is important they are entered correctly into the spirometer, or the predicted values and interpretation of the result will not be correct.
   - Height: predictor of lung size.
   - Biological sex: an important predictor of lung size, independent of height.
   - Age: predictor of the driving force of respiratory muscles, elasticity of lungs and rigidity of the chest wall/ chest wall muscles changes with the aging process.
   - Ethnicity: traditionally used to adjust for differences in body proportions. The GLI reference populations for historic ethnicity groupings can be seen in Table 1. International societies (ATS/ERS) recommend the use of the race-neutral "GLI Global" equations (Bhakta NR et al 2023 Race and Ethnicity in Pulmonary Function Test Interpretation: An Official American Thoracic Society Statement). If ethnicity-based equations are used, or if switching between ethnicity-based and race-neutral interpretation, this must be done with caution and clearly documented, as classification at the LLN may change. If there is uncertainty about the appropriate ethnicity grouping, the "Other" category or the GLI Global equations should be selected.

Table 1: GLI reference populations (Stanojevic et al. (2021), ERS/ATS Technical Standard on Interpretive Strategies for Routine Lung Function Tests)

GLI group	Typical regions/populations	Considerations
Caucasian/European ancestry	Europe, Israel, Australia, USA, Canada, Brazil, Chile, Mexico, Uruguay, Venezuela, Algeria, Tunisia, Mediterranean populations	Appropriate for individuals of European descent from other regions (e.g. New Zealand, South Africa)
African American/ Black	African American populations in the United States	Non-North American Black populations should be classified as *Other*, unless validated local reference data are available

GLI group	Typical regions/populations	Considerations
North-East Asian (NEA)	Korea, Japan, Northern China	Populations from NEA countries not listed should be classified as *Other.*
South-East Asian (SEA)	Thailand, Taiwan, Southern China (including Hong Kong)	Populations from SEA countries not listed should be classified as *Other.*
Other/Mixed	Persons not represented in the four main population groups, including Aboriginal and Torres Strait Islander peoples, Sub-Saharan Africans, South Asians (India, Sri Lanka, Pakistan), and Pacific Islanders	Derived as an average of the four main groups. Use when ancestry is mixed or unclear.

Note on Race-Neutral GLI Interpretation

The ATS and ERS recommend use of the GLI Global race-neutral equations, which do not require ethnicity as an input, in preference to traditional ethnicity-based models (Bhakta NR et al 2023 Race and Ethnicity in Pulmonary Function Test Interpretation: An Official American Thoracic Society Statement). Where race-neutral equations are applied, the choice should be consistent and documented.

Caution must be exercised if changing from one reference approach to another, as an individual's LLN may shift, with results reclassifying from above to below the LLN (or vice versa). Any such change should be interpreted in clinical context, considering exposure history, clinical findings, and job demands. Significant changes in determination should be reviewed by the AMP and, if required, escalated to the CS Health CIT.

Importantly, spirometry interpretation must always prioritise longitudinal comparison with the coal mine worker's most recent prior test, as this provides the clearest indication of functional decline or ongoing disease requiring further investigation.

To comply with the TSANZ Standard and assist interpretation of the result, additional information must be recorded by the operator on the spirometry report, including:

- the type and dosage of any inspired, oral, or injected medications that may alter lung function, and when the drugs were last administered
- observed signs or symptoms, such as cough, wheeze, dyspnoea, or cyanosis
- the smoking history in pack/years and vaping history
- relevant clinical history and conditions, e.g. asthma or COPD
- weight: BMI may be relevant in interpreting spirometry results in obese workers.

5. Before proceeding, check the patient's details, clinical history, medications and smoking history are consistent with the responses in the Standardised Respiratory Questionnaire (SRQ), the medical history, and clinical components of the health assessment. All errors must be corrected, and spirometry report regenerated for CS Health Order 43 compliance.

Step 2: Assess spirometry quality

1. High quality spirometry is essential for obtaining results that are accurate, reliable and suitable for use in the CS Health respiratory health surveillance programme. Spirometry quality of at least Grade A or B is required for Order 43 compliance.
2. Accurate and reliable test results are crucial for:
   - establishing a baseline for lung function before exposure begins so the effects can be measured with repeat testing over time
   - comparing test results and identifying trends on longitudinal assessment of lung function. Poor quality results may falsely lower the baseline, and obscure detection of accelerated lung function decline over time
   - correctly interpreting and identifying abnormal findings
   - determining the need for additional tests and identifying the correct follow-up within the Pathways
   - poor quality spirometry may affect FEV1 and FVC values and trigger unnecessary additional tests or missed cases for follow-up.
3. Spirometry test quality can only be determined by directly inspecting the flow-volume curves displayed on the spirometry report. The 'session quality' comment on the spirometry report must be ignored, as it is based on test values only and does not consider acceptability criteria for grading.
4. Test quality is based on how many technically acceptable manoeuvres are achieved in the test, and how repeatable the largest FVC and FEV1 values from the selected manoeuvres are. For Grade A spirometry, an acceptable manoeuvre must be achieved at least three times, and the best FVC and FEV1 values must be repeatable within 150mls. The best values must be selected from one of the curves displayed on the spirometry report.
5. A manoeuvre is only acceptable if it achieves **all the criteria** in Table 2.

Table 2: Spirometry acceptable criteria

- a maximal inspiration prior to the forced expiration.
- fast expiration without delay, creating an observed sharp rise in the flow trace. Back extrapolated volume is to be =<5% of FVC or <0.10L, whichever is greater.
- maximal continuous expiration with a plateau in flow despite continued effort (<0.025L measured over one sec) OR
- achieved expiratory time ≥ fifteen seconds OR
- the individual cannot expire long enough to achieve a plateau and the FVC is within 0.15L of or is greater than the largest prior observed FVC.
- no observed leaks or artefact in the trace.
- If performing inspiratory loops:
- if the maximal inspiration after EOFE is greater than FVC, then FIVC - FVC must be ≤0.100 L or 5% of FVC, whichever is greater.

6. Repeatability is determined by applying the repeatability criteria in Table 3 to the differences between the 2 largest FVC values and the 2 largest FEV1 values, which must come from acceptable manoeuvres.

Table 3: Spirometry repeatability criteria

A testing session is deemed to be repeatable if the following is achieved:

- ≥2 acceptable FVC values are within 0.15L of each other; and
- ≥2 acceptable FEV1 values are within 0.15L of each other.

7. The largest FVC and FEV1 values are used to calculate the FEV1/FVC ratio and interpret the spirometry result. They may arise from different manoeuvres, but it is essential the values have been selected from one or more of the trials displayed on the spirometry report. The other trials in the test have not been assessed against acceptability criteria and cannot be used for interpretation purposes.
   - Check that the 'best' FVC and FEV1 values used to calculate the FEV1/FVC ratio have been selected from one or more of the trials displayed on the spirometry report.
   - If the 'best' FVC or FEV1 value is not from one of the trials you can see on the report, the other trials need to be deselected and the spirometry report regenerated before proceeding.

8. While the aim is to achieve A-grade spirometry, B-grade is acceptable for establishing a baseline, interpretation, and assessment of longitudinal decline for health monitoring purposes.
   - For A-grade spirometry, at least 3 acceptable manoeuvres are required with the 2 largest FEV1 and FVC values meeting repeatability criteria: within 0.15L of each other. If the difference is >0.15L but <0.2L, the spirometry is C-grade.
   - For B-grade spirometry, at least 2 acceptable manoeuvres are required with the FEV1 and FVC values repeatable within 0.15L. The best FVC and FEV1 values must come from the 2 acceptable trials and must be repeatable.

   Determine the spirometry quality grade based on acceptability and repeatability criteria, and the Spirometry Matrix in Table 4. A separate grade must be determined for both FEV1 and FVC from acceptable manoeuvres.

   Note: The AMP must not rely on the system or tester interpretation of the spirometry test quality or result. A separate comment needs to be recorded by the AMP in the medical assessment confirming their own interpretation of the test result as justification for decision-making/escalation via the Pathways.

9. If BRT is required, a separate grade must be determined as per Table 4 for pre-test and post-test results, and recorded by the approved medical practitioner in the spirometry interpretation comment in the medical assessment. The indications for BRT are summarised in Table 5.

Table 4: Spirometry grading matrix[2]

		Repeatability between 2 best trials			
		≤0.150L	≤0.200L	≤0.250L	≥0.25L
No. acceptable trials	3	A	C	D	E
	2	B	C	D	E
	1	F			

Grade	Acceptability and repeatability criteria	Comment
A	3 acceptable and 2 repeatable trials within 0.150L	Desirable
B	2 acceptable and 2 repeatable trials within 0.150L	Acceptable
C	≥2 acceptable and 2 repeatable trials within 0.200L	Repeat testing required

2 Matrix adapted from Workbook V1.0 (May22) Sarah Baum t/a Spirometry Trading Company (Aust) Pty Ltd 2011.

Step 3: Bronchodilator responsiveness testing (BRT)

1. The interpretation of spirometry is based on values of airflow, lung volumes and gas transfer measurements (where relevant). The LLN, or fifth percentile of the healthy GLI reference population, is the cut-off used to identify abnormal results.
2. The best FVC, best FEV1 and the FEV1/FVC ratio must be compared against the respective LLN. Spirometry is abnormal if any of these parameters, individually or in combination, are below the LLN.
3. The purpose of BRT is to determine if a clinically relevant or treatable component is present in abnormal spirometry. BRT also reduces individual variation between tests in those with asthma or reactive airways.
4. As coal mine dust disease can present with any pattern of impairment on spirometry (obstructive, restrictive, or mixed), BRT is required for all abnormal spirometry results, i.e., where the best FEV1, best FVC or the FEV1/FVC ratio is less than the respective LLN.
5. In addition, BRT is recommended in the following clinical contexts, even if spirometry result is normal:
   - A documented history of lung disease, e.g., asthma.
   - Where asthma or other obstructive lung diseases, e.g., COPD are suspected.
   - Significant or chronic symptoms declared in the Standardised Respiratory Questionnaire in the medical assessment.

Table 5: Indications for conducting BRT

Spirometry	Indication	Comment
Abnormal BRT required	Absolute FVC <LLN	Suggestive of restrictive lung disease – diagnosis established by reduced TLC on complex lung function testing.
	Absolute FEV1 <LLN	Reduced in individuals with airway obstruction.
	FEV1/FVC ratio <LLN	Airflow obstruction - indicative of obstructive lung disease.
Normal BRT recommended	History of lung disease	Reduces intra-individual variation between tests.
	Suspected lung disease	Suspected asthma or COPD (smoker, symptoms, history).

6. Changes in FEV1 and FVC following administration of a bronchodilator should be reported as a change relative to the individuals predicted GLI value. This minimises the effects of sex and height on the magnitude of the response. An example of how this is calculated is shown below:

Determination of a bronchodilator response (BDR)

$$BDR = \frac{(\text{Post-bronchodilator value (l)} - \text{Pre-bronchodilator value (l)}) * 100}{\text{Predicted value (l)\#}}$$

A change of >10% is considered a significant BDR response.

#Predicted value should be determined using the appropriate GLI spirometry equation.

For example:
A 28-year-old Caucasian male; 175cm in height has a pre-brochodilator FEV1 4.41L and a post-bronchodilator FEV1 of 4.65L. The predicted FEV1 is 4.39L (using the GLI Caucasian equation).

The BDR is calculated as $\frac{(4.65 - 4.41) * 100}{4.39} = 5.5\%$

Therefore, their BDR is reported as an increase of 5.5% of their predicted FEV1 and is classified as not having a bronchodilator response.

Adapted from the 2022 ERS/ATS Technical standard on interpretive strategies for routine lung function tests.

7. A pre-post change of more than 10% in the predicted GLI value for FVC or FEV1 indicates a clinically relevant or positive bronchodilator response.
8. Post-test quality must be assessed, and the bronchodilator response reviewed to determine if the result is clinically relevant or positive.
9. BRT must be undertaken where required before final interpretation of the spirometry result and determining escalation in the Pathways.

General guidelines for spirometry not meeting QA requirements

1. Spirometry of at least Grade A or B is required for Order 43 compliance. This applies to both pre and post spirometry tests, where relevant.
2. Spirometry of Grade-C or lower is not suitable for health surveillance purposes and repeat testing on another day will generally be required.
3. Follow-up requirements will depend on the context (pre-placement assessment vs. periodic assessment), spirometry grade achieved, the result (normal vs. abnormal), availability of past spirometry records (if relevant), the clinical context, and whether there are other findings triggering escalation via the Pathways.
4. In the situation where an adequate spirometry assessment cannot be completed, repeat testing should be completed. If unsuccessful and an existing NSW coal mine worker, refer directly to a respiratory laboratory. New entrants to the NSW coal industry should be referred to their treating doctor to arrange testing at a respiratory laboratory.

Practical considerations/interim arrangements for spirometry not meeting QA requirements

1. **Periodic assessments**
   - In general, normal spirometry may be used with caution if the result is consistent with past test results for the individual. Repeat testing for QA purposes will be required within 12 months.
   - In general, abnormal spirometry that is consistent with the pattern of past test results for the individual (chronic abnormality), should be escalated via the Pathways. Interim dust restrictions may apply based on the severity of the findings and the role.
   - In general, abnormal spirometry that is not consistent with the pattern of past test results (new finding), should be repeated within 3 months to confirm the result, before determining if escalation via the Pathways is required.

2. **Pre-placement assessments for existing NSW coal mine workers**
   - In general, normal spirometry may be used with caution if the result is consistent with past test results. Repeat testing for QA purposes will be required within 6 months.
   - In general, abnormal spirometry that is consistent with the pattern of past test results (chronic abnormality), should be escalated via the Pathways. Interim dust restrictions may apply based on the nature and severity of abnormality.
   - If the result is abnormal, and not consistent with past results (new finding), repeat testing will generally be required before the determination is finalised. Alternatively, interim dust restrictions may apply. Repeat testing will be required within 3 months.

3. **Pre-placement assessments for new entrants to the NSW coal industry**
   - In general, spirometry quality Grade C or lower will require repeat testing/QA compliance before finalising the assessment.

Step 4: Interpreting the BRT result

1. Within the context of coal mine dust exposure, a bronchodilator response cannot be used in isolation to determine risk and management of abnormal spirometry through the Pathways. A positive response does not necessarily exclude disease from coal mine dust or other exposures, and the result needs to be interpreted in the context of the medical and exposure history.
2. A bronchodilator response is commonly seen in workers with COPD, caused by occupational and non-occupational exposures. In some cases the response may be <10% with post-spirometry values within the normal range. In other cases the response may be >10% with persisting obstruction on spirometry. This is strong evidence of COPD and not diagnostic of asthma in the setting of coal mine dust exposure.
3. Where results show a positive bronchodilator response (>10%), the approved medical practitioner needs to determine if a presumptive diagnosis of asthma can be made, and whether the worker requires further evaluation through the Pathways.
4. In general, abnormal spirometry in individuals with past dust exposure (coal, mineral mines, tunnelling, construction, quarry work, stone benchtop industry) and/or current/past smokers, will require escalation via the Pathways, regardless of the size of the bronchodilator response and whether post-spirometry is normal.

Example 1: past dust exposure and/or smoking history

Individuals with abnormal pre-bronchodilator spirometry meeting the following criteria should be escalated via the Pathways based on pre-spirometry values:

> a bronchodilator response of any amount; and
> the post-spirometry result is normal or abnormal; and
> there is a significant smoking history; and/or
> there is a significant dust exposure history.

Example 2: periodic assessment, known asthmatics with abnormal post spirometry

In general, known asthmatics in the context of periodic assessments should be escalated through the Pathways where:

- the bronchodilator response is greater than 10%; and
- the post-spirometry result is abnormal, i.e. FEV1, FVC or FEV1/FVC ratio below the LLN.

There may be two underlying causes for the spirometry abnormality – asthma and impairment from coal mine dust exposure. The result needs to be considered in the context of the medical and exposure history, and longitudinal assessment of spirometry results. The coal mine worker may also be referred to their treating doctor for review of their asthma management plan.

Example 3: periodic assessments, known asthmatics with normal post spirometry

Known asthmatics in the context of periodic assessments may be referred to their treating doctor for review of their asthma management plan where:

- the bronchodilator response is greater than 10%; and
- the post-spirometry result is normal, i.e. FEV1, FVC and FEV1/FVC ratio are all above the LLN.

These findings may indicate that treatment is sub-optimal. The result still needs to be considered in the context of the medical and exposure history, and longitudinal assessment of spirometry results, as they may require escalation in the Pathways. The coal mine worker may also be referred to their treating doctor for review of their asthma management plan.

Example 4: Presumptive asthma

A presumptive diagnosis of asthma may be made if all the following criteria apply:

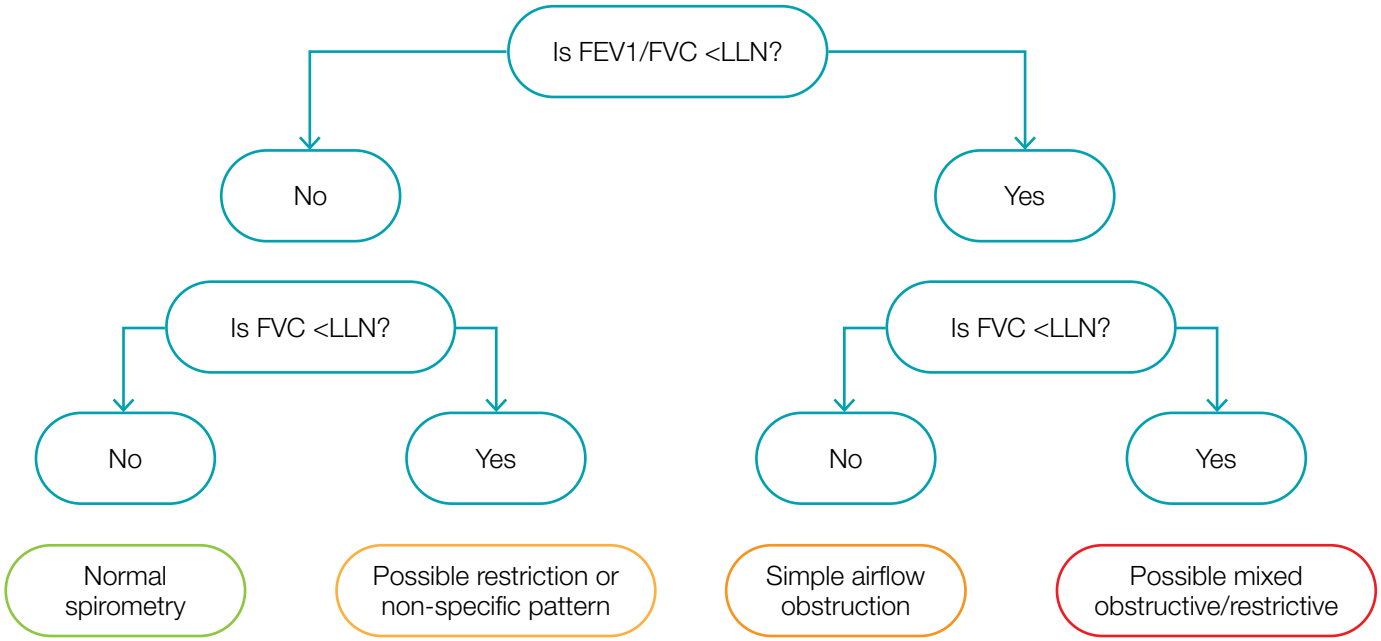
- the bronchodilator response is greater than 10% (clinically relevant, positive); and
- the post-spirometry result is normal, i.e. FEV1, FVC and FEV1/FVC ratio are all above the LLN; and
- there is no significant smoking history; and
- there is no significant dust exposure history.

5. Individuals meeting all the above criteria may have undiagnosed asthma and can be referred to their GP for confirmation of diagnosis and an asthma management plan, with a 6-month spirometry review. In general, for pre-placement assessments for new coal mine workers, confirmation of diagnosis with CLFT will be required before the determination can be finalised. Post-spirometry values may then be used for follow-up in the Pathways, provided there are no other clinical findings requiring escalation. Refer to the CS Health CIT for advice.

Step 5: Interpreting the spirometry result

1. Spirometry escalation triggers through the Pathways are based on pre-bronchodilation test values, as are dust restrictions for individuals with respiratory impairment.
2. The best FVC, best FEV1 and the FEV1/FVC ratio must be used for interpretation of results and classification of respiratory impairment pattern.
   - If FEV1, FVC and FEV1/FVC ratio are all >LLN, spirometry result is classified as normal.
   - If any of these parameters, individually or in combination, are <LLN, spirometry is abnormal, and the relevant functional pattern of impairment is identified as per Table 6.

Flow chart: Functional classification of spirometry impairments



Classification of spirometry impairment pattern and severity:

1. Identify the functional pattern based on FEV1/FVC ratio and FVC compared to LLN (Z-score -1.65) as per Table 6.
2. Determine the severity of any identified impairment (obstructive, restrictive, or mixed) based on the Z-score of the relevant parameter(s) (primarily FEV1 for obstruction/mixed, FVC for restriction), using the ERS/ATS 2022 recommended thresholds:
   - Normal: Z-score > -1.65
   - Mild Impairment: Z-scores between -1.65 and -2.5 (approx. ≥ 70% predicted)
   - Moderate Impairment: Z-scores between -2.5 and -4.0 (approx. 60-69% predicted)
   - Severe Impairment: Z-score <-4.0 (approx. < 60% predicted)

(Note: The previous definitions numbered 1-4 under 'Spirometry criteria for mild lung function impairment category' based on % predicted FEV1 ≥70% are superseded by this Z-score classification).

Practical considerations and interim arrangements for abnormal spirometry

Periodic assessments

1. New finding: Repeat BRT spirometry at CS Health clinic within 3 to 6 months to confirm result and determine if escalation via the pathways is required.
2. Chronic finding, with early or mild abnormality/impairment:
   - Refer for a HRCT and medical information in 3 months.
   - No interim dust restrictions if FEV1 >LLN or Mild Impairment (FEV1 Z-score between -1.65 and -2.5).
3. All other cases (Moderate or Severe Impairment (FEV1 or FVC Z-score <-2.5), new or chronic findings) must be referred to the CS Health CIT for case management/determination advice in the context of the medical and exposure history. Interim dust restrictions consistent with published guidelines may apply during the investigation phase, dependent on the role and severity of the abnormality.

Pre-placement assessments

New entrants to the NSW coal industry

In general, all pre-placement assessments for new entrants to the NSW coal industry will need to complete all required investigations before a determination is made.

Existing coal mine workers

1. New finding:
   - Repeat spirometry with BRT within 3 to 6 months at CS Health clinic.
   - Use 'Amber 1' for monitoring, no interim dust restrictions if FEV1 >LLN (and there are no other clinical findings requiring escalation via the Pathways).
2. Chronic finding with early or mild abnormality:
   - Refer for a HRCT and medical information in 3 months.
   - Amber 1 for monitoring, no interim dust restrictions if FEV1 >LLN (and there are no other clinical findings requiring escalation via the Pathways).
   - Amber 1 & 2 for monitoring and restrictions, interim dust restrictions Mild Impairment (FEV1 or FVC Z-score between -1.65 and -2.5) as outlined in Appendix F.

All other cases (Moderate or Severe Impairment (FEV1 or FVC Z-score <-2.5) must be referred to the CS Health CIT for case management/determination advice in the context of medical exposure history. Interim dust restrictions consistent with published guidelines may apply during the investigation phase, dependent on the role and severity of abnormality.

Longitudinal decline assessment for CS Health clinical pathways

1. Mine dust exposure may be associated with rapid decline in FEV1 and impairment in lung function (obstructive, restrictive, or mixed patterns). The magnitude of decline is proportional to cumulative mine dust exposure and of the same order of magnitude as that caused by exposure to tobacco smoke.
2. Longitudinal spirometry assessment is important for detecting clinically meaningful changes from baseline and identifying individuals potentially experiencing rapid or excess decline related to coal mine dust exposure.
3. Regardless of whether spirometry result is normal or abnormal, a comparative assessment of past spirometry results must be undertaken for all periodic assessments, and pre-placement assessments for existing coal mine workers, where results are available.
4. When looking for meaningful decline in lung function, the recommendation is to assess the change in lung function from baseline, which is the earliest reliable record available for the individual.
5. Rapid decline is defined as more than 15% decline in GLI predicted %FEV1 or %FVC, over any period, compared with baseline spirometry values.
6. As past spirometry tests may have used different predictive models, the absolute values obtained for FEV1 and FVC need to be converted to GLI % predicted values using the online GLI lung function calculator before assessing for rapid decline.
7. The GLI has made available an online assessment of spirometry at ERS lung tracker which is recommended for use and is based on the most up-to-date evidence
8. For obstructive lung disease, serial FEV1 decline is usually assessed, whereas for other lung diseases, this may not be the most appropriate parameter (FVC and DLCO can also be used)

Process for converting past spirometry records using the GLI reference range

1. Obtain and review past spirometry records. These may be requested from csh@coalservices.com.au (if not already saved to the client files).
2. Confirm quality and reliability of baseline record chosen by reviewing flow-volume curves, calibration and accuracy check dates on the original spirometry report.
3. If the GLI reference range has not been used for the original record chosen as the baseline or reference spirometry, or the height is inconsistent versus the current spirometry record, these must be converted/ corrected using the online GLI calculator https://gli-calculator.ersnet.org/
   - Enter absolute FEV1 and FVC values, selecting appropriate height, age (at time of original test), sex and ethnicity to calculate new LLN and predicted values for FEV1 and FVC. Use the height recorded on the latest spirometry record as the reference height for this comparison (height may have varied by up to 5cms or more for spirometry tests across the years).
4. Enter absolute spirometry values into a table, with the recalculated LLN and percent predicted values for FEV1, FVC and FEV1 ratio to facilitate assessment of decline.
5. Calculate % change in FEV1 and FVC from the difference between GLI predicted values for FEV1 and FVC at baseline and current values. Examples from the Standard using this methodology for calculating % GLI decline are provided below:

Interpretation of changes in spirometry over time

The following worked example illustrates how to appropriately determine a change in spirometry over time in an individual. The use of appropriate alignment with robust predicted equations allows for changes with age to be accounted for. This example highlights that a significant decline in lung function can occur in individuals whose lung function remains within the normal range of the broader population.

A female worker, of Aboriginal ancestry, 170.5cm tall, enters the resource sector workforce at age 25.5 years. The Global Lung Function Initiative Spirometry 'Other' predictive equations are used as per ANZSRS recommendations.

Her lung function on entering the workforce was:

FEV_1	3.48L (103.1% predicted, LLN = 2.74L)
FVC	3.94L (100.8% predicted, LLN = 3.16L)
FEV_1/FVC	0.88 (101.7% predicted, LLN = 0.762)

Her spirometry is within normal limits. She does not report taking any respiratory medications.

At age 30.0 her respiratory health is reassessed. There are no reported symptoms, she does not report taking any respiratory medications and her lung function is:

FEV_1	3.31L (95.1% predicted, LLN = 2.64L)
FVC	3.87L (99.4% predicted, LLN = 3.15L)
FEV_1/FVC	0.81 (95.2% predicted, LLN = 0.750)

Her lung function remains within normal limits. Her change in FEV_1 (% predicted) over the five-year period is 8.0% (103.1% - 95.1%) and within acceptable limits.

At age 33.6 years she changes employers and undergoes a repeat assessment. She has no reported symptoms and does not report taking any respiratory medications. Her spirometry is:

FEV_1	2.85L (87.6% predicted, LLN = 2.599L)
FVC	3.79 (98.0% predicted, LLN = 3.131L)
FEV_1/FVC	0.75 (87.9% predicted, LLN = 0.741)

Her spirometry is within normal limits. Her change in lung function since entering the resource sector workforce at age 25 years is 15.5% (103.1% to 87.6% – after adjusting for age-related changes by using the GLI predicted equations). Based on the recommendations (above) her age-related longitudinal decline over the 8.1 years of employment exceeds 15.0%. She should be referred for a HRCT.

Interim arrangements and practical considerations - excess decline in FEV1 or FVC >15% predicted since baseline:

1. **Periodic assessments**
   - Refer for HRCT and medical information in 3 months.
   - Interim dust restrictions may apply, dependent on the role, severity of the decline and if spirometry is abnormal. Results need to be interpreted in the context of the medical and exposure history. Refer to the CS Health CIT for case determination advice.

2. **Pre-placement assessments for existing coal mine workers**
   - Refer for HRCT and medical information in 3 months.
   - Amber 1 & 2, interim dust restrictions as per published guidelines for rapid decline.
     - Mild category restrictions if longitudinal decline since baseline in percent predicted FEV1 or FVC >15% and FEV1 Z-score of ≥-2.5.
   - If spirometry abnormality is moderate or severe (FEV1 or FVC Z-score of <-2.5) refer to the CS Health CIT for case determination advice.

3. **Pre-placement assessments for new entrants to the NSW coal industry**

For coal mine workers with a history of dust exposure in other states or industries it may not be possible to identify cases of rapid or longitudinal decline unless baseline spirometry records are made available.

Therefore, all new entrants to the NSW coal industry with a work history including:

- Stonemasonry; or
- Working with engineered stone; or
- Tunnelling; or
- Coal, mineral mine, or quarrying work of 10 years duration or more; and
- No evidence of health monitoring, or past spirometry records (baseline) are not available to rule out a decline in spirometry of 15% or more require a baseline HRCT scan regardless of their chest imaging and spirometry findings. Any HRCT findings that may be consistent with a mine dust lung disease require a CLFT.

These investigations need to be completed before clearance.

Note: Guideline Recommendations are from the *National Guidance for Doctors Assessing Workers Exposed to Respirable Crystalline Silica Dust.*

Respiratory symptom assessment for CS Health clinical pathways

Exposure to coal mine dusts can cause chronic bronchitis and emphysema (COPD) and other mine exposures can cause or exacerbate asthma in susceptible individuals. Symptoms of chronic bronchitis in miners, including cough and sputum production and infective exacerbations are associated with significant declines in the FEV1 in both smokers and non-smokers.

The aim of further investigation of unexplained significant symptoms is the early detection of potential adverse effects of mine dust and other exposures, so that further exposures can be managed and health effects minimised.. The approved medical practitioner needs to consider any **unexplained significant symptoms** and should refer these for further evaluation as per the Pathways.

Recommended process for determining if symptoms are significant and unexplained

Respiratory symptoms may be reported by the worker in the Standardised Respiratory Questionnaire (SRQ) or observed and recorded during spirometry testing or the clinical examination process. These components of the assessment need to be considered by the approved medical practitioner in determining whether escalation is required via the Pathways.

1. Review the clinical history, findings and SRQ responses. If significant or chronic respiratory symptoms are reported or observed, a comprehensive symptom history needs to be obtained from the individual. Past SRQ responses and records should also be reviewed for comparison and to identify trends (if available). The most common cause of an increase in respiratory symptoms is a recent respiratory infection, and sufficient time should elapse in order to enable the worker to recover (between 4-6 weeks) before deciding whether a symptom is significant.
2. Where the symptoms are explained, no escalation is required and a referral to the GP can be made where clinically indicated. In these cases, symptoms will typically be (i) consistent with the medical history, e.g., chronic asthmatic, heavy smoker or vaper; and (ii) of a stable pattern, i.e. not worsening or progressing over time; and (iii) with no significant change at work versus home.
3. Where symptoms are significant and not explained, escalation via the Pathways is required. In these cases symptoms will typically be (i) inconsistent with the medical history; (ii) excessive or worsening over time; and (iii) may show significant change at work versus home. Excessive or worsening symptoms in coal mine workers with a significant smoking and dust exposure history should also be escalated via the Pathways.

Interim arrangements and practical considerations

Periodic and pre-placement assessments for existing coal mine workers

> For excessive, unexplained symptoms:
  - Refer coal mine worker for a HRCT and AMP to review medical information within 3 months.
  - No dust restrictions are relevant unless spirometry is abnormal.

> For excessive/worsening symptoms in coal mine workers with a significant smoking and dust exposure history, or for cases with abnormal spirometry and extensive exposure history, refer to the CS Health CIT for advice.

Pre-placement assessments for new entrants to the NSW coal industry

In general, all pre-placement assessments for new entrants to the NSW coal industry will need all required investigations completed before health certification.

CS Health

Guidelines for managing identified lung disease in the NSW coal industry

Guidelines for managing identified lung disease in the NSW coal industry

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Abbreviations

CLFT	Complex lung function testing
CMDLD	Coal mine dust lung disease
CWP	Coal workers' pneumoconiosis
CXR	Chest x-ray
DLCO	Diffusing capacity of lung for carbon monoxide
FEV1	Forced expiratory volume in the first second
HRCT	High-resolution computed tomography
ICOERD	International Classification of HRCT for Occupational and Environmental Respiratory Diseases
ILO	International Labour Organization
IMD	Inhalable mine dust
PCBU	Person conducting a business or undertaking
PMF	Progressive massive fibrosis
RCD	Respirable coal dust
RCS	Respirable crystalline silica
SEG	Similar exposure group
WCRS	Workers' Compensation Regulatory Services

Introduction

Coal mine workers may be exposed to a range of respiratory hazards in the mine atmosphere, including not only coal dust, but also silica, diesel exhaust particulate and other airborne contaminants. In some coal mine workers, these exposures collectively comprising coal mine dust may cause coal mine dust lung disease (CMDLD), a spectrum of chronic lung diseases resulting from cumulative exposure to these respiratory hazards.

CMDLD includes not only the "classic" pneumoconioses – coal workers' pneumoconiosis (CWP), mixed-dust pneumoconiosis, and silicosis – but also obstructive lung diseases, including emphysema and chronic bronchitis, lung function decline, and pulmonary fibrosis, known as dust-related diffuse fibrosis.

It is critical that the health of coal mine workers is protected, both by controlling exposure to airborne contaminants in the workplace and, where coal mine workers have developed CMDLD, close monitoring to preserve their respiratory health and quality of life.

The NSW Coal Industry Respiratory Health Standard (this Standard) adopts exposure limit recommendations for respirable coal dust (RCD) and respirable crystalline silica (RCS) from the Queensland Workers' Compensation Regulatory Services (WCRS) guideline *Returning Workers with Mine Dust Lung Disease to the Workplace* (2022). However, the WCRS guidance on inhalable mine dust (IMD) is not included. Instead, this Standard draws on updated recommendations from the University of Illinois *Review of the Coal Services Health Inhalable Mine Dust Restrictions* report (April 2025), which, based on current evidence, advises against applying IMD exposure limits when RCD and RCS are already controlled.

The *Guidelines for Managing Identified Lung Disease in the NSW Coal Industry* (the guidelines) have been prepared to provide guidance to industry and may be utilised by persons conducting a business or undertaking (PCBU) to guide the return to work process for affected coal mine workers.

The guidelines should be used in conjunction with the *Coal Services Clinical Pathways for Coal Mine Dust Lung Disease (CMDLD) Monitoring*.

Why is this important?

Returning to work with a CMDLD is different to traditional return to work arrangements. This is because a coal mine worker with a CMDLD will require ongoing and enhanced medical surveillance, as well as additional health and safety measures to mitigate dust exposure and to understand these measures are working effectively.

These expert medical guidelines provide a best practice and evidenced-based framework, taking into account the individual circumstances of the coal mine worker's CMDLD, including the severity of their disease and the best outcome that can be achieved.

The guidelines are best used as a tool to facilitate discussion about return to work between a coal mine worker and their family, and their employer, insurer and medical specialists. It is also important to recognise that any decision about return to work should be made in consultation between these parties and under the guidance of an occupational and environmental physician and/or respiratory physician.

The guidelines do not change existing rehabilitation and return to work obligations, or health and safety duties that apply to workers, employers, mine operators and workers' compensation insurers.

Enhanced medical surveillance

Coal mine workers with identified lung abnormalities will require more frequent health monitoring. The frequency may vary with the condition and severity, but should be at no greater intervals than 12 monthly. The health monitoring could include:

- standardised respiratory questionnaire
- chest examination
- complex lung function testing (CLFT)
- low dose high-resolution computed tomography (HRCT): at the direction of the respiratory physician, or in response to test results
- review of work tasks and monitoring data.

Ongoing exposure to coal mine dust is not recommended if subsequent monitoring indicates progression:

- a decline of ≥15% in spirometry values, or greater than the ERS lung tracker rate of decline, or
- a 10% to 15% decline in DLCO, or
- radiological progression by more than 1 ILO subcategory in 5 years, or an increase in the ICOERD score for small opacities by 2 or more points to an ICOERD score of 4 or greater, or
- the development of progressive massive fibrosis (PMF).

Dust exposure limits

1. Radiological evidence of mine dust lung disease: ILO category 1/0 1/1 & 1/2 or ICOERD score 1 to 7
   - should aim, as far as reasonably practicable, to comply with a reduced 8-hour time weighted average exposure level of less than 0.5mg/m³ RCD and 0.025mg/m³ RCS.
   - will require enhanced medical surveillance (as per requirements in table below) in no longer than 12 months.

2. Radiological evidence of mine dust lung disease: ILO category 2/1 or ICOERD score 8 to 9
   - should aim, as far as reasonably practicable, to comply with reduced 8-hour time weighted average exposure level of less than 0.5mg/m³ RCD and 0.025mg/m³ RCS
   - will require enhanced medical surveillance (as per requirements in table below) in no longer than 12 months.

3. Radiological evidence of mine dust lung disease: ILO category ≥ 2/2 or ICOERD score ≥ 10, and Category A, B, C PMF
   - case by case assessment, usually should avoid further exposure to coal mine dust.

4. Lung function abnormalities

Severity based on Z-score (FEV1 or DLCO)	Dust exposure limits (time weighted average)	Enhanced medical surveillance
Rapid decline in FEV1 defined as >15% fall in reference value even if FEV1 >LLN	Should aim, as far as reasonably practicable, to comply with reduced 8-hour time weighted average exposure level of **<1mg/m³ RCD and 0.025mg/m³ RCS**	Requires at least annual respiratory review and consider CLFT.
Mild impairment Z-score between -1.65 and -2.5 (approx. FEV1 ≥70% or DLCO ≥ 60% predicted)	Should aim, as far as reasonably practicable, to comply with reduced 8-hour time weighted average exposure level of **<1mg/m³ RCD and 0.025mg/m³ RCS.**	
Moderate impairment Z-score between -2.5 and -4 (approx. FEV1 60-69% or DLCO 40-59% predicted)	Should aim, as far as reasonably practicable, to comply with reduced 8-hour time weighted average exposure level of **<0.5mg/m³ RCD and 0.025mg/m³ RCS.**	
Severe impairment Z-score < -4 (approx. FEV1 < 60% or DLCO <40% predicted)	Case by case: usually excluded from further dust exposure. Consider not fit for work.	

Radiological abnormalities

ILO CXR classification	HRCT ICOERD classifications	Dust exposure limits (time weighted average)	Enhanced medical surveillance
≥1/0 and <2/1 or 1/0, 1/1 and 1/2	≥1 through 7	Should aim, as far as reasonably practicable, to comply with reduced 8-hour time weighted average exposure level of **<0.5mg/m³ RCD and 0.025mg/m³ RCS.**	Requires at least annual respiratory review, and CLFT with HRCT at respiratory physician direction.
2/1	8 to 9	Should aim, as far as reasonably practicable, to comply with reduced 8-hour time weighted average exposure level of **<0.5mg/m³ RCD and 0.025mg/m³ RCS.**	
≥2/2 and Category A, B or C PMF	≥10 and Category A, B or C PMF	Case by case: usually exclude from dust exposure.	

Radiological lung disease without lung function impairment

Imaging may identify that a coal mine worker has non-pneumoconiosis changes, such as emphysema, without abnormal spirometry or DLCO measurements. In such cases, follow the exposure guidelines in the lung function abnormalities section (point 4 above) for *Mild impairment*.

Dust-related diffuse fibrosis

Follow the recommendations based on the profusion of small irregular opacities and any lung function abnormalities. Lung function abnormalities should be monitored with at least annual CLFT. The threshold for removal from further dust exposure should be low.

Mixed radiological and lung function abnormalities

Follow-up should be based on both sets of requirements and follow the recommendations of the assessing respiratory physician.

Other factors

- Psychological factors: the investigation process and identification of these diseases frequently causes significant anxiety and distress in coal mine workers. This often relates to the possible disease itself and the consequences of ongoing exposure. There is also often a significant fear for how it may affect their job. Many employers offer support services and the worker's general practitioner is also well placed to assist. The best outcomes for health and work come from early discussions involving all affected parties to manage all the arising issues, and to provide adequate and early access to relevant advice.

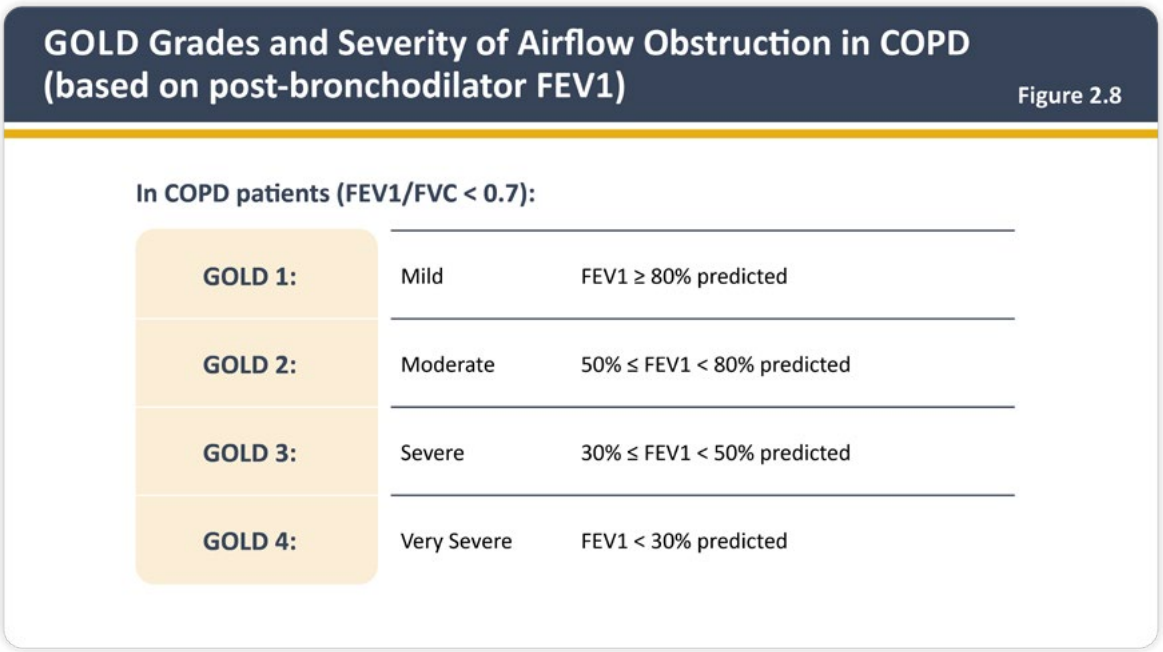
Review of Respiratory Health Standard

All NSW Coal Industry Health Standards are reviewed 12 months after initial publication, and then every 5 years thereafter, or sooner, as required.

Appendix G: GOLD criteria for COPD control

Extract from the Global Initiative for Chronic Obstructive Pulmonary Disease, 'Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease (2025 Report)', page 31

https://goldcopd.org/wp-content/uploads/2024/11/GOLD-2025-Report-v1.0-15Nov2024_WMV.pdf



Global Initiative for Chronic Obstructive Pulmonary Disease. Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease, 2025.

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