

Contents

Preface: Occupational and Environmental Contributions to Lung Disease xiii

Kristin J. Cummings, Peggy S. Lai, and Carrie A. Redlich

Master Clinician and Public Health Practitioner: Selected Occupational and Environmental Pulmonary Cases 567

Efia James, Brian Linde, and Carrie A. Redlich

Occupational and environmental exposures contribute to the development and progression of most lung diseases, yet their impact is greatly under-recognized in clinical practice. Clinicians caring for patients with respiratory diseases should maintain a high index of suspicion for occupational and environmental contributing factors. Mastering occupational and environmental medicine clinical decision making requires specialized clinical skills. These skills include obtaining an appropriate work and exposure history; making an assessment of the magnitude and relevance of exposures and their contribution to a patient's respiratory disease; utilizing appropriate resources for evaluation and management of exposure-related disease; and considering socioeconomic and public health factors.

Chest Imaging in the Diagnosis of Occupational Lung Diseases 581

Lara Walkoff and Stephen Hobbs

Imaging plays a crucial role in the diagnosis and monitoring of occupational lung diseases (OLDs); however, the sensitivity and specificity of detection and diagnosis vary greatly depending on the imaging modality used. There is substantial overlap in appearance with non-occupation-related entities. OLDs should be considered in the differential even in the absence of a provided exposure history. Because many findings are not specific, a multidisciplinary approach is important in arriving at the diagnosis and will continue to be important as workplace-related pulmonary diseases evolve with changing industrial practices and workplace regulations.

Informatics Approaches for Recognition, Management, and Prevention of Occupational Respiratory Disease 605

Philip Harber and Gondy Leroy

Computer and information systems can improve occupational respiratory disease prevention and surveillance by providing efficient resources for patients, workers, clinicians, and public health practitioners. Advances include interlinking electronic health records, autocoding surveillance data, clinical decision support systems, and social media applications for acquiring and disseminating information. Obstacles to advances include inflexible hierarchical coding schemes, inadequate occupational health electronic health record systems, and inadequate public focus on occupational respiratory disease. Potentially transformative approaches include machine learning, natural language processing, and improved ontologies.

Contents

Health Disparities in Environmental and Occupational Lung Disease

623

Emily Brigham, Cassandra Allbright, and Drew Harris

Pulmonary health disparities disproportionately impact disadvantaged and vulnerable populations. This article focuses on disparities in disease prevalence, morbidity, and mortality for asthma, chronic obstructive pulmonary disease, pneumoconiosis, and lung cancer. Disparities are categorized by race, age, sex, socioeconomic status, and geographic region. Each category highlights differences in risk factors for the development and severity of lung disease. Risk factors include social, behavioral, economic, and biologic determinants of health (occupational/environmental exposures, psychosocial stressors, smoking, health literacy, health care provider bias, and health care access). Many of these risk factors are complex and inter-related; strategies proposed to decrease disparities require multilevel approaches.

Respiratory Health Effects of Exposure to Cleaning Products

641

Sara De Matteis, Steven Ronsmans, and Benoit Nemery

There is consistent and growing evidence of an epidemic of “asthma-like” symptoms among professional cleaners. Questions include how big is this problem worldwide, which cleaning agents are dangerous, how do they affect the lungs, and is it really asthma? This issue is important to public health because of the increasing number of professional cleaners, many from vulnerable categories. There are implications for anybody exposed to cleaning products during housekeeping, including children. This article uses available evidence to give a broad but concise overview on what we know so far and how we can prevent the cleaning-associated respiratory public health burden.

Work-Related Upper-Airway Disorders

651

Ambrose Lau and Susan M. Tarlo

Work-related rhinitis and laryngeal disorders are common and can significantly contribute to work absences and presenteeism. Each can cause respiratory symptoms that may be misdiagnosed as asthma symptoms, and each may occur as an isolated disorder or may also accompany asthma. Suspicion of these disorders and correct management require a careful medical and occupational history. Investigations for work-related rhinitis include examination of the nose, allergy skin tests, and in some cases, monitoring of peak inspiratory nasal flows at work and off work, or specific challenge tests. Work-related laryngeal disorders require assistance from an otolaryngologist and speech language pathologist.

Occupational Bronchiolitis: An Update

661

Randall J. Nett, R. Reid Harvey, and Kristin J. Cummings

Occupational bronchiolitis is characterized by inflammation of the small airways following a range of inhalation exposures. Workers in industries producing or using flavorings containing diacetyl or 2,3-pentanedione are at risk. Cases of constrictive bronchiolitis also have been associated with military deployments, but the causative exposure(s) have not been identified. Multiple reports in recent years have drawn attention to previously unrecognized risk factors for occupational bronchiolitis in several settings, such as fiberglass-reinforced plastic boatbuilding. Both current and past occupational exposures should be considered in patients undergoing

evaluation for unexplained dyspnea. Diagnostic testing should include a thorough assessment of the small airways.

Coal Workers' Pneumoconiosis and Other Mining-Related Lung Disease: New Manifestations of Illness in an Age-Old Occupation 687

Leonard H.T. Go and Robert A. Cohen

Coal workers' pneumoconiosis (CWP) and other mining-related lung diseases are entirely preventable, yet continue to occur. While greater attention has been given to CWP and silicosis, mining exposures cause a broad spectrum of respiratory disease, including chronic bronchitis, emphysema, and pulmonary fibrosis. Physicians must obtain a detailed occupational and exposure history from miners in order to make an accurate diagnosis and determine the risk of disease progression. Mining-related lung diseases are incurable and difficult to treat. Therefore, primary prevention by limiting dust exposure and secondary prevention through chest imaging and physiologic screening should be the primary focus of disease control.

Occupational Contributions to Interstitial Lung Disease 697

Carl Reynolds, Johanna Feary, and Paul Cullinan

Historically well-recognized occupational threats such as coal workers pneumoconiosis, silicosis, and asbestosis remain important and are very likely underestimated in measures of global disease burden. Studies of occupational exposure related to idiopathic pulmonary fibrosis, the most common interstitial lung disease, are limited but there is moderate evidence for metal, wood, and stone dust being significant contributors. Vigilance is required to identify causes, such as hypersensitivity pneumonitis due to microbial contamination of metalworking fluid (now responsible for greater than 50% of occupational hypersensitivity pneumonitis cases in the United Kingdom) in an everchanging workplace environment.

Silicosis: An Update and Guide for Clinicians 709

Silpa Krefft, Jenna Wolff, and Cecile Rose

This overview provides an update on silicosis epidemiology with review of exposures and emerging trends in acute and accelerated silicosis in the twenty-first century. The silicosis epidemics in mining, denim sandblasting, and engineering stone industries are highlighted. Clinical presentations of silicosis and silica-related conditions such as autoimmune, kidney, and mycobacterial disease, as well as lung cancer, are discussed. Important aspects of the new OSHA 2017 Silica Standard are presented. This review also includes practical guidance for clinicians to address questions that may arise when evaluating silica-exposed patients and to the public health responses needed following a diagnosis of silica-related disease.

Screening for Occupational Lung Cancer: An Unprecedented Opportunity 723

Steven B. Markowitz and Brittany Dickens

Selected occupational populations are at the highest risk of lung cancer, because they smoke at increased rates and are concurrently exposed to workplace lung carcinogens. Low-dose computed tomography (CT)-based lung cancer screening has an enormous potential to reduce lung cancer mortality in these populations, as shown both in the lung cancer screening studies in the general population and in studies of workers at high risk of lung cancer. Pulmonologists can play a key role

Contents

in identifying workers at high risk of lung cancer and ensuring that they are offered annual low-dose CT scans for early lung cancer detection.

Occupational Respiratory Infections

739

Marie A. de Perio, Miwako Kobayashi, and Jonathan M. Wortham

Occupational respiratory infections can be caused by bacterial, viral, and fungal pathogens. Transmission in occupational settings can occur from other humans, animals, or the environment, and occur in various occupations and industries. In this article, we describe 4 occupationally acquired respiratory infections at the focus of NIOSH investigations over the last decade: tuberculosis (TB), influenza, psittacosis, and coccidioidomycosis. We highlight the epidemiology, clinical manifestations, occupational risk factors, and prevention measures.

Update on Climate Change: Its Impact on Respiratory Health at Work, Home, and at Play

753

Hari M. Shankar and Mary B. Rice

Climate change is a crisis of vast proportions that has serious implications for pulmonary health. Increasing global temperatures influence respiratory health through extreme weather events, wildfires, prolonged allergy seasons, and worsening air pollution. Children, elderly patients, and patients with underlying lung disease are at elevated risk of complications from these effects of climate change. This paper summarizes the myriad ways in which climate change affects the respiratory health of patients at home and in outdoor environments and outlines measures for patients to protect themselves.

Working in Smoke: Wildfire Impacts on the Health of Firefighters and Outdoor Workers and Mitigation Strategies

763

Kathleen Navarro

Wildland firefighters work on wildfire incidents all over the United States and perform arduous work under extreme work conditions, including exposure to smoke. Wildland fire smoke is a mixture of hazardous air pollutants. For assessing wildland firefighter exposure to smoke, most studies measured carbon monoxide (CO) and particulate matter and reported changes in lung health by measured lung function, airway responsiveness, and respiratory symptoms across individual work shifts and single fire seasons. All fire personnel should understand the hazards of smoke and develop ways to mitigate exposure to smoke.

The Changing Nature of Wildfires: Impacts on the Health of the Public

771

John R. Balmes

Catastrophic wildfires are increasing around the globe as climate change continues to progress. Another risk factor for large wildfires in the western United States is a legacy of fire suppression that has allowed overgrowth of underbrush and small trees in forests where periodic lightning-sparked wildfires are part of the natural ecosystem. Wildfire smoke contains CO₂, CO, NO_x, particulate matter, complex hydrocarbons (including polycyclic aromatic hydrocarbons), and irritant gases, including many of the same toxic and carcinogenic substances as cigarette smoke. The public need clear and consistent messaging to understand that wildland fire smoke poses a health risk.

Indoor Microbial Exposures and Chronic Lung Disease: From Microbial Toxins to the Microbiome 777

Molly Wolf and Peggy S. Lai

Effects of environmental microbial exposures on human health have long been of interest. Microbes were historically assumed to be harmful, but data have suggested that microbial exposures can modulate the immune system. We focus on the effects of indoor environmental microbial exposure on chronic lung diseases. We found contradictory data in bacterial studies using endotoxin as a surrogate for bacterial exposure. Contradictory data also exist in studies of fungal exposure. Many factors may modulate the effect of environmental microbial exposures on lung health, including coexposures. Future studies need to clarify which method of assessing environmental microbial exposures is most relevant.

Electronic Cigarettes: Past, Present, and Future: What Clinicians Need to Know 797

Stephen R. Baldassarri

Electronic cigarettes (EC) are battery-operated devices that heat and aerosolize a liquid solution that typically contains nicotine. ECs have become commonly used among youth and may pose substantial risks of future addiction and health problems in this population. However, ECs are far less toxic per puff compared with combustible cigarettes, and as a result, might present an important harm reduction opportunity for cigarette smokers who cannot stop smoking by traditional means. The long-term health effects of ECs on individuals and the net effect on public health will remain unknown for many years.

The Respiratory Risks of Ambient/Outdoor Air Pollution 809

Gary Adamkiewicz, Jahred Liddie, and Jonathan M. Gaffin

Globally, exposure to ambient air pollutants is responsible for premature mortality and is implicated in the development and exacerbation of several acute and chronic lung disease across all ages. In this article, we discuss the source apportionment of ambient pollutants and the respiratory health effects in humans. We specifically discuss the evidence supporting ambient pollution in the development of asthma and chronic obstructive pulmonary disease and acute exacerbations of each condition. Practical advice is given to health care providers in how to promote a healthy environment and advise patients with chronic conditions to avoid unsafe air quality.

Indoor Air Pollution and Respiratory Health 825

Sarath Raju, Trishul Siddharthan, and Meredith C. McCormack

Worldwide, more than 4 million deaths annually are attributed to indoor air pollution. This largely preventable exposure represents a key target for reducing morbidity and mortality worldwide. Significant respiratory health effects are observed, ranging from attenuated lung growth and development in childhood to accelerated lung function decline and is determined by chronic obstructive pulmonary disease later in life. Personal exposure to household air pollutants include household characteristics, combustion of solid fuels, cooking practices, and household pest allergens. This review outlines important sources of indoor air pollution, their respiratory health effects, and strategies to reduce household pollution and improve lung health across the globe.