Actionable Geolocation Intelligence and Smart Sensing Solution

PEOPLE AND TECHNOLOGY

Healthcare Digital Transformation through IoT and AI

IndoorPlus+ SmartCare IoT Healthcare Solutions

Mental Hospital Case Study

People & Technology

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Context

THE PROBLEM

- Mentally ill patients require continuous observation and treatment due to the unstable nature of the disease and patient's low understanding of dangerous situations.
- Mentally ill patients present a risk of self-harm or harm towards others.

STATUS QUO

- Lack of staff awareness during low activity hours (e.g. : night time)
- Patrol omissions due to busy personnel and repetitive task s
- Impossibility to always watch all patients

OUR SOLUTION

- Use sensing data to prevent abnormal behaviors and ensure quick response to dangerous situations
- Use of wearables to track pat ients and personnel locations at all times and prevent exit of safety zones
- Use location capabilities to e nsure complete and non-red undant patrol routes

Reference

YONGIN SEVERANCE HOSPITAL

- Yongin Mental Hospital is ranked among the biggest mental illness inpatient hospitals in South Korea and the only one to be recognized with digital and smart clinical know-how and experience.
- Project deployments :
  - First phase in 2021 – Smart patrol
  - Second phase in 2023 – Patient vital signs and abnormal behavior monitoring

2414	25	21,348	~500
Beds	Wards	m^2 floorspace	Staff

Situation in Korea in 2019

1,839	78,739	65,436
Mental health institutions	Beds	Hospital admissions

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Scope of work

Smart Patrol Monitoring system

#Security Compliance

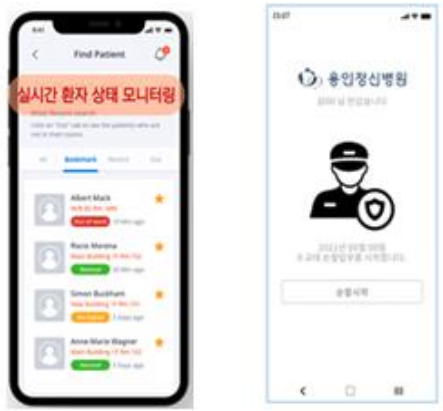
Purpose : Enable accurate indoor positioning using multiple sources including sensors, geomagnetic footprint and beacons.

Features :

- Record patrol routes and times automatically
- Electronically record key elements to be checked during patrol

Goals :

- Prevent patrol route de viations
- Prevent patrol omission s
- Prevent intentional dep arture from patrol rout e



Abnormal behavior monitoring

#Patient Safety

Purpose : Create a safe treatment environment for mentally ill patients through the collection and analysis of vital signs data and activity patterns.

Features :

- Continuous vital signs monitoring (heart rate, etc.)
- Continuous location-based activity indicators monitoring

Goals :

- Detection of abnormal beh aviors
- Confirmation of abnormal b ehavior monitoring through staff
- Early danger signs detectio n and response
- 20% reduction of patient's pain levels

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Smart patrol

Facility safety check in vulnerable time
(Fire, etc.)

보호사의 동선 위치 기반
순찰 자체 누락 및 경유지 누락 방지

Record key checkpoints

Electronic patrol log

Automate records with patrol application

Closed Inpatient Ward Smart Patrol Monitoring System

Unusual and emergency reporting

Mental Health Doctors

Faint | Sleep Disorder | Immobile | Anxiety | Delirium

Patient health check in vulnerable time

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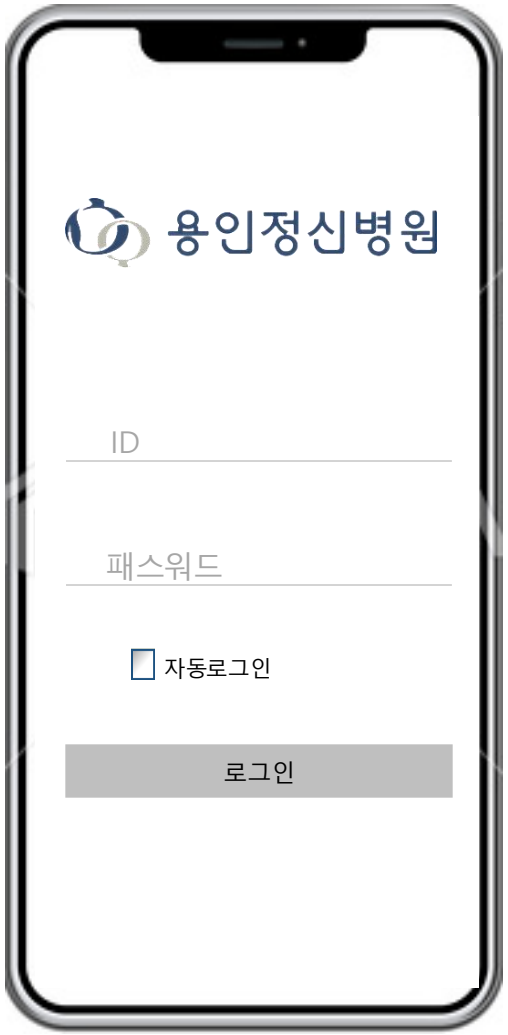
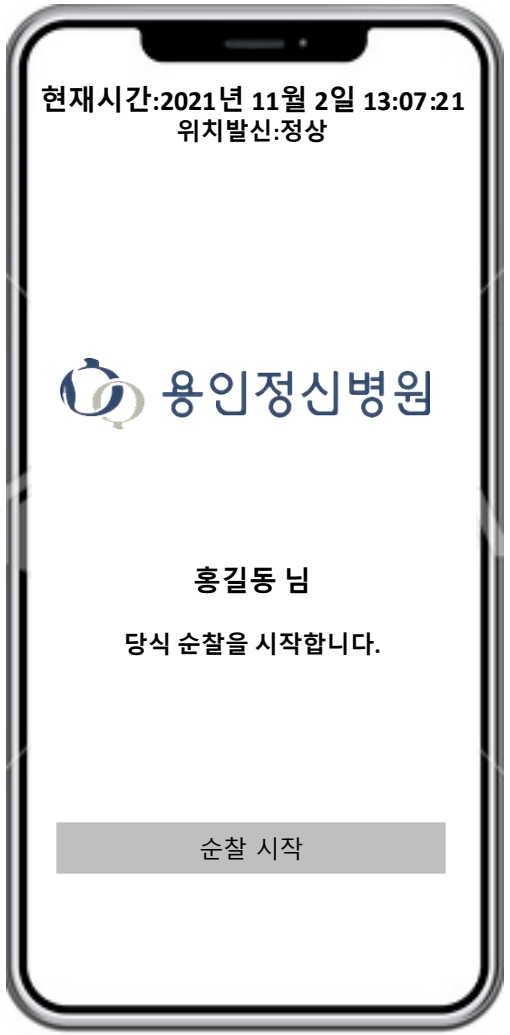
Smart patrol

Registration of Patrol management plan system	Unusual matters reporting	Patrol execution based on movement route location
• Register plans for patrol targets, patrol routes and patrol times • Register management plans for multiple patrol teams • Register key items to check during the patrol	• Guidance for patients wandering at night • Check safety facilities • Check usual behaviors among patients sleeping at night • Report unusual issues depending on item severity	• Notify patrol teams to start patrol at predetermined times • Record patrol team's location-based movements • Notify when the patrol team deviates or exits from patrol route

Smart patrol - Screens overview

- Personal login for patrol team individual
- Real time and location display
- Notification for patrol start





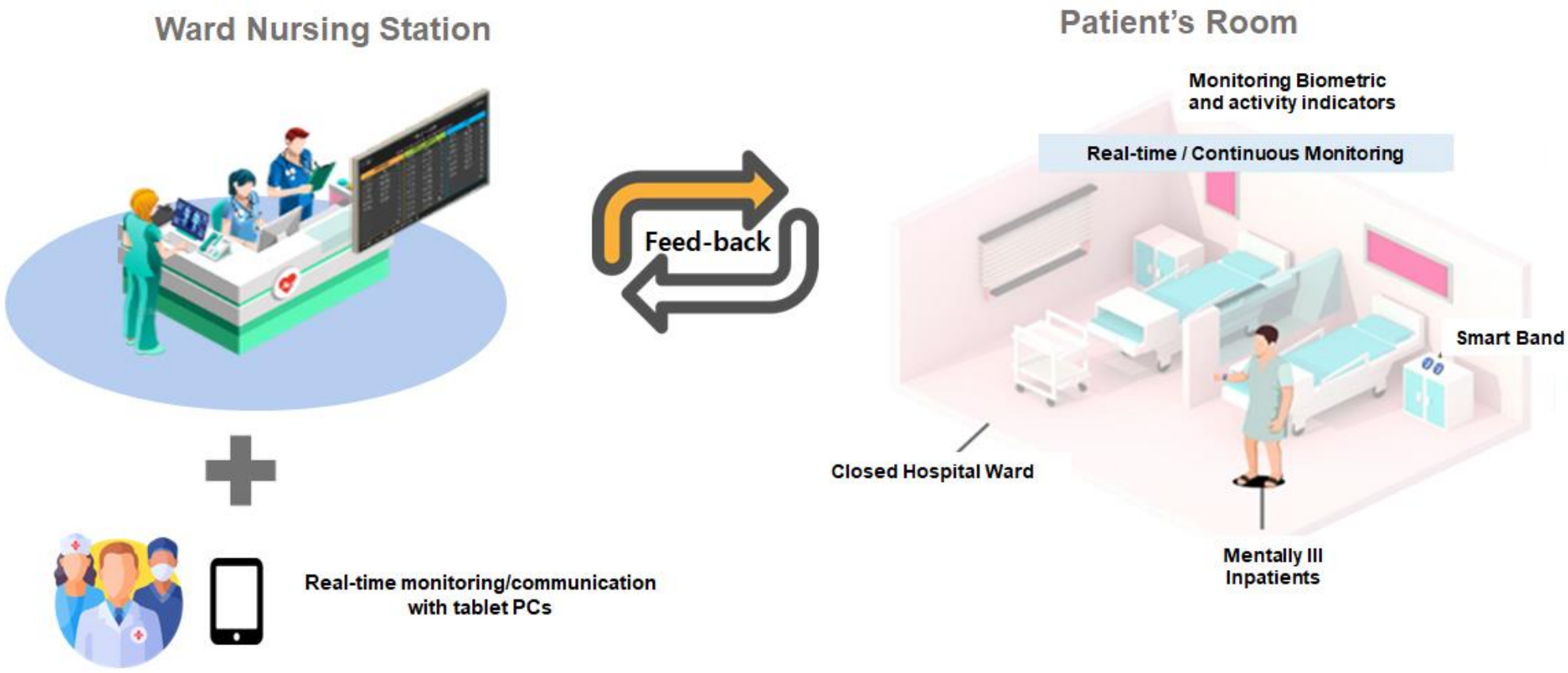
Smart patrol - Screens overview

- List of the rooms to check and check completion status
- Visual map of the corresponding rooms assigned to the patrol personel
- Real-time display of the patrol route taken by the selected personel
- Ensurance that a room is controlled only once by one person

Smart patrol - Screens overview

- The patrol staff confirms the completion of check items by clicking on them
- Checked items are highlighted on the screen

Abnormal behavior monitoring



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Abnormal behavior monitoring

- Patients are required to wear a wearable device (e.g. wrist band) to collect the relevant data
- While beacons are a cheap alternative for real time location, smart bands allow for additional vital signs collection.

The outdoor walks used to require the patient to have a walk card.

Now the patients only need to scan the QR code on their bands to go for their walk time.

Beacon

Smart band

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Non-removable smart band

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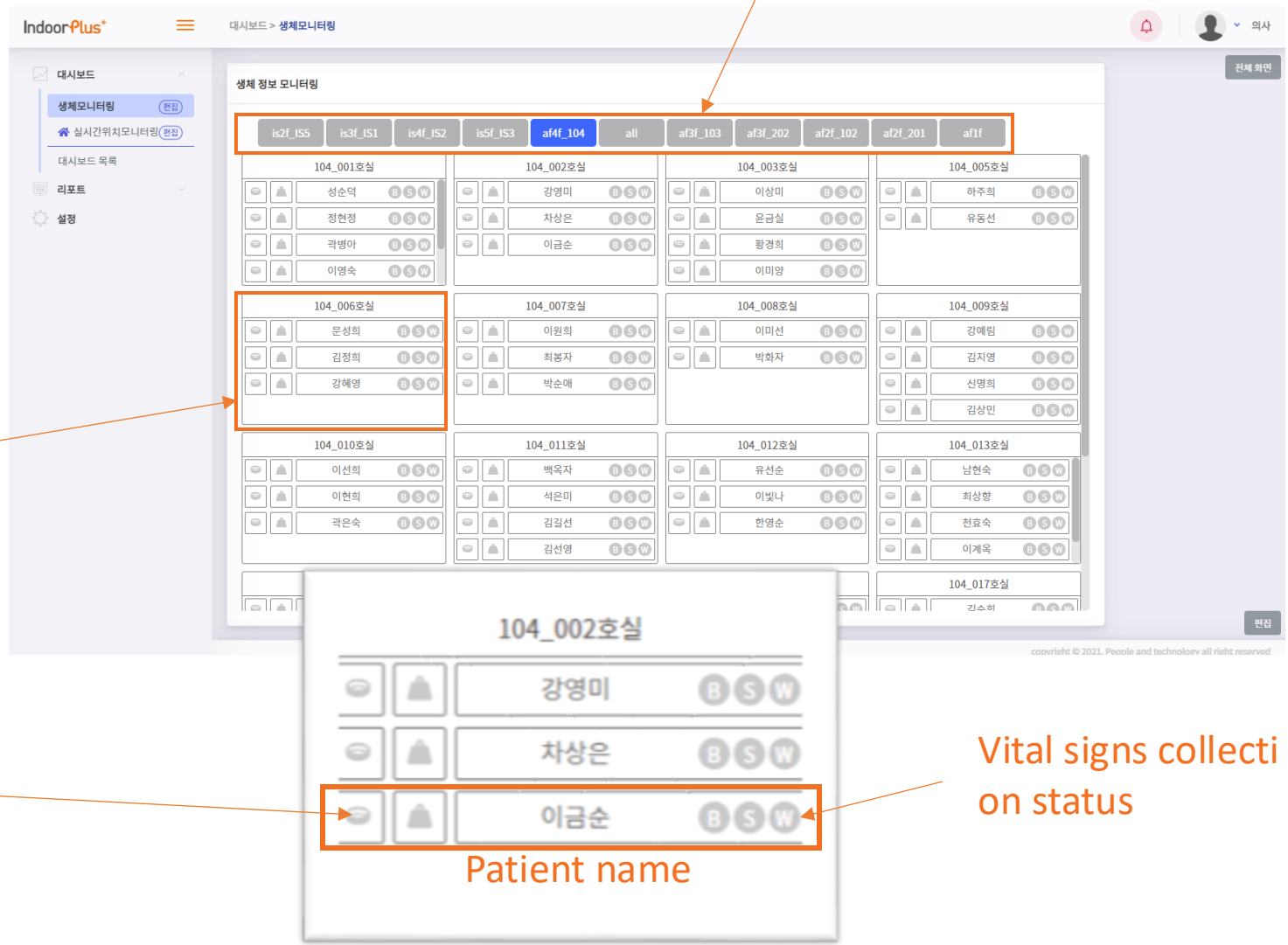
Abnormal behavior monitoring

- The nurse can check all patient statuses in all rooms in each ward.
- Clicking on a patient's name displays all patient's information and details of rec orded vital signs



Abnormal behavior monitoring

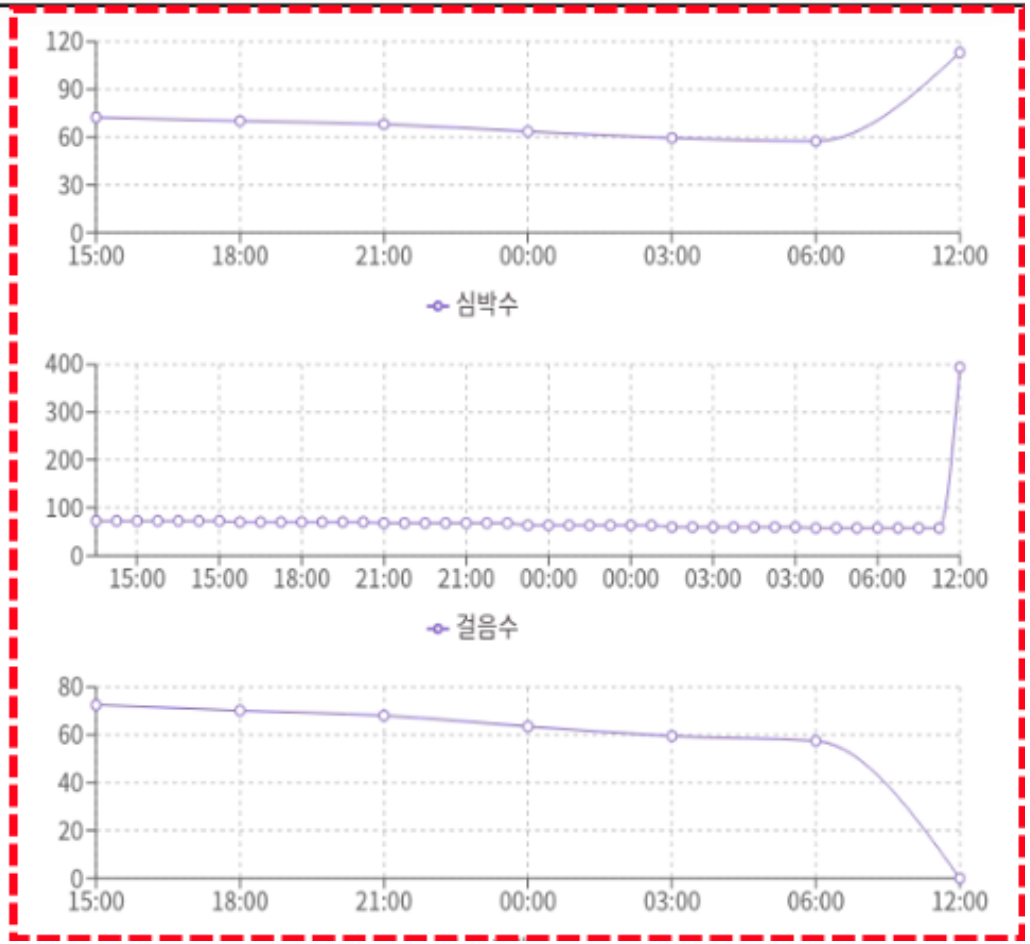
- Patient's information :
  - Name
  - Sex
  - Age
  - Height
  - Weight
  - Current heart rate
  - Today's step count
  - Last night's sleep time
  - Room number
  - Bed ID

- Vital signs Records :
  - Heart rate
  - Step count
  - Sleep time

Patient's informations

- 이름 PWB400_CD4D
- 성별 여성
- 나이
- 키
- 몸무게
- 심박수
- 걸음수 394
- 수면시간
- 병실 002
- 침상

Vital signs status



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