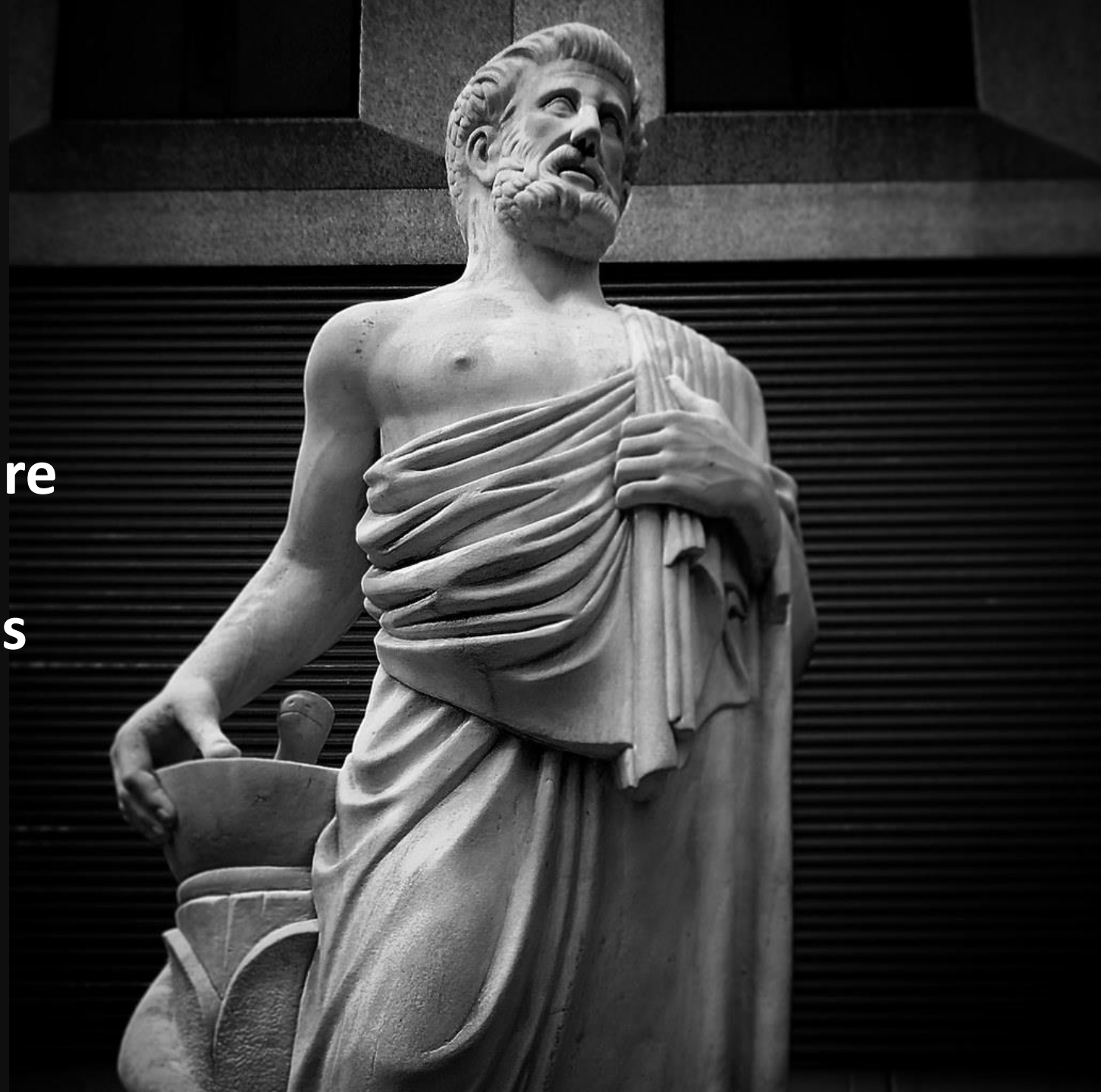
健康長壽之人工智慧創新發展

陳亮恭

臺北市立關渡醫院（北榮經營）院長

國立陽明交通大學醫學系特聘教授

The goal of medicine is to cure diseases when possible, to relieve suffering when cure is not possible, and to comfort the patient throughout the course of illness.




生物
醫學

數位科技

手工業與科技業的協作

The Economist

醫療病床 179

一般病床 (112)

- 急性病床：45
- 慢性病床：67

特殊病床 (67)

- 急診觀察床：3
- 加護病房：3
- 血液透析病床：19
- 慢性呼吸照護：32
- 安寧緩和照護：10

長照相關 (142)

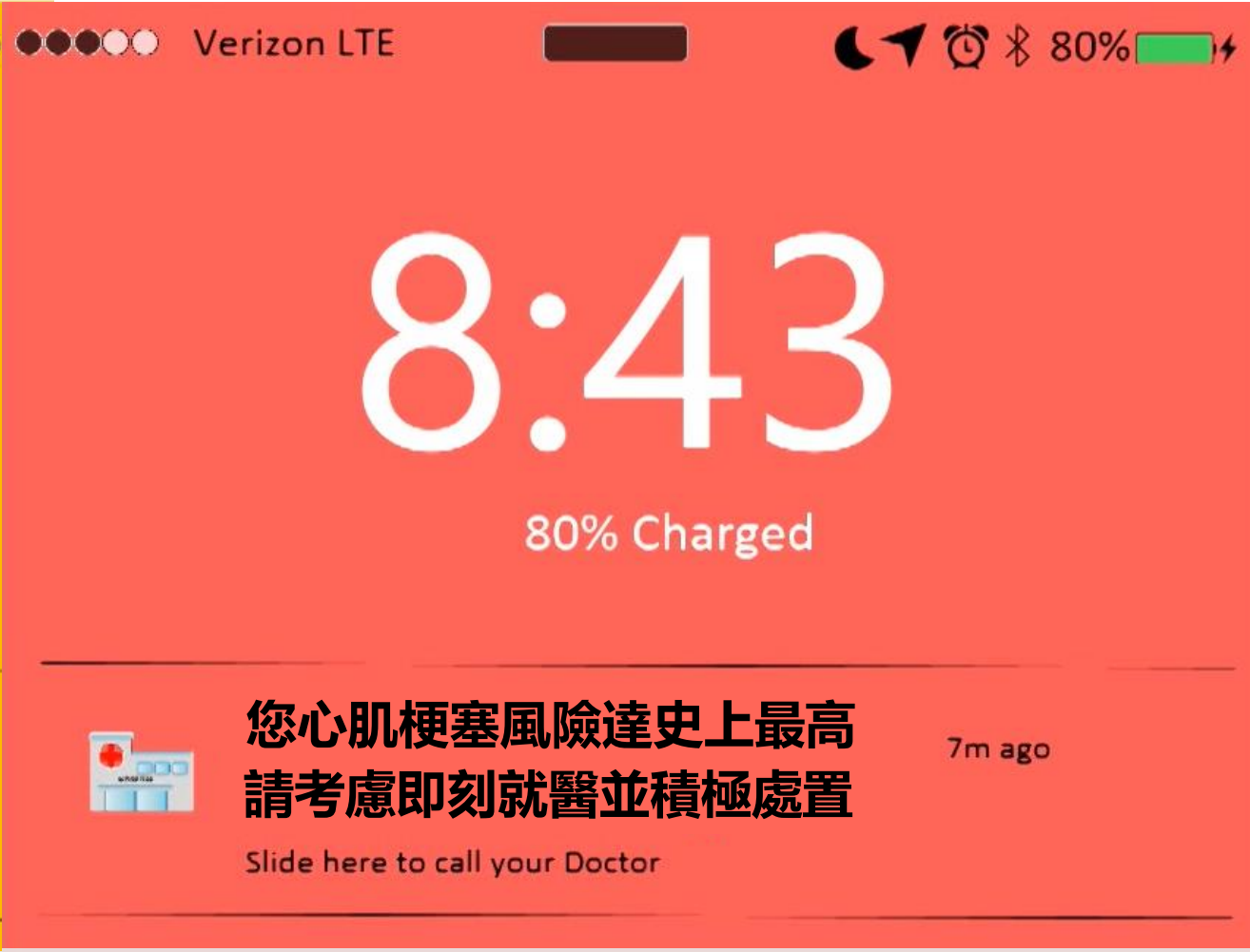
- 精神科日間：50
- 護理之家：92

總床數 321

MAKING DATA-DRIVEN DECISIONS

生物醫學數據通知
經由過去行為資料進行建議

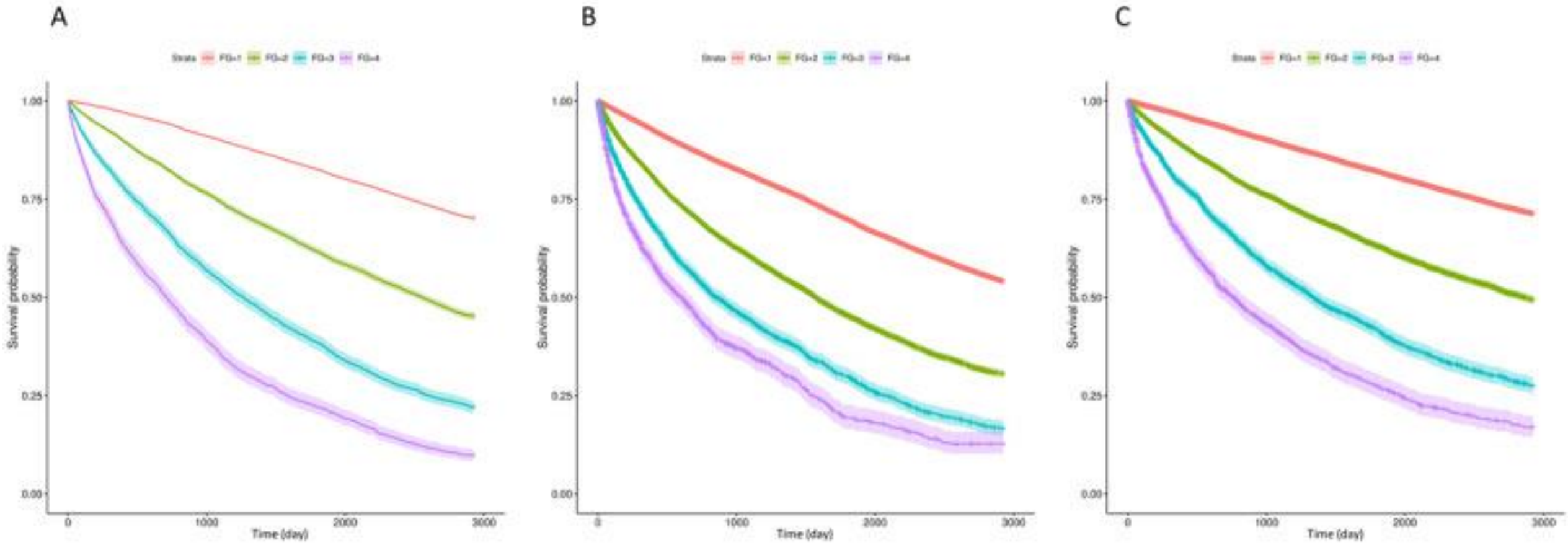
生物醫學數據通知
經由過去行為資料進行建議



生物醫學與行為數據通知
個人化健康風險預測與通知

生物醫學與行為數據通知
個人化健康風險預測與通知

機器學習建置死亡、住院、重症與死亡預測



Peng LN, et al. J Med Internet Res 2022;22:e16213

Table 2. Hazard ratios of all-cause mortality, unplanned hospitalizations, and intensive care unit admissions for the ML-mFI and the mFI at the 1-, 5- and 8-year follow-up periods.[a,b,c] All values are given as hazard ratio (95% CI).

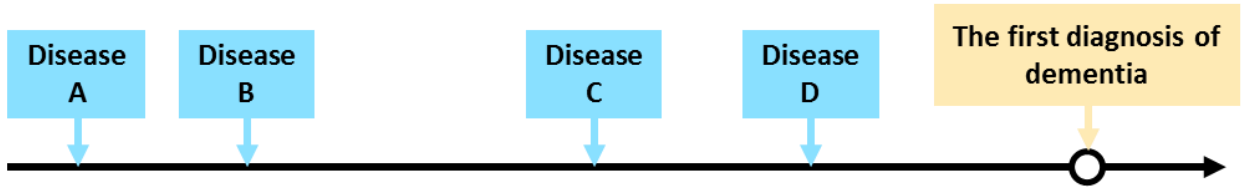
Adverse outcomes at follow-up periods	Mild frailty		Moderate frailty		Severe frailty	
	mFI (n=14,244)	ML-mFI (n=9366)	mFI (n=4741)	ML-mFI (n=2522)	mFI (n=2498)	ML-mFI (n=1488)
1-year all-cause mortality HR[d]						
Unadjusted	2.21 (2.04-2.39)	3.66 (3.38-3.97)	4.09 (3.72-4.50)	8.81 (8.00-9.71)	7.52 (6.81-8.30)	16.62 (15.08-18.32)
Adjusted	1.86 (1.71-2.01)	3.13 (2.89-3.39)	3.08 (2.80-3.39)	6.79 (6.15-7.49)	4.97 (4.49-5.50)	11.40 (10.32-12.59)
5-year all-cause mortality HR						
Unadjusted	1.76 (1.70-1.82)	2.57 (2.48-2.67)	2.85 (2.72-2.99)	5.27 (5.00-5.55)	5.00 (4.74-5.28)	9.02 (8.49-9.58)
Adjusted	1.46 (1.41-1.52)	2.19 (2.11-2.27)	2.14 (2.04-2.25)	4.04 (3.83-4.26)	3.28 (3.11-3.46)	6.15 (5.79-6.54)
8-year all-cause mortality HR						
Unadjusted	1.69 (1.64-1.74)	2.32 (2.25-2.39)	2.65 (2.55-2.76)	4.72 (4.54-4.94)	4.50 (4.29-4.71)	8.05 (7.61-8.51)
Adjusted	1.41 (1.37-1.45)	1.99 (1.93-2.05)	2.01 (1.93-2.09)	3.70 (3.53-3.88)	2.98 (2.84-3.12)	5.52 (5.22-5.84)
1-year unplanned hospitalization HR						
Unadjusted	2.08 (1.97-2.20)	2.86 (2.70-3.02)	3.30 (3.07-3.54)	5.21 (4.82-5.64)	5.29 (4.88-5.73)	7.65 (6.99-8.38)
Adjusted	1.91 (1.80-2.01)	2.63 (2.49-2.79)	2.85 (2.65-3.06)	4.53 (4.18-4.90)	4.28 (3.94-4.64)	6.20 (5.66-6.80)
5-year unplanned hospitalization HR						
Unadjusted	1.78 (1.73-1.83)	2.28 (2.21-2.36)	2.51 (2.40-2.62)	3.79 (3.59-4.00)	3.85 (3.65-4.06)	5.43 (5.07-5.83)
Adjusted	1.61 (1.57-1.66)	2.09 (2.02-2.16)	2.14 (2.05-2.24)	3.23 (3.06-3.41)	3.05 (2.89-3.23)	4.33 (4.04-4.65)
8-year unplanned hospitalization HR						
Unadjusted	1.67 (1.63-1.71)	2.11 (2.05-2.17)	2.32 (2.24-2.41)	3.53 (3.36-3.71)	3.53 (3.36-3.71)	5.03 (4.69-5.38)
Adjusted	1.51 (1.48-1.55)	1.93 (1.87-1.99)	1.98 (1.91-2.06)	3.01 (2.86-3.17)	2.79 (2.65-2.94)	3.98 (3.72-4.27)

Peng LN, et al. J Med Internet Res 2022;22:e16213

個人慢性疾病就診模式精準測失智症發病風險

Step 1: identify all of the incident disease diagnosed before dementia in each dementia patient in training data

For example



Step 2: constructing possible triplet disease pathway according to the diagnosis date (each pathway has three disease)

For example

Disease A → Disease B → Disease C → Disease D

Possible triplet disease pathway

A → B → C	A → C → D
A → B → D	B → C → D

Step 3: summarizing all possible triplet disease pathway among all of dementia patients in training data

Possible triplet disease pathway in patient 1

A → B → C	A → C → D
A → B → D	B → C → D

Possible triplet disease pathway in patient 2

A → B → E	A → E → F
A → B → F	B → E → F

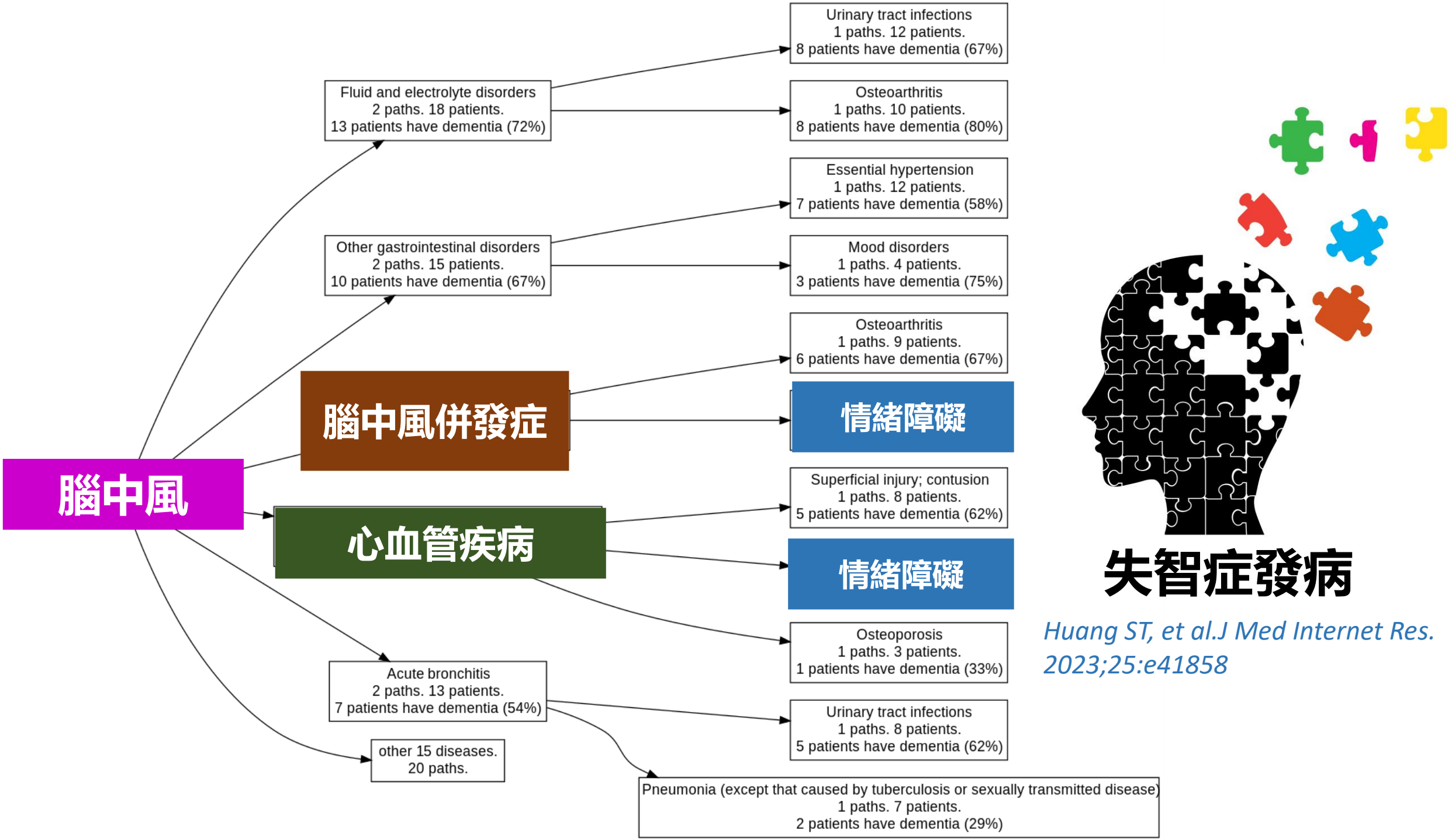
⋮

Possible triplet disease pathway in patient N

H → B → C	H → C → E
H → B → E	B → C → E

All possible triplet disease pathway among dementia patients in training data

A → B → C	A → C → D	H → B → C
A → B → D	B → C → D	H → B → E
A → B → E	A → E → F	H → C → E
A → B → F	B → E → F	B → C → E
⋮	⋮	⋮



失智症發病

Huang ST, et al.J Med Internet Res. 2023;25:e41858

個人生活數據
精準健康風險


數位生物指標

www.aging-us.com AGING 2021, Vol. 13, No. 15

Research Paper

Active wearable device utilization improved physical performance and IGF-1 among community-dwelling middle-aged and older adults: a 12-month prospective cohort study

Wei-Ju Lee[1,2], Li-Ning Peng[1,3], Ming-Hsien Lin[1,3], Ching-Hui Loh[1,4], Liang-Kung Chen[1,3,5]

[1]Aging and Health Research Center, National Yang Ming Chiao Tung University, Taipei, Taiwan
[2]Department of Family Medicine, Taipei Veterans General Hospital Yuanshan Branch, Yilan County, Taiwan
[3]Center for Geriatrics and Gerontology, Taipei Veterans General Hospital, Taipei, Taiwan
[4]Center of Health and Aging, Hualien Tzu Chi Hospital Buddhist Tzu Chi Medical Foundation, Hualien County, Taiwan
[5]Superintendent Office, Taipei Municipal Gan-Dau Hospital, Taipei, Taiwan

Correspondence to: Liang-Kung Chen; **email:** lkchen2@vghtpe.gov.tw
Keywords: walking speed, wearable device, average steps, community-dwelling older adults
Received: May 18, 2021 **Accepted:** July 17, 2021 **Published:** August 3, 2021

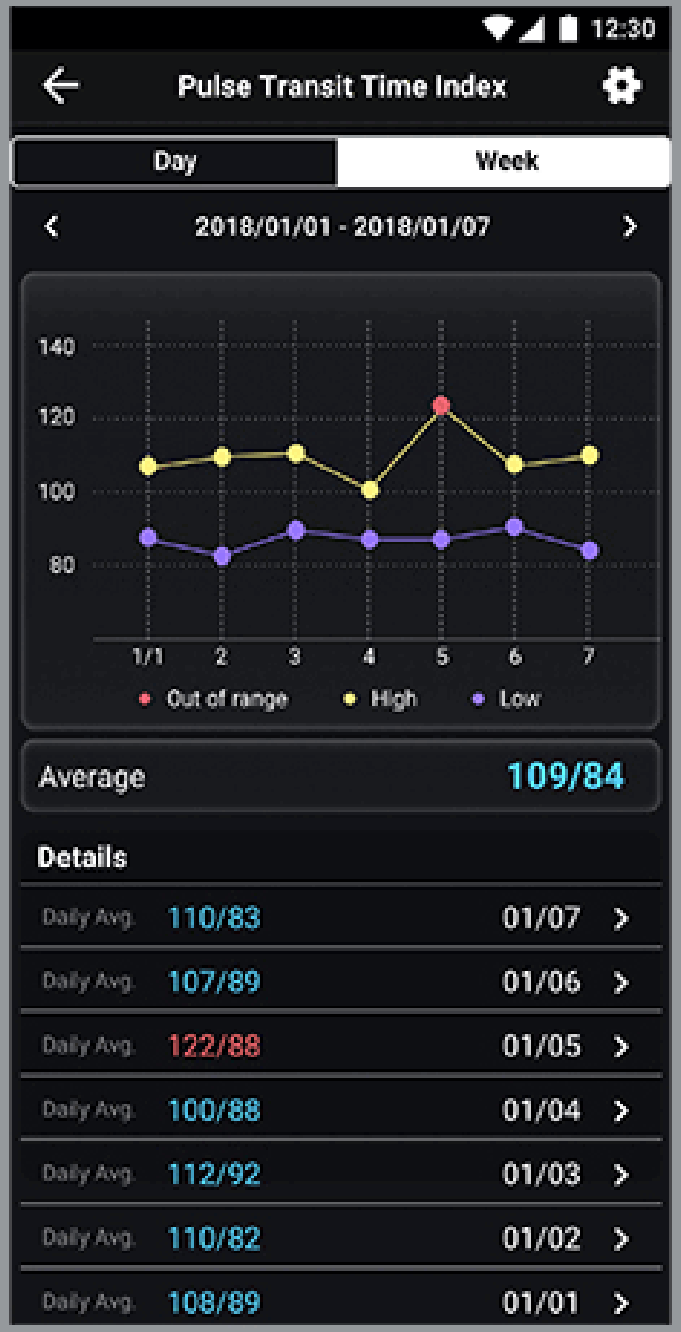
ABSTRACT

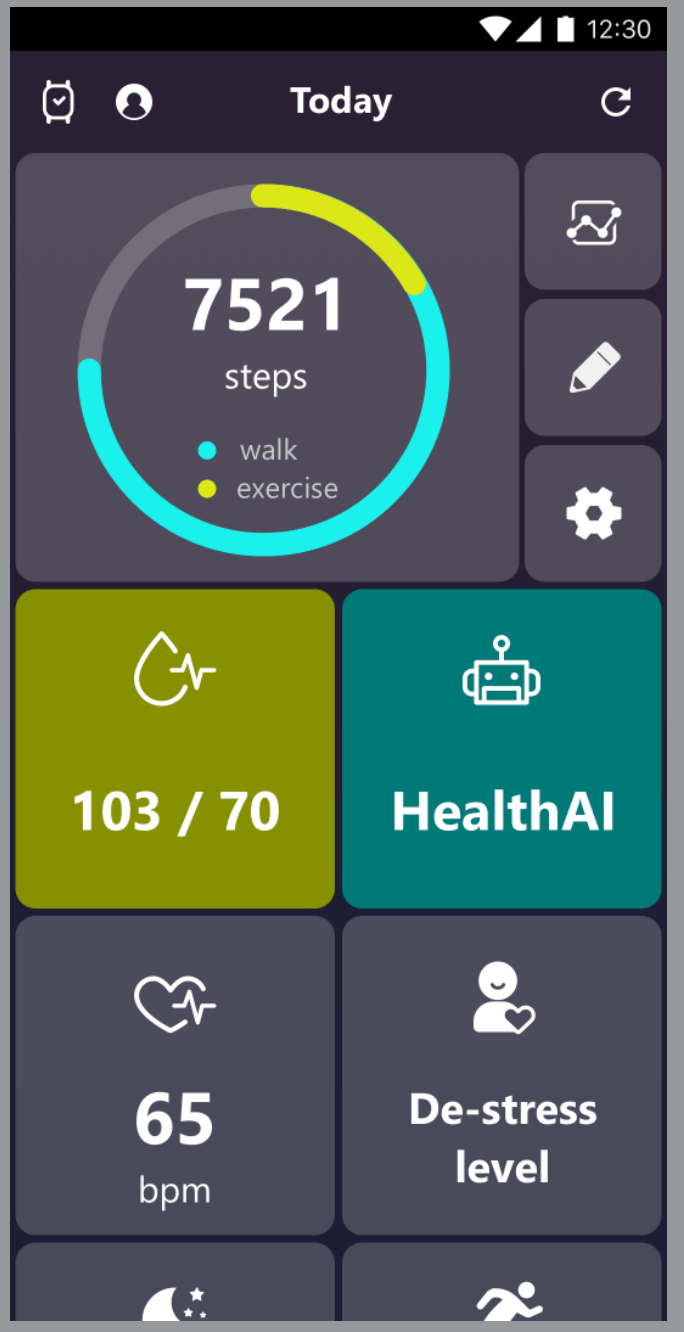
Wearable devices provide real-time and patient-powered data that enable the development of personalized health promotion and management programs. This study aimed to explore the clinical benefits of using the wearable device and to examine associated factors, utilization patterns on health status. 319 community-living adults aged 50-85 years were enrolled and clinically followed for 12 months. Participants were categorized into 3 groups based on the wearable device utilization patterns (active: >30 days of use, non-active: <3 days of use, usual: 3-30 days of use). 128 (40.1%) and 98(30.7%) were active and usual wearable device users, and no significant differences in the baseline demographic characteristics and functional status were noted across groups. Higher cognitive performance was significantly associated with the wearable device use (OR: 1.3,95%CI: 1.1-1.5, p=0.005). Multivariable linear regression showed that 0.16 m/s increase in walking speed among active users, which was significantly higher than non-active users (p=0.034). Compared to usual users, active users had higher average daily, weekday, and holiday step counts. The walking speed increased for 0.03 m/s when participants walked 1,000 more daily step counts (p=0.020). Active use of wearable devices substantially increased walking speed, which suggested better functional outcomes and survival benefits in the future.

INTRODUCTION

Advanced development of internet telecommunication technologies (ICT) enables clinicians and healthcare professionals to collect real-time information through wearable biosensors that further changes healthcare services and healthy lifestyles. The integration of electronic health records and wearable devices may overwhelmingly modify the disease diagnosis, treatment and care management of clinical conditions. The World Health Organization's Global Observatory recognized the roles of mobile devices in supporting medical and public health practice to collect health data, to support diagnosis, to monitor progress, and to promote health promotion [1]. The advantage of real-time and person-powered data nature of wearable devices promotes integration of daily lifestyle conditions in disease diagnosis, health promotion, and personalized care planning that echoes the concepts of precision medicine [2, 3].

Although a great variety of parameters have been developed to measure health, the usual walking speed is a well-established and widely-recognized biomarker to





Chen LY, et al. Aging (Albany NY). 2022;14(3):1280-1291

Umeda-Kameyama Y, et al. Aging (Albany NY). 2021;13(2):1765-1772.

ASUS 國立陽明交通大學 NATIONAL YANG MING CHIAO TUNG UNIVERSITY 臺北市立關渡醫院 委託臺北榮民總醫院經營

iHARP

Healthy Aging & Rejuvenation Platform

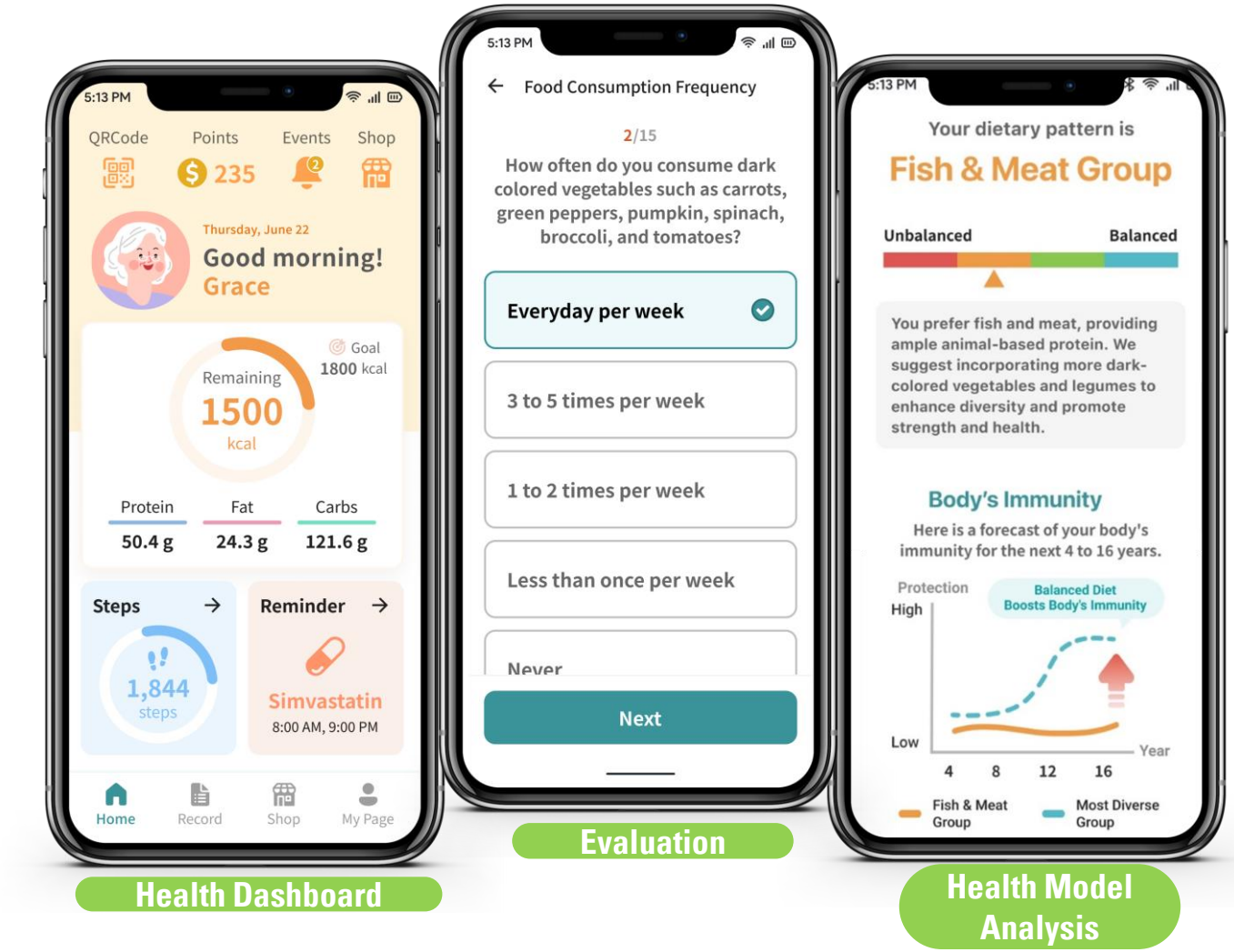
intelligent innovative individual

Healthy Aging & Rejuvenation Platform

ASUS Personal Healthcare

- Unleash your potential for a vibrant life with our empowering health app!-

1. Track Health Data with Personalized Assessments
2. AI recommendations for specified health concerns
3. Convenient Access to Daily Shopping Needs
4. Seamless Integration with Community and Medical Center Systems



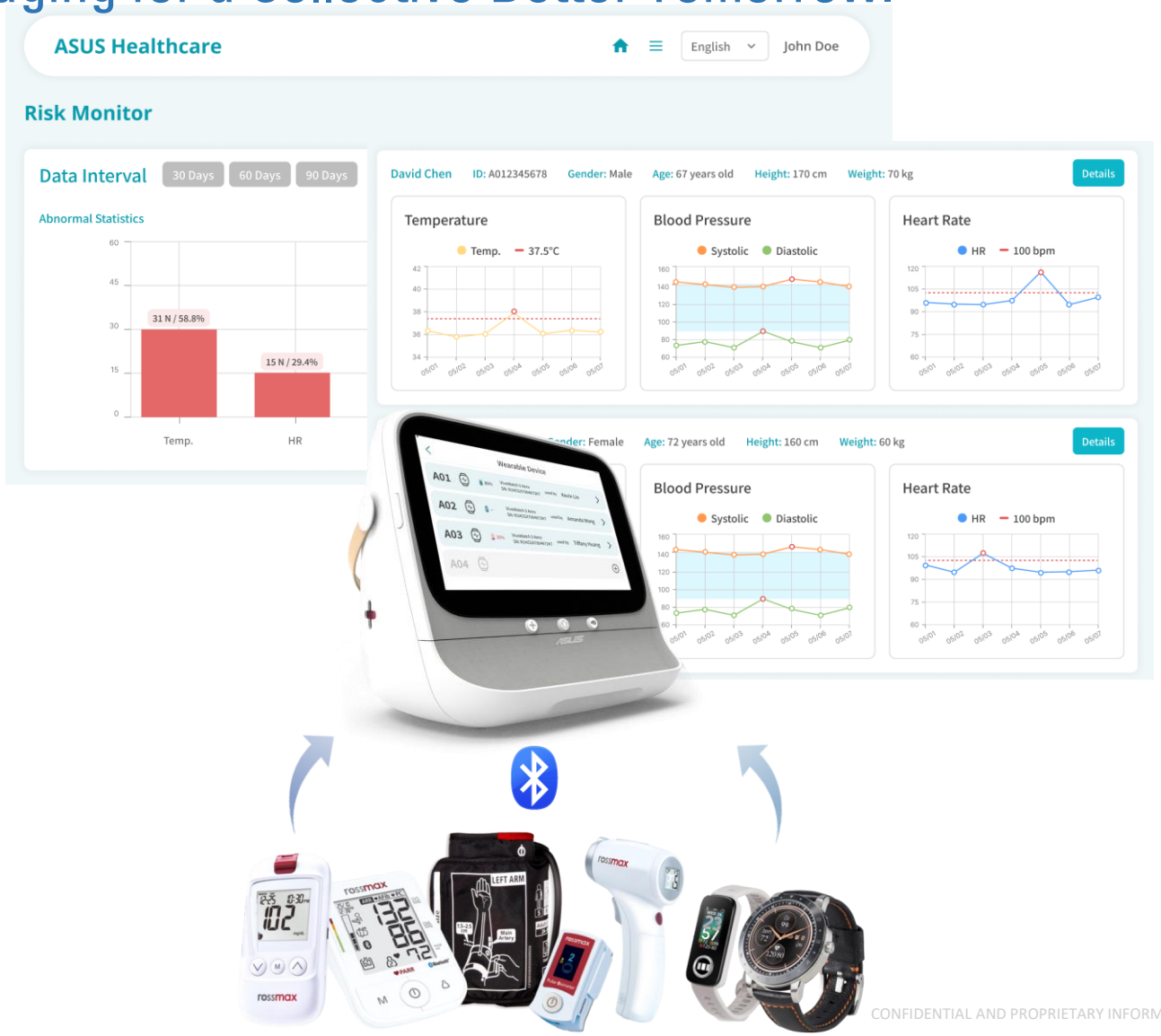
ASUS Home & Community Healthcare

Tracking, Detecting, and Managing for a Collective Better Tomorrow.

1. Rapid synchronization of measurement instrument data.

2. In addition to vital signs, activity records captured by the wristband also included

3. The data backend enables quick filtering of elderly with anomalies.

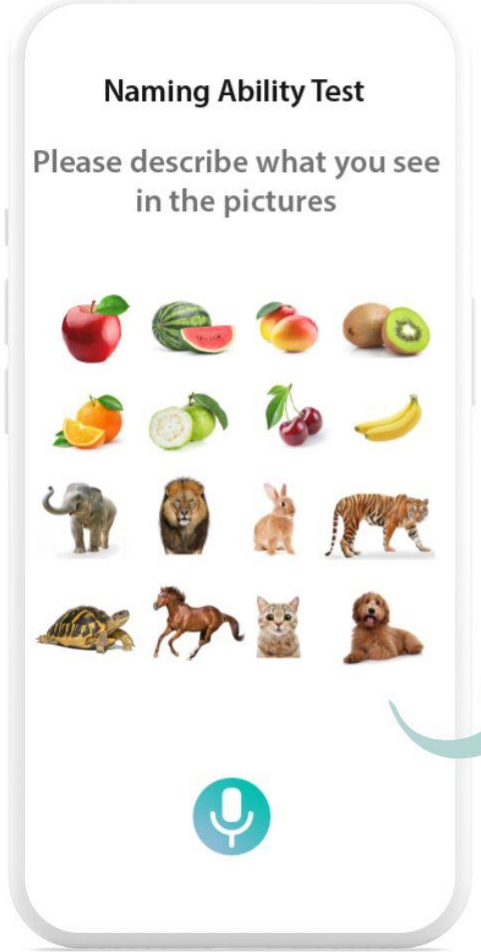


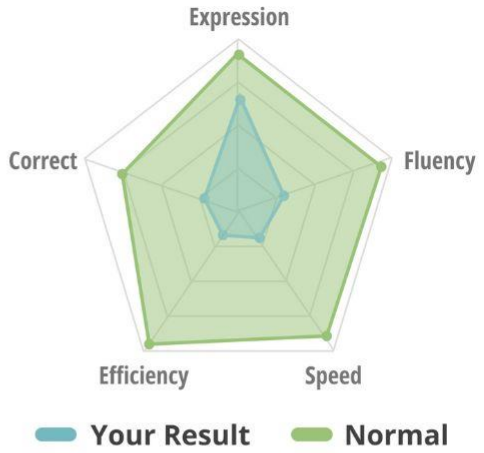
AI Cognitive Assessment

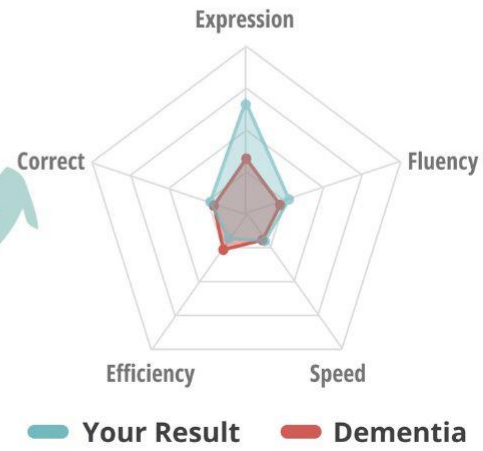
- Early Detection for Cognitive Well-being with AI-

1. Identify subtle differences and detect early signs of cognitive decline.

2. Multifactorial numerical results for easy tracking and comparison.







Cloud-Based Health Information

- Early Detection for Cognitive Well-being with AI-

1. Could-abased platform applying SaaS HIS for system operation

2. Linking various health data from personal, community and hospital levels for further computation

3. Personalized health care plans using longitudinal data with real-time recommendations

Interactive Social Robot – Zenbo Jr

- Connecting Personal Life to Healthy Longevity-

Continuous Health Management

Vital Sign Measurements

Health Questionnaires

Health Education

Zenbo Junior


數位轉型目的非炫技，而
是整合數位科技精準提升
品質與效能之全方位策略


永續發展
健康宜居