



Umělá inteligence v zobrazovacích metodách

DATAMED SIA
MEDICAL DIAGNOSTICS SYSTEMS, SINCE 2009

9.04.2024, Mikulov

Maria Shandor

DATAMED: AUTOMATING MEDICAL DIAGNOSTICS

Vývojáři softwaru
pro telemedicínu
a zdravotnictví

Poskytovatelé
cloudových
zdravotnických IS,
E-Health



Radiologie
PACS
RIS
DICOM



Funkční diagnostika
EKG, ultrazvuk



Laboratorní informační
system
middleware pro přístroje

Gleamer přední značkou AI v radiologii

15 publikací

Včetně třech v *Radiology*



50+ významných institucí



Spolupráce s KOL

Medical Advisory Board



Pr Jean-Denis Laredo
APHP Lariboisière,
Paris



Pr Gabriel Krestin
Erasmus MC,
Rotterdam



Pr Nicolas Theumann
Hirslanden,
Lausanne

Významná globální ocenění



36m€ Fundings

Since 2017



World leading KOLs



Pr Stefan Niehues,
La Charité,
Berlin



Pr Elmar Kötter
Uni Freiburg,
Freiburg



Pr Ali Guermazi
Boston University,
Boston



Pr Marie-Pierre Revel
APHP Cochin,
Paris



Dr Björn Anton Graff
Vestre Viken HF,
Oslo



Dr Gadi Levi
Ichilov Medical Center,
Tel Aviv

Rychle rostoucí globální stopa

1000+

Klinická pracoviště po celém světě

20m+

Pacientů ročně

100%

Meziroční růst příjmů

Globální distribuční partneři

AGFA
HealthCare

aidoc

Blackford

CXRPL

DM
DATAMED

deepc

ferrum

FUJIFILM



INCEPTO

INFINITT
HEALTHCARE

NUANCE

PHILIPS

RMS
MEDICAL DEVICES

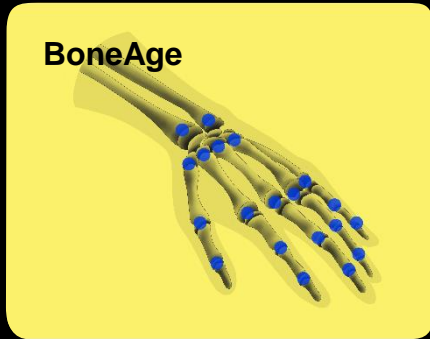
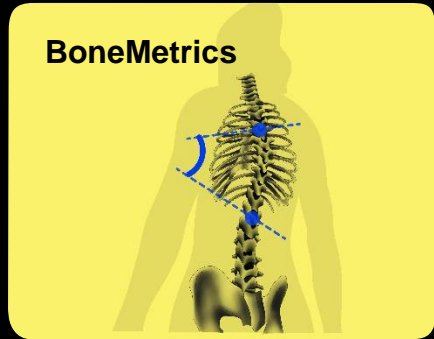
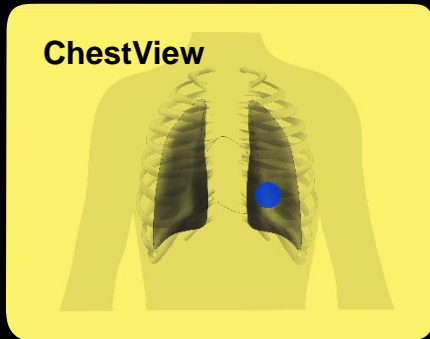
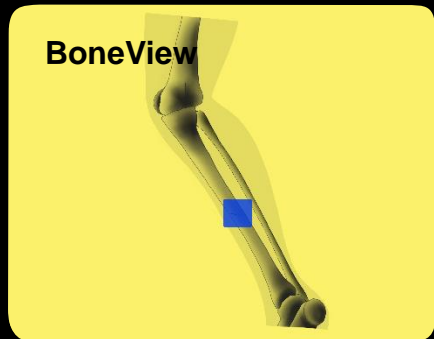
SECTRA

SIEMENS

SOFTWAY
MEDICAL

The AI copilot

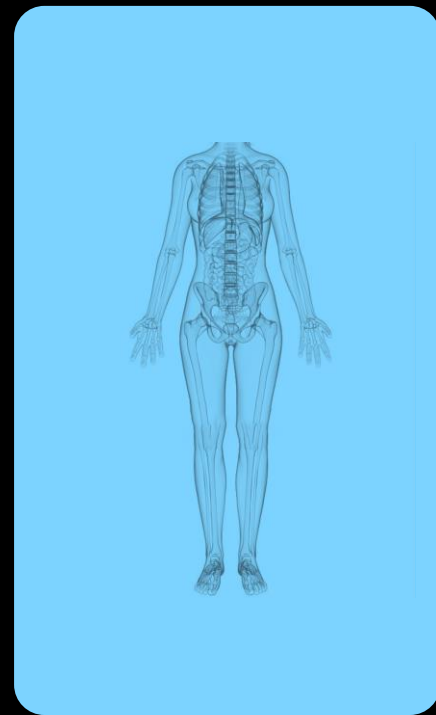
X-ray



Mammo **COMING SOON**



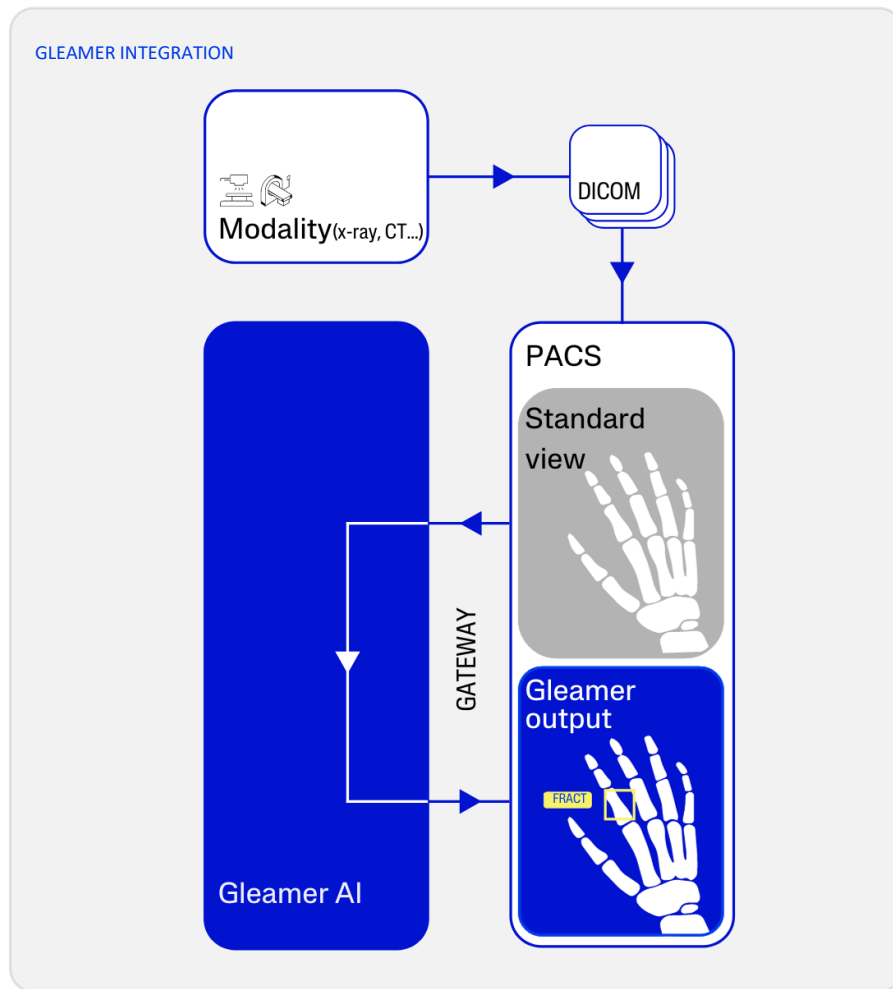
CT **COMING SOON**



Integrates seamlessly into your existing workflow



General
Data
Protection
Regulation



BoneView

Detekce poškození kostí



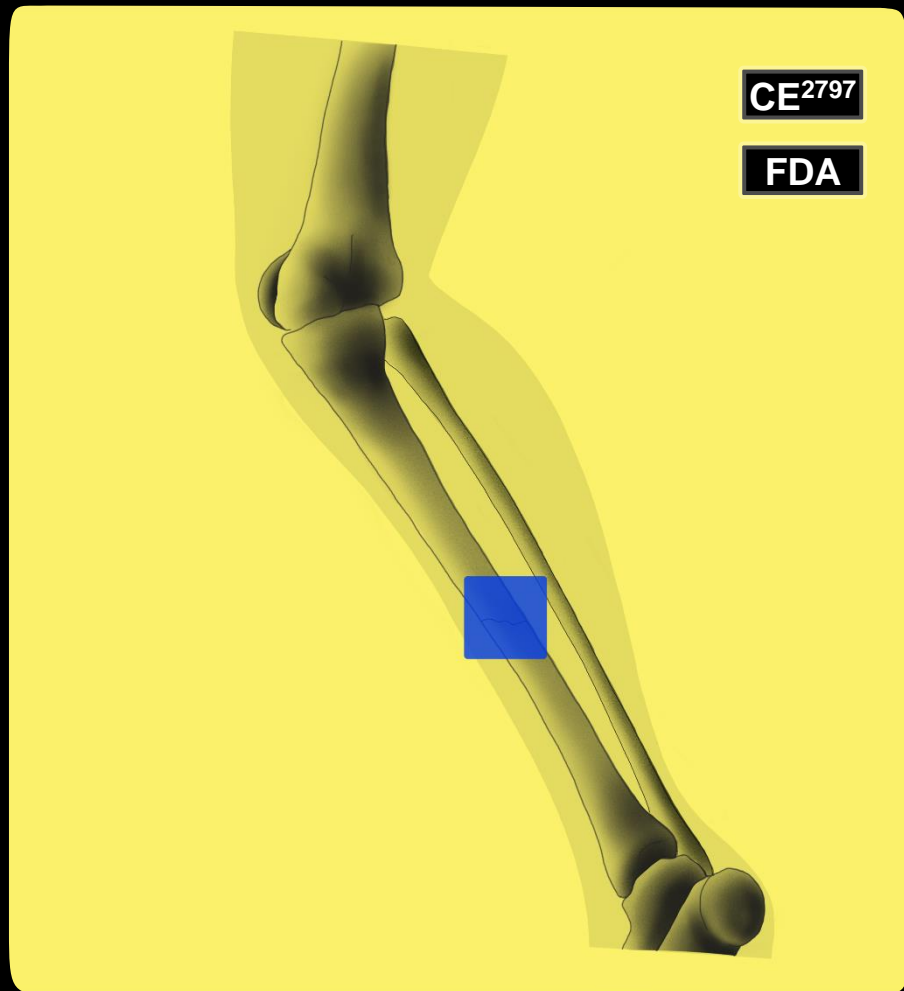
Fraktury
Výpotky
Dislokace
Fokální
kostní líze



Končetiny
Pánev
T/L páteř
Hrudní koš



Dospělé a
děti*









 **POSITIVE**

8

ANALYZED



8

RECEIVED

DID YOU RECEIVE ALL THE IMAGES?

Please note, that if Gleamer did not receive all the images in the study then the result may be inaccurate.



BoneView

FRACTURE

YES

DISLOCATION
EFFUSION

LESION

NO



GLEAMER

AREA(S) OF INTEREST: 00



GLEAMER

AREA(S) OF INTEREST: 00



GLEAMER

AREA(S) OF INTEREST: 00



GLEAMER

AREA(S) OF INTEREST: 00



GLEAMER AREA(S) OF INTEREST: 00

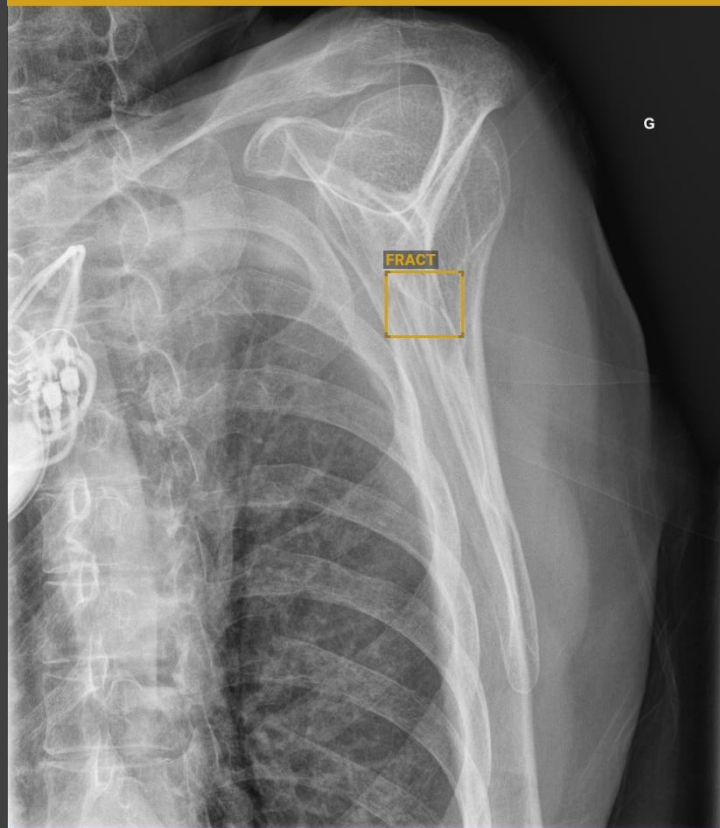


GLEAMER AREA(S) OF INTEREST: 00



GLEAMER BoneView

AREA(S) OF INTEREST: 00



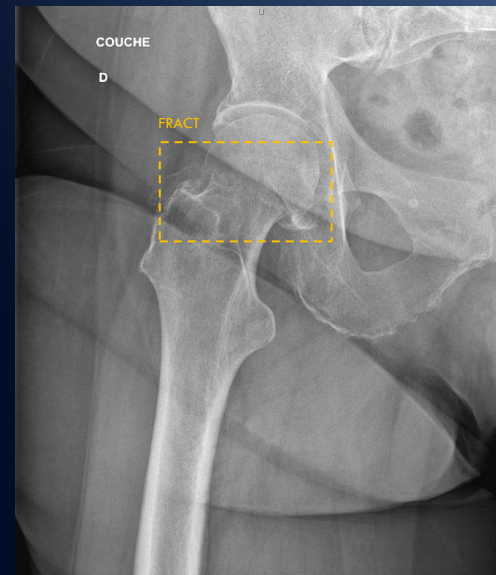
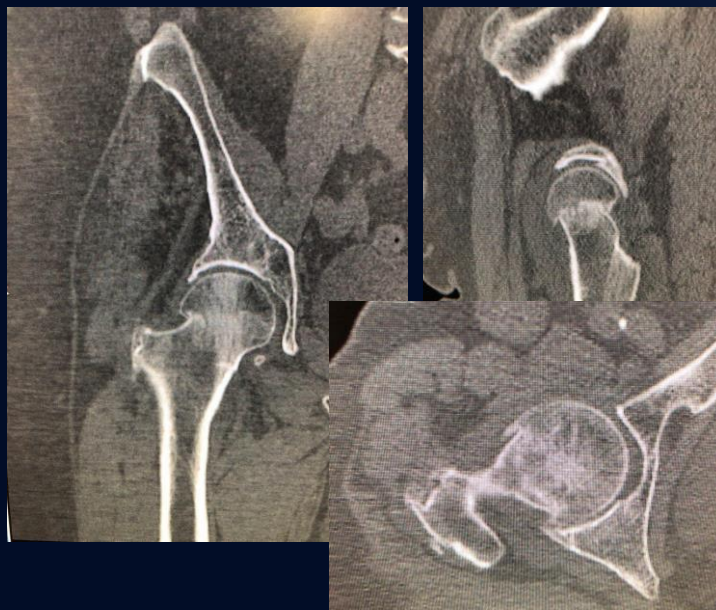
Vyhnutí se komplikacím po prvním vyšetření

INDIKACE

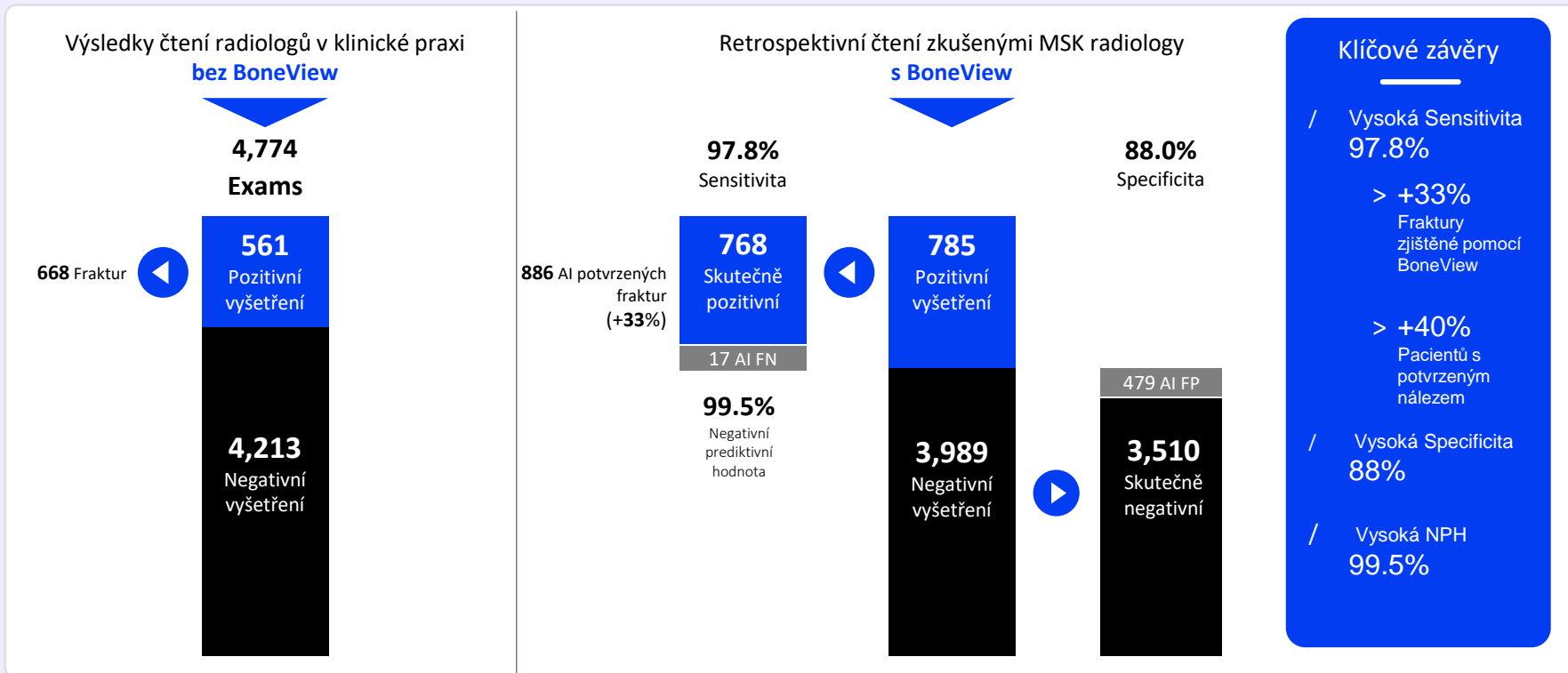
- 76 let, spadl
- Na prvním rentgenovém snímku nebyla zaznamenána žádná traumatická léze
- Pacient byl poslán domů a o dva dny později si kvůli bolestem zavolal záchranku.

VÝSLEDKY

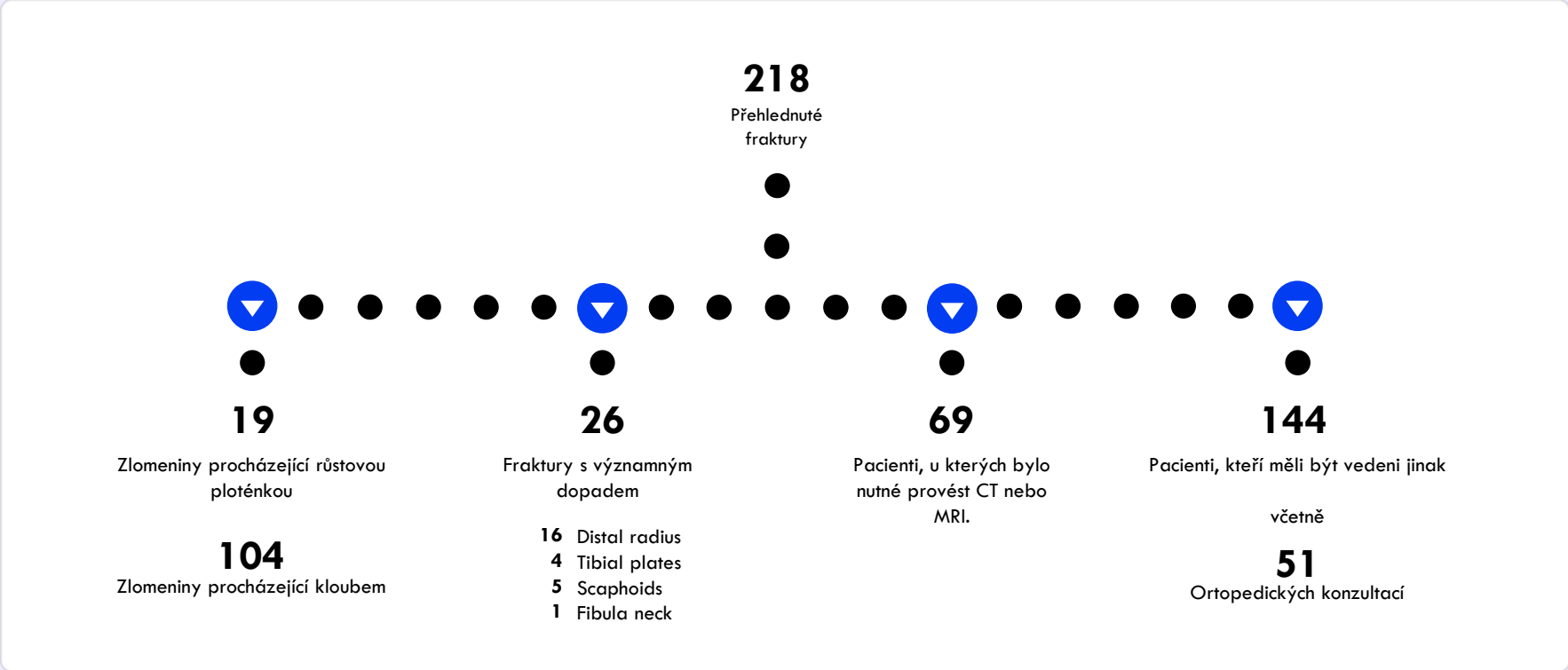
- Lékař na UP předepsal CT ihned
- CT ukazuje prasklinu krčku stehenní kosti, zjištěnou zpětně pomocí BoneView



Hodnocení výkonů BoneView na 3 měsíce po sobě jdoucích traumatologických vyšetřeních (1/2)



Hodnocení výkonů BoneView na 3 měsíce po sobě jdoucích traumatologických vyšetřeních (2/2)



BoneMetrics

MSK measurements at a glance



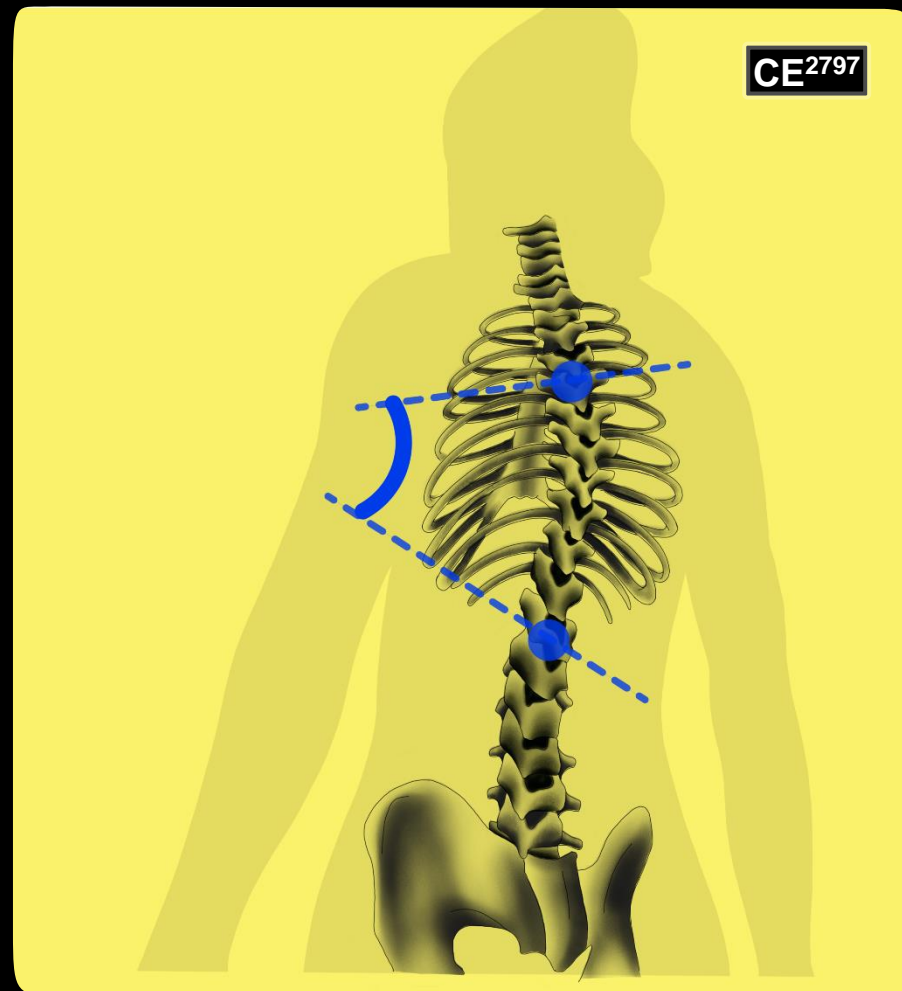
X-ray
EOS



Chodidla
Nohy
Pánev a
kyčle
Páteř



Dospělé a
děti*



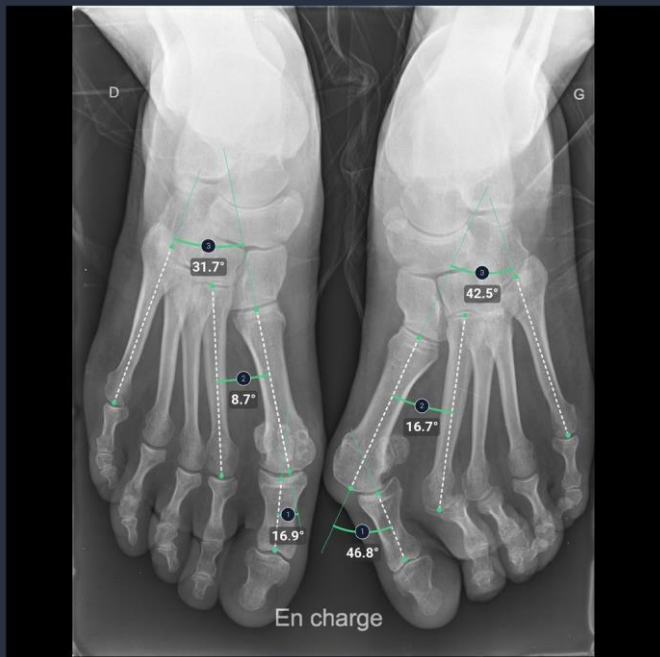
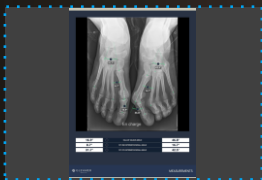
*>3yo for legs and spine / >10yo for foot and pelvis







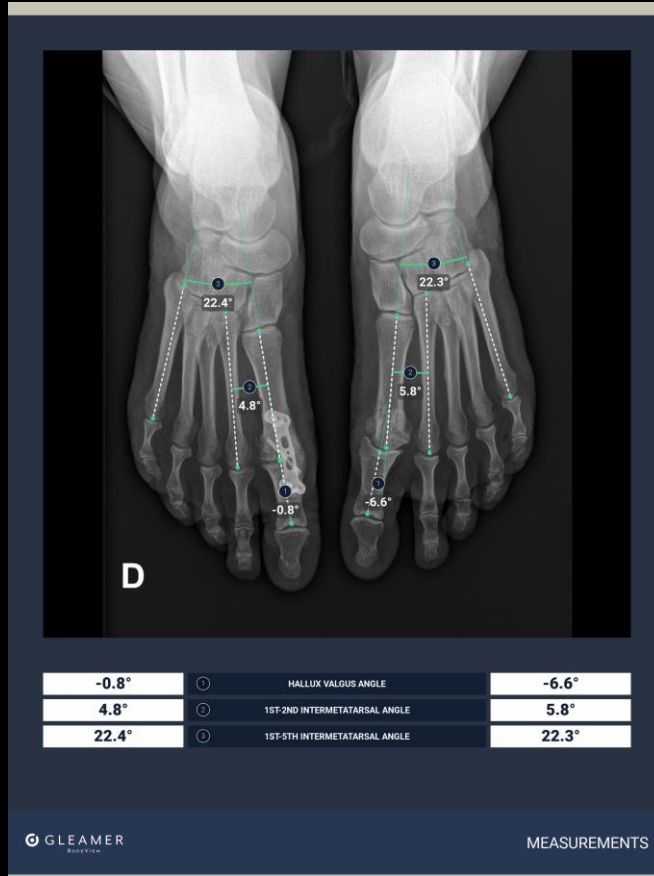
① TALUS 1ST METATARSAL ANGLE	9.3°
② MEDIAL ARCH ANGLE	114.5°
③ CALCANEAL INCLINATION ANGLE	27.2°



16.9°	①	HALLUX VALGUS ANGLE	46.8°
8.7°	②	1ST-2ND INTERMETATARSAL ANGLE	16.7°
31.7°	③	1ST-5TH INTERMETATARSAL ANGLE	42.5°

Supporting external materials

Posouzení před a po operaci



Chodidlo



- Talus-1st metatarsal angle
- Medial arch angle
- Calcaneal inclination angle

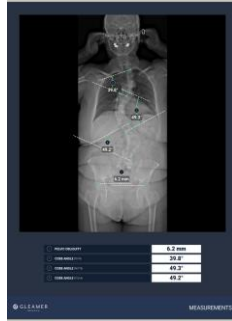
Lateral



- Hallux valgus angle
- 1st-2nd intermetatarsal angle
- 1st-5th intermetatarsal angle

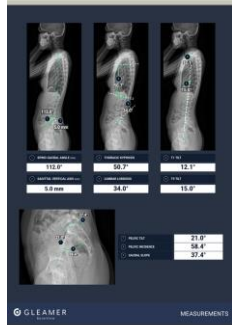
Frontal

Páteř



- Cobb angle
- Pelvic obliquity
- Coronal balance

Frontal



- Spino-sacral angle
- Sagittal vertical axis
- Thoracic kyphosis
- Lumbar lordosis
- T1 & T9 tilt
- Pelvic version
- Pelvic tilt
- Sacral slope

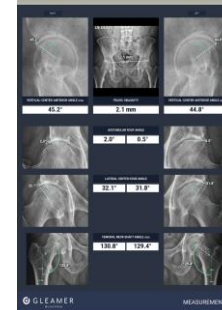
Lateral

Nohy



- Hip-knee-ankle angle (HKA)
- Femur length
- Tibia length
- Leg length
- Pelvic obliquity

Pánev a kyčle



- Pelvic obliquity
- Acetabular roof angle
- Lateral center-edge angle
- Caput-Collum-Diaphyseal angle (CCD)
- Vertical-center-anterior angle (VCA)

BoneMetrics, clinical study

AUTOMATED MEASUREMENTS REACH HIGH ACCURACY

COMMUNICATION ACCEPTED AT THE ECR 2023

100+ radiographs
Per anatomical views

2 MSK Radiologists VS **AI**
Gold standard

<4°

MAE on all angle
measurements

<2mm

MAE on all length
measurements

BoneAge

Posouzení zralosti kostí



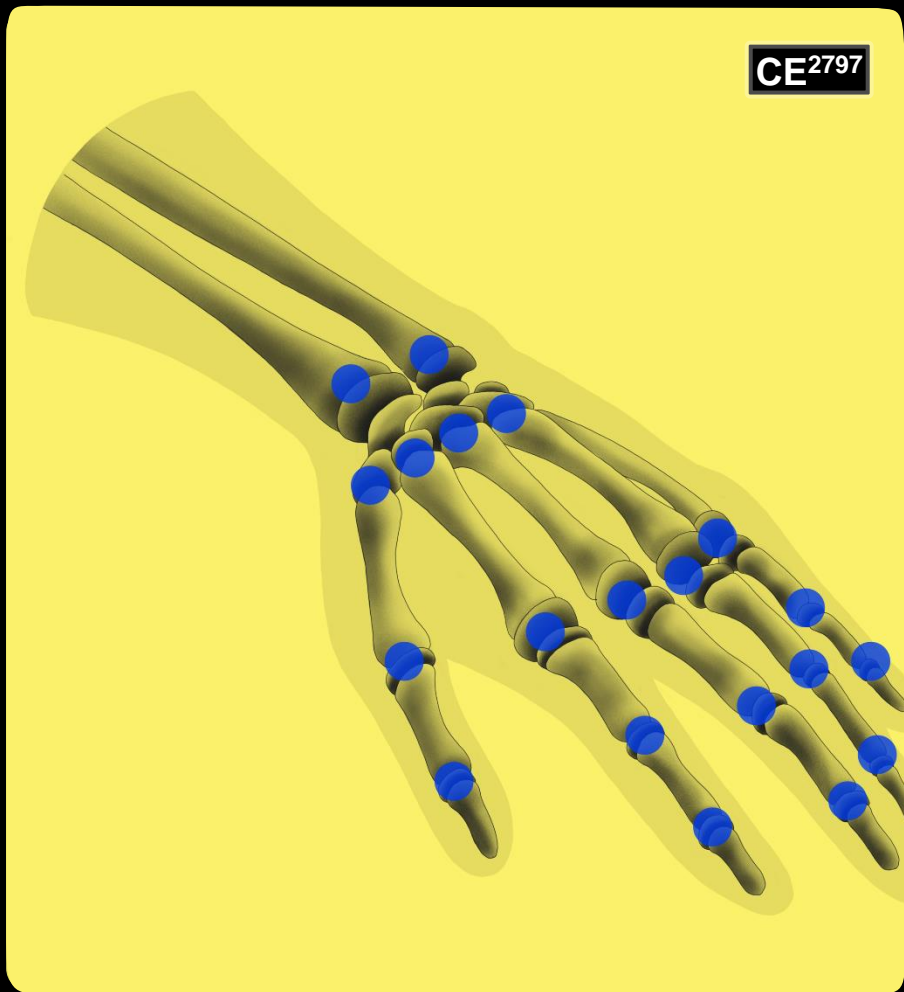
Greulich
& Pyle



Frontální
snímek ruky



3 to 17 y.o.







CHRONOLOGICAL AGE

10 years 0 month

AI-BASED GREULICH & PYLE (MALE)

7 years 9 months

SD* = 9.79



2 SD = [8 years 4 months ; 11 years 8 months]

*Standard Deviation (Greulich & Pyle, 1951)

BoneAge, clinical study

Accurate

With a low MAE

Standardize

Reduce inter & intra variability

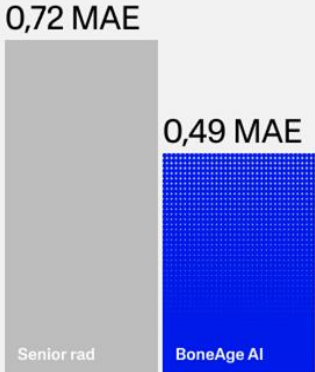
HIGH PERFORMANCES IN BONE AGE ESTIMATIONS USING AI
PUBLISHED IN DIAGNOSTIC & INTERVENTIONAL RADIOLOGY

206 Exams
8 boys and 8 girls per age group
From 5 to 17 y.o.

2 Pediatrics Radiologists
Gold standard

1 General Radiologist VS AI

BONEAGE ACCURACY



Nguyen et al. High performance in bone age estimation using artificial intelligence solution. Diagnostic and Interventional imaging. April 2023

ChestView

Detekce patologie hrudníku



Pneumothorax
Konsolidace
Pleurální Efúze
Nodule
Mediastinální
masa

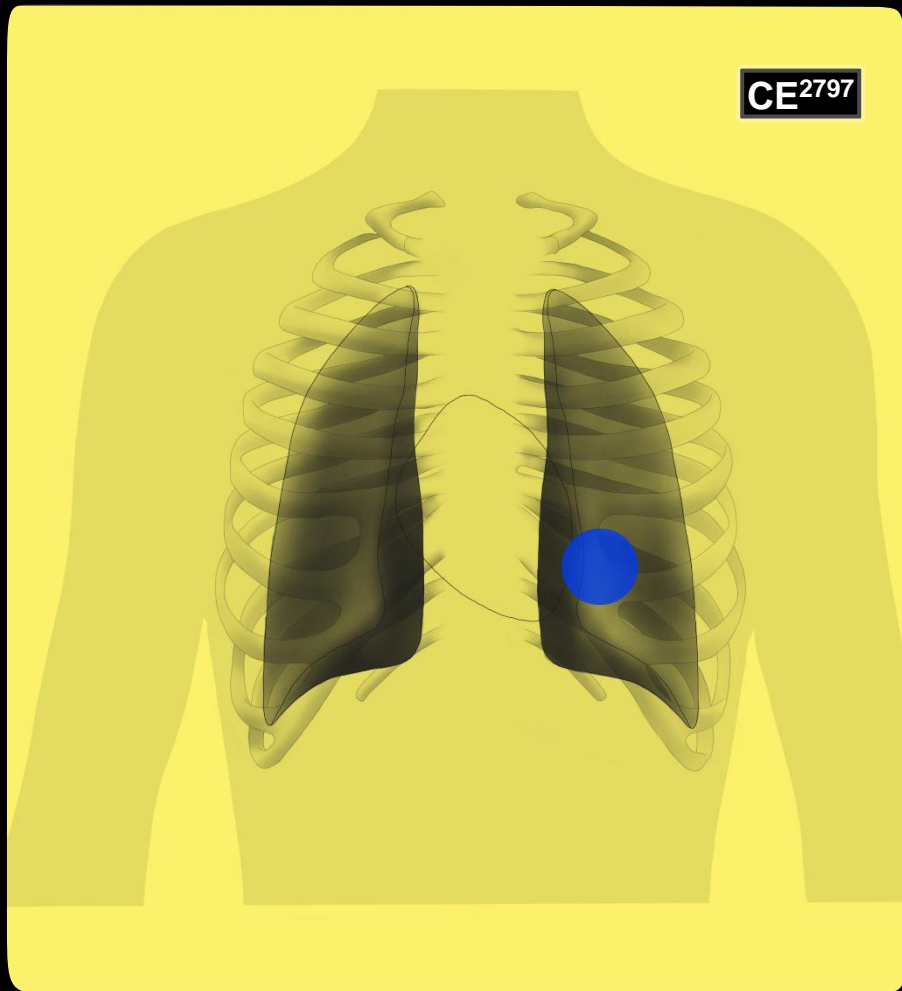


PA & AP
Bedside
Frontal view
Lateral view



Od 15 let

CE2797



ChestView, clinical study

Increase

Sensitivity

Equal

Specificity

31%

Reduction
on reading time

HIGH PERFORMANCES OF AI FOR CHEST EXAMINATION



12

readers

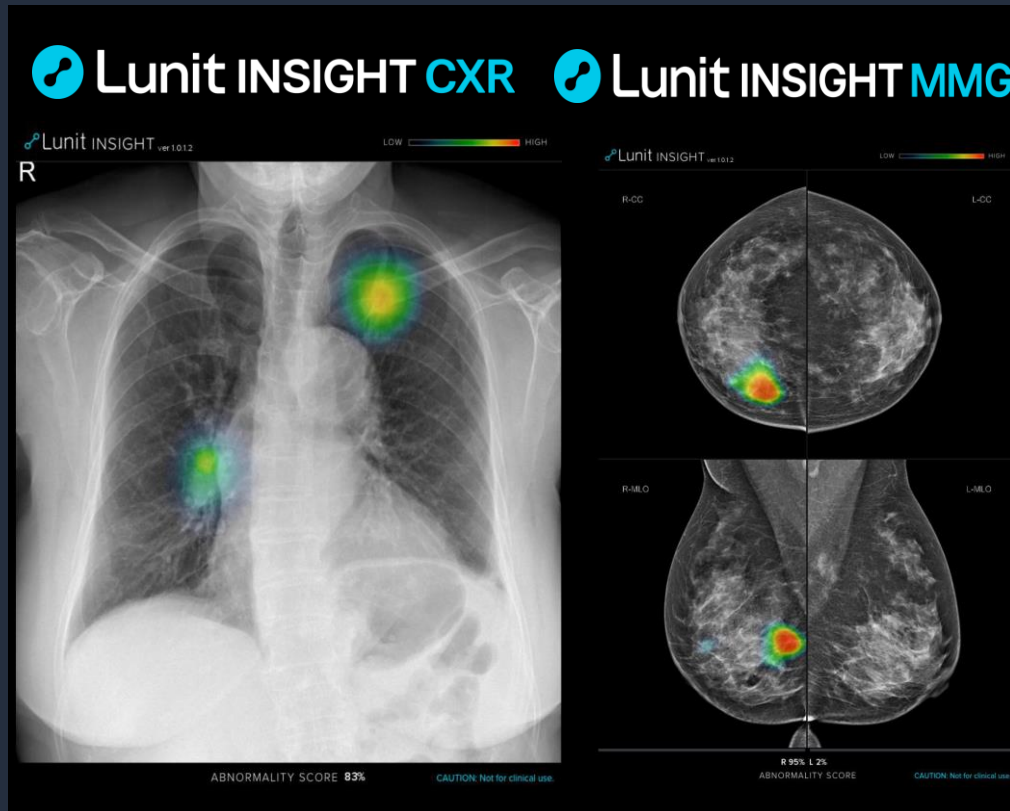
CT-scan

Gold standard

500 exams

250 with AI and 250
without

Čtení rentgenových snímků hrudníku a mamografie s umělou inteligencí



Klíčové vlastnosti



- **Skóre abnormality** pro pravděpodobnost výskytu podezřelých nálezů
- **Informace o umístění** zjištěných nálezů v barevné tepelné mapě nebo obrysech ve stupních šedi
- **Porovnaní** s předchozím vyšetřením
- **Triage** pro zlepšení workflow

Lunit INSIGHT CXR

Hlášení 10 abnormálních radiologických nálezů a screening tuberkulózy na rentgenových snímcích hrudníku.

Noduly

Konsolidace

Kalcifikace

Fibróza

Pneumothorax

Pneumoperitoneum

Kardiomegalie

Pleuralní efuze

Rozšíření
mediastina

Atelektáza

Screening tuberkulózy

Při nahrávání snímku hrudníku AP/PA, jsou abnormální nálezy označeny tepelnou mapou nebo obrysem a skóre abnormality, které odráží pravděpodobnost výskytu každého nálezu i každého případu.

Kromě toho se může zobrazit také "Skóre screeningu tuberkulózy" ..

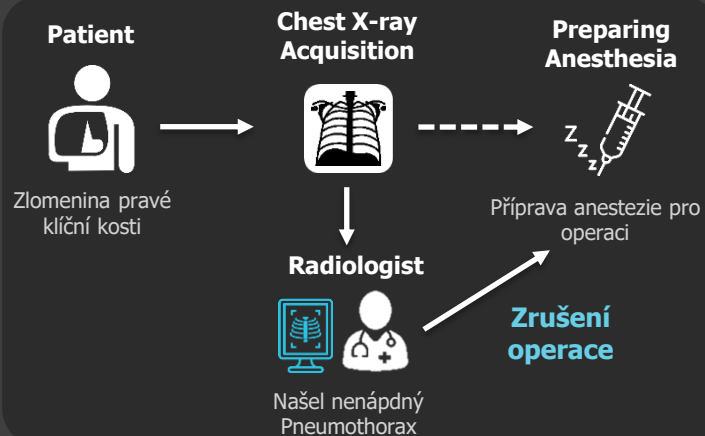


CASE REPORT

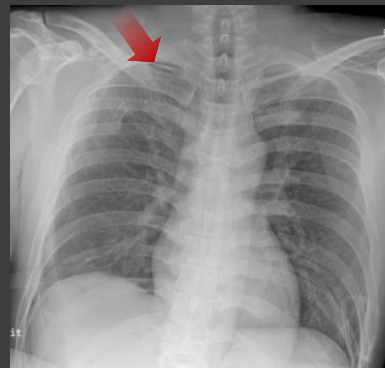
		Abnormality Score	98%
Calc	Calcification	Low	-
Atl	Atelectasis	Low	-
Fib	Fibrosis	Low	-
Ptx	Pneumothorax	95%	Left Zone
Cm	Cardiomegaly	Low	-
Ndl	Nodule	98%	Left Upper Zone
PEf	Pleural effusion	Low	-
Ppm	Pneumoperitoneum	Low	-
MW	Mediastinal Widening	Low	-
Csn	Consolidation	Low	-

S Lunit INSIGHT CXR vám neuniknou nálezy, které vyžadují naléhavou péči

Patient Journey



Original Image



INSIGHT CXR Image



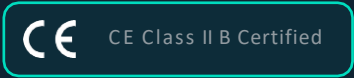
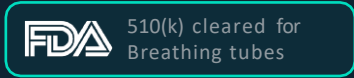
- Lunit **Pneumothorax** 87%
- Nenápadný pneumothorax
 - Žádné respirační symptomy.

Lunit INSIGHT CXR umožňuje včasné a přesné čtení RTG plic na oddělení urgentního příjmu

All Studies											
Patient ID	Patient Name	Modality	Image ...	Study Date Time	Score	Findings	Procedure ...	Accession No	Proc Description	Status	Complete Time
4189300768794385	Anon, Pneumoperitoneum, 3	CR	4	05/14/2016 6:35:30 AM	97	Pneumoperitoneum	UNKNOWN CR	9323316777922780	UNKNOWN	Complete	11/19/2018 5:48:48 AM
5096147485200885	Anon, Pneumothorax, 1	CR	3	10/16/2013 8:34:47 AM	89	Pneumothorax	UNKNOWN CR	885359385092207	UNKNOWN	Complete	11/19/2018 2:26:28 AM
5518276520093635	Anon, Pneumothorax, 2	CR	3	01/11/2014 6:57:51 PM	62	Pneumothorax	UNKNOWN CR	490641462324511	UNKNOWN	Complete	11/19/2018 2:26:47 AM
434410451839864	Anon, Pneumothorax, 3	CR	3	10/28/2017 4:35:43 PM	94	Pneumothorax	UNKNOWN CR	781363243338781	UNKNOWN	Complete	11/19/2018 2:27:05 AM
5047431317536131	Anon, Fibrosis, 2	CR	5	01/26/2015 6:05:10 AM	89	Pneumoperitoneum	UNKNOWN CR	4228574257642888	UNKNOWN	Complete	11/19/2018 2:17:29 AM
172558321808795	Anon, Pleural/effusion, 1	CR	5	02/09/2012 5:24:52 PM		Pneumothorax	UNKNOWN CR	2328555753904485	UNKNOWN	Complete	11/19/2018 2:23:11 AM
5696964987018034	Anon, Pleural/effusion, 3	CR	5	12/27/2012 5:36:56 PM	88	Pneumothorax	UNKNOWN CR	3922252684015769	UNKNOWN	Complete	11/19/2018 2:23:50 AM
1592724177638	Anon, Pneumoperitoneum, 1	CR	3	03/09/2016 8:06:56 AM	94	Pneumoperitoneum	UNKNOWN CR	0758704471299785	UNKNOWN	Complete	11/19/2018 2:24:28 AM
9054816387249670	Anon, Pneumoperitoneum, 2	CR	7	01/03/2016 8:30:37 AM	86	Pneumoperitoneum	UNKNOWN CR	9688830409974354	UNKNOWN	Complete	11/19/2018 2:25:09 AM
263364522744509	Anon, Calcified/nodule, 3	CR	3	11/19/2018 2:40:57 AM	59	Calcified nodule	UNKNOWN CR	32407796571220616	UNKNOWN	Complete	11/19/2018 2:41:45 AM
9982031541507723	Anon, Cardiomegaly, 1	CR	6	04/10/2015 2:19:19 PM	21	Fibrosis	UNKNOWN CR	9661839667461244	UNKNOWN	Complete	11/19/2018 2:14:12 AM
8817468537592378	Anon, Cardiomegaly, 4	CR	4	03/09/2019 9:53:38 AM	70	Cardiomegaly	UNKNOWN CR	7364590587034862	UNKNOWN	Complete	11/19/2018 2:45:35 AM
7202276271409923	Anon, Consolidation, 1	CR	5	02/16/2014 11:05:45 AM	21	Pleural effusion	UNKNOWN CR	0327925746764030	UNKNOWN	Complete	11/19/2018 2:12:52 AM
1002276573838443	Anon, Consolidation, 2	CR	5	12/14/2014 7:55:54 AM	30	Calcified nodule	UNKNOWN CR	4695620380023290	UNKNOWN	Complete	11/19/2018 2:18:08 AM
6996466376539082	Anon, Calcified/nodule, 1	CR	3	08/29/2016 2:52:54 PM	71	Calcified nodule	UNKNOWN CR	9673276485843430	UNKNOWN	Complete	11/19/2018 2:11:22 AM
6935942867820241	Anon, Consolidation, 3	CR	5	05/14/2012 9:38:57 AM	28	Calcified nodule	UNKNOWN CR	9928654411904562	UNKNOWN	Complete	11/19/2018 2:15:29 AM
8681268301930177	Anon, Fibrosis, 3	CR	3	02/22/2016 3:48:28 PM	69	Fibrosis	UNKNOWN CR	9305048841415096	UNKNOWN	Complete	11/19/2018 2:48:31 AM
7534705350156076	Anon, Fibrosis, 4	CR	3	11/15/2016 10:31:57 AM	75	Fibrosis	UNKNOWN CR	2204118271586603	UNKNOWN	Complete	11/19/2018 2:47:53 AM
2141824981471682	Anon, Mediastinal/widening, 1	CR	4	11/19/2013 1:44:03 AM	24	Fibrosis	UNKNOWN CR	8813790317801775	UNKNOWN	Complete	11/19/2018 2:18:47 AM
4212082076867396	Anon, Mediastinal/widening, 2	CR	3	09/19/2011 3:30:52 PM	91	Mediastinal widening	UNKNOWN CR	6545236270759244	UNKNOWN	Complete	11/19/2018 2:19:25 AM
6295387751387543	Anon, Mediastinal/widening, 3	CR	3	07/20/2018 1:20:38 PM	96	Mediastinal widening	UNKNOWN CR	9383635641863850	UNKNOWN	Complete	11/19/2018 2:20:02 AM
004649507502232	Anon, Calcified/nodule, 2	CR	3	05/31/2017 10:22:28 AM	54	Calcified nodule	UNKNOWN CR	8958450935774256	UNKNOWN	Complete	11/19/2018 2:13:30 AM
9624272476448692	Anon, Nodule, 4	CR	3	11/15/2011 6:08:22 AM	76	Nodule	UNKNOWN CR	4165237370171168	UNKNOWN	Complete	11/19/2018 2:22:35 AM
4224294964803614	Anon, Nodule, 5	CR	3	10/29/2012 7:37:45 PM	71	Nodule	UNKNOWN CR	4292474965334130	UNKNOWN	Complete	11/19/2018 2:21:57 AM
6023187804375468	Anon, Nodule, 8	CR	3	11/06/2015 6:47:48 PM	73	Nodule	UNKNOWN CR	1162259877255402	UNKNOWN	Complete	11/19/2018 2:49:53 AM
1563628230756081	Anon, Pleural/effusion, 2	CR	6	06/27/2016 2:32:01 PM	20	Nodule	UNKNOWN CR	1638556234348881	UNKNOWN	Complete	11/19/2018 2:47:31 AM
7310934078764507	Anon, Normal, 5	CR	1	01/26/2017 8:50:10 AM			UNKNOWN CR	7398500856408366	UNKNOWN	Complete	11/21/2018 11:57:47 PM
3296576389862692	Anon, Normal, 6	CR	1	02/21/2017 7:55:54 AM			UNKNOWN CR	5393632814651881	UNKNOWN	Complete	11/21/2018 11:57:47 PM
7336056495261921	Anon, Normal, 7	CR	1	02/27/2017 8:32:10 AM			UNKNOWN CR	3558701588234799	UNKNOWN	Complete	11/21/2018 11:57:48 PM
9531451306367032	Anon, Normal, 1	CR	1	07/07/2016 12:12:42 PM			UNKNOWN CR	1359470991545245	UNKNOWN	Complete	11/21/2018 11:57:46 PM
4632768445137737	Anon, Normal, 8	CR	1	02/27/2017 9:13:11 AM			UNKNOWN CR	2183045857181914	UNKNOWN	Complete	11/21/2018 11:57:48 PM

qER: Neuro-Critical Care

Automatizovaná interpretace CT hlavy s umělou inteligencí pro okamžitou podporu rozhodování lékaře



- Detekce 12 různých abnormalit na CT hlavy
- Rozděluje kritické a nekritické CT hlavy
- Třídí pacienty v pracovním seznamu
- Lokalizuje léze do anatomických struktur
- Kvantifikuje zprávy s odhadem objemu
- Předvyplněné šablony pro radiologickou zprávu

Oblasti onemocnění



Krvácení



Fraktury lebky



Mrtvice



Hydrocephalus



Mass Effect



Posun střední čáry



Pneumocephalus



500k

Scans for Training dataset

3.2Mn

Scans processed annually

7

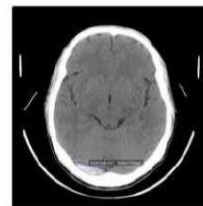
Countries using

10+

Sites deployed

Druhy abnormalit detekované AI

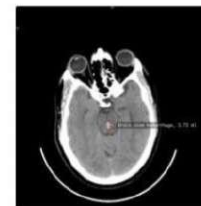
- Extradurální krvácení
- Subdurální krvácení
- Subarachnoidální krvácení
- Intraparanchymální krvácení
- Intraventrikulární krvácení
- Infarkt
- Zlomenina lebky
- Pneumocefalus
- Hydrocefalus
- Útlak tkání (Mass efekt)
- Posun střední čáry (Midline shift)
- Atrofie



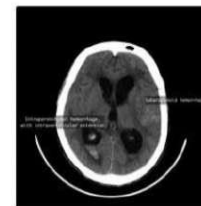
Extradural hemorrhage



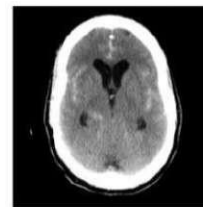
Subdural hemorrhage



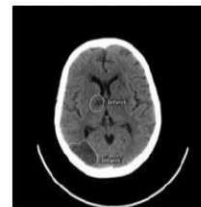
Intraparenchymal hemorrhage



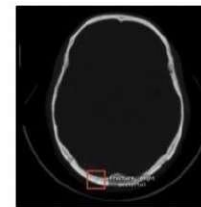
Intraventricular hemorrhage



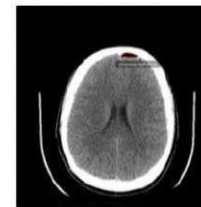
Subarachnoid hemorrhage



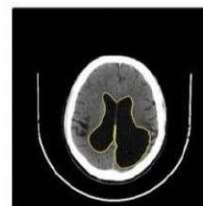
Infarct



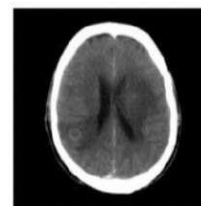
Cranial fracture



Pneumocephalus



Hydrocephalus



Mass effect

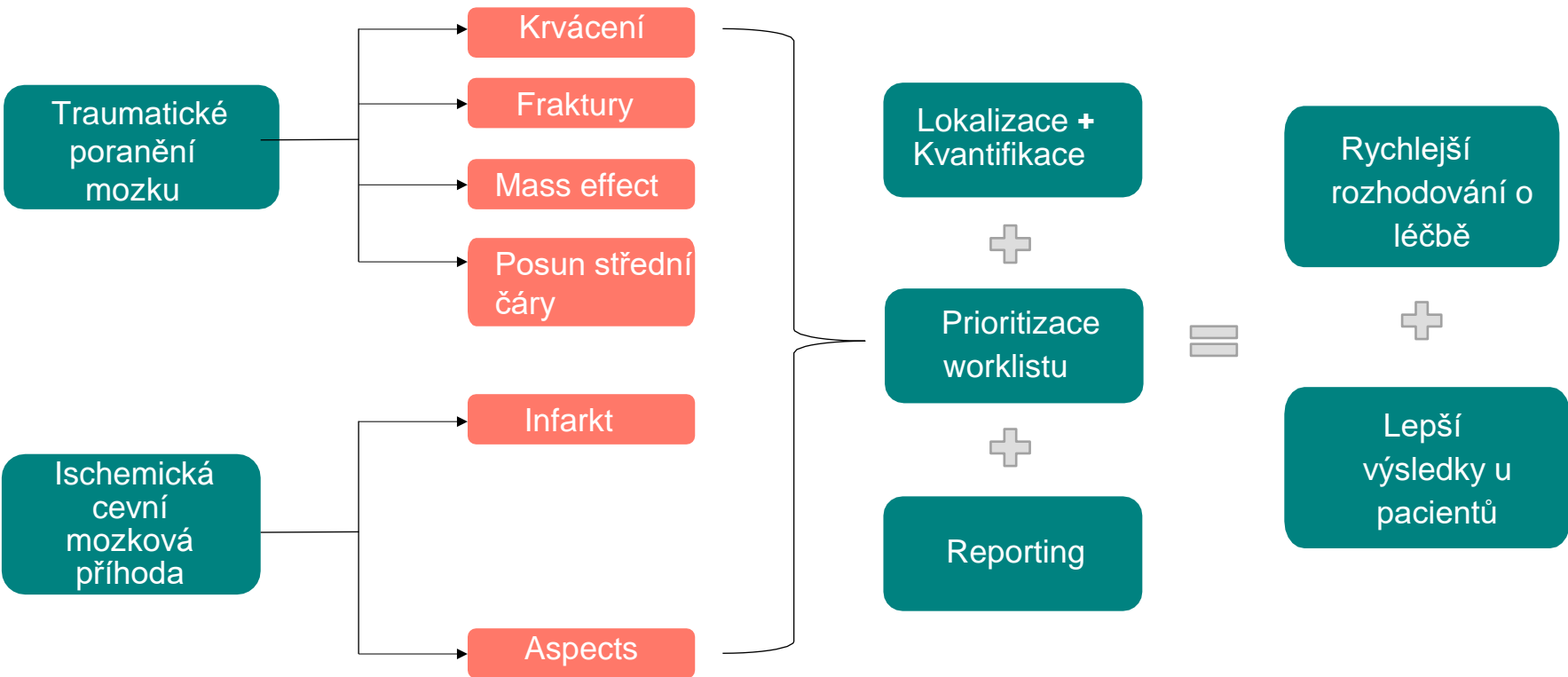


Midline shift



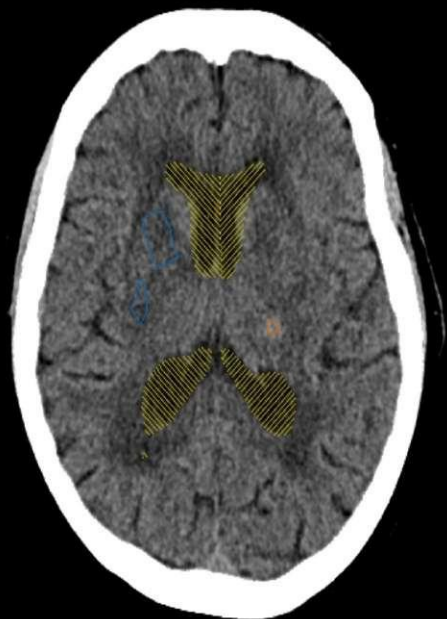
Atrophy

Komplexní nález na NCCT pro třídění pacientů na urgentním příjmu



Ukázka interpretace qER

Adalard Banks
SDH19771110



Critical: Yes

Detected findings:

- Intracranial hemorrhage
- Infarct
- Left lateral ventricle
- Right lateral ventricle

Diffuse cerebral atrophy

Image no: 17
Image 17 of 34
8/14/2022, 4:59:39 PM

P

Ukázka reportu qER

qER Automated head CT scan analysis

Patient Name	Adalard Banks
Patient ID	27e90794-417b-49b4-9616-46283ba0d881
Scan date	16 Oct 2017
Analysis date	19 Oct 2021 08:30:24 PM
qER version	3.0

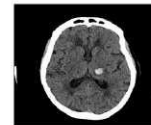
Impression

- Intracranial hemorrhage of 1.1 ml in left gangliocapsular region
- Intraparenchymal hemorrhage
- Hypodensity suggestive of infarct in right cerebellum region
- Left lateral ventricle of 17.5 ml
- Right lateral ventricle of 22.5 ml
- Diffuse cerebral atrophy

Key Preview Slices



slice #14: intracranial hemorrhage, infarct



slice #15: intracranial hemorrhage



slice #16: intracranial hemorrhage, infarct

Observations

Critical Abnormality	Presence
Intracranial hemorrhage of 1.1 in left gangliocapsular region	Yes
Intraparenchymal hemorrhage	Yes
Subdural hemorrhage	No
Subarachnoid hemorrhage	No
Intraventricular hemorrhage	No
Extradural hemorrhage	No
Mass effect	No
Midline shift	No
Cranial fracture	No
Hypodensity suggestive of infarct in right cerebellum region	Yes
Diffuse cerebral atrophy	Yes

Warning: This is a preliminary report of head CT scan findings by automated analysis. It is not intended for standalone diagnostic use. Please refer to a radiologist or neurologist for final diagnosis.

qere.ai

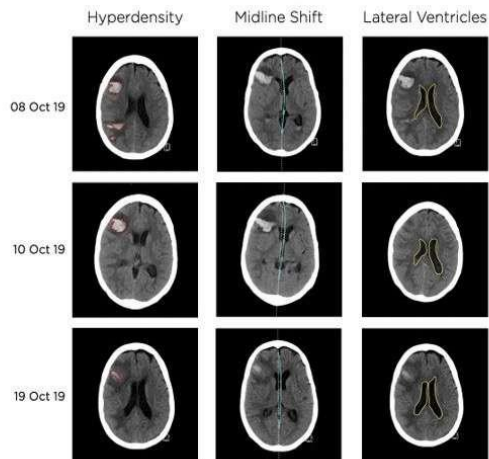
SAMPLE

qER-Quant Analysis Report

Patient ID 346pd2lds Age 69 years
 Accession Number 20202020,1 Analysis Date 19 Oct 19

Type of Scan Non-contrast CT head
 Analysis Automated quantification and prgression measurement of intracranial hyperdensities, lateral ventricles and midline shift

Preview Slices



Study Time 08 Oct 19, 15:03:47, 10 Oct 19, 18:32:29, 14 Oct 19, 06:42:16,
 Analysis Time 19 Oct 19, 11:02:09
 qQuant Version 1.0.0

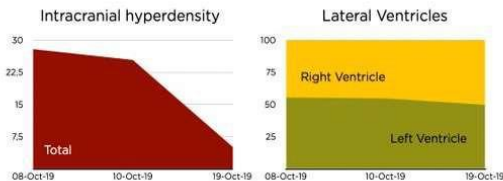
qER-Quant Analysis Report

Patient ID 346pd2lds Age 69 years
 Accession Number 20202020,1 Analysis Date 19 Oct 19

Type of Scan Non-contrast CT head
 Analysis Automated quantification and prgression measurement of intracranial hyperdensities, lateral ventricles and midline shift

Quantitative analysis

Date	Hyperdensity	Midline shift	L Ventricle	R Ventricle	Total
	Total	Shift Side	Volume %	Volume %	Volume
08 Oct 19	27,92	4mm Left	17,46 55,5	13,98 44,5	31,44
10 Oct 19	25,37	2mm Left	17,76 54,8	14,64 45,2	32,4
19 Oct 19	5,12	2mm Left	15,9 49,8	16,03 50,2	31,93



Study Time 08 Oct 19, 15:03:47, 10 Oct 19, 18:32:29, 19 Oct 19, 06:42:16,
 Analysis Time 19 Oct 19, 11:02:09
 qQuant Version 1.0.0

Ukázka
 interpretace
 qER &
 Sledování
 progresse

Děkuji za pozornost!

The logo for DATAMED, featuring the letters 'DM' in a large, bold, white font with a blue square background. Below 'DM', the word 'DATAMED' is written in a smaller, white, sans-serif font.

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