



## Consensus

## Expert consensus on technical and protection standards for digital chest X-ray examination in the Guangdong-Hong Kong-Macao Greater Bay area



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## ABSTRACT

Digital chest radiography is a widely used modality for screening and diagnosing respiratory diseases. Within the Guangdong–Hong Kong–Macao Greater Bay Area, however, regional differences in equipment parameters, operating procedures, and radiation-protection standards have hindered medical collaboration, mutual recognition of results, and multicenter research. Meanwhile, although dynamic digital radiography (DDR) has been introduced into clinical practice, unified standards for image acquisition, functional evaluation, and radiation protection remain lacking. To address these challenges and promote high-quality integration of imaging services across the Greater Bay Area, there is an urgent need for a consensus that integrates both static and dynamic chest radiography while accommodating the regulatory frameworks and clinical practices of the three regions. The consensus establishes technical specifications, quality-control standards, and radiation-protection requirements applicable to both conventional and dynamic digital chest radiography. For the first time, it systematically integrates DDR acquisition under quiet breathing, forced breathing, and blood-flow sequences; defines methods for functional parameter extraction and clinical application scenarios; and provides BMI-stratified exposure recommendations with reference dose ranges. In addition, the consensus harmonizes relevant radiation-protection provisions from the Chinese Mainland, Hong Kong, China, and Macao, China, thereby forming a unified and actionable system for quality control and safety management.

### 1. Introduction

Digital radiography (DR) is among the most familiar imaging examinations to the public. It is widely used for the screening and diagnosis of pulmonary diseases—such as pneumonia, tuberculosis, and lung cancer—as well as thoracic structural abnormalities.<sup>1–3</sup> Despite continual advances that have made DR systems more user-friendly, radiologic technologists must still master the core principles of chest imaging and enforce rigorous quality control to ensure accurate, consistent results.

As a national strategic economic hub, health authorities in Guangdong, Hong Kong, and Macao signed the *Guangdong-Hong Kong-Macao Greater Bay Area Health Cooperation Consensus* in 2019, committing to establish a high-quality "Healthy Greater Bay Area" and an efficient healthcare system aligned with international standards. However, significant disparities in digital chest radiography equipment parameters,

operating procedures, and radiation-protection standards across the three regions hinder effective medical collaboration. These inconsistencies impede the development of smart healthcare, coordinated insurance reimbursement, multicenter research, and the growth of the medical device industry. Consequently, there is an urgent need to harmonize imaging protocols and protection standards in these regions.

The advent of dynamic digital radiography (DDR) and other advanced X-ray technologies necessitates revision of existing standards. DDR couples a large field-of-view dynamic flat-panel detector with advanced digital processing to acquire continuous chest images at high temporal resolution across the respiratory or cardiac cycle. The resulting cine sequences provide functional information on pulmonary ventilation, diaphragmatic and chest-wall motion, and pulmonary perfusion.<sup>4–6</sup> Emerging evidence indicates that DDR enables quantitative assessment of ventilation in chronic obstructive pulmonary disease (COPD) and offers a simple, effective approach for dynamic evaluation of

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