

穿戴裝置與智慧醫療發展

Han Wen Guo 2022.03.28



FocalTech Smart Sensors 敦捷光電

Normal Internal Use Confidential Restricted Confidential

Looking for the Healthy Smart Life

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專長

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敦捷光電 追求健康的智慧生活



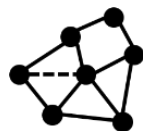
RhythmCam



愛心鏡心律不整篩檢APP

- 心率偵測
- 心律分析

衛部醫器製字第007323號



先進演算法
技術

FocalTech
SMART SENSORS



智慧雲端
平台



新穎生理量測
設計



VITOM多功能生理參數裝置

- 心率
- 血壓
- 心律分析
- 血氧



outline



穿戴裝置簡介



醫療穿戴裝置原理與應用



穿戴裝置與智慧醫療目前難題



未來發展趨勢



穿戴裝置與醫療產業交集的商機起飛



全球穿戴裝置投資布局-

- 軟體與應用(程式)開發: 26%。
- 硬體與材料: 15%。
- 健康與醫療照護: 16%。
- 安全與輔助: 13%。
- 運動與健身: 11%。
- 智慧與人性化互動: 9.7%。
- 服飾: 5.3%。

Classroom-Aid.Com 2020

治療/診斷/照護 -> 養生/保健/預防



穿戴裝置於醫療健康上之幫助

Pulse/ EKG
Motion
Orientation
Glucose
Blood Pressure
Oxygen Saturation
....



- 可隨時監控個人的健康
- 具有連續監測與現場監測的功能
- 即時反饋和警報機制
- 提供更高的舒適度和便利性，以及安全性
- 智慧醫療的可能性-疾病預測、AI判讀
- 改變現有的醫療行為



Top companies developing wearable medical devices in US



- 穿戴式醫療裝置占全球穿戴裝置市場的1/5。
- 穿戴式醫療裝置成長率最高。

Wearables in US Healthcare research report from Business Insider Intelligence (2020)



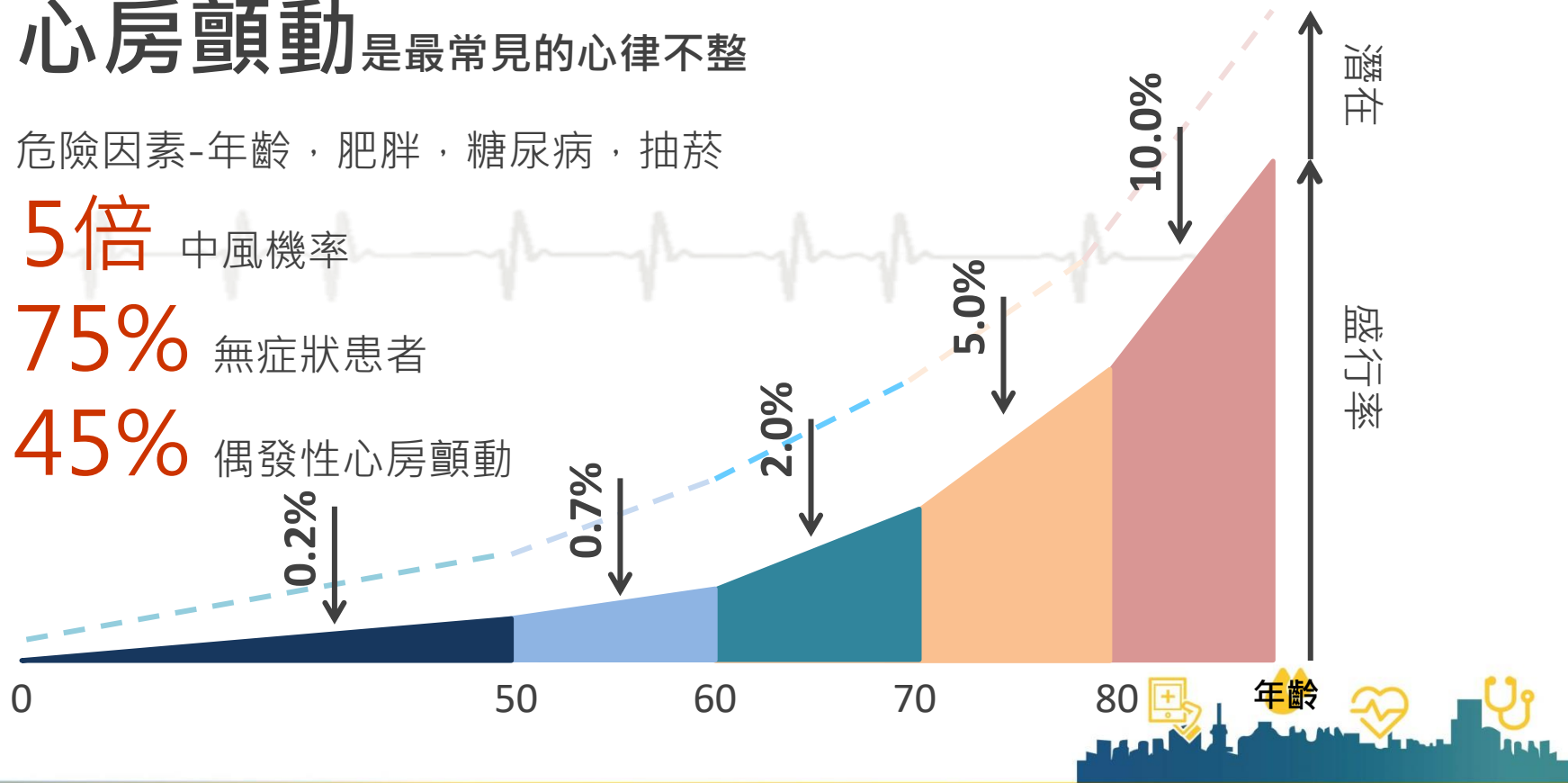
心房顫動是最常見的心律不整

危險因素-年齡，肥胖，糖尿病，抽菸

5倍 中風機率

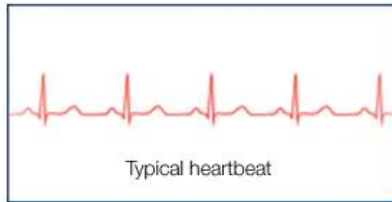
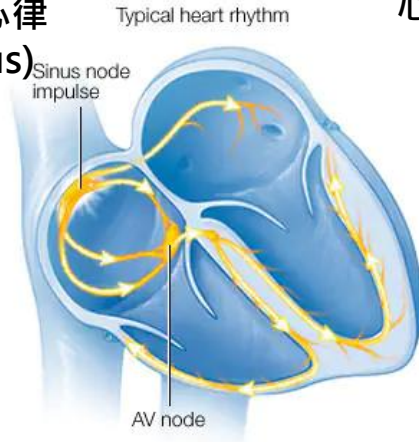
75% 無症狀患者

45% 偶發性心房顫動

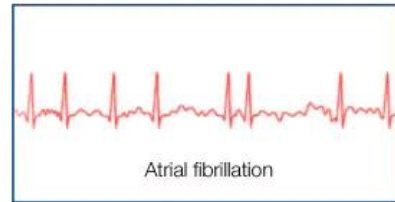
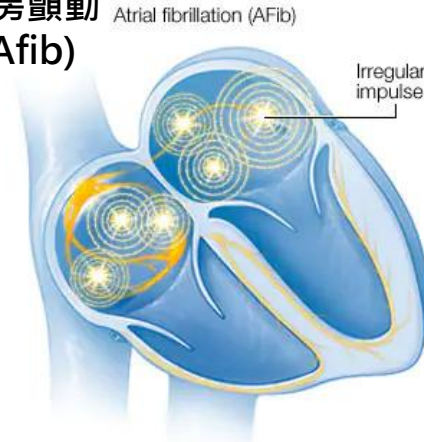


I 心房顫動 (Atrial fibrillation)

正常心律
(Sinus)



心房顫動
(Afib)



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From Mayo Clinic

- 心律不整的一種，特色是心房快速而不規則的跳動。
- 大部分沒症狀，少部分可能會有心悸、昏厥、呼吸困難、胸痛等症狀。
- 心電圖/脈搏表現-心跳間距忽快忽慢。



心房顫動的篩檢工具



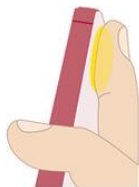
Patient initiated (or medical professional) oscillometric blood pressure cuff



Pulse palpation, auscultation



Patient initiated (or medical professional) intermittent ECG rhythm strip using smartphone or dedicated connectable device



Patient initiated photoplethysmogram on smartphone



Semi-continuous photoplethysmogram on a smartwatch or wearable



Intermittent smartwatch ECG initiated by semi-continuous photoplethysmogram with prompt or symptoms



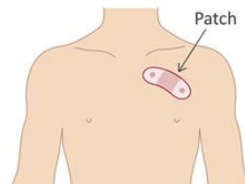
Wearable belts for continuous recordings



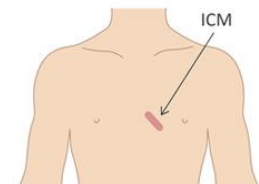
Stroke unit/in-hospital telemetry monitoring



Long-term Holter



1-2 week continuous ECG patches



Implantable cardiac monitors

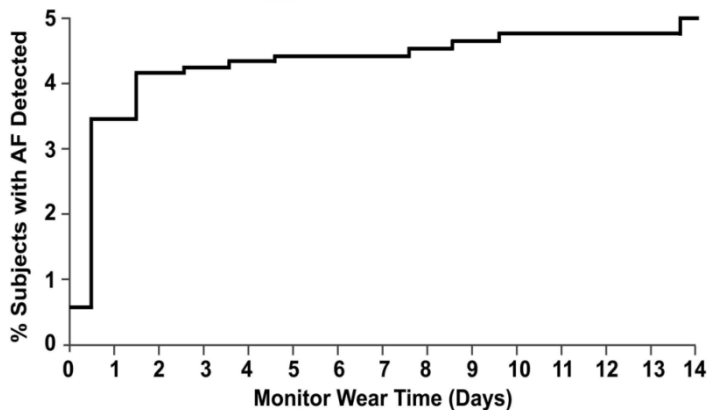


Circulation. 2019;140:1834-1850

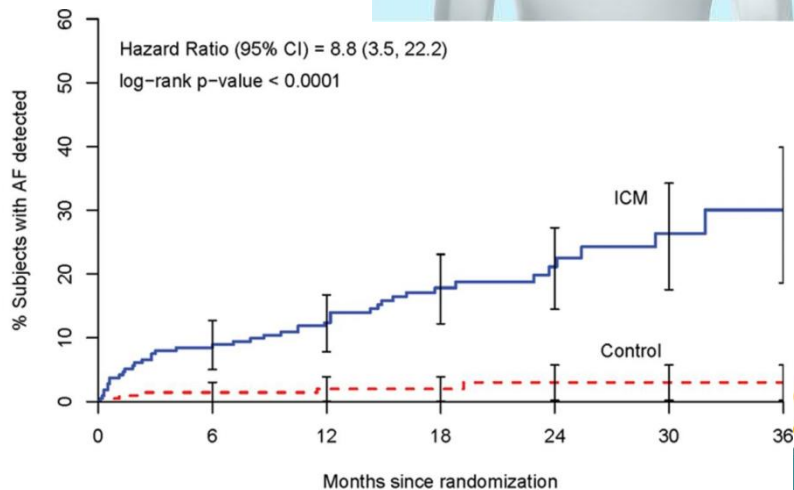
穿戴式ECG裝置監控偶發性心房顫動



- ECG貼片
- 14天不間斷量測 ECG



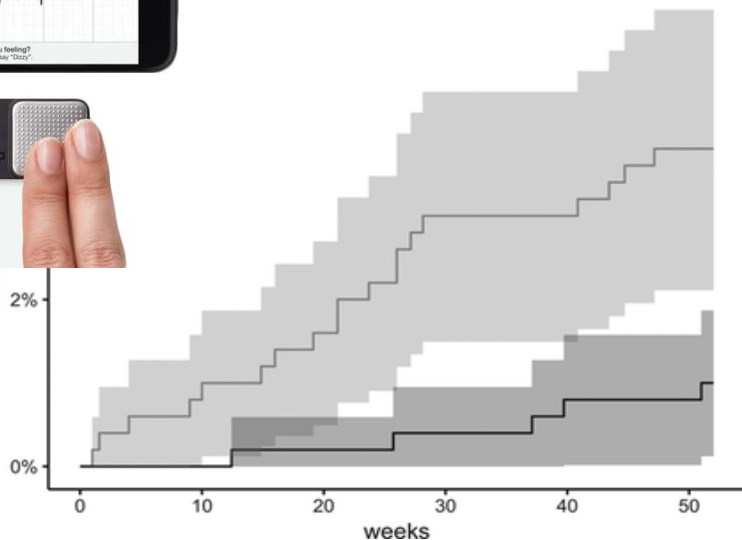
植入式ECG量測裝置
Insertable cardiac monitor(ICM)
監控長達3年



手持式ECG紀錄器篩檢心房顫動



AliveCor®

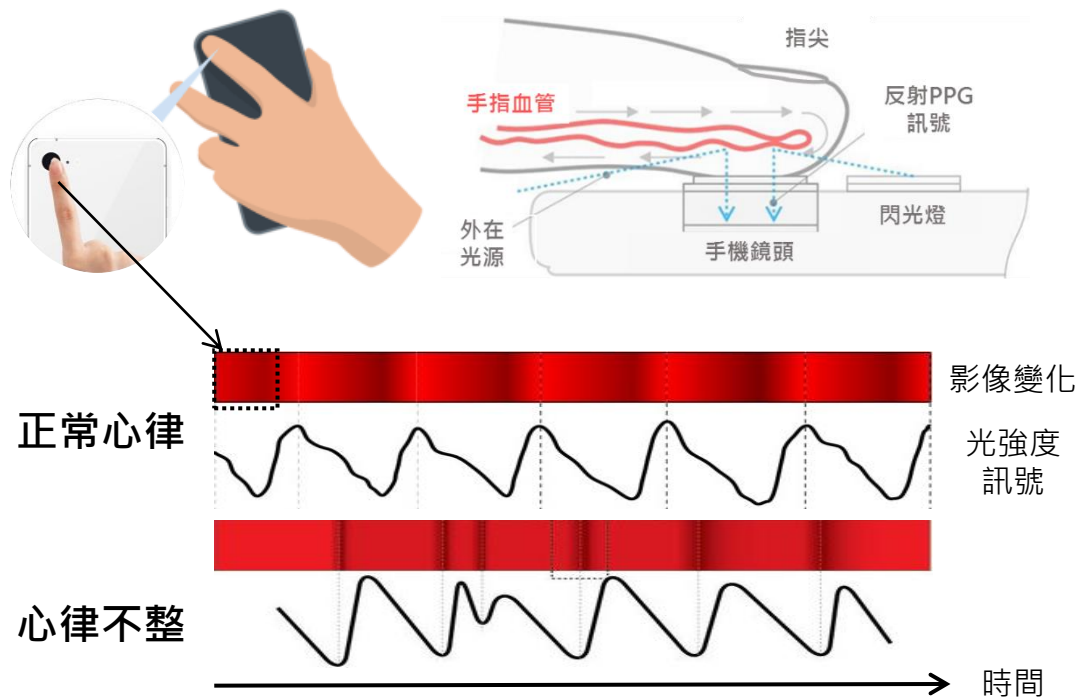


Circulation. 2017;136:1784-1794

- 65歲以上老年人。
- 每周兩次，每次30秒。
- 一年後篩檢出心房顫動提高兩倍以上。



手機鏡頭偵測心律變化介紹



歐洲心臟科協會建議心房顫動初篩工具之一。

88.4%智慧手機高普及率，每天平均使用手機時間近3小時。

最方便使用的心房顫動偵測工具。





RhythmCam

“愛心鏡” 心律分析應用軟體 臺大醫院與敦捷光電合作

#專業級心律不整檢測APP
#一分鐘心律分析 #完整分析報告
#健康小提示 #台大追蹤診斷



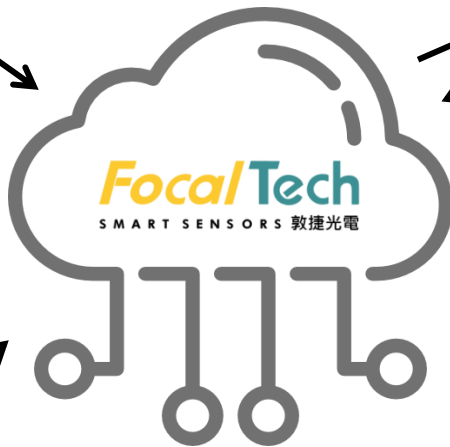
AFib Screening Tool – Rhythm cam



Tele-homecare



Smart Health
Monitoring Platform



Physician Diagnose



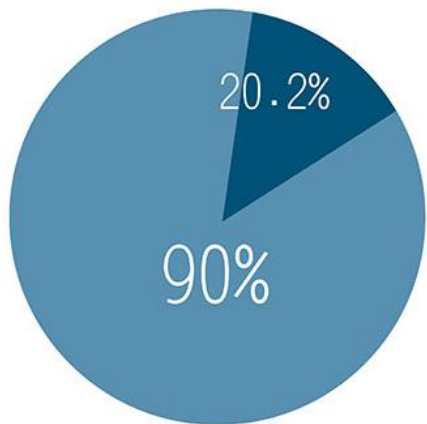
Continuous
Monitoring



Exam & Treatment

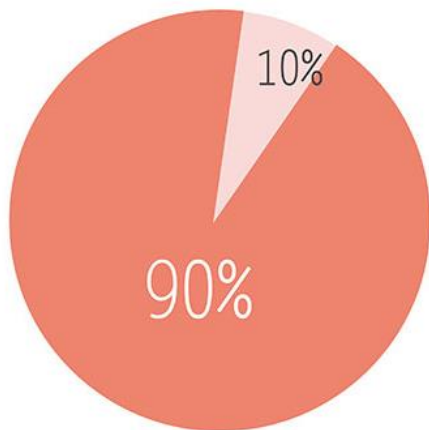


睡眠障礙



睡眠障礙

台灣2千4百萬人口
慢性失眠盛行率佔2成



未接受診斷

在台灣僅有10%病患接受診斷
，而治療的患者更少

睡眠障礙主要原因

1. 疾病
2. 晝夜失調(熬夜)
3. 精神壓力
4. 環境因素

睡眠障礙容易導致**糖尿病**、
高血壓、**肥胖**。



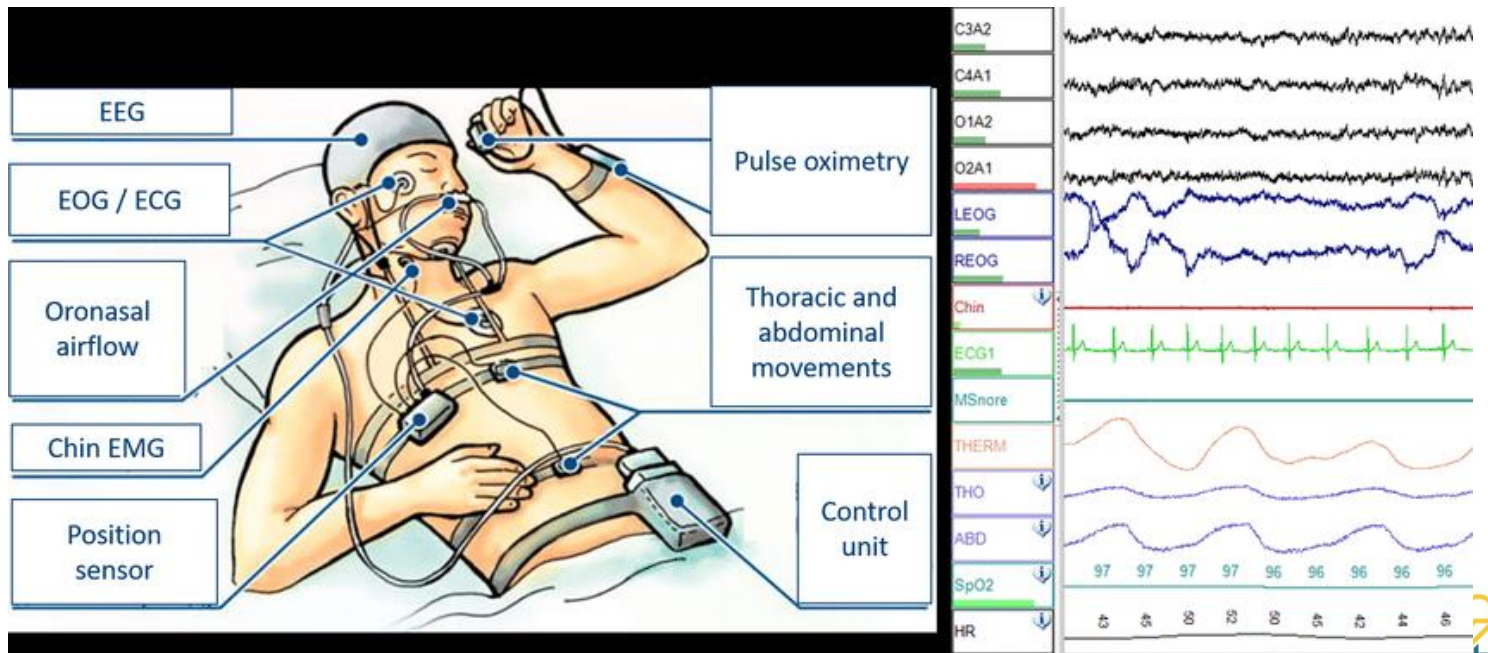
https://www.iskin.com.tw/sleep_01

I 呼吸中止症 (sleep apnea)

- 因呼吸道肌肉鬆弛，容易塌陷而造成阻塞。
- 夜間-打呼，淺眠，呼吸暫停。
- 白天-精神不集中，嗜睡，頭痛，口乾。
- 好發於40歲以上男性，肥胖(BMI>27)。



睡眠多項生理功能檢查 (Polysomnography, PSG)



睡眠狀態偵測的gold standard

DOI:10.3233/978-1-61499-633-0-23

Wearable Sleep Trackers Market



大部分無醫療認證，僅分析睡眠時候的活動量。



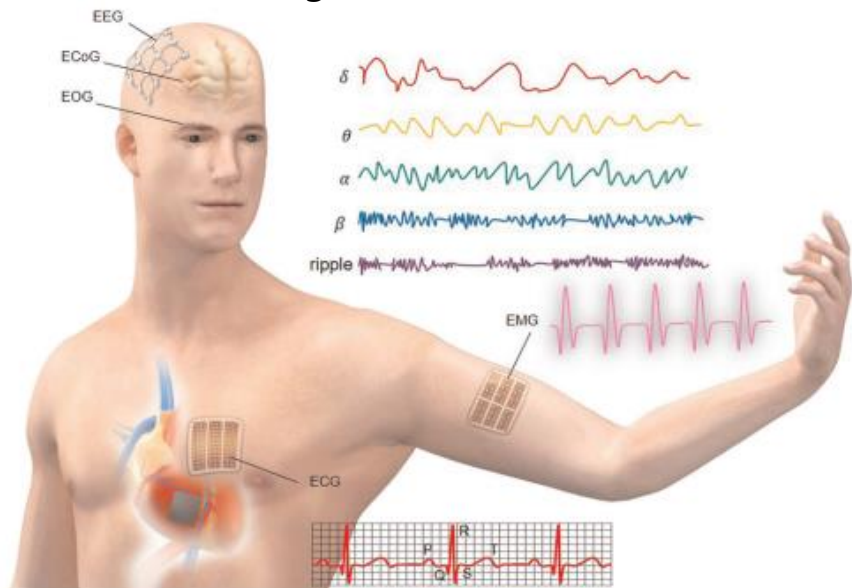
大立雲康-居家睡眠檢測

- 衛福部許可睡眠檢測裝置
- 台灣數十醫療院所採用



未來的穿戴裝置

Flexible inorganic bioelectronics



Tattoo sensor

Dermal tattoo sensors for the detection of blood pH change and metabolite levels

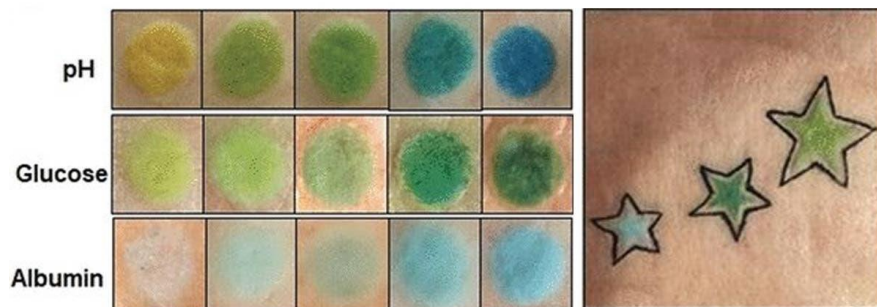


Image by Wiley

Flexible Electronics (2020) 2



穿戴式醫療裝置目前的難題



使用者黏著度

✓ 不見棺材不掉淚



Who pay the bill?

✓ 穿戴裝置的商業模式



醫療法規的限制

✓ 智慧醫療法規



針對強需求族群提升產品功能



VITOM多功能生理參數裝置

- 心率
- 血壓
- 心律分析
- 血氧

More Features!!

針對慢性病患者(強需求族群)提供所需功能

1. 腎臟病族群

- AI判斷透析低血壓發生機率
- 分析動靜脈瘻管堵塞機率

2. 心臟衰竭病患

- 預估心輸出量
- 肺部電阻抗量測-肺積水



心房顫動篩檢及追蹤計畫



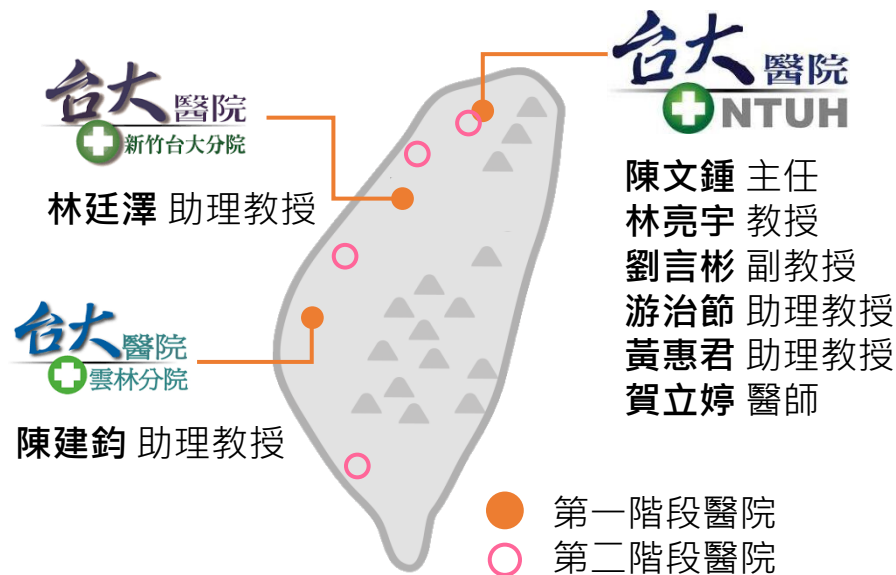
① 心房顫動篩檢

② 心房顫動監測

③ 醫師追蹤診斷

④ 持續追蹤

全民防「顫」 拒絕中風



最大規模心房顫動普篩計畫

- 第一階段 **臺大醫院分院**系統
- ✓ 初步預計篩檢**10-20萬人**
- ✓ 預期心律不整篩出率**+1-2%**
- 第二階段 更多醫院參與(邀請中)
- ✓ 亞東，輔大，長庚，中國醫，義大....

全體國民心律不整篩檢
降低國人中風機率



APPLE Health 軟硬體生態圈

關鍵硬體與軟體集成



Dad 9:23 AM > 1 Alert 3 Changes

Mom 9:36 AM > 2 Changes

Sabine 8:30 AM > No recent changes

Sean 7:59 AM > 1 Alert 1 Change

Share data with loved ones

Fall risk notification

Low Walking Steadiness
Your Walking Steadiness is low and you may have an increased risk of falling in the next 12 months.

Lab Results educational content

Walking Steadiness

Blood Glucose highlights

Health

Lab Results highlights

Sleep widget
TIME ASLEEP
7 hr 58 min

Share data with doctor

Lab Results pinning

Improved cycle tracking predictions with heart rate

Trends
Trending higher for 7 days
5Steps



專注技術開發 提升不可取代性

Prospective blinded evaluation of smartphone-based ECG for differentiation of supraventricular tachycardia from inappropriate sinus tachycardia

Awareness campaigns of atrial fibrillation as an opportunity for early detection by dispensing pharmacists: an international cross-sectional study

This cross-sectional study was conducted during the Arrhythmia Alliance World Heart Rhythm Week, and suggested pharmacists can contribute to greater outreach of awareness campaigns. The Atrial Fibrillation Association formed a partnership with the International Pharmacists for Anticoagulation Care Taskforce, and goals to test a model for raising awareness of AF involving pharmacists globally; and to identify barriers and enablers to its implementation. Pharmacists from 10 countries invited individuals (≥ 40 years; without anticoagulation therapy of AF) to participate in the awareness campaign. Participants agreeing were engaged in the early detection of AF (EDAF) using pulse palpation. Individuals with rhythm discrepancies were referred and prospectively assessed to have information on the proportion of confirmed diagnosis, leading to estimate the detection rate. Interviews with country coordinators explored barriers and enablers to implementation. The study involved 4,193 participants in the awareness campaign and 2,762 in the EDAF event (mean age 65.3 ± 13.0), of whom 46.2% individuals were asymptomatic, recruited across 120 sites. Most common CHA2DS2-VASc risk factor was hypertension. Among 161 patients referred to physician, feedback was obtained for 32 cases, of whom 12 new arrhythmia diagnoses were confirmed (5 for AF, 2 for atrial flutter), all among elders (≥ 65 years). Qualitative evaluation suggested a local champion to enable pharmacists' success; technology enhanced engagement amongst patients and increased pharmacists' confidence in referring to physicians; interprofessional relationship was crucial in success.

Alves da Costa F, Mala-Ladova K, Lee V, Tous S, Papastergiou J, Griffiths D, et al. *Journal of thrombosis and thrombolysis* (2019): 1-12.

↓
ted in a symptom-driven remote arrhythmia
vacht ECGs. ↓

ia remote monitoring program in the Netherlands, initiated by
aluation of KardiaMobile in a real-world cohort of ambulatory
country. Between January 2017 and March 2018, 5,982
ceived, with a median of 28 ECGs per patient per year (mean
to record an ECG when they experienced palpitations or
l fibrillation ↓ as Possible AF, 17% as Unclassified,
-analysis ↓ terpretable. The AF algorithm had a
for detection of AF was high, at
; being interpreted by the
PV, and a specificity of 91% and a
y the cardiologist as being sinus
hythm with and without ectopy to

ostic accuracy of
or Holter monitor.
ECGs) settings. The
7%) in the hospital.
; to 98%) in the
y ranged from

↓
ire usually not
res them difficult
ty of 89% and a
5% with a
mmented that
:ing unnecessary

ECG device type ($p=0.022$) significantly
nsitivity and specificity of single-lead
e type were significant factors of variation in



智慧醫療的未來發展

