ASEAN Movement in Radiology

Thailand is implementing artificial intelligence to assist interpreting chest radiographs in public health

Wiwatana Tanomkiat, M.D.[(1), (6)]
Sitthichok Chaichulee, Ph.D.[(2), (6)]
Thammasin Ingviya, M.D., Ph.D.[(3), (4), (6)]
Supharerk Thawillarp, M.D., D.P.H.[(5), (6)]
From [(1)]Department of Radiology, [(2)] Department of Biomedical Sciences and Biomedical Engineering, [(3)] Department of Family and Preventive Medicine,
[(4)] Department of Clinical Research and Medical Data Science, Faculty of Medicine, Prince of Songkla University, Hat Yai, Songkhla, Thailand,
[(5)] Epidemic Intelligence Unit (EIU), Department of Disease Control, Ministry of Public Health, Nonthaburi, Thailand,
[(6)] The Royal College of Radiologists of Thailand, Bangkok, Thailand.
Address correspondence to W.T. (e-mail: twiwadha@hotmail.com)

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Background

According to World Health Organization (WHO), six out of top ten causes of death worldwide are in the thorax, three of which are communicable and the other three are non-communicable [1]. The communicable ones are tuberculosis, pneumonia and COVID-19, of which a chest radiograph (CXR) plays an important role in both diagnosis and management. CXR is a WHO-recommended tool for TB screening [2]. Thailand has a high TB burden, with a prevalence of 242 cases per 100,000 adults CXR, and is committed to eradication in line with WHO's End TB Strategy, which sets a target of reducing incidence to 89 per 100,000 population by 2027 [3]. In 2019, based on a survey in 360 out of 1,554 hospitals in Thailand, performed by The Royal College of Radiologists of Thailand (RCRT.) and the

Department of Medical Sciences, Ministry of Public Health (MOPH.), it was estimated that almost half of working hours of radiologists were spent interpreting radiographs. The data collected during 2015-2021 from Songklanagarind Hospital, Prince of Songkla University, in southern Thailand showed that fewer than 25% of chest radiographs were interpreted by radiologists, more than half of which were normal (Table 1).

Table 1. *The number of chest radiographs performed and interpreted in Songklanagarind Hospital in southern Thailand during 2015-2021.*

Year	Total Number of Chest Radiographs	Chest Radiographs without Radiological Reports	Chest Radiographs with Radiological Reports	Chest Radiographs with Negative Radiological Reports
2015	160,712	141,274 (87.9%)	19,438 (12.1%)	11,696 (60.2%)
2016	146,555	126,902 (86.6%)	19,653 (13.4%)	10,627 (54.1%)
2017	118,828	100,324 (84.4%)	18,504 (15.6%)	10,538 (56.9%)
2018	98,514	77,326 (78.5%)	21,188 (21.5%)	12,737 (60.1%)
2019	98,412	76,603 (77.8%)	21,809 (22.2%)	13,853 (63.5%)
2020	89,850	69,241 (77.1%)	20,609 (22.9%)	13,398 (65.0%)
2021	81,382	61,354 (75.4%)	20,028 (24.6%)	13,131 (65.6%)

AI- based CAD software has shown promising accuracy in TB screening [4,5] and the WHO recommended the use of CAD software for TB screening and triage in 2021 [6]. A shortage of radiologists and a high TB burden in Thailand make AI attractive in the market. Private hospitals adopted commercially available AIs to assist radiologists to minimize the risk of missed detection. Some health institutes are developing their own AI systems, hoping that all CXRs will be accurately interpreted or appropriately prioritized. MOPH aims to eliminate TB and improve people's health by integrating AI in the service flow.

Introduction of AI during COVID-19 pandemics

In January 2020, the first case of COVID-19 outside China was reported in Thailand just a few weeks after an outbreak in Hubei, China when millions of Chinese people traveled not only across China but throughout Asia during the Lunar New Year holiday [6]. Because pneumonia is the main manifestation, chest radiographs, initially not recommended to detect or confirm the COVID-19 pneumonia by various organizations [7], played a pivotal role in prioritizing the infected patients to limited healthcare after the third wave of COVID-19 attacked Thailand in the middle of 2021 when the state of emergency was declared and infected patients needed to be admitted to hospitals, field hospitals, and community isolations centers, and finally isolate at home when new cases exceeded 20,000 cases a day [8]. Radiographic units were installed at all field hospitals and some community isolation sites and reports from radiologists were used for triaging the level of medical care. RCRT launched a project called "RadioVolunteer" to interpret and report CXRs of COVID-19 patients in prisons, field hospitals where there was a shortage of radiologists, and some community isolation centers [9]. The RadioVolunteer digital platform was designed to facilitate seamless collaborations between radiologists and healthcare providers. Built on a secure, cloud-based infrastructure, the platform served as the backbone of the RadioVolunteer project and enabled real-time sharing and interpretation of CXRs. Due to the high volume of images and the fact that volunteers ranged from general radiologists to specialists in chest and other organs, the AI-assisted prioritizing system identified and scored the positive radiographs (Figure 1). Cases that seemed to have high abnormality scores were alerted and prioritized in the radiologist worklist. The chest-expert radiologists could quickly review these likely positive cases in real-time as well as quickly screen through likely negative cases later. The general radiologists or subspecialist radiologists in other organ systems felt more comfortable and confident to report the images with low abnormality scores. The volunteers interpreted the original CXR image side-by-side with a computer-assisted image assessed by an AI provided by the platform. During the project, from 31 May 2021 to 25 December 2021, 288,824 CXRs from 115 caring units were interpreted and AI was utilized by more than 350 radiologist volunteers.

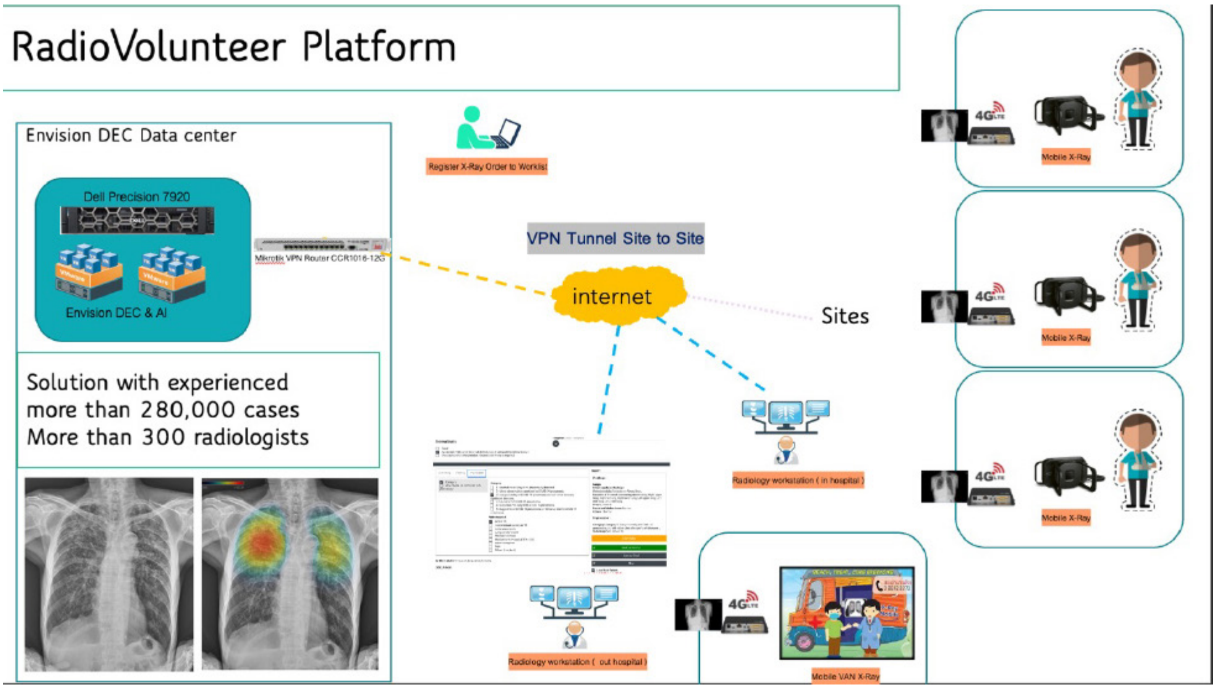

Figure 1. *An infographic showcasing that AI system was introduced in RadioVolunteer platform to identify and score the positive radiographs.*

Development of external validation

While AI models are rapidly entering Thai markets, studies show that many AI models perform worse on external datasets compared to manufacturers' internal data, with only 6% of AI models in medical imaging being externally validated [10,11]. The lack of robust external datasets for validation limits their wider use. While microbiological references are typically recommended for assessing accuracy, comparing AI models with human-read CXRs is crucial when considering their adoption [12].

In Thailand's efforts to integrate artificial intelligence into chest radiograph interpretation, the Thailand Center of Excellence for Life Sciences (TCELS) serves as a crucial national facilitator and coordinator rather than a direct developer of AI algorithms. Operating as a public entity under the Ministry of Higher Education, Science, Research and Innovation, TCELS's primary mandate is to accelerate healthcare innovation by building networks, providing funding, and sharing resources across public and private sector organizations. It acts as a central hub, connecting the different parts of the complex AI ecosystem to ensure cohesive and rapid progress.

TCELS fulfills its mission through several key actions. It provides essential financial support for AI development projects, such as the collaboration to create an AI-based screening tool for pneumonia. A significant part of its role involves fostering strategic public-private partnerships, a prime example being its work within the Yothi Medical Innovation District (YMID) to unite hospitals and technology firms during the COVID-19 pandemic. Furthermore, TCELS works closely with professional bodies, having signed a formal Memorandum of Understanding (MOU) with the RCRT to facilitate resource exchange and co-organize initiatives like the "Standard Dataset for Chest AI" project [13]. Through these efforts, TCELS effectively bridges the gap between research, clinical needs, and commercial application, accelerating the deployment of vital AI health technologies across the nation.

Among radiologists, B Readers-the certified physicians by the NIOSH to diagnose pneumoconiosis-are considered skilled in interpreting CXRs with greater concordance with the final diagnosis of pneumoconiosis compared to other readers [14]. TB share many common radiographic findings with silicosis, the RCRT hypothesized that B Readers would also exhibit proficiency in diagnosing TB on CXR. The 1,097 CXRs, both normal and biologically confirmed TB, carefully curated from various geographic locations in Thailand were interpreted by six B readers. These CXRs were not used for AI training but served as an external test set to conduct external validation.

In 2020, the RCRT, with support from TCELS, launched a vendor-neutral external validation to close the existing gap between internal and real-world performance in Thai population. Vendors submitted results from locked models at predetermined operating points. The protocol included ROC/AUC, sensitivity, specificity, and calibration curves. Results including Thai benchmark performance and recommended thresholds for triage and TB screening, aligned with WHO use cases, were packaged as concise validation documents for hospital adoption and announced on the the RCRT website [15] (Figure 2).

Figure 2. *RCRT webpage where certifications and validation documents of AI submitted for external validation appear and can be acquired [15].*

Thailand healthcare system

There are two important stakeholders in the Thai healthcare system: MOPH, an entity responsible for public hospital covering more than 70% of the hospitals in Thailand and the National Health Security Office (NHSO) that is responsible for the reimbursement model for Universal Health Coverage program, the largest health reimbursement scheme in Thailand.

Giving the growing recognition of the benefit of AI in medicine, AI Clinical Decision Support started to gain traction among several government bodies. Several AI proof of concept were co-developed between the university and MOPH. For example, the R3D3 was co-developed with the Naresuan University and the MOPH hospital, Chattrakan hospital. However, large scale implementation was limited due to the digital infrastructure constraints and policy commitment [16].

During the COVID-19 pandemic, several investments were made to develop a digital platform, digital transformation, and infrastructure to accommodate telemedicine and COVID-19 Certificate to revive Thailand's tourism and economy that was impacted by the COVID-19 lockdown and travel restriction.

The MOPH saw the opportunity and established the Bureau of Digital Health (BDH) in 2022 at the MOPH to continue the digital transformation into the post-COVID-19 era. The office directly reports to the MOPH Chief Information Office (CIO) as a digital transformation office.

The BDH leveraged the national platform originally developed for the COVID-19 vaccination registry to establish the National Digital Health Plat form (NDHP) to support MOPH's hospital digital health initiatives, including online appointments booking, Personal Health Records, and Clinical Decision Support services. By connecting all MOPH hospitals nationwide, the NDHP is able to significantly expand the hospital capabilities by connecting the authorized third-party to develop modules which will become available for all MOPH hospitals. In other words, the NDHP module function helps expand MOPH hospital digital functionality.

The Imaging Hub program was initiated in 2024 as part of the NDHP to act as MOPH radiology image repository for research and patient care. The program offers MOPH in-house developed AI CXR screening available for MOPH hospital free of charge and more AI models are being developed. The Imaging Hub program facilitates the use of AI among the MOPH. hospitals regardless of their size or location [17].

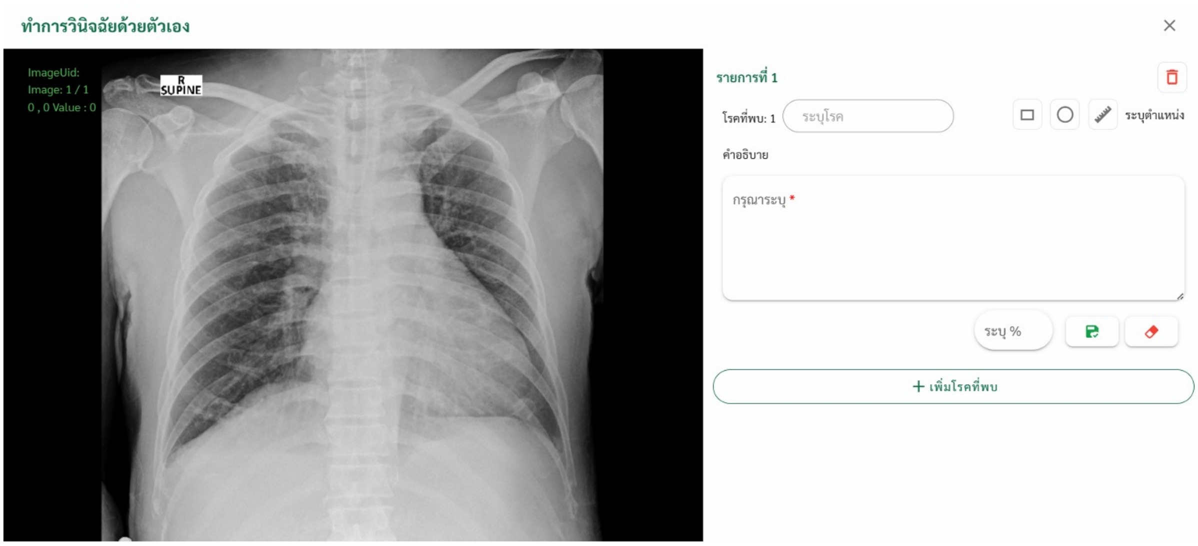

Figure 3. *Imaging Hub panel; the image shows a Chest-X-Ray from MOPH hospitals, stored on Cloud and a panel for physicians to record their findings [16].*

The MOPH also has the AI approval pathway, "Software as a Medical Device (SaMD)" Pathway for healthcare AI under the Medical Device Control Division, Food and Drug Administration (FDA). AI vendor will need approval from this pathway to be certified in Thailand [18].

On the reimbursement side, NHSO is also working with the MOPH to initiate the reimbursement model which will greatly incentivize the AI adoption in Thailand. The NHSO approved AI CXR as a new Universal Coverage Scheme (UCS) health benefit on July 7, 2025 [19]. Approximately 167 MOPH hospitals are eligible for this benefit in 2025. The estimated cost for AI CXR is 329,000 baht per hospital, totaling a budget of 55 million baht in 2025 (Figure 4).

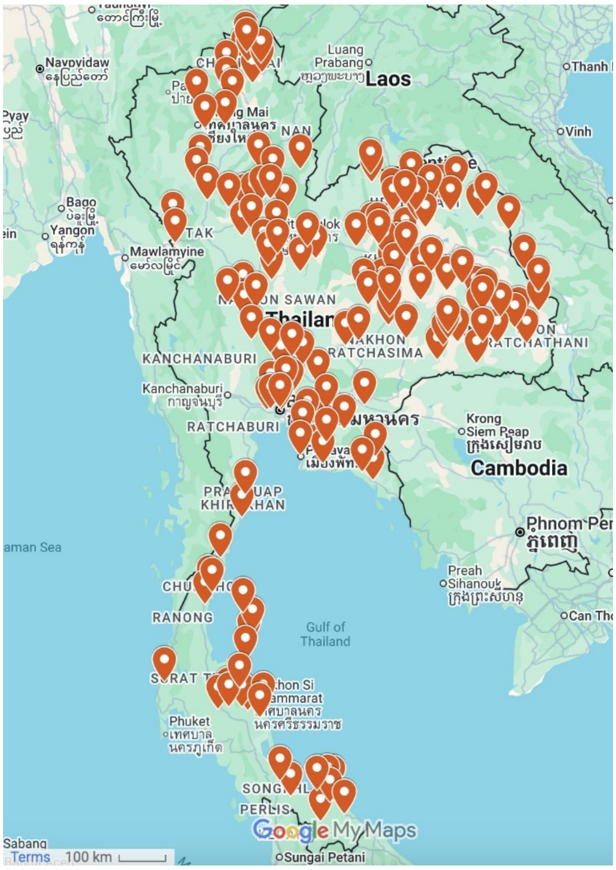

Figure 4. *The map of Thailand showing 167 MOPH hospitals in which AI-assisted workflow for interpreting chest radiographs will be installed by the end of 2025.*

Monitoring (TCELS dashboard)

To ensure the safe and effective nationwide deployment of artificial intelligence in chest radiography, the TCELS and the NHSO established a partnership. A key outcome of this collaboration is the formation of an expert monitoring team tasked with overseeing the real-world application and performance of AI tools. This initiative is critical for building trust among clinicians and ensuring that these advanced technologies consistently enhance patient care and safety in diverse clinical settings. The team's primary objective is to create and implement a robust governance structure for the evaluation, use, and continuous monitoring of AI algorithms in practice.

At the core of this oversight is a proposed framework for the annual review of all hospitals that have integrated chest AI into their diagnostic workflows. This comprehensive evaluation is structured around four key pillars to provide a holistic assessment of the technology's impact. First, ethical and legal considerations examines adherence to data privacy standards, patient consent protocols, and the complex issue of medicolegal liability in cases of AI-assisted diagnostic errors. The framework ensures that the use of AI respects patient rights and that clear lines of accountability are established. Second, technical performance involves the continuous monitoring of the AI algorithm's diagnostic accuracy and reliability. It includes proactive surveillance for issues like "model drift," where an AI's performance degrades over time as it encounters new types of data from different patient populations or imaging equipment. This ensures the tool remains effective long after its initial deployment. Third, workflow Integration assesses how seamlessly the AI tool integrates into existing hospital information systems (HIS) and picture archiving and communication systems (PACS). The goal is to confirm that the AI optimizes the clinical workflow, for example, by automating the triage of urgent cases—rather than creating bottlenecks or increasing the burden on medical staff. Last but not least, user satisfaction gauges the experience and confidence among the clinicians using the AI. Given that user reluctance can be a major barrier to adoption, this feedback is crucial for understanding the practical value of the AI, addressing any usability issues, and ensuring the technology serves as a trusted "second reader" for physicians.

This monitoring framework is designed to be applied to all AI platforms in use, with mainstream commercial systems like Perceptra's Inspectra CXR [20] serving as a key example. Perceptra already provides comprehensive end-to-end support, including extensive monitoring services, which aligns with the national oversight goals (Table 2). This multi-layered approach, combining government oversight, professional self-regulation, and responsible vendor practices, is essential for building a sustainable and trustworthy AI-powered healthcare ecosystem.

Education and Training	Monitoring and Evaluation			
	Dashboard monitoring	Infrastructure Evaluation	Clinical Evaluation	
มหาวิทยาลัยมหิดล คณะแพทยศาสตร์ศิริราชพยาบาล	PERCEPTRA	มูลนิธิ HPP Thailand		มหาวิทยาลัยมหิดล คณะแพทยศาสตร์ศิริราชพยาบาล
• Educational Program (Workshop in regional public hospitals) • Online Training (Basics of AI, Social & Ethical issues, Workflow consideration, Practice based learning & improvement in use of AI)	• Monitor the number of service units, patients, and Images screened • Monitor results from AI-based screening of 8 conditions • Divided into three tiers: NHSO headquarters, NHSO regional offices, and health service units	• Document Policy formulation & Policy implementation • Measure user satisfaction, technology acceptance among healthcare professionals, procurement processes, distribution and implementation, and product improvement • Recommend policies to the NHSO	• Performance report (sensitivity, specificity and Area Under the ROC curve (AUROC) of AI CXR • Optimal threshold value of AI CXR for hospitals of different sizes • Cost analysis of providing Tuberculosis screening using AI CXR compared with conventional screening methods, from the perspective of healthcare providers	• Performance report (sensitivity, specificity and Area Under the ROC curve (AUROC) of AI CXR • Optimal threshold value of AI CXR for hospitals of different sizes. • Cost analysis of providing CA lung screening using AI CXR compared with conventional screening methods, from the perspective of healthcare providers
Support policy rollout and appropriate use of AI-CXR	Monitoring by NHSO	Evaluate the AI CXR implementation a		

Table 2. *The pre-deployment education and the monitor during deployment of AI in chest radiography developed by TCELS, NHSO and non-profit professional organizations; Perceptra provided the dashboard for monitoring.*

Conclusion

Implementing artificial intelligence to assist in interpreting chest radiographs in public health of Thailand requires comprehensive collaboration of government, non-profit professional organizations, and private sectors. A holistic approach, encompassing before and during the deployment, was planned to ensure safety and effectiveness. The outcomes and cost analysis after implementation will be evaluated in 2026.

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