

# COMPANY PROFILE

VUNO Inc. / Global Leader in Healthcare AI (Artificial Intelligence)

2024.1Q

## Disclaimer

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This material has been prepared for the purpose of providing investors with information on VUNO's business prospects, management objectives, and business strategy, and is prohibited from being taken out, copied, or redistributed to others.

Please note that the forward-looking statements contained in this document relates to future events, not the past, and is inherently subject to uncertainty, and may not correspond to the company's actual operating results due to uncertainties such as changes in the market environment and risks beyond the company's control.

Finally, this material is intended as a reference for investors' investment judgment, and we do not provide any warranty or assume any liability to investors for the contents of this material.

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In full-fledged deployment

VUNO Med®

Nationally recognized  
healthcare AI solutions

**1st** • MFDS approved medical AI device  
• Innovative medical device

**10** Ready to use solutions



Proven clinical validity  
based on multiple  
clinical studies &  
real-world examples

**700+** Hospitals

**100+** Publications

**100+** Patents

Global network  
of collaborations

Extensive Network  
of Global Partners





**Established**  
2014.12

**Building R&D Foundation**  
(2015~)

**Product Development**  
(2018~)

**Commercialization + Deployment**  
(2021~)

- **2014**
  - 12. Selected as a Tech Incubator Program for Startup (TIPS) by Ministry of SMEs
- **2015**
  - 08. Deep-learning based case studies on lung images with Asan Medical Center (Seoul)
  - Established **corporate R&D Center**
  - 12. Top 5<sup>th</sup> in CLS of ImageNet IL SVRC 2015
- **2016**
  - 12. Approval for K-GMP
  - Participated in \*RSNA 2016 & exhibited AI solutions  
\* Participating every year since 2016
- **2017**
  - 01. IND Approval for VUNO Med-BoneAge
  - 11. Participated in drafting MFDS regulatory approval guidelines for medical AI devices

- **2018**
  - 05. 1st AI medical device approved by MFDS (Kor), **VUNO Med-BoneAge**
  - Commercialized medical speech record S/W  
VUNO Med-DeepASR (Automatic Speech Recognition)
  - 09. Commercialized 1st AI medical device service (Kor)
- **2019**
  - 06. MFDS Approval for VUNO Med-DeepBrain
  - 08. MFDS Approval for VUNO Med-Chest X-Ray
  - 12. Korea's 1st PMDA certification for VUNO Med-LungCT
- **2020**
  - 04. MFDS Approval for VUNO Med-Fundus AI / LungCT AI
  - 06. 5 VUNO Med Solutions – CE Certified  
Partnership w/ **M3, SONY Subsidiary**
  - 07. VUNO Med-Fundus AI became Korea's **first-ever Innovative Medical Device**
  - 09. VUNO Med-DeepCARS designated as 6th Innovative Medical Device

- **2021**
  - 02. Listed on KOSDAQ (Korean Stock Exchange)**
  - 06. MFDS Approval for VUNO Med-PathQuant
  - 08. MFDS Approval for VUNO Med-DeepCARS
  - 10. VUNO Med-DeepECG designated as 16th Innovative Medical Device**
- **2022**
  - 05. VUNO Med-DeepCARS Desig. as Early Access Innovation Med Device**
  - 06. VUNO Med-DeepBrain eligible for 3D MRI reading insurance reimbursement
  - 08. VUNO Med-DeepCARS eligible for out-of-pocket insurance (8.1. ~)**
  - 12. VUNO Med-LungCT designated as 22nd Innovative Medical Device**
- **2023**
  - 01. **Hativ (ECG Technology-based electrocardiograms) launched**
  - 06. VUNO Med-DeepCARS designated FDA Breakthrough device**
  - 10. VUNO Med-DeepBrain obtained FDA 510K clearance**
- **2024**
  - 01. VUNO Med-LungCT won reimbursement in Japan



X-ray, MRI, CT, Funduscopy

**Medical Imaging**

EMR, ECG, Patient Monitor

**Bio Signal**



**VUNO Med®**

**Process Improvement**

VUNO Med-DeepASR

**Quantification**

VUNO Med-DeepBrain

**Diagnostic Support**

Ministry of Food and Drug Safety | FDA | CE

VUNO Med-DeepCARS

Ministry of Food and Drug Safety

VUNO Med-BoneAge

Ministry of Food and Drug Safety

CE | fmda

VUNO Med-Chest X-ray

Ministry of Food and Drug Safety

CE | FDA  
食品藥物管理署  
Food and Drug Administration

VUNO Med-LungCT AI

Ministry of Food and Drug Safety

CE | fmda

VUNO Med-Fundus AI

Ministry of Food and Drug Safety

CE

VUNO Med-DeepBrain AD

Ministry of Food and Drug Safety

Hativ

Ministry of Food and Drug Safety

VUNO Med-DeepECG

Clinical Trials in Progress

**Prediction & Prognosis**

• Income Statement

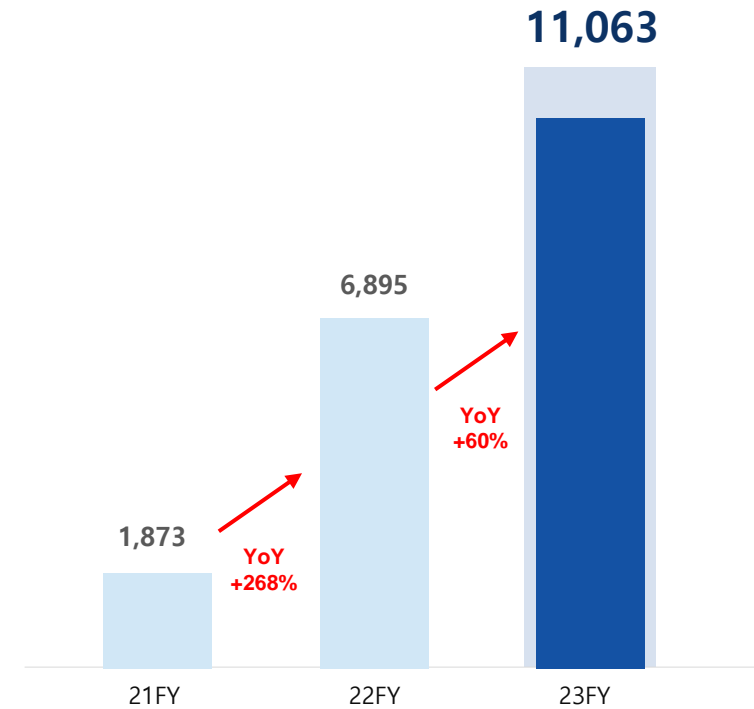
(Unit: USD 1,000)

Type	'21 FY	'22 FY	'23 FY	YoY
<b>Revenue</b>	<b>1,873</b>	<b>6,895</b>	<b>11,063</b>	<b>60%</b>
Operating Expense	16,545	19,065	23,049	
Operating Loss	(14,672)	(12,170)	(11,986)	△2%
<b>Non-Operating Revenue</b>	<b>(1,453)</b>	<b>(246)</b>	<b>41</b>	
Financial Income	315	201	433	
Other Income	15	71	3,419	
Non-Operating Expense	1,782	518	3,811	
<b>Net Loss</b>	<b>(16,125)</b>	<b>(12,416)</b>	<b>(11,945)</b>	<b>△4%</b>

Note1) Based on unaudited separate income statement  
Note2) Exchange Rate: 1 USD=1,200 KRW

• Revenue

(Unit: USD 1,000)





## Company Overview – '23 FY Review (YoY, QoQ)

• Income Statement

(Unit: USD 1,000)

Type	'23.3Q	'23.4Q	QoQ	'22.4Q <sup>Note3)</sup>	'23.4Q	YoY
<b>Revenue</b> (Included one-time revenues)	2,973	4,105	38%	5,271	4,105	△22%
<b>Revenue</b> <sup>Note3-2)</sup> (Excluded one-time revenues)				3,188		29%
Operating Expense	4,512	6,778		4,476	6,778	
Operating Loss	(1,539)	(2,673)	74%	796	(2,673)	△436%
<b>Non-Operating Revenue</b>	<b>(99)</b>	<b>(2,478)</b>		<b>(207)</b>	<b>(2,478)</b>	
Financial Income	88	63		58	63	
Other Income	24	646		(8)	646	
Non-Operating Expense	211	3,187		256	3,187	
<b>Net Loss</b>	<b>(1,638)</b>	<b>(5,151)</b>	<b>215%</b>	<b>589</b>	<b>(5,151)</b>	<b>△975%</b>

Note1) Based on unaudited separate income statement

Note2) Exchange Rate: 1 USD=1,200 KRW

Note3) One-time increase in revenues due to the conclusion of a business transfer agreement.

Note3-1) Company name: PuzzleAI(Unlisted Company) / Object of transfer: VUNO Med®-Deep ASR™ / [puzzle-ai.io](http://puzzle-ai.io)

Note3-2) Contract amount: USD 2,083 Thousand (KRW 2.5 Billion)

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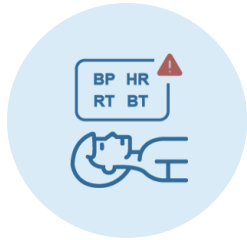
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In-hospital Cardiac Arrest (IHCA)

3,600 cases<sup>1</sup>



Warning Signs/ Early symptoms

80%<sup>2</sup> (2,880)



IHCA Death

75%<sup>3</sup> (2,700)



Severe Shortage of Medical Staff



A Lack of Effective Track-and-Trigger System

**DeepCARS™**

Overcoming the limitations of traditional methods with AI

Efficient management with fewer false alarms, Higher sensitivity and specificity by using AI Model

68%  
Avoidable IHCA<sup>4</sup>

1) Crit Care Med. 2012;39:2401-2406  
2) Resuscitation. 2004;62(3):275-282. doi:10.1016/j.resuscitation.2004.05.016  
3) JAMA. 2019;321(12):1200-1210  
4) Resuscitation. 2002 Aug;54(2):115-23

DeepCARS by VUNO

Detected 543 Done 31 DNR 12 All patients 8592

Search PID/Name All wards All ages

Screening 445 Observing 50 In action 48 All detected

Date/Time	PID	Name	Age	Sex	Date of admission	Diagnosis	Department	Ward	SBP	DBP	HR	RR	BT	DCARS	DNR	Co.	Status
2022-07-11 11:06	W-000LL4	유재이	71	F	2022-07-08	Gastro-oesophage...	이비인후과	구관_7층_2병동	161	31	115	15	36.6	88	DNR		Screening
2022-07-11 11:05	W-000A0D	노승유	85	M	2022-06-10	Attention deficit hy...	호흡기내과	구관_11층_2병동	116	78	96	43	37.0	95	DNR		Screening
2022-07-11 11:03	W-000JLZ	김이현	79	M	2022-07-03	Clostridium difficile	유형외과	별관_20층_2병동	153	75	96	35	36.3	92	DNR		Screening
2022-07-11 11:03	W-000K0F	곽주호	73	M	2022-07-06	Ovarian cyst	대장항문외과	별관_2층_2병동	176	70	119	24	36.2	93	DNR		Screening
2022-07-11 11:02	W-000I7E	양재은	40	F	2022-06-29	Varicose eczema	방사선종양학과	구관_5층_2병동	100	69	111	29	35.5	93	DNR		Screening
2022-07-11 11:01	W-000KLO	김은서	51	F	2022-07-05	Fibromyalgia	건강의학과	신관_6층_2병동	92	54	120	26	36.4	95	DNR		Screening
2022-07-11 10:59	W-0002TV	심지민	27	F	2022-05-24	Whooping cough	안과	구관_20층_1병동	94	46	64	24	36.6	69	DNR		Screening
2022-07-11 10:59	W-000KRI	강민호	99	M	2022-07-06	Loss of libido	폐식도외과	구관_12층_2병동	100	77	140	12	36.0	95	DNR		Screening
2022-07-11 10:59	V-0003Y3	신다원	82	F	2022-06-29	Slapped cheek syn...	이비인후과	구관_1층_2병동	146	67	102	36	36.2	95	DNR		Screening
2022-07-11 10:59	W-000JNS	곽예나	97	F	2022-07-03	Constipation	내분비내과	별관_11층_2병동	214	59	146	29	36.5	97	DNR		Observing
2022-07-11 10:58	W-000JM3	정준원	101	M	2022-07-03	Lung cancer	가정외과	구관_14층_1병동	110	55	91	38	36.1	95	DNR		Screening
2022-07-11 10:57	W-000LZ0	황서아	100	F	2022-07-09	Kidney stones	혈관외과	신관_12층_2병동	113	71	108	27	37.2	93	DNR		Screening

Screening Observing In action Done

↓ Export

Deep Learning(AI) based Cardiac Arrest Risk Management System

Description

Predicts the risk of cardiac arrest within 24 hours for general ward inpatients

Indications

The VUNO Med®-DeepCARS™ is intended for use in helping identify general ward patients at a high risk of cardiac arrest

Mechanism

- Uses 4 vital signs (blood pressure, HR, respiratory rate, body temperature) collected from the electronic medical record (EMR)
- Provides a risk score from zero to 100 (the higher score the higher risk)

**1**



**Select risky-patient**

- Check the rate of high-risk patients classified by DeepCARS
- After the 1st review, notify to ward medical team

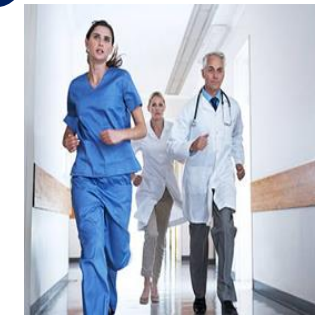
**2**



**Planning**

- Selected patient visits hospital, medical team reviews
- Share content with relevant departments
- Requirements reflection, make an intervention plan

**3**

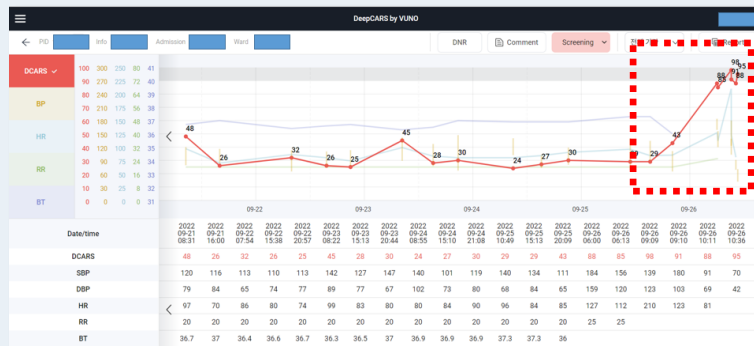


**Exacerbation Intervention**

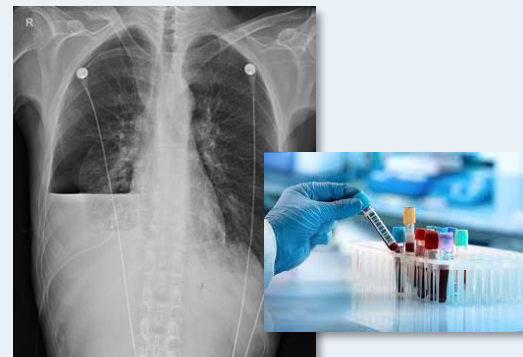
- Provide immediate and appropriate intervention depending on the exacerbation situation (airway management, medication and test formula, CPR etc.)

**• DeepCARS Use Case**

- ①** Can check the scores distribution and rate of high-risk patients classified based on the scores set by the DeepCARS



- ②** Exacerbation patient visits a hospital, check symptom and proceed with additional inspections as necessary



- ③** Take measure to patient e.g., After confirming signs of acute exacerbation, airway intubation was performed, and the patient was then transferred to the intensive care unit



• DeepCARSTM adoption expectations



**Patients**

Reduced cardiac arrest rates  
Improved outcomes  
through preventive measures



**Medical Staff**

Early identification of  
critically ill patients  
Rapid collaboration  
between healthcare providers



**Hospitals**

Efficient use of healthcare resources  
Help to promote the hospital

• DeepCARSTM pathway to go market



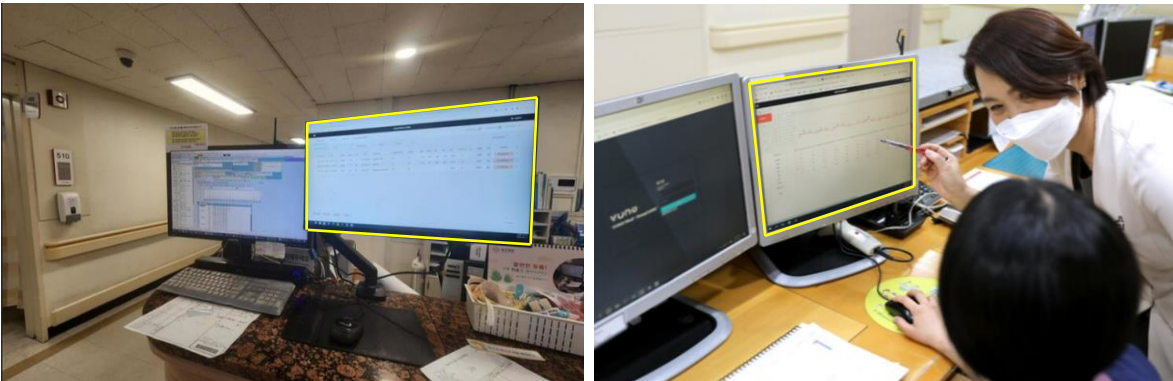
- ✓ Innovative Medical Device designated by MFDS (2020. 09)
- ✓ MFDS approval (Class II) (2021. 08)
- ✓ Designated as a candidate for New Health Technology Assessment (2021. 12)
- ✓ Designated as Early Access Innovation Medical Device (2022.05)
- ✓ Official Launching (2022.08~)

- **70+ hospitals** totaling **28,000+ beds** have adopted DeepCARS in Korea  
 - Includes Tertiary Hospital 13, General Hospital 50 etc.)

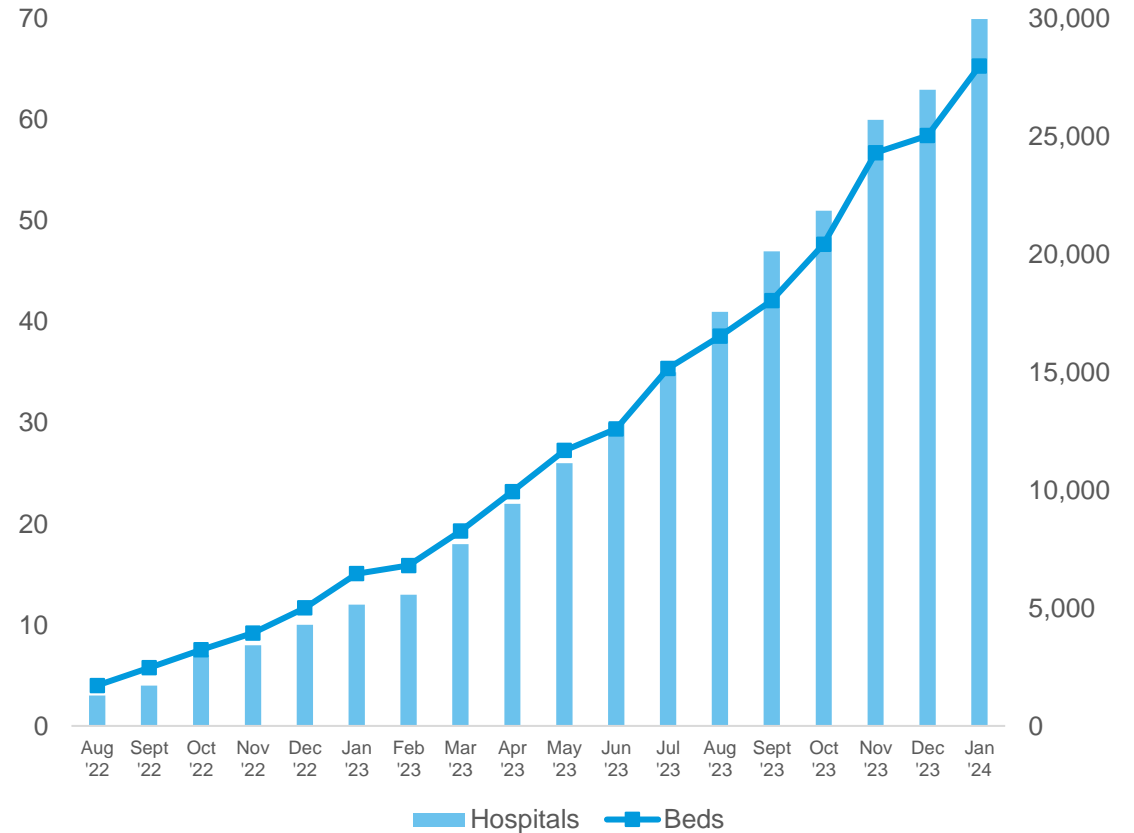
**Use in a Medical Emergency Team**



**Use in a Nurses' Station**



**Number of Hospitals / Beds Monitored**



- Demonstrated superior cardiac arrest prediction performance through clinical publications in Resuscitation, ACC, CCM, etc.



**JAHA**

[An algorithm based on deep learning for predicting in-hospital cardiac arrest \(JAHA, 2018\)](#)



**Critical Care Medicine**

[Detecting patient deterioration using artificial intelligence in a rapid response system \(CCM, 2020\)](#)



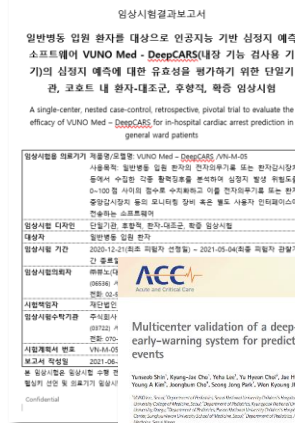
**RESUSCITATION**  
OFFICIAL JOURNAL OF THE EUROPEAN RESUSCITATION COUNCIL

[A multicenter validation study of the deep learning-based early warning score for predicting in-hospital cardiac arrest in patients admitted to general wards \(RESUSCITATION, 2021\)](#)

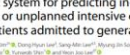
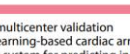


**Biomedical Journal**

[Development and validation of a deep-learning-based pediatric early warning system \(Biomedical Journal 2021\)](#)



[VUNO Med – DeepCARS의 심정지 예측에 대한 유효성을 평가하기 위한 단일기관 임상시험 \(Clinical trial result by MFDS, 2021\)](#)



[Multicenter validation of a deep-learning-based pediatric early-warning system for prediction of deterioration events \(Acute and Critical Care 2022\)](#)



[Prospective, multicenter validation of the deep learning-based cardiac arrest risk management system for predicting in-hospital cardiac arrest or unplanned intensive care unit transfer in patients admitted to general wards \(Critical Care 2023\)](#)

- Clinical trial result by MFDS (KFDA)



**Predicting cardiac arrest  
with superior performance**

- **High Sensitivity** Products
  - Prediction accuracy based on AUROC : 0.8934



**Enough time to take  
preventive action**

- Predicts cardiac arrest on **average 15.78 hours** in advance



**Applies to all inpatients  
on general wards**

- No difference in sensitivity by **age, gender, or specialty**



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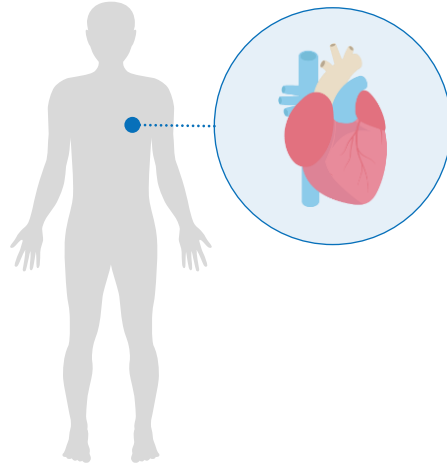
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## Cardiovascular Disease



1st leading cause of death worldwide<sup>1)</sup>

- Approximately 17.9 million people die each year from **cardiovascular disease**, 31% of all deaths worldwide
- 2nd leading cause of death in Korea after cancer and 1st in medical expenses
- Increase in cardiovascular complications due to an increase in younger chronic disease patients

Note 1) World Health Organization, 'The top 10 causes of death'

## ECG test types by number of inductions



12-Lead

- Electrocardiography in the Clinical Setting
- High accuracy based on 12-lead ECG
- Difficult to use in daily life due to low portability/convenience



6-Lead

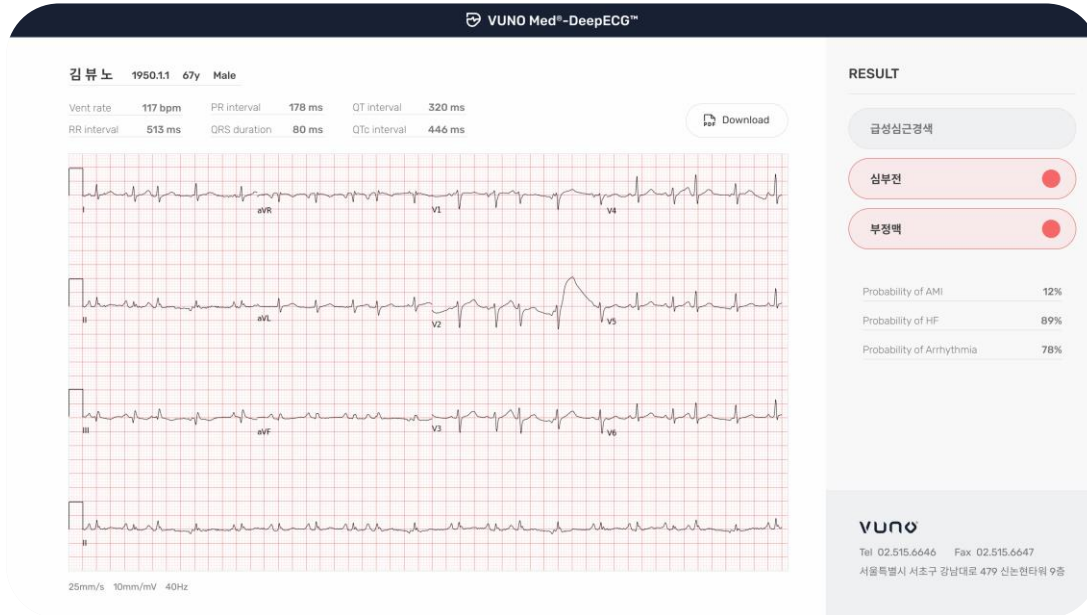
- Tests with 12-lead accuracy and the portability, convenience of 1-Lead
- Higher accuracy compared to 1-Lead, suitable for medical diagnostic aids



1-Lead

- Highly portable and convenient
- Because it uses a 1-Lead electrocardiogram **limited information** for medical purposes

VUNO Med-DeepECG + Hativ ('23.01 Launched)



AI-BASED ECG ANALYSIS SOLUTION

Description

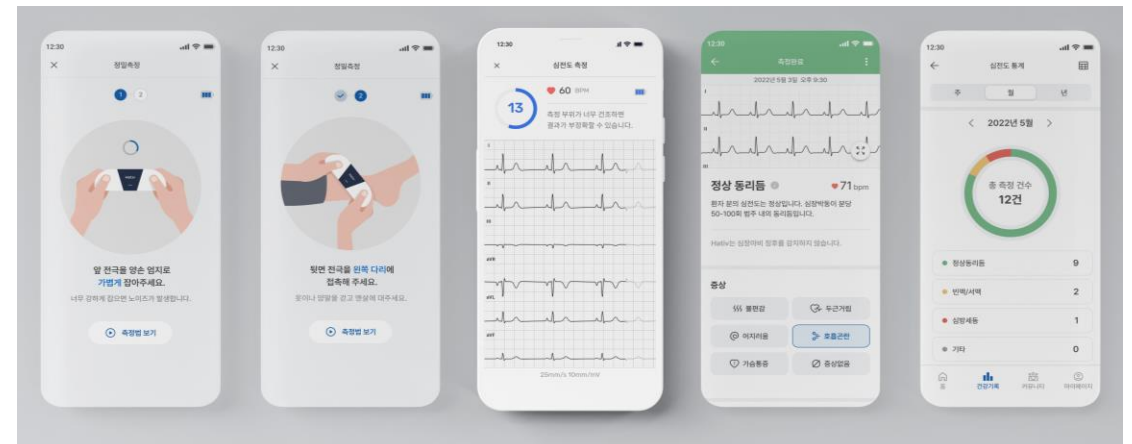
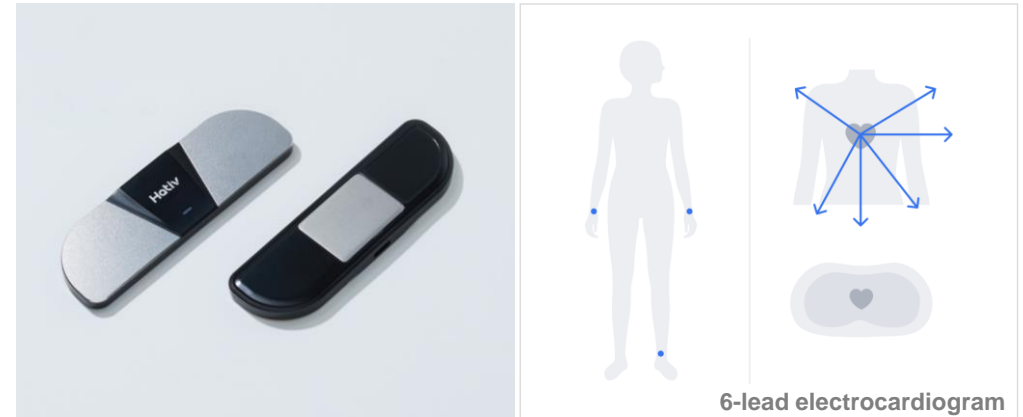
- Detects abnormalities in patient's ECG data that could indicate **cardiovascular and other critical diseases** (e.g., chronic kidney disease)
- **Allows at risk patients susceptible to kidney and heart disease to self-measure and receive early treatment**

Method

- Analyzes **ECG data** from portable mobile ECGs and other devices

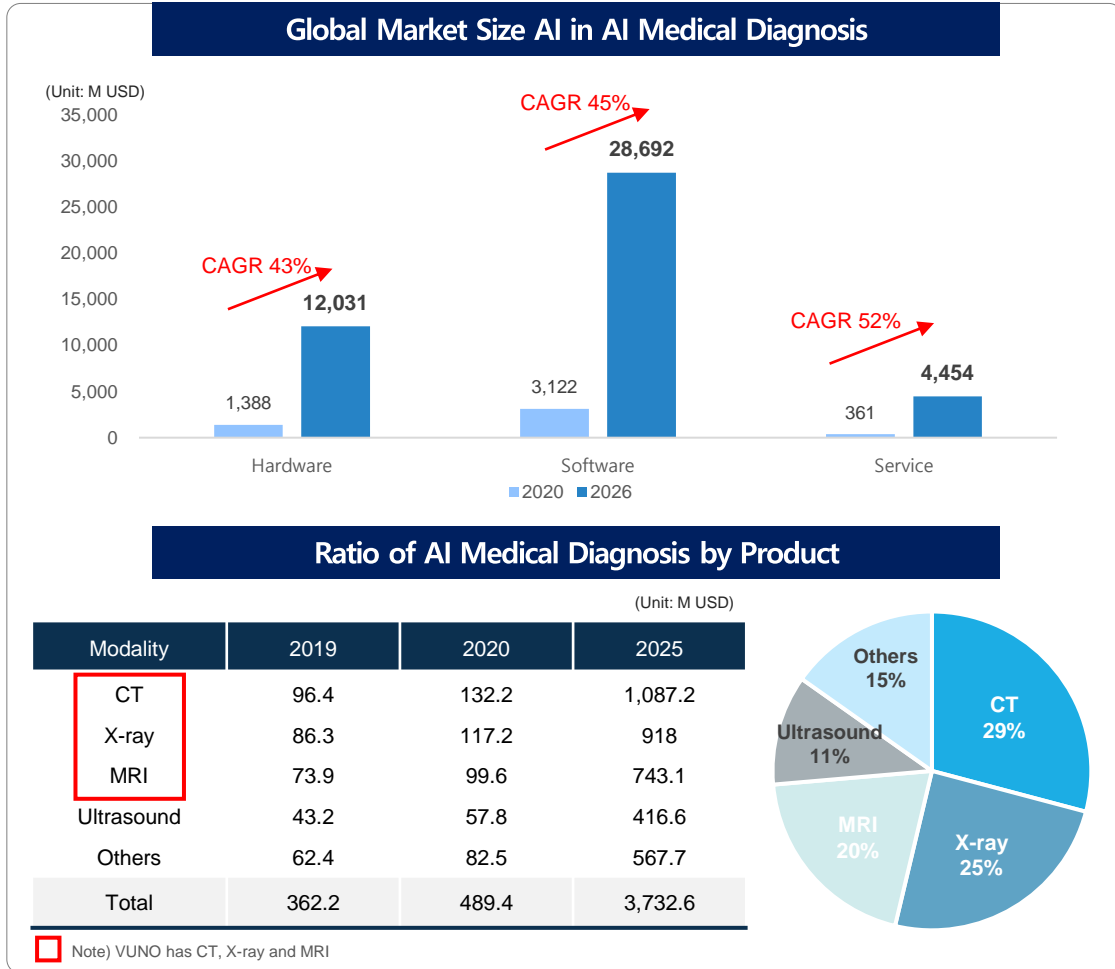
Hativ

Portable ECG device to monitor cardiovascular and other critical diseases using AI software to analyze ECG data  
 (Arrhythmia, Heart Failure, Myocardial Infarction, Kidney Failure, Hyperkalemia)

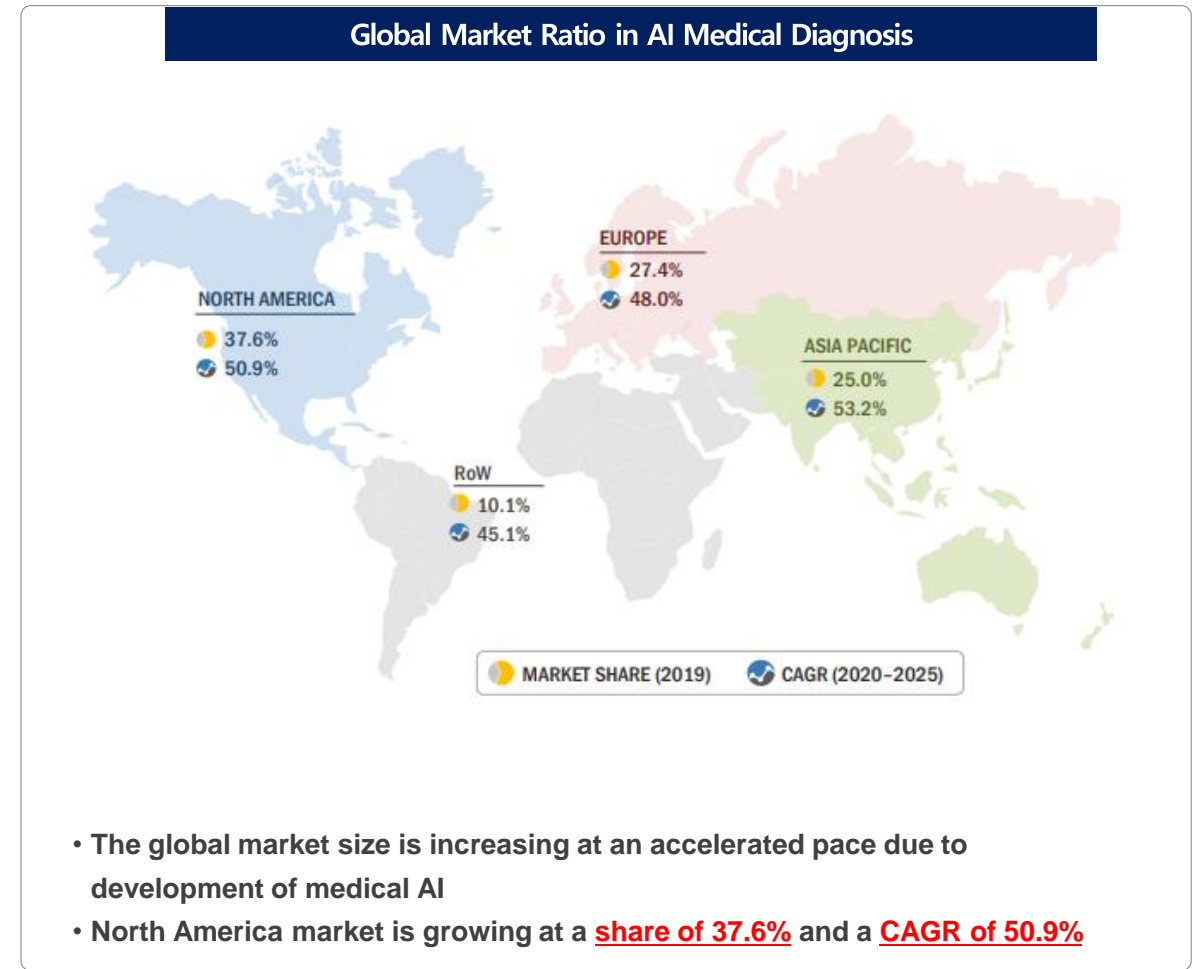


# VUNO Med-Solutions - Medical Imaging Market

• Global AI in Healthcare Market Size : ('20) 4.86 Bil USD → ('26) 45.17 Bil USD (Total Market **CAGR 47%** )



Source) Markets&Markets, Artificial Intelligence in Healthcare Market, 2020



Source) Markets&Markets, Artificial Intelligence in Healthcare Market, 2020

VUNO Med-DeepBrain

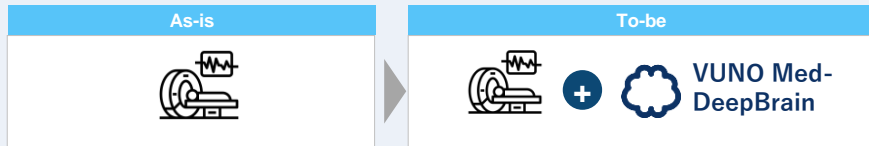


Brain MRI-based quantification solution

- Analyzes 3D brain MRI images to provide volumetric data of **104 brain regions** through brain parcellation (brain volumes, cortical thickness, White Matter Hyperintensity(WMH)) **within 1 minute**
- Helps to diagnose **Major neurodegenerative diseases** (e.g mild cognitive Impairment,(MCI) Alzheimer's disease, dementia, etc)

Neurodegenerative Disease Diagnosis with 3D Brain Images

- **Improves patient satisfaction** and understanding by providing the Brain Atrophy Report with the **statistical analysis results and visualized graphs within 1 minute**



Regulatory Approval

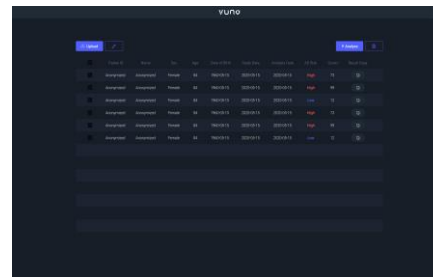


('23.10)

R&D Partners



VUNO Med-DeepBrain AD AI Diagnostic Support for Alzheimer's Disease in MRIs



AI Diagnostic Support for Alzheimer's Disease in MRIs

- Assist Alzheimer's disease (AD) diagnosis by providing AD risk score calculated from T1 MR image.
  - Allows medical professionals to identify patients with high risk of AD with high accuracy (AUC 0.937) and provide AD Score Report to patient for further consultation needs
- \* Alzheimer's disease: a degenerative neurological disease in which abnormal proteins accumulate in the brain and brain neurons slowly die, leading to mild cognitive impairment and dementia (7th cause of death in Korea, 7,500 deaths per year)

World's First Brain MRI-Based Alzheimer's Risk Detection Medical Device

- Approved by MFDS and preparations are underway for commercialization by '24
- Trained on MR T1 images of 3,000 Amyloid PET positive patient scans collected from leading institutions in S. Korea and on Alzheimer's Disease Neuroimaging Initiative (ADNI)'s data
- Expected to be widely used in the diagnosis of Alzheimer's disease in the future (domestically & overseas)

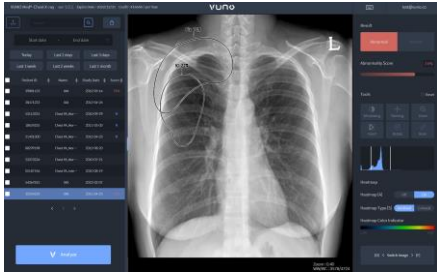
Regulatory Approval



R&D Partner



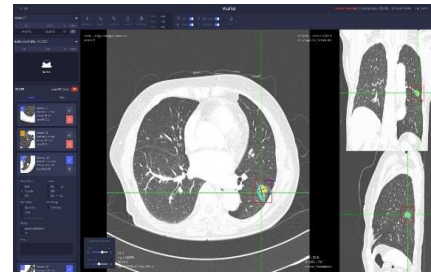
VUNO Med-Chest X-ray



AI Diagnostic Support for Abnormalities in Chest X-Rays

- Instantly detects and flags **five chest abnormalities** (Nodule/Mass, Consolidation, Interstitial Opacity, Pleural Effusion, Pneumothorax), which are indicative of **major pulmonary diseases** (inc. TB & Pneumonia) from chest X-ray images.
- Provides information on findings of chest related abnormalities, abnormality scores as well as their locations, maximizing the reading accuracy and efficiency of radiological reporting<sup>1</sup>

VUNO Med-LungCT AI



Detection of Pulmonary Nodules in Chest CTs

- Detects the presence, types and locations of pulmonary nodules, and predicts lung-RADS (malignancy) score.
- The **super-resolution algorithm** optimizes nodule detection performance and enhances CT images.
- Provides physicians with proofreading tool for false negatives; detected 269 nodules in 9,952 cases reported as normal<sup>2</sup>

B2B expansion to X-ray equipment companies

- **Embedded into X-Ray equipment** e.g., Samsung Electronics (Portable X-Ray Machines) and Vieworks (X-Ray Detector)



Focus on Japan and U.S. markets

- **Japan** : Wins reimbursement in Japan (Since Jan 15<sup>th</sup> '24)  
1st **PMDA approval in S. Korea** + Japan's health authority (MHLW) decides to give insurance reimbursement (Since Jun 22<sup>nd</sup> '23)  
VUNO collaborates with Japan's **largest medical data company, M3**
- **U.S.** : **Clinical trial\* with MGH (Massachusetts General Hospital) underway**, currently pre-marketing in the U.S. Office located in Boston  
\* Clinical trial - Expected to be completed in **late '24**

Regulatory Approval



R&D Partners



Regulatory Approval



R&D Partners



1) Added Value of Deep Learning-based Detection System for Multiple Major Findings on Chest Radiographs: A Randomized Crossover Study, Radiology, 2021, Mar.  
2) A Deep Learning-Based CAD that Can Reduce False Negative Reports: A Preliminary Study in Health Screening Center, RSNA 2019

VUNO Med-Fundus AI



AI Screening Solution for Fundus Images / Abnormalities



- Diagnostic support on common ocular diseases based on detection of **12 retinal findings** associated with diagnosis of vision-threatening ocular diseases (e.g DR, Glaucoma, etc)
- Automatically detects the location of macula and optic disc and labels the **8 regions of the fundus**
- Korea's **1st innovative medical device** (Class III)

Accurate & Time-Saving Interpretation Assistance for Fundus Images

- Accurately detects and locates (AUROC = 95% and above) fundus abnormalities.
- Trained on **100,000+ fundus images by 57 Ophthalmologists**
- Increase market penetration through collaboration with **pharmaceutical and biotechnology companies** such as eye care products to target internal medicine / checkup centers

Regulatory Approval



R&D Partners



VUNO Med-BoneAge



Automatic BoneAge Assessment in Hand X-Rays



- Korea's **1st AI Medical Device**
- Provides bone age assessment based on the 3 most likely candidates for bone age results, probability (%) and provides the AI based bone age → **Improved accuracy and efficiency compared to traditional bone age method**
- Improved quality of patient care with comprehensive "Key Growth & Development" report

Deep-Learning Based Instant Bone Age Assessment

- Bone age estimates skeletal maturity, typically based on X-ray of the left hand of a child to assess if their development is within the normal range.
- Evaluates how fast or slowly a child's skeleton is maturing, which it can be used to predict when a child will enter puberty, the child's ultimate height etc.
- Can be used to monitor treatment of kids with conditions that affect growth such as growth hormone levels, genetic growth disorders, orthopedic or orthodontic problems.

Regulatory Approval



R&D Partner



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Solutions that are **Medically Necessary** for your customers



Solutions that are **economically beneficial** to the customer



Solutions that are **effectively communicated** to customers

VUNO's Business Approach

The logo for VUNO, featuring the word "VUNO" in a stylized, white, sans-serif font. The letter "O" is replaced by a circular icon containing a stylized human figure or a similar abstract shape. A registered trademark symbol (®) is located to the upper right of the "O".

# VUNO®

The VUNO logo, consisting of the word "VUNO" in a stylized, blue, sans-serif font. The letter "O" is replaced by a circular icon containing a stylized human figure or a similar abstract shape.

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