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ndomized Controlled Trial > Int J Cardiol. 2023 Jan 1;370:435-441.
0.1016/j.ijcard.2022.10.154. Epub 2022 Nov 5.

ep learning to detect significant coronary artery sease from plain chest radiographs AI4CAD

eppe D'Ancona [1], Mauro Massussi [2], Mattia Savardi [3], Alberto Signoroni [3], Lorenzo Di Bacco [4], de Farina [5], Marco Metra [2], Roberto Maroldi [5], Claudio Muneretto [4], Hüseyin Ince [6], de Costabile [7], Monica Murero [8], Giuliano Chizzola [2], Salvatore Curello [2], Stefano Benussi [4]

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nd: The predictive role of chest radiographs in patients with suspected coronary artery
nderestimated and may benefit from artificial intelligence (AI) applications.

s: To train, test, and validate a deep learning (DL) solution for detecting significant CAD
ographs.

Data of patients referred for angina and undergoing chest radiography and coronary a
rsed retrospectively. A deep convolutional neural network (DCNN) was designed to det

CAD from posteroanterior/anteroposterior chest radiographs. The DCNN was trained t
y classification (absence/presence).

angiography reports were the ground truth. Stenosis severity of ≥70% for non-left main

for left main defined severe CAD.

nformation of 7728 patients was reviewed. Severe CAD was present in 4091 (53%). Pa
livided for algorithm training (70%; n = 5454) and fine-tuning/model validation (10%; n
nical validation (model testing) was performed with the remaining patients (20%; n = 1
stic regression, DCNN prediction was the strongest severe CAD predictor (p < 0.0001;
.048). Using a high sensitivity operating cut-point, the DCNN had a sensitivity of 0.90
CAD (specificity 0.31; AUC 0.73; 95% CI DeLong, 0.69-0.76). Adding to the AI chest ra
on angina status improved the prediction (AUC 0.77; 95% CI DeLong, 0.74-0.80).

n: AI-read chest radiographs could be used to pre-test significant CAD probability in p
r suspected angina. Further studies are required to externally validate our algorithm, d
pplicable tool, and support CAD screening in broader settings.

risingly More Nonsustained VT Shown in Using Extended ECG Monitoring

r, PhD

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rtant arrhythmias, especially nonsustained ventricular tachycardia (NSVT), may be more prevalent in patients with
y (HCM) than widely believed, suggests a study that questions current risk stratification practices in HCM.

study, such arrythmias were observed in about six times as many HCM patients during 30 days of ambulatory
raphic (ECG) monitoring as would havebeen identified based on the first 24 hours of the monitoring period: 65% vs

% of the patients showed NSVT at "extended" 30-day monitoring, compared with an 8% prevalence of the arrythm
entional ECG monitoring period of 24 hours.

ventricular tachycardia, an important arrhythmia used every day in clinical practice to make decisions, is "much, m
we thought" in patients with HCM, Juan Caro Codón, MD, the study's principal investigator, told *theheart.org | Me*
/e should invest in further research regarding extended ECG monitoring in these patients."

of La Paz University Hospital, Madrid, Spain, presented the findings from the TEMPO-HCM study April 17 at the 20
an Heart Rhythm Association, held in Barcelona and virtually.

said, have implications for stratifying HCM patients according to their risk for sudden cardiac death in deciding who
lantable cardioverter-defibrillator (ICD).

nce of atrial fibrillation (AF) in patients like those in the current analysis has previously been found to be about 20%
NSVT about 20% to 30%, using traditional 24- or 48-hour Holter monitoring, Caro Codón said.

mias are clinically relevant events because they are linked to very meaningful clinical endpoints," including stroke
ism, he said, "but also for sudden cardiac death."

G monitoring has been shown useful in the setting of cryptogenic stroke and after AF ablation, but similar findings h
l. Patients using personal wearable monitors such as 'smart watches,' Caro-Codón said, have come to his clinic wi
es may have signaled a problem. But the lack of relevant data leaves them without a sufficient answer.

gs, invited discussant Isabelle van Gelder, MD, PhD, observed after Caro Codón's presentation that the number of
bled based on extended monitoring compared to the first 24 hours of monitoring.

C guidelines from 2020, "Once clinical AF has been documented, there is a class IIA recommendation to start antico
er, University of Groningen, the Netherlands. "Therefore, your data really are a call for more data on screening for A
ardiomyopathy patients."

ective Multicenter Registry

MPO-HCM registry includes patients with HCM and a clinical indic
ndard Holter monitoring at five hospitals in Spain. It excludes patien
CM phenocopies and those implanted with ICDs.

n the current analysis underwent 30-day ECG monitoring with a si
le device that Caro Codón described as about 7 cm long, worn in
ntially a T-shirt with a pocket. Patients could remove the shirt and
e or go swimming, for example, and still be monitored for most of t

alysis included the registry's first 100 patients (mean age 57 years
Hypertension was present in 47%, 58% were on beta-blockers, 16
or AF or atrial flutter, and 19% were taking anticoagulants. Only 8%
n antiarrhythmic drugs, Caro Codón reported.

tients had good functional status (68% and 29% were in NYHA cla
respectively) and their left ventricular ejection fraction averaged 66
patients who underwent MRI, 28.2% showed late gadolinium
cement suggesting myocardial scarring.

hmias on 30-day Monitoring

ndpoint of clinically relevant arrhythmia (AF, atrial flutter, or NSVT) was identified during the first 24 h
11% of patients. The prevalence rose to 65% ($P < .001$) based on 30-day monitoring.

valences of the composite primary endpoint components grew on extended monitoring, but the increases
ificance only for NSVT; its prevalence went from 8% to 62% ($P < .001$). Prevalences rose nonsignificant
and 0% to 1% for sustained ventricular tachycardia.

of NSVT during monitoring climbed fastest from day 0 through about day 19 and then rose more slowly
n said. "It actually didn't reach a plateau during this time period, so there is the possibility that if we had
tients, the difference between both periods may have been even higher."

es predicted the incidence of nonsustained VT during monitoring, he said: age, atrial wall thickness, and
inium enhancement at MRI.

y analysis looked at the 5-year risk of sudden cardiac death using the European Society of Cardiology (E
ulator recommended in guidelines. Risk assessment based on the 30-day extended monitoring period, co
urs of monitoring alone, predicted a significantly higher 5-year risk of sudden death, Caro Codón said.

mportantly," he added, "over 20%" of patients would have been reclassified into a higher-risk group and p
an ICD based on extended monitoring compared to 24-hour monitoring.

en that more than 50% of patients were found to have NSVT during extended monitoring, Caro Codón pr
whether to implant an ICD should not be so "binary" based on the presence or absence of symptoms, and
gations be conducted into the complete phenotype of these arrhythmias.

limitations, he observed, including a relatively small size; but it was able to detect important differences
days monitoring outcomes even with only 100 patients. It was also limited by a lack of clinical follow-up
n endpoints like stroke, thromboembolism, and sudden cardiac death.

itoring detected more cases of NSVT in the study's relatively low-risk HCM patients who would not gen
for ICD implantation, observed van Gelder. Also, at present the prognostic value of NSVT for SCD "seen
ounger age" — that is, younger than 30 years — in patients with HCM.

hoed Caro Codón's call for more data from prolonged monitoring to help stratify patients according to ri
VT frequency, duration, and rate as possible targets.

lligence Shortens Reading Times of Radiologists for Chest X-Rays

ternational staff writers
2023

Intelligence (AI) has become an integral tool for radiology researc
ability of commercial AI software, there has been increased emph
trating the effectiveness of AI in practical medical applications du
demand. Most of the research has focused on the influence of AI o
care and physicians' decision-making processes, as well as obtaini
diagnostic results via AI. Radiologists are interested in determining
nce can prioritize images for review, reduce overlooked cases, or in
times. There has been particular interest in determining how the us
he analysis of chest radiographs can influence radiologists' worklo
prospective observational study has found that the use of AI impac
tation times of chest radiographs among radiologists and can redu
times.

study, researchers at Yonsei University (Seoul, South Korea) enliste
ists who consented to allow the recording of their interpretation ti
f 18,680 chest radiographs from September to December 2021. Th
time was defined as the span from when chest radiographs were c
they were transcribed by the same radiologist. With commercial A
e implemented for all chest radiographs, the radiologists could con
or two months (AI-assisted period). In contrast, during the other tw
the radiologists were automatically prevented from accessing the
AI-unassisted period).

udy found that total reading times were significantly reduced w
e of AI, in comparison to without it. When AI detected no
nalities, reading times were shorter with the use of AI. Howeve
ected any abnormality, reading times were unaffected by the u
abnormality scores rose, so did reading times, with a more
able increase observed with the use of AI.

clusion, the prospective observational study in a real-world cli
revealed that the availability of AI results influenced the read
of chest radiographs among radiologists. Overall, when radiol
ted AI, especially for normal chest radiographs, reading times
sed; however, abnormalities identified by AI on chest radiogra
d to increase reading times. Therefore, AI can enhance radiol
ncy by saving time spent on normal images and enabling then
te this time to chest radiographs with detected abnormalities.

elp Radiologists Avoid Missed Lung Cancer on Chest X-Ray Images

ng International staff writers
Apr 2023

adiography is the most frequently performed first-line imaging
ation, often used for routine health checkups, preoperative evaluat
g cancer screenings in primary healthcare settings worldwide. Hov
egative or misleading chest radiography results are common, and
cted abnormalities like lung cancer may be overlooked. Missing lu
can result in the disease progressing from an early-stage, potentia
state to advanced-stage lung cancer, leading to poor patient outc
recent analysis has identified common features of missed lung ca
n chest X-ray images, suggesting that computer-aided detection s
cial intelligence could assist radiologists in avoiding such errors.

chers at Ramathibodi Hospital (Bangkok, Thailand) analyzed chest
5 patients at a single institution, where initial signs of lung cancer w
ked. They found common features of missed lung cancer cases, in
or's location, density, and any superimposed anatomical structure
ing to the researchers, radiologists can prevent such errors by com
st radiograph being read with previous examples, focusing on com
pots, avoiding misidentification of lesions as normal structures, an
ter-aided detection systems or artificial intelligence.

dy retrospectively reviewed chest X-rays of 95 patients taken at least six
before a lung cancer diagnosis. The final sample consisted of 75 patien
even gender distribution and an average age of nearly 65 years. The me
lung cancer size was approximately 16 mm. Most cases (75%) occurred
vo-thirds of the lung, followed by 68% in the middle/lower zones and 55%
. Common features included anatomical superimposition (88% of cases
lower than the aortic knob (85%), partly or poorly defined margin (77%),
r or spiculated border (61%), and rounded or oval shape (57%). Almost 4
sed cases had stage 3 or 4 lung cancer, and 41% of patients died.

lings indicate that certain radiographic features of missed lung cancer,
location, and superimposed anatomical structures, identified in the firs
chest radiograph were linked to advanced-stage lung cancer diagnosis
-year all-cause mortality. Delayed detection of missed lung cancer with
aphic features on chest radiography may lead to worse outcomes. Henc
gists should pay special attention to and promptly report equivocal or
ne lesions in the upper zone or inner one-third of the lung, those with de
or greater than the aortic knob, or those superimposed by midline struc
ary vessels, and ribs found incidentally on chest radiographs. The resea
at these findings will help radiologists avoid errors that can result in poo
outcomes and death. Furthermore, computer-aided detection systems c
intelligence could improve radiologist performance and help detect sm
suggested the researchers.

Digital X-Ray *Sponsored by Carestream Health*

tswana study questions accuracy of bone age estimates

Will Morton, AuntMinnie.com staff writer

28, 2023 -- Current approaches for estimating a person's age on x-rays may
n Botswana populations, according to a study by forensic scientists. The findin
ons in rising court cases involving children, they noted.

ed by Baraedi Olaotse of the Botswana International University of Science and
gy in Palapye found that the use of the Greulich-Pyle (GP) atlas -- the most fre
thod for assessing skeletal age around the world -- underestimated ages for m
ales in a set of 140 children's hand and wrist x-rays.

na is experiencing an increase in the number of cases of human trafficking and
nd the offenders range in age from minors to adults," the group noted. "Age es
methods with high accuracy and reliability as the estimate can be used to deci
perpetrator should be treated as an adult or as a minor during trial." The study
d February 23 in *Forensic Science International: Reports*.

atlas was introduced in the 1950s and consists of 1,000 hand x-rays of white p
Cleveland between the ages of 0 and 18 years old. To estimate bone age, doct
a patient's left-hand wrist x-ray with images in the atlas.

, considerable evidence suggests that bone age is affected by different criteria
er, ethnicity, nutrition, and geographical location, according to the authors. Eve
tlas is used for court purposes in Botswana, its validity for the Botswana popul
been tested, they wrote.

nd, the group collected 140 x-rays from local hospitals for patients between the
18. Sixty were females and 80 were males. Two experienced readers first deri
age estimates using the GP atlas. This was followed by a comparison between
age estimates and the chronological ages of the patients.

l results indicated that use of the GP atlas underestimated Bo
age by 0.64 years, while age for males was underestimated
For the important 15- to 18-year-old age group, the mean ske
ference was found to be 0.94 for males and 0.50 for females,
ng that age was underestimated for both males and females,
s reported.

resents a problem in cases where the offender and/or the vic
the critical legal age of 18 as the method can underestimate
timate their ages and thereby leading to wrong classification
' they wrote.

tely, the researchers called for a Botswana-specific standard t
t for variations in nutrition and ancestry between the Botswan
tion and individuals used in the atlas, the researchers sugges

tlas should be used in conjunction with other age estimation
ds. We recommend the use of high-resolution x-rays and a big
e size for the establishment of Botswana specific standard," th
concluded.

n

x-ray is best for carpal injuries?

Morton, AuntMinnie.com staff writer

023 -- Hand x-rays appear as useful as standard wrist x-rays for diagnosing ca
ries and could reduce costs and radiation exposure to injured patients, accordi
lished May 27 in the *Journal of Hand Surgery*.

f orthopedic surgeons led by Dr. Heather Taillac at the University of Florida in
e reported that angles among carpal bones can be measured as accurately on
series of hand radiographs compared to wrist radiographs.

nding the accuracy of these measurements on hand radiographs versus wrist
hs could facilitate the assessment of carpal stability without obtaining additiona
hic views," the group wrote.

nes connect the radial and ulnar bones of the forearm to the bones of the han
carpal bones. Measuring angles among these bones after injuries is key for pla
eatments, the authors explained.

lly, these angles are measured using standard wrist radiographs, yet patient
g is difficult and often reduces their reliability, which can require additional ima
radiation exposure to patients, the authors noted. Moreover, the accuracy of t
ments has not been determined based on x-rays of the hand, they added.

d, the researchers gathered images from 40 patients who had undergone both
x-rays. Three orthopedic surgeons used both sets to measure five carpal bone
e radioscaphoid, radiolunate, scapholunate, capitolunate, and radiocapitate.

ers had moderate, good, or excellent agreement for all measurements for both
radiographs. Specifically, interrater agreement was superior in favor of hand
hs for the radiocapitate and capitolunate angles.

Reader agreements for measuring carpal angles on hand and wrist x-rays		
	Wrist x-rays	Hand x-rays
Radiocapitate angle	54%	74%
Capitolunate angle	65%	82%
Scapholunate angle	76%	75%
Radiolunate angle	93%	91%
Radioscaphoid angle	83%	78%

, the mean differences in measurements on hand versus wrist radiographs were less t
es, which is within a reported 5.2° standard deviation.
y demonstrated high interrater and intrarater reliability for all carpal angle measuremen
and wrist radiographs," the researchers wrote.
difficulty in obtaining standardized lateral wrist radiographs is that positioning is based
ndmarks that do not correlate precisely with radiographic parameters used to assess w
e authors wrote. In this regard, easier-to-obtain hand x-rays may offer an alternative in
reducing the need for additional imaging due to improper patient positioning, they sug
n to minimizing radiation exposure and cost in the clinical setting, this could increase
es for retrospective studies in which the only available lateral radiographs are those of
group concluded.

n

T superior to scintigraphy for detecting metastatic bone

r

Morton, AuntMinnie.com staff writer

023 -- PET/CT is more accurate than bone scintigraphy for detecting bone metastases
ith prostate cancer, according to a study published May 20 in the *Journal of Medical In*
tion Sciences.

t Dalhousie University in Halifax, Canada, reviewed existing literature for studies comp
3 (Ga-68) prostate-specific membrane antigen (PSMA) PET/CT and technetium-99m (
hyl diphosphonate (MDP) bone scintigraphy in prostate cancer patients. Findings sugg
epartments should consider transitioning to Ga-68 PSMA-11 PET/CT, according to the
rs.

Ga-68 PSMA-PET/CT has been incorporated into clinical practice before a comprehe
had been conducted, our study sought to put this proverbial horse in front of the cart,"
te.

e most common places for prostate cancer cells to metastasize to is bone, specifically
eton (ribs, pelvis, and spine, where red marrow is most abundant), the authors explain

tigraphy has been the standard diagnostic approach for decades for detecting prostate
ne metastases, yet numerous studies have suggested that Ga-68 PSMA-PET/CT may
with the approach quickly deployed clinically after its U.S. approval in 2020. However,
n no systematic reviews comparing the two approaches, according to the authors.

s this shortcoming, the group combed the literature for comparative studies between
er 2011 to July 2022. For inclusion, they focused on studies that reported accuracy dat
y, specificity, negative predictive value, and positive predictive value) in patients, with i
ns between the two modalities performed within three months of each other.

rchers identified five single-centered studies that met these criteria. In total, the studie
-51 patients at varying treatment and diagnosis stages. Across all measures of accura
PET/CT was superior to Tc-99m MDP bone scintigraphy in the detection of skeletal
es, they found.

Patient-based sensitivities and specificities for detecting bone metastases

	Tc-99m MDP bone scintigraphy	Ga-68 PSMA-PET/CT
	50%-91%	91%-100%
	19%-96%	88%-100%

MA-PET/CT was more accurate than Tc-99m MDP bone scintigraphy in the detection of [prostate
tases," the authors stated.
costs associated with PET/CT technology are the main limitation for using the approach in most
cording to the authors. For example, in Nova Scotia, there is one PET/CT scanner to support a p
n 1 million people, they noted.
s, the question that needs to be answered is whether bone scintigraphy, with inferior accuracy, is
andard of care, they wrote.
eriority of Ga-68 PSMA-PET/CT becomes more widely recognized, diagnostic imaging departme
ransition to this procedure," the researchers concluded.

n

mates lung cancer mortality on x-rays

Morton, AuntMinnie.com staff writer

2023 -- An artificial intelligence (AI) model can identify individuals at risk of dea
cer on easily obtainable x-rays, which could improve personalized prevention a
t strategies, according to a group in Boston.

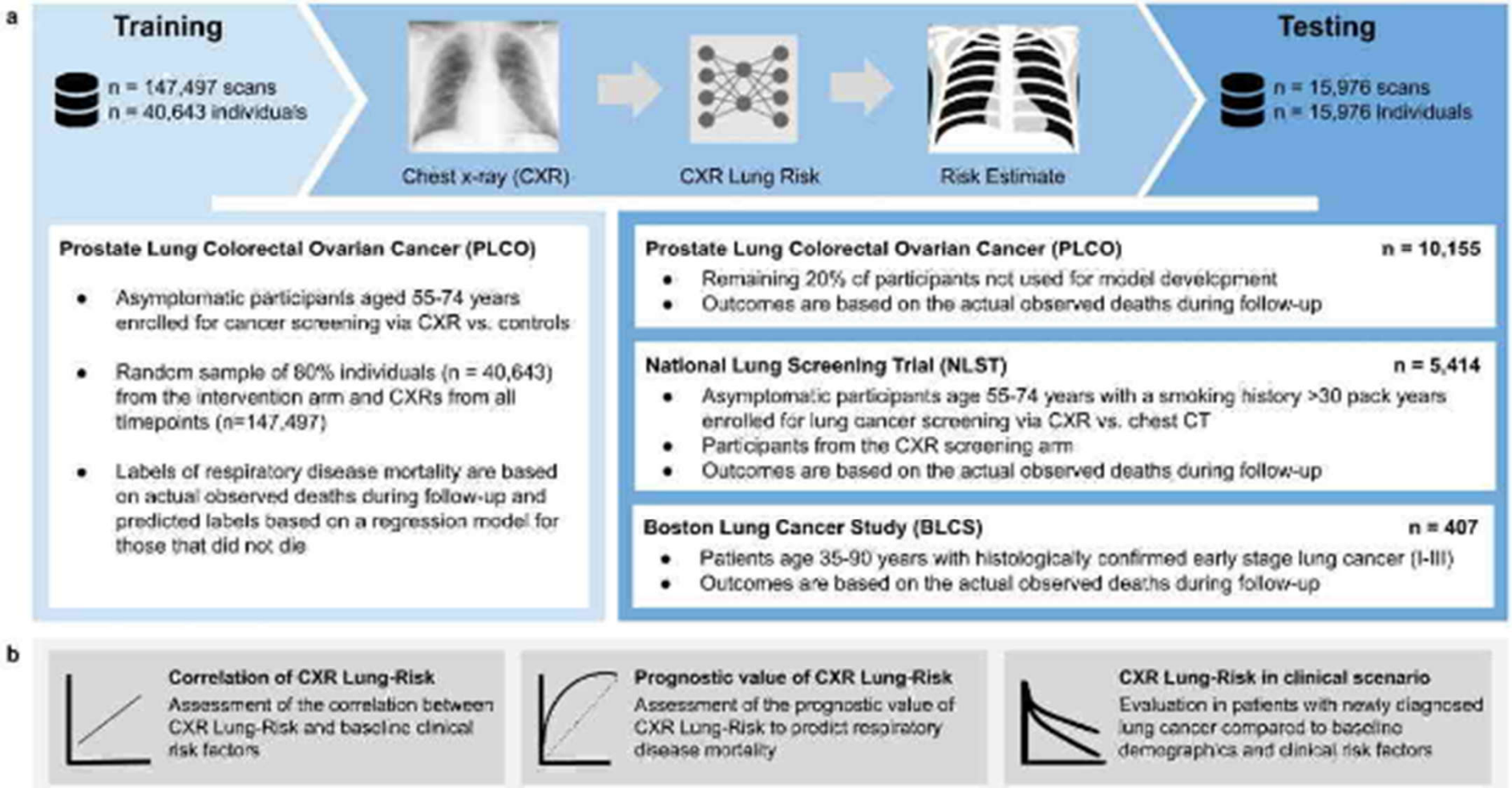
hers led by Dr. Jacob Weiss of Massachusetts General Hospital developed a
onal neural network (CNN) model to estimate the risk of lung disease mortality
adiograph as the only input. In a test on three datasets comprising more than
ls, the model performed well.

ings motivate the use of deep learning to identify individuals at high risk of lung
mortality from easily obtainable and low-cost chest radiograph images," the gro
he study was published May 16 in *Nature Communications*.

ray is a common preliminary test for lung cancer, yet actionable radiological fin
ult to detect by human readers in the early stages of the disease, the research
d. They suggest that AI may provide an early window into the risk and extent o
beyond established methods.

us work using chest x-rays, the group has shown that AI can enhance survival
ns in lung cancer based on a patient's biological age. They have also shown th
rning model can predict a patient's 10-year risk of death from heart attack or s
udy, the group developed a CNN they've named CXR-Lung-Risk to identify ind
s who may be at high risk for lung disease mortality.

archers trained the model using 147,497 x-ray images of 40,643 individuals. T
ncluded lung nodules, atelectasis, pleura and lung fibrosis, chronic obstructive
ry disease (COPD)/emphysema, opacities, cardiac abnormalities, lymphadenop
e/chest wall lesions. In addition, data included the dates of actual observed dea



erview of the study design. (a) The CXR-Lung-Risk model was developed in PLCO. The only ut to the model is a chest radiograph image; the model output is an estimated risk of lung ease mortality. Independent testing was performed in a held-out subset of PLCO ticipants, individuals enrolled in NLST and patients with histologically confirmed lung cancer n the BLCS. (b) The prognostic performance of the CXR-Lung-Risk model was evaluated l compared to clinical risk factors in all datasets. Image courtesy of Nature Communications ough [CC BY 4.0](). .

ed the model in three independent cohorts comprising 15,976 individuals between 35 a
ge enrolled in previous trials: an asymptomatic community population, heavy smokers
ancer screening CT exams enrolled in the National Lung Screening Trial (NLST), and
logically confirmed early-stage (I-III) lung cancer.

archers noted that risk probabilities are usually expressed in percentages, which can b
Thus, they devised a method for the model to output risk from a single x-ray expressed

input to the model is a single existing chest radiograph and the output is a risk for lung
ortality expressed in years, meaning if the model outputs a risk of 75 years this is an
g disease mortality as the risk of an average 75-year-old individual," they explained.

sting for risk factors, including age, smoking, and radiologic findings, CXR-Lung-Risk
ated between individuals at high versus low risk for lung disease mortality, according to
Specifically, the lowest mean CXR-Lung-Risk (63 years) was found on x-rays in the
natic screening population without known lung cancer. Patients in the NLST had a high
k on average (mean, 66.1 years), while the model estimated the highest mean risk of 7
atients with histologically confirmed lung cancer.

d that CXR Lung-Risk showed a graded association with lung disease mortality after
nt for risk factors, including age, smoking, and radiologic findings," the group wrote.

s of the study included not knowing which alterations and findings in the x-ray images
for the model's final prediction, which is a common drawback of deep-learning models
oted. However, association analysis did show correlation with clinical risk factors (e.g.,
age, prevalent hypertension) and traditional radiologic findings (e.g., nodules, fibrosis,
ma), suggesting that the model identifies anatomical changes known to be correlated w
risk, they added.

ng-Risk could be used with minimal disruption of current clinical workflows and automa
he latest radiograph of a patient at high speed and low additional cost," the group conc

ongkhớp: Synovial
dromatosis

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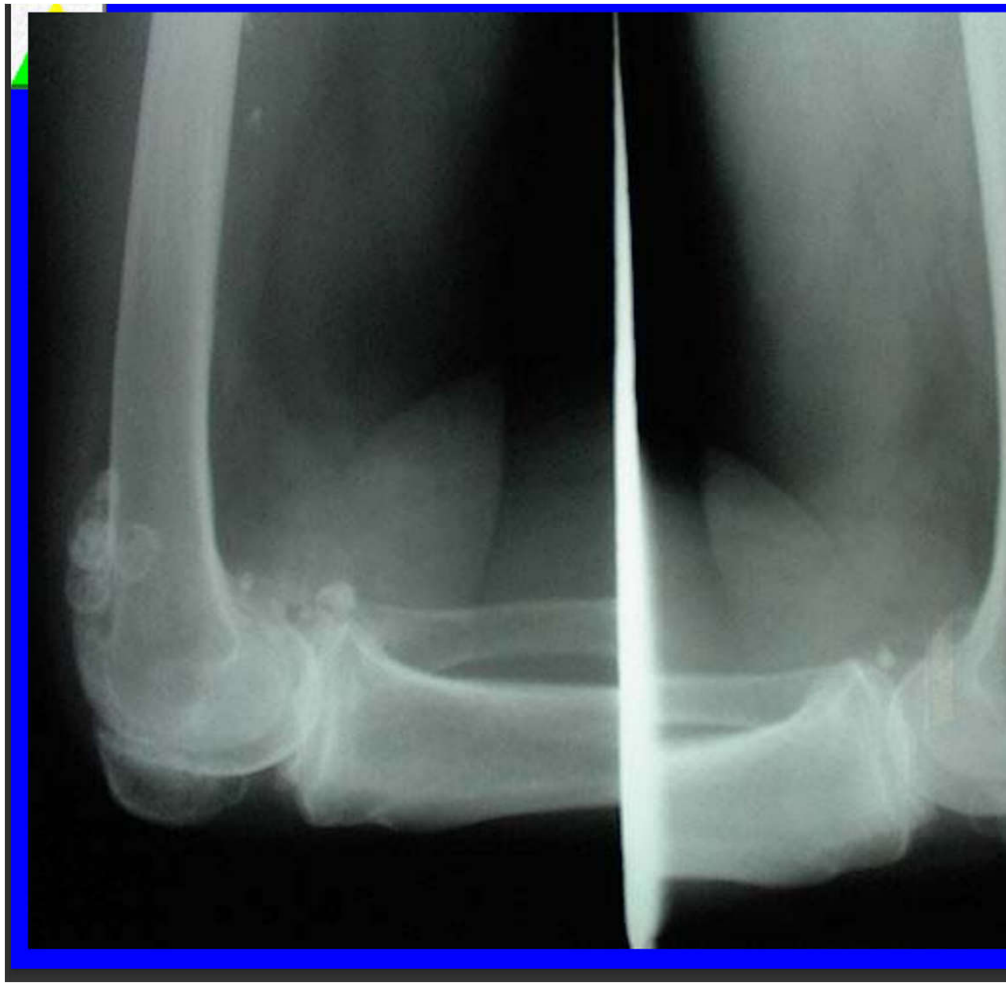
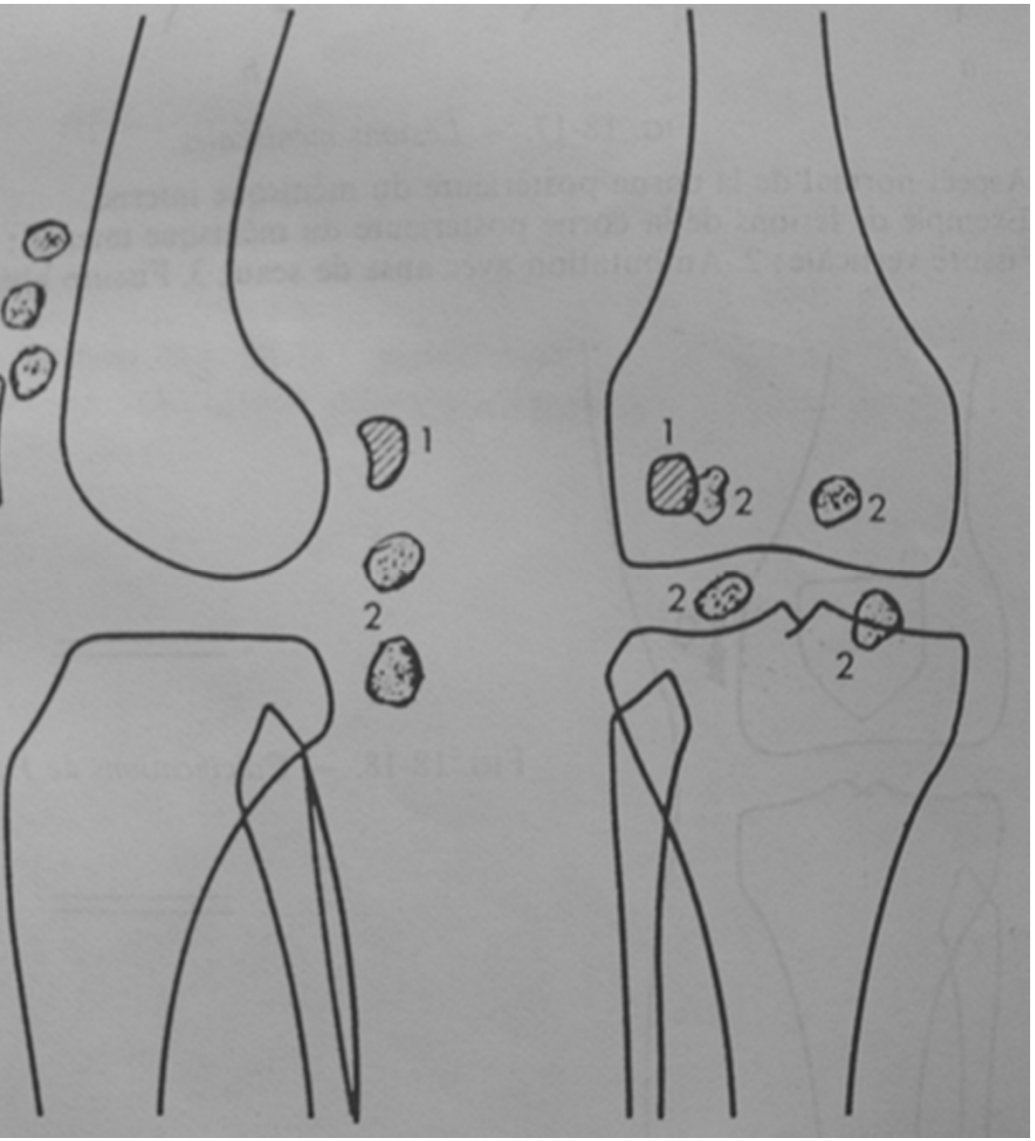
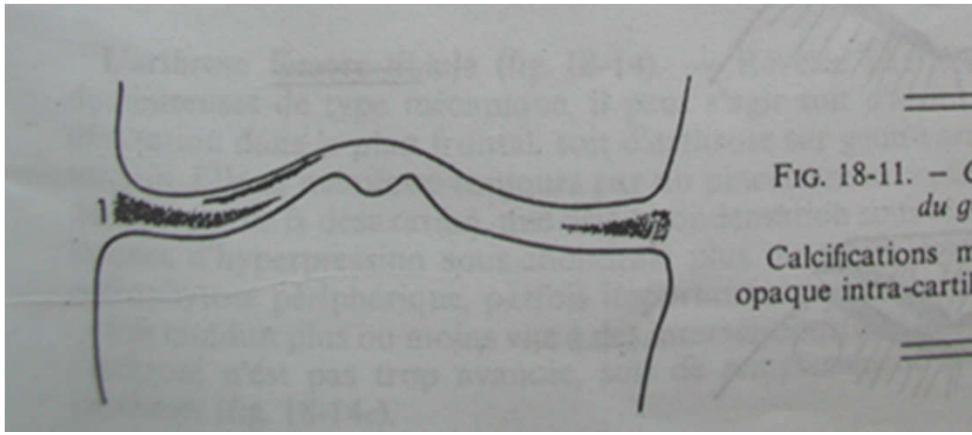




Synovial chondromatosis



CPPD: Calcium PyroPhosphosphate Deposit