wistron

高雄榮民總醫院

KSVGH Inside

Power by WMT

Delivered by CHT

智慧醫療
數位轉型

精實為先, 智慧為體,
營造下世代智能醫療環境,
從何處著力?

報告人: 楊宗龍　研創中心, 品管中心主任
斜槓醫師/基督徒/創客/品管人/碼農/電子病歷專家/放射線醫師/**數位雙生**愛好者

高雄榮總攜手中華電信、緯創醫學
佈局智慧醫療、國際醫療輸出

2020-08-06

醫策會
HQIC
品質奠基 共燦二十
2019年國家醫療品質獎頒獎典禮
高雄榮民總醫院
Kaohsiung Veterans General Hospital
高質服務・雄心創新・榮耀生命・總歸愛心
智慧醫院
Smart Hospital
主辦單位：財團法人醫院評鑑暨醫療品質策進會
全機構獎

謝謝大家，歡迎指教

2019年獲得3大獎
國家醫療品質獎、智慧醫院全機構認證、近10年醫品病安全國第一

高榮優勢: 最好, 智慧, 信仰, 光明, 希望

下世代專網
如何建構醫療的
數位雙生
從設計思維啟動！

<台灣醫療資訊一統的大好機會>

Thin Slicing

Family
理想的家庭

三磚可起灶，一鼎乃行炊

Design Thinking

在真實的場域解決真實的問題

數位雙生

防疫網, 醫療網, 共助網

The 7th kingdom: Technium

破冰2

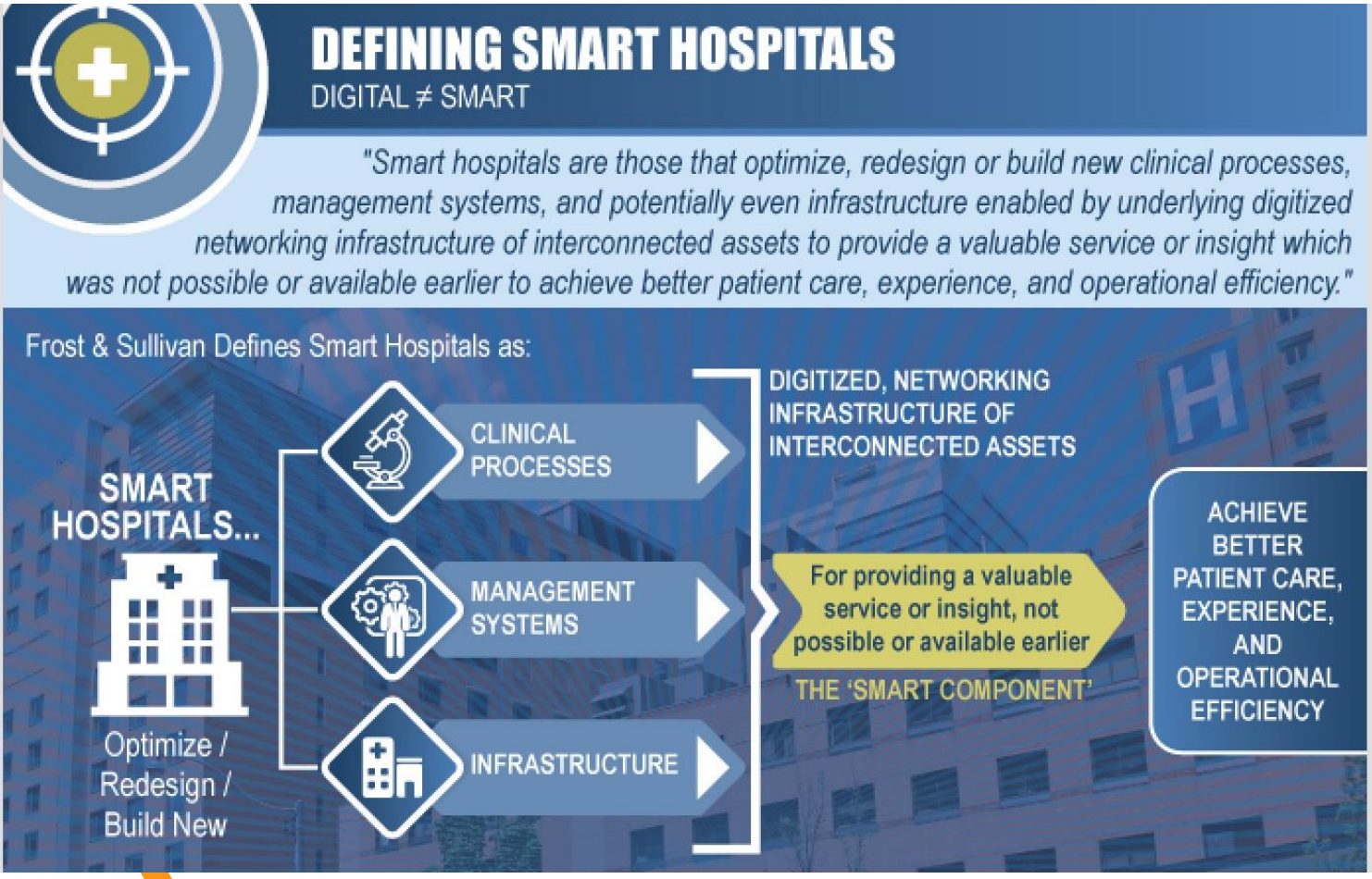
From digital phenotypes to digital twins

大家都在期待智慧醫院

醫療的創新

智慧醫院.智慧醫療

創造一種在醫療場域的新工作，
雇用一種前所未見的新服務，
一種不需醫師執照，護理執照，
醫技藥執照的新型工作



傳統醫院

智能元件

更優質的醫療照護
更舒心的就醫經驗
更精實的醫療流程

智能醫院

FROST & SULLIVAN

2019 Key 8 Predictions for Global Healthcare Industry

Value-based Care Progresses as Outcomes Focus Globalizes

AI explodes across the Healthcare & Life Sciences post Flagship Use Cases yield Positive Results

Digital Health will come of Age with an Increased Focus on Individual Care

Asia become the New Local Innovation focus for Global Drug and Device OEMs

Healthcare Data Analytics shifts from Big Data to Meaningful Small Data by Hospital Specialty

Healthcare will be a Dominant Vertical in Voice Applications

Blockchain moves from Hype to Reality with further Commercial Implementations

Innovative Private Insurance Models Shake up Healthcare Payer Industry

Top 8 Predictions That Will Disrupt Healthcare in 2020

Social determinants of health (SDOH) analytics platform gains traction during 2020

AI develops more use cases and faces more ethical challenges, beginning with radiology

Annuity-based model to catapult gene therapy commercialization

Continued VC funding mega-rounds make 2020 a banner year for digital health unicorns' IPO exits

Interoperability by pure-play solution vendors will gain ground against standalone systems

Telehealth will gain mainstream adoption in overall mix of healthcare services

Precision medicine-led approaches will pave the way for next-gen health data analytics solutions

2020 will be a year of 'Retailization' for healthcare industry, promoting comparison shopping consumer mindset

Source: Frost & Sullivan

Healthcare Quality Improvement Campaign

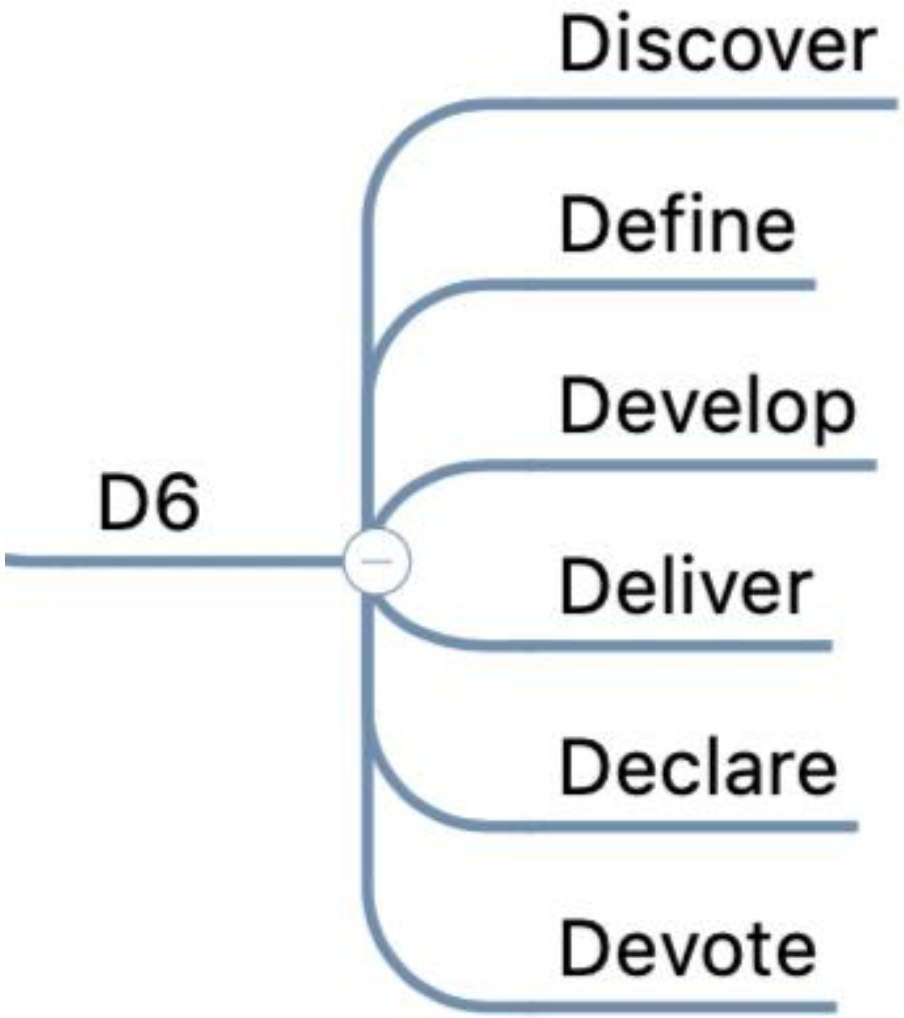
- 醫策會智慧醫療類
  - 六大領域標章
    - 門急診服務
    - 住院服務
    - 教學研究
    - 環境管理
    - 行政管理
    - 社區健康（含長照）
  - 醫療機構組
    - 服務流程驗證
    - 全機構認證

創新的種類

Market-creating innovation 創造市場的創新

產品、流程、服務的創新

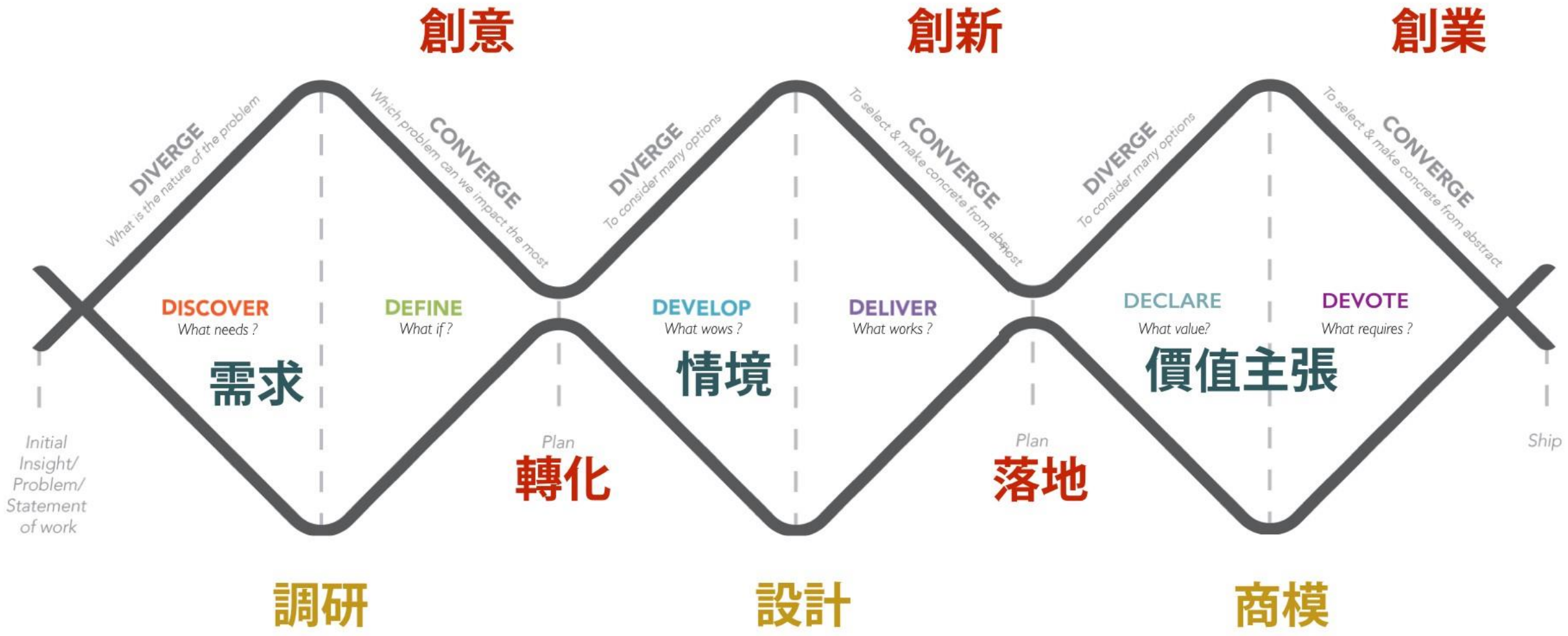
D6P6V6



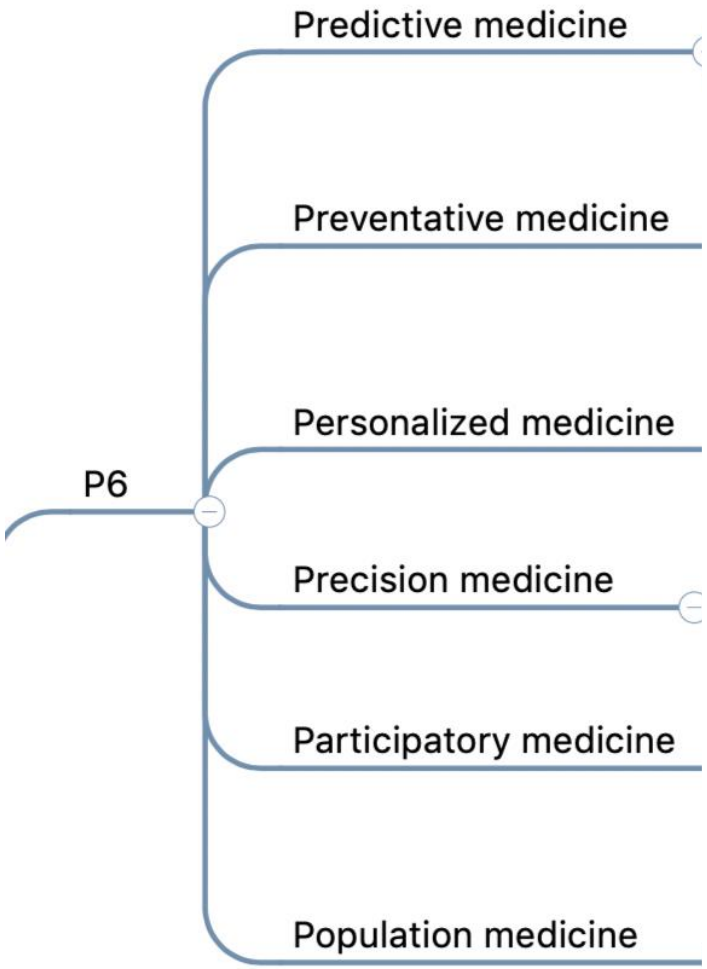
D6

Course Structure

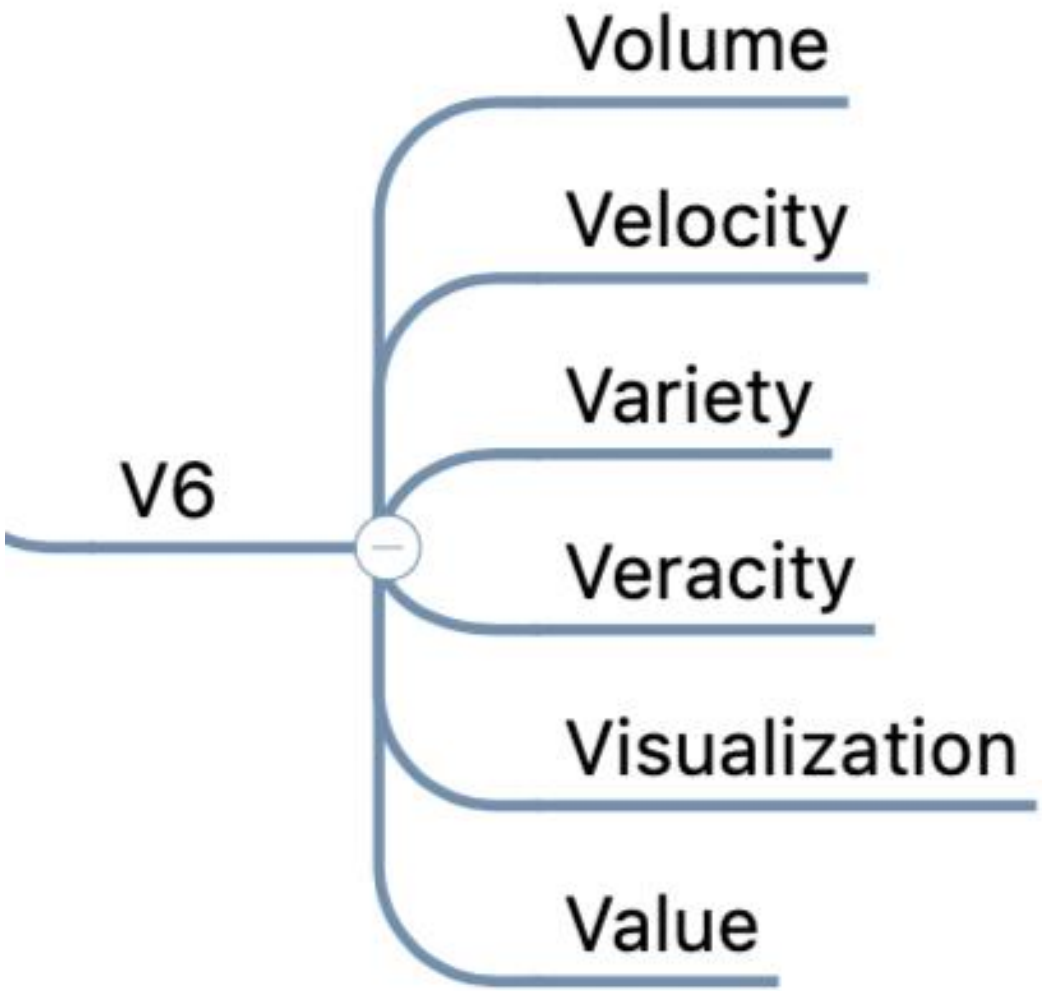
思考



三個鑽石模型 by 政大別蓮蒂教授 & 台科大唐玄輝教授)


P6
Predictive medicine
Preventative medicine
Personalized medicine
Precision medicine
Participatory medicine
Population medicine

P6



V6

Thin Slicing EMR

高雄榮民總醫院醫療健康微服務化資訊架構 ➔ 精實為心, 智能為體

新世代精實智慧醫院之實踐

全人照護場域應用

- 臨床服務/業務：醫療、醫技、醫藥、影像
- 經營管理：人事、物資、財務、辦公
- 醫病關係管理：醫院、醫護、長照、病人、家屬
- 第三方應用軟硬體：AIoMT、機器人、風險評估、風險分層、區塊鏈

全 WEB 化 SSO 服務平台

基於微服務的醫療資訊分佈與服務架接

- 主動防災資訊
- 體檢中心資訊
- 智能護理資訊
- 綠色通道管理
- 雲端儲存資訊
- 多層權限管理
- 精實醫療流程管理
- 實驗室醫檢資訊
- 各式病歷資訊管理
- PFM/UDI 管理
- 手術全期開刀房資訊
- 多元收費資訊管理
- 智能藥品管理
- 結構性病歷
- 病人資訊管理

HIS 微服務混管平台

先進架構平台

- 資安
- 監控
- 計算
- 虛擬伺服器
- 大數據儲存
- 中介軟體
- 容器 Container
- 5G
- 企業網絡

其他傳統應用接合
HIS, LIS, RIS, PIS, PACS etc.

透過安全公有雲與電子病歷私有雲的無縫接合, 建置參與式與人群醫學的最佳落實模式

全 WEB化, SSO 的好處

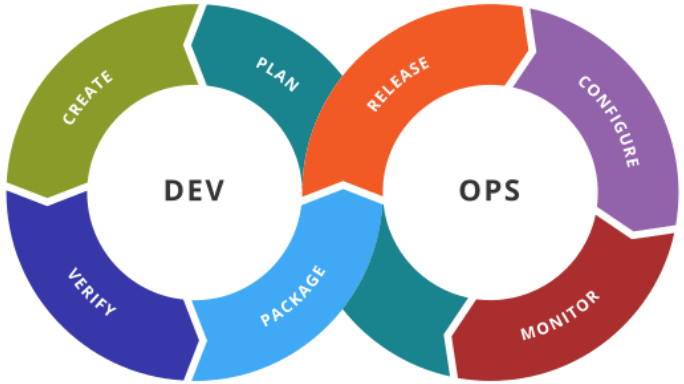
資安保護下, 哪裡需要資訊, 資訊就流向哪裡

消除繁雜, 不方便, 不即時的資訊交換

降低縱向與橫向資訊整合的成本

讓資訊交換更有意義, 成就造福醫病的真義

單一身份認證, 留下所有交易細節紀錄



邁向敏捷管理, 全行動化

新世代精實智慧醫院之實踐

手術全期平台

早期警示系統

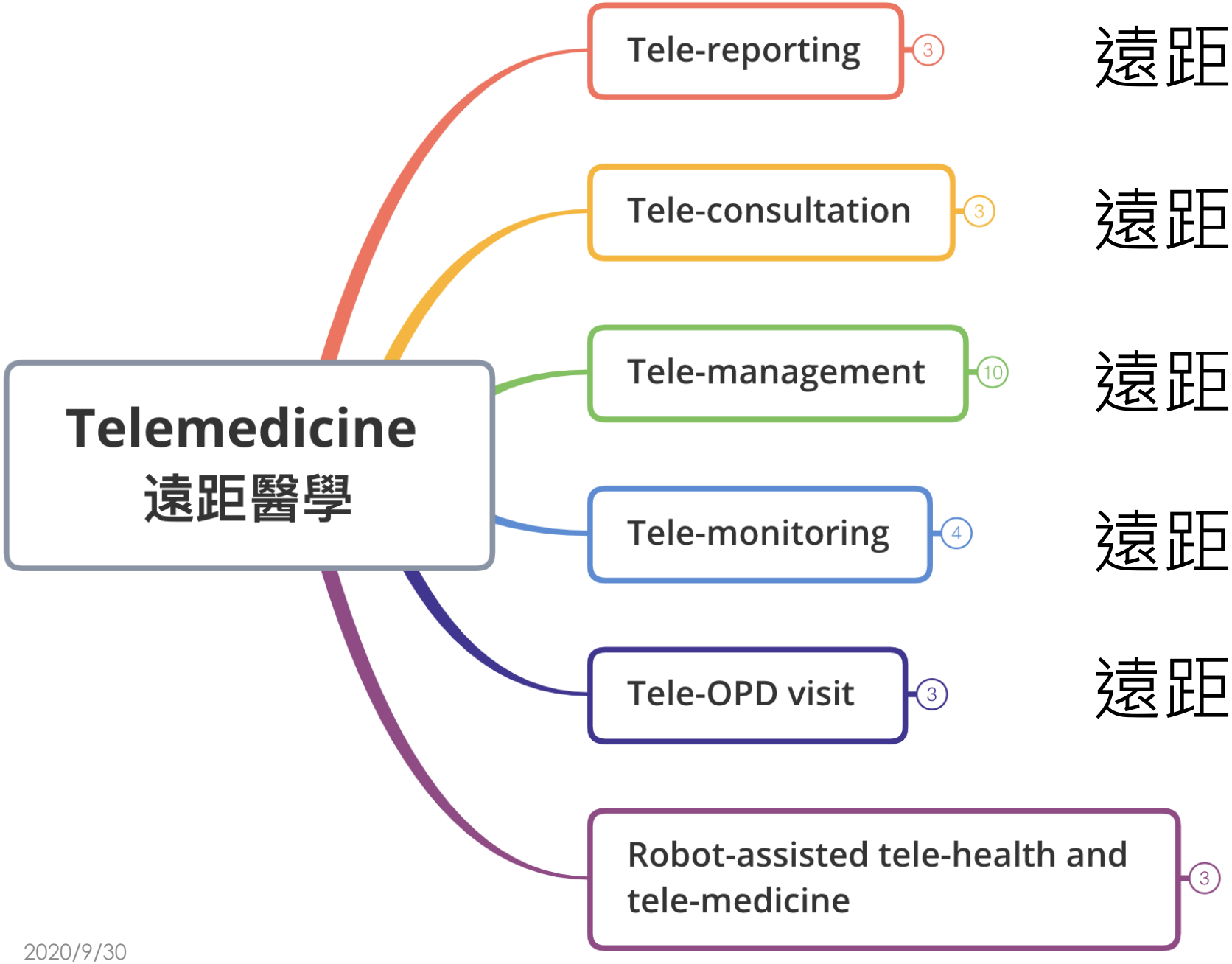
全人照護平台

精實行政數位治理平台

智能藥事平台

Unconscious

Data being collected → Enrichment → Analysis → Visualization → Interpretation → Decision Making



遠距報告

遠距會診

遠距處置

遠距監督

遠距看診

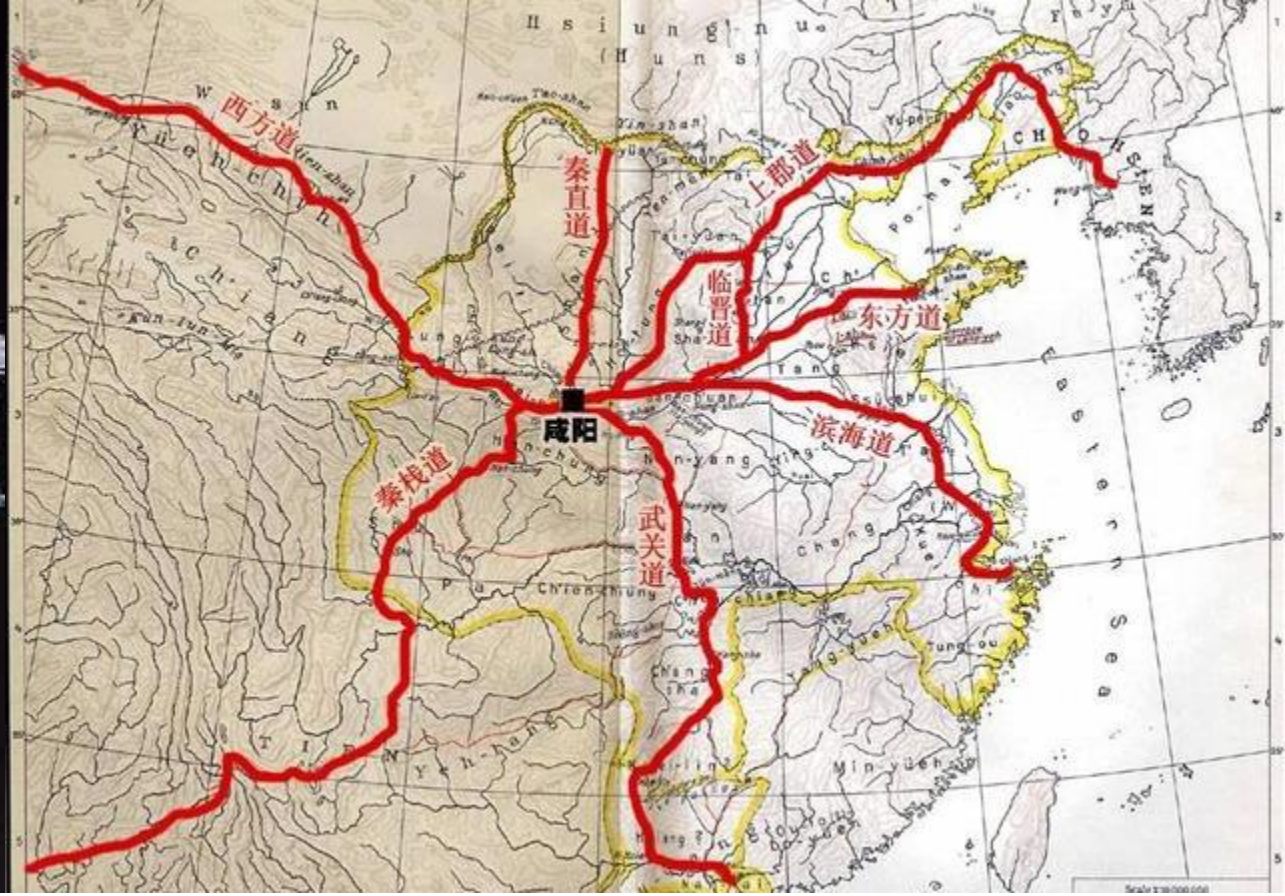
遠距健康

HL7® FHIR®

SMART®

The Essence of F.H.I.R. and A little bit of S.M.A.R.T. and more

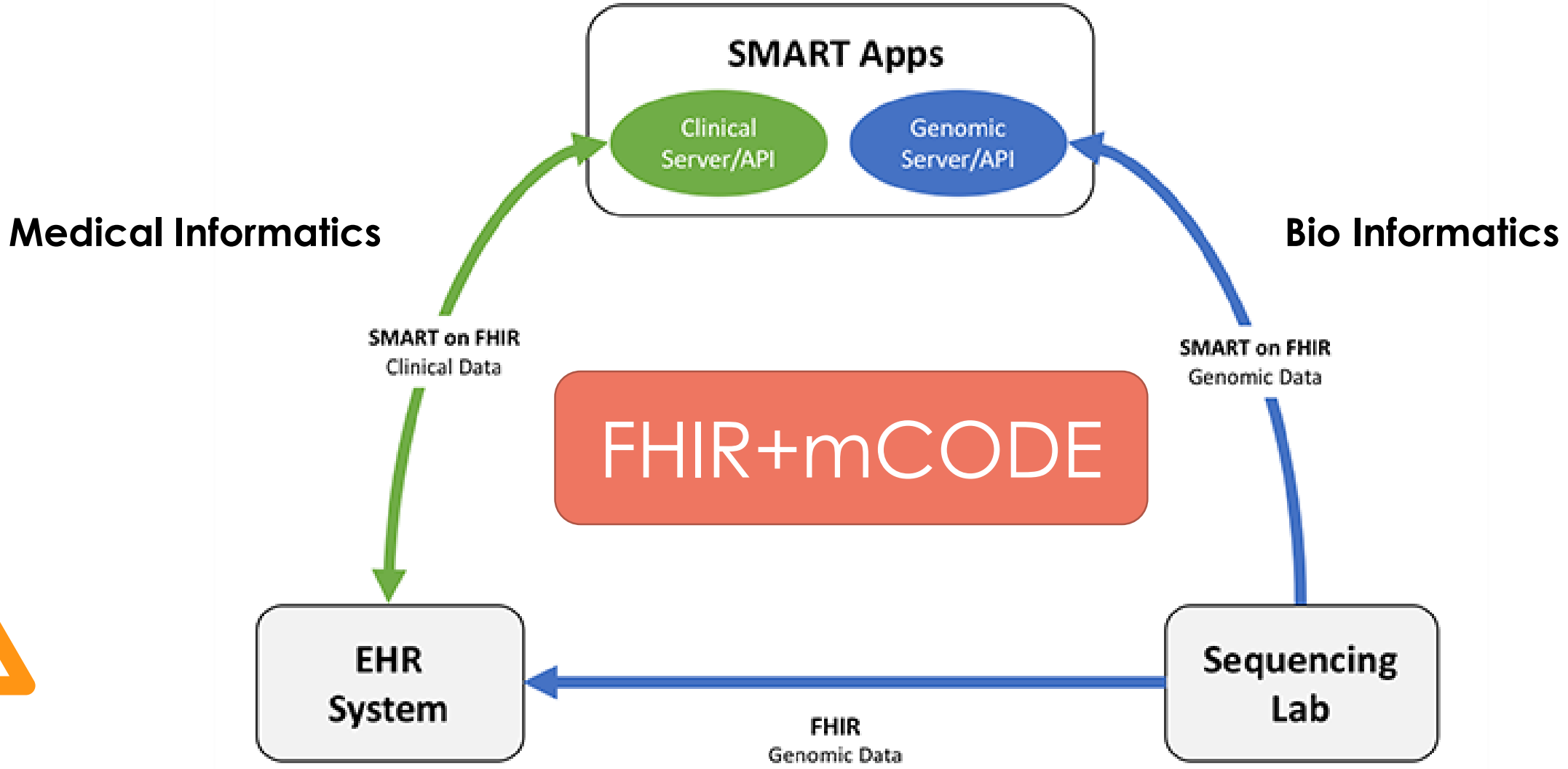
資訊力與品管力雙管強下協助數位治理創建智慧醫療



車同軌，書同文，行同倫

醫療薄數據與厚數據的大一統

採用標準的醫療資料架構與程式介面達到通用數據訪問(UDA: Universal Data Access)作為產官學研用醫療服務成果的交換準則



Substitutable Medical Applications and Reusable Technologies

“Smart”

Fast Healthcare Interoperability Resources

S.M.A.R.T. on F.H.IR.

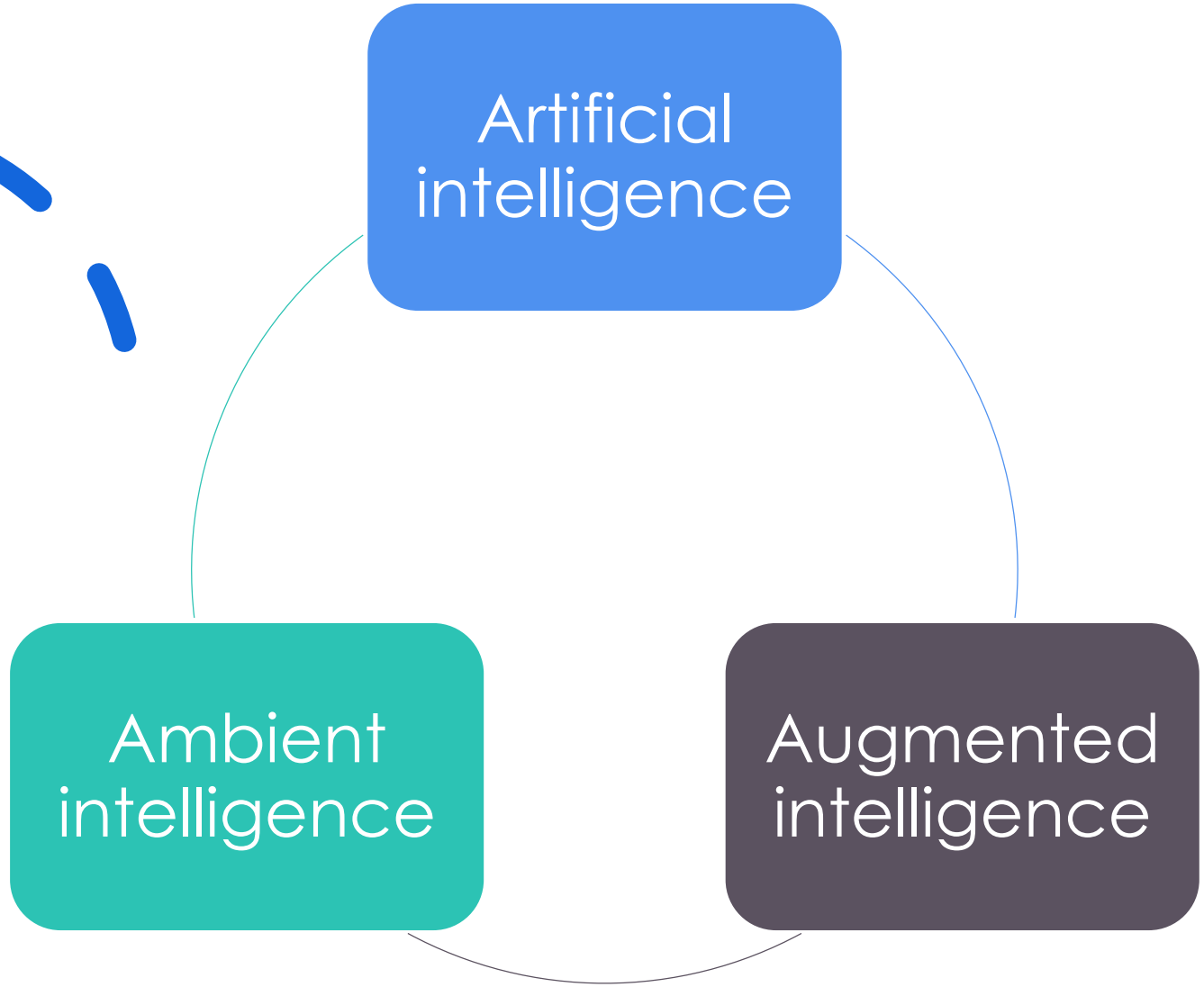
- **A Standard-based, Interoperable Apps Platform to Secure EHR Records**

to be written once and run on a repeatable basis across different healthcare IT systems

培育
精準醫學資料科學家
Data Scientists for Precision Medicine

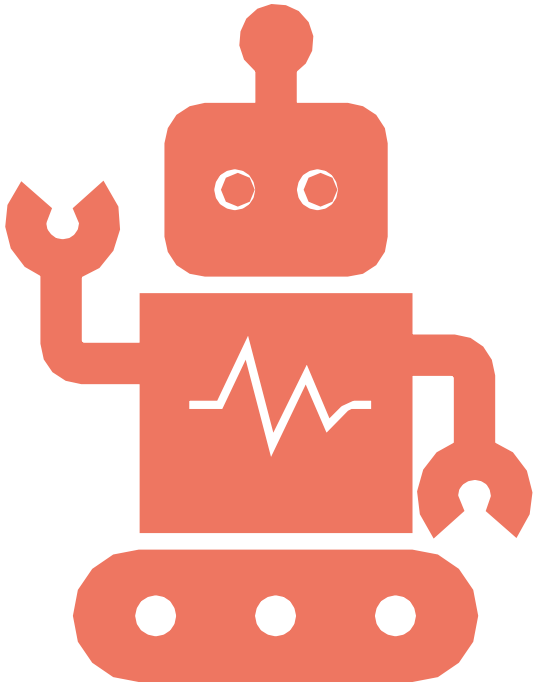
- 協助精準醫學家的最佳夥伴組合
  - 服務、研究、教育、行政
  - Sight technology 視野科技
- 大思維，高維度的資料哲學家
  - Database administrator
- 資料創新專家，未雨綢繆，超前佈局
  - Data architect
- 資料闡釋, 視覺化專家
  讓資料成為易懂資訊，一眼定江山
  - Data visualizer
- 資料工程師
  - Data engineer
    - 設計、建置、管理
- 資料能源專家, 讓資料穿梭於公有雲、私有雲，在資安保護下，以最省資源方式營造最大效益
  - Data ecologist

A.I. cubed


Artificial intelligence
Ambient intelligence
Augmented intelligence

研創中心
Capacity And Production: $(AI)^3$

- **Artificial Intelligence (人工智能)**
- **Augmented Intelligence(擴大智能)**
  - **Assistive Intelligence**
- **Ambient Intelligence(環境智能)**
  - **Autonomous Intelligence**



Artificial Intelligence
人工智能

AI for 腦部電腦斷層:

以深度學習方式

偵測腦出血

AI for 乳房攝影:

以深度學習方式

偵測乳癌

AI for 數位病理:

以深度學習方式

偵測肝癌與肝炎

Deep01愛因斯坦人工智慧股份有限公司

財團法人資訊工業策進會

成功大學電機系、國家實驗研究院台灣半導體研究中心

人工智能

U.S. FOOD ADMINISTRATIO

Deep01 Limited
% Mr. William Lai
Medical Regulatory Affairs Specialist
Rm. 5, 11F., No.162, Sec. 4, Roosevelt Rd.
Taipei City, Taiwan 10091
TAIWAN

July 10, 2019

Re: K182875
Trade/Device Name: DeepCT
Regulation Number: 21 CFR 892.2080
Regulation Name: Radiological computer aided triage and notification software
Regulatory Class: Class II
Product Code: QAS
Dated: June 7, 2019
Received: June 7, 2019

Device Classification Name	Radiological Computer-Assisted Triage And Notification Software
510(K) Number	K182875
Device Name	DeepCT
Applicant	Deep01 Limited Rm. 5, 11F., No.162, Sec. 4, Roosevelt Rd. Taipei City, TW 10091
Applicant Contact	William Lai
Correspondent	Deep01 Limited Rm. 5, 11F., No.162, Sec. 4, Roosevelt Rd. Taipei City, TW 10091
Correspondent Contact	William Lai
Regulation Number	892.2080
Classification Product Code	QAS
Date Received	10/12/2018
Decision Date	07/10/2019
Decision	Substantially Equivalent (SESE)
Regulation Medical Specialty	Radiology
510k Review Panel	Radiology
Summary	Summary
Type	Traditional
Reviewed By Third Party	No
Combination Product	No

高榮協助開發腦出血AI判讀系統 獲FDA認證

分享 分享 留言 列印 存新聞 A- A+

2019-07-17 03:11 經濟日報 黃啟銘 讚 304 分享

急診室中常見的腦出血患者，通常由中風或腦部創傷所致，醫生須盡快下治療上的判斷，不然患者的傷殘與死亡率極高。高雄榮總研創中心16日舉行對外記者會，因協助愛因斯坦人工智能公司（DEEP01）開發腦出血的人工智慧（AI）判讀系統，率先成為台灣首家獲得美國FDA認證，也為亞太地區第一家取得該認證的AI新創公司。這套系統30秒內演算完一個CP回傳到醫師，判讀準確度高達95%，讓急診室醫師快速、準確判讀腦出血病人的電腦斷層而決定後續治療方式。

人工智能

510(k) Premarket Notification

FDA Home · Medical Devices · Databases

全世界第五家公司
在 QAS 領域獲證

1 to 6 of 6 Results
ProductCode: *QAS* **Decision Date To:** *07/17/2019*

Results per Page 10

New Search

Export to Excel | Download Files | More About 510(k)

Device Name	Applicant	510(K) Number	Decision Date
Deepct	Deep01 Limited	K182875	07/10/2019
Healthich	Zebra Medical Vision Ltd.	K190424	06/13/2019
Briefcase	Aidoc Medical, Ltd.	K190896	05/31/2019
Briefcase	Aidoc Medical, Ltd.	K190072	04/15/2019
Accipiolx	MaxQ-AI Ltd.	K182177	10/26/2018
Briefcase	Aidoc Medical, Ltd.	K180647	08/01/2018

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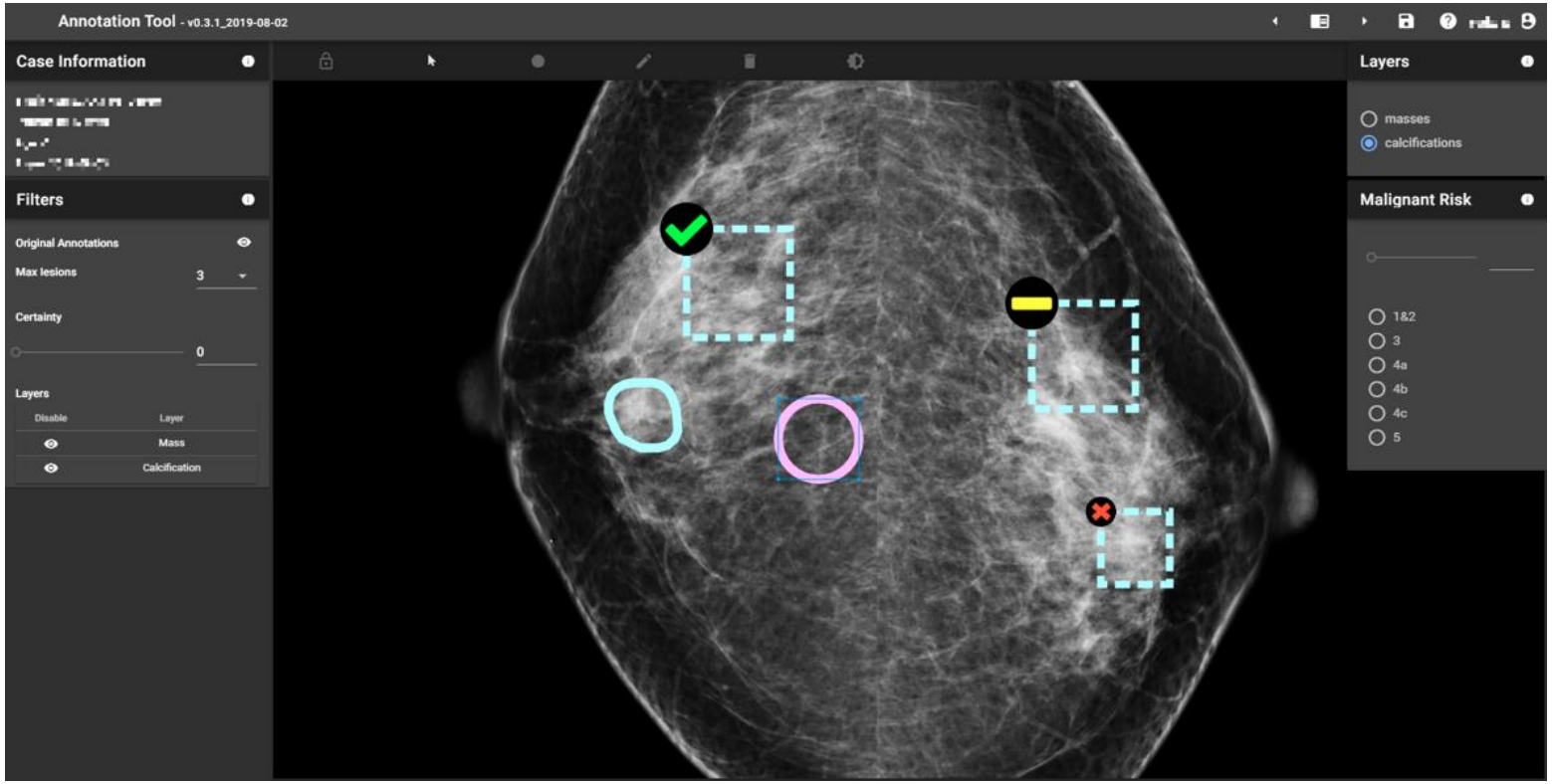
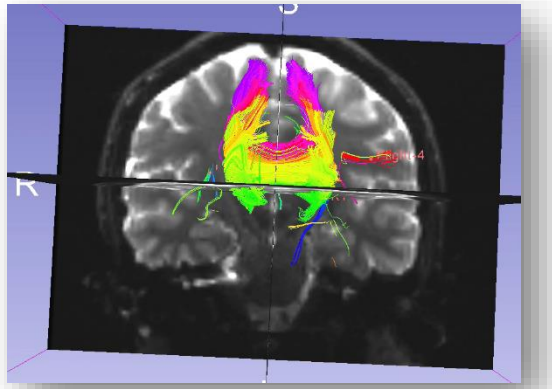
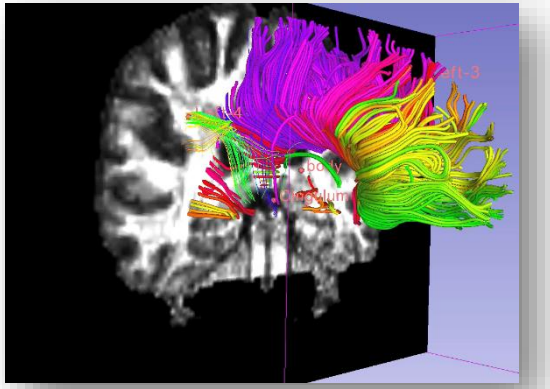
人工智能

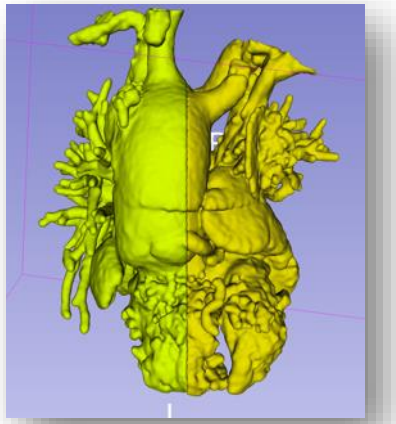
科技報橘專訪：高榮與資策會合作乳癌篩查 AI 助理



Augmented Intelligence
擴大智能







3D 列印技術探索中心與臨床體驗診線

虛擬實境(VR)於醫療之應用

- 建置多重外傷病人急救虛擬實境擬真訓練環境
- 以試管嬰兒取卵及植入為題, 應用虛擬實境進行醫病共決(SDM)實作
- 重症病房虛擬運動會

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擴大智能 從三維成像到3D 列印

- Harvard and MIT 兩位教授由 Wistron Medical 緯創醫療團隊陪同, 來訪研創中心, 討論合作事宜, 約定啟動 “三維成像, 3D 列印, 到動態數據與 mocking simulation system 的創造”，落實於 congenital heart (先行) and brain tumor 兩大主題

擴大智能

重症病房虛擬運動會

虛擬實境於醫療的創新應用

自由時報 Liberty Times Net

即時 政治 社會 生活 國際 地方 人物 蒐奇 影音 財經 娛樂 寵伴
時尚 體育 3C 評論 玩咖 食譜 健康 地產 專區 TAIPEI TIMES 求

醫訊》用VR讓病患快樂運動 高雄榮總重症病房虛擬運動會

透過虛擬實境遊戲，重症病患穿戴無線頭盔，腳踏躺臥式運動器材，也能快樂運動復健。（記者方志賢攝）

擴大智能

建置多重外傷病人急救虛擬實境擬真訓練環境

虛擬世界行為辨識
智能評分
發明專利獲證

擴大智能

以試管嬰兒取卵及植入為例，應用擴
擬實境進行醫病共決(SDM)實作

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Ambient Intelligence

環境智能

開刀房精實醫療

智能護理排班

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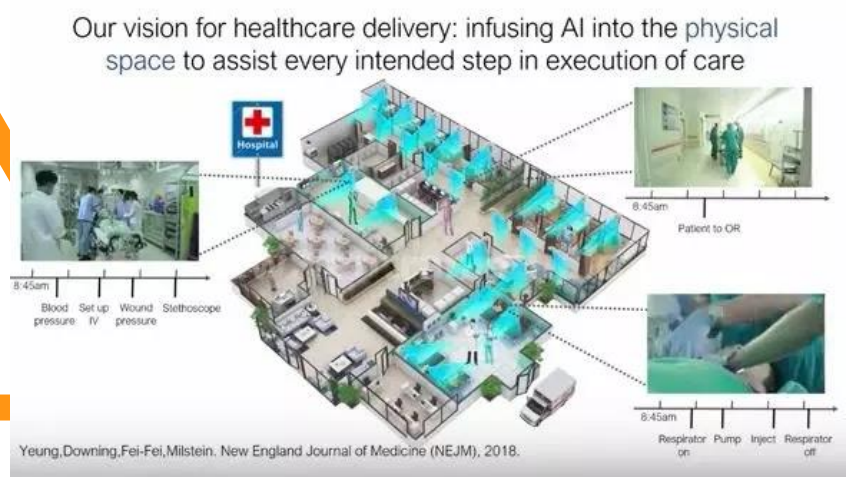
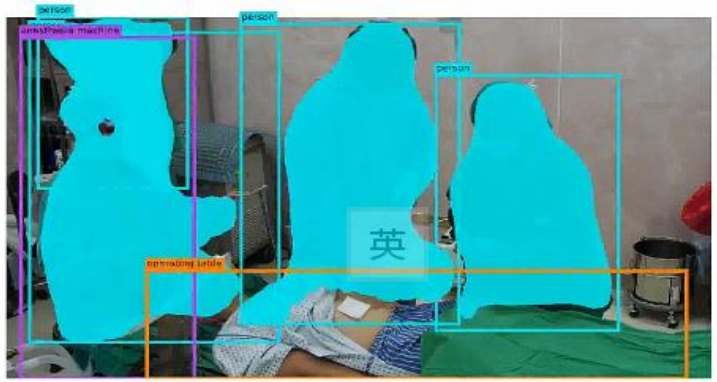
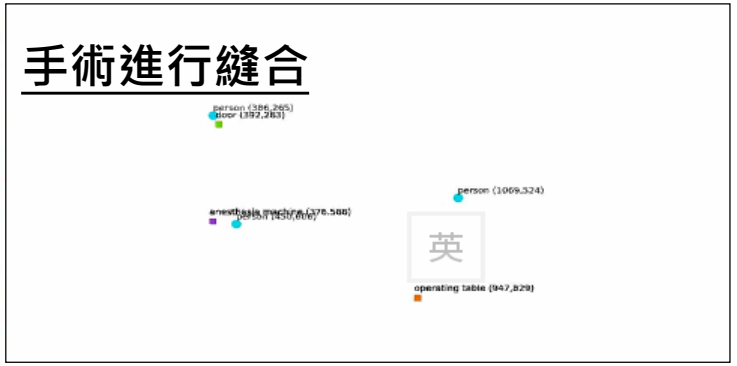
環境智能

Behavior recognition: 環境智能的基本元素
高榮作為: 首創環境智能與精實醫療的結合







手術流程紀錄節點

到達等候區

轉送手術室

入手術室

麻醉開始

麻醉完成

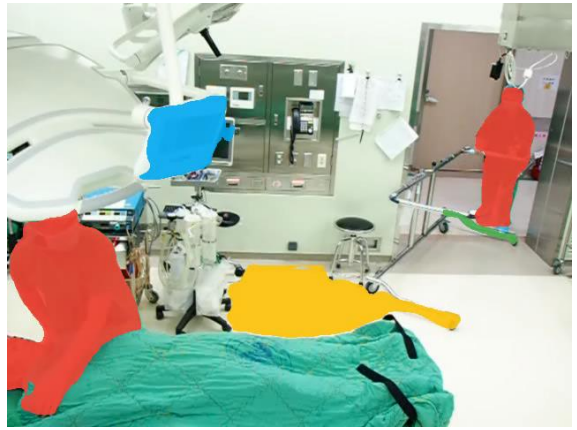
劃第一刀

手術結束
進行縫合

離開手術室

46

環境智能

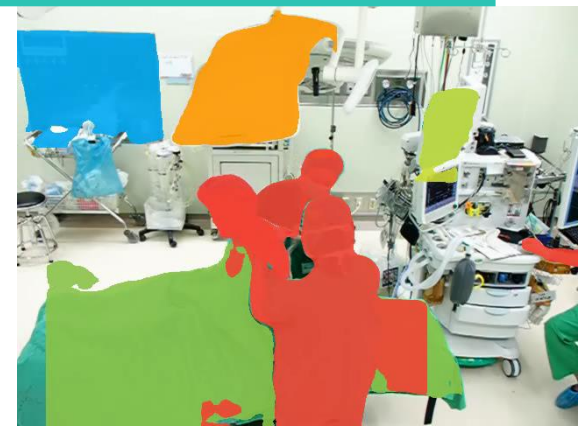


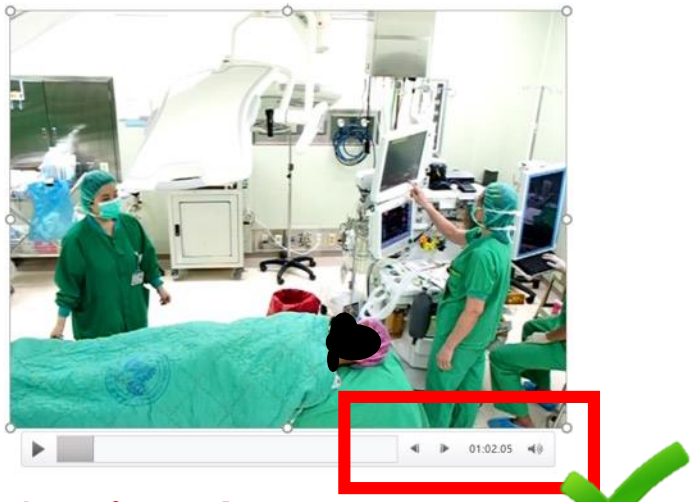
CV Timestamp

Arrival Time
00:00:50

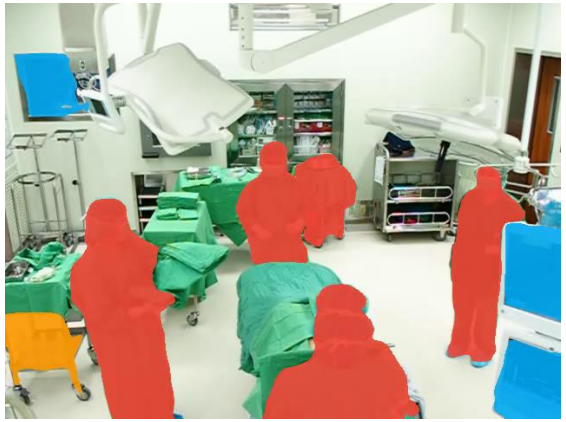
Transfer
00:01:26

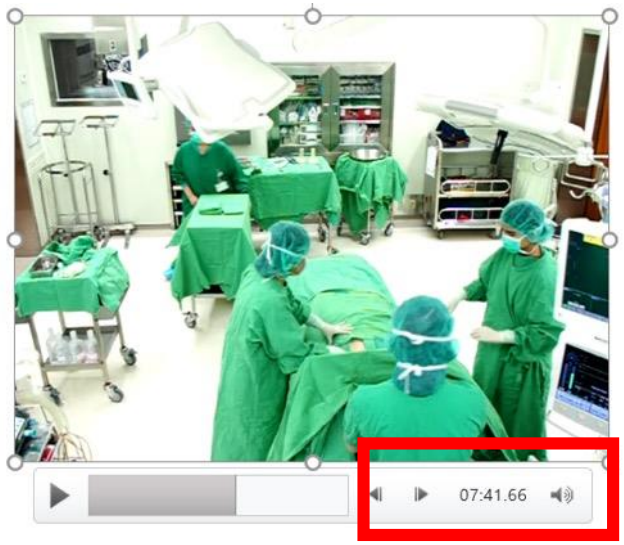
環境智能

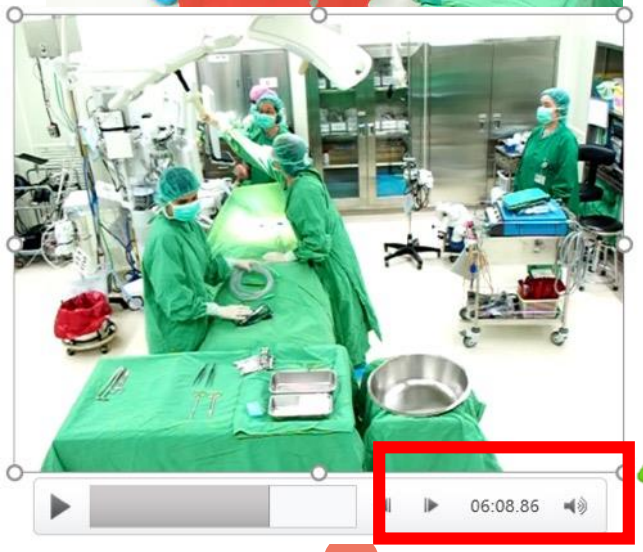




CV Timestamp







Anesthesia begin
00:01:02

Time Out
00:07:41 (Video 1)

Time Out
00:06:08(Video 2)

環境智能

護理師排班系統

月份:

2020-07 | 產生班表 | 匯出月班表 | 設定規則 | 人員設定

請選擇月期 | 匯出差勤班表 | 查看紀錄

送出變更

身分別: 全部

參與排班總人數: 85　月天數: 31　自動產生班別數: 2507 / 2635 (95.14%)　人工調整班別數: 128 / 2635 (4.86%)

2020-07			日期	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
身分	室號	卡號	姓名	三	四	五	六	日	一	二	三	四	五	六	日	一	二	三	四	五	六	日	一	二	三
契約小夜	A10	F7[illegible]0	[illegible]	E	E	E	-	-	11"-19"	11"-19"	11"-19"	11"-19"	11"-19"	-	-	-	-	-	-	-	D	-	11"-19"	11"-19"	11"-1
契約小夜	B1	F6[illegible]8	[illegible]	-	-	-	D	-	11"-19"	11"-19"	11"-19"	11"-19"	11"-19"	-	-	-	-	-	-	-	-	-	-	-	-
契約小夜	C2	G3[illegible]0	[illegible]	-	-	-	-	-	-	-	-	11"-19"	11"-19"	E	E	12-20	-	-	-	-	-	-	11"-19"	11"-19"	11"-1
契約小夜	沒有	G4[illegible]9	[illegible]	11"-19"	11"-19"	11"-19"	-	-	E	E	E	E	E	-	-	-	-	-	-	-	-	-	11"-19"	11"-19"	11"-1
契約小夜	B8	F6[illegible]5	[illegible]	-	-	-	D	-	-	-	-	11"-19"	11"-19"	E	E	12-20	-	-	-	-	-	-	-	-	-
契約小夜	B1	G2[illegible]3	[illegible]	-	-	-	-	-	E	E	E	E	E	-	-	-	-	-	-	-	D	-	E	E	E

環境智能

智能排班成效

開刀房護理師排班
硬邏輯 + 軟邏輯

系統利用 10 秒鐘完成原來需要 2 個工作天外才能完成符合硬性規定的班表

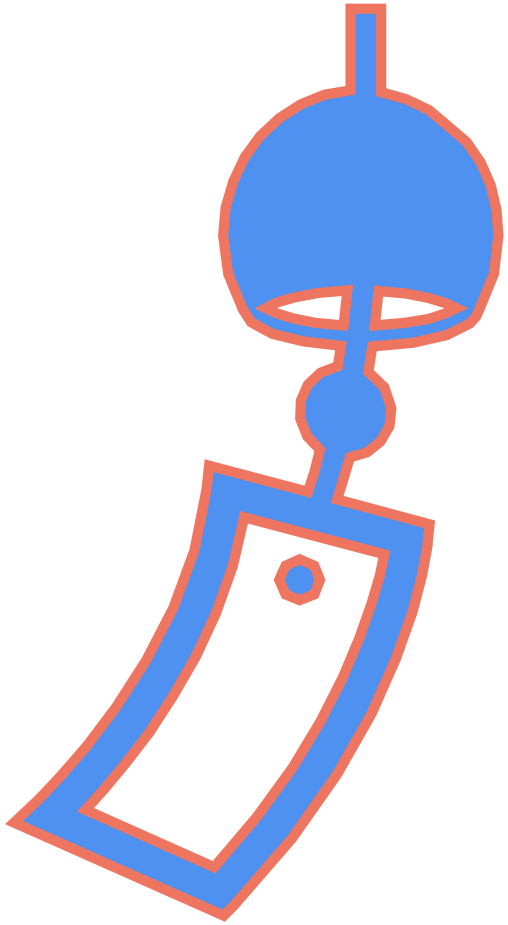
符合人性幸福感的排班異動, 再交由排班專家, 利用 1 天時間完成, 但也較以前容易

智能排班的下個目標就是利用深度學習來學習排班家專滿足符合人性幸福感的排班異動部分

50

謝謝聆聽
敬請指導

讓高榮成為一個祝福!
(Being A Blessing)
祝福眾醫院, 攜手共同邁向
精實, 智能醫院的康莊大道!



謝謝聆聽
高雄榮總研創中心
歡迎您的來訪

MENU nature biotechnology

Commentary | Published: 12 May 2015

The digital phenotype

Sachin H Jain, Brian W Powers, Jared B Hawkins & John S Brownstein

Nature Biotechnology **33**, 462–463(2015) | Cite this article

1532 Accesses | **90** Citations | **148** Altmetric | Metrics

In the coming years, patient phenotypes captured to enhance health and wellness will extend to human interactions with digital technology.

數字表型是一門多學科的科學領域，Jukka-Pekka Onnela在 **2015** 年將其定義為“使用個人數字設備（尤其是智能手機）中的數據在原位對個人水平的人類表型進行逐一量化”

Moment to moment, in situ, personal digital devices, human p

Digital Phenotyping for 行為科學, 人群醫學

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October 3, 2017

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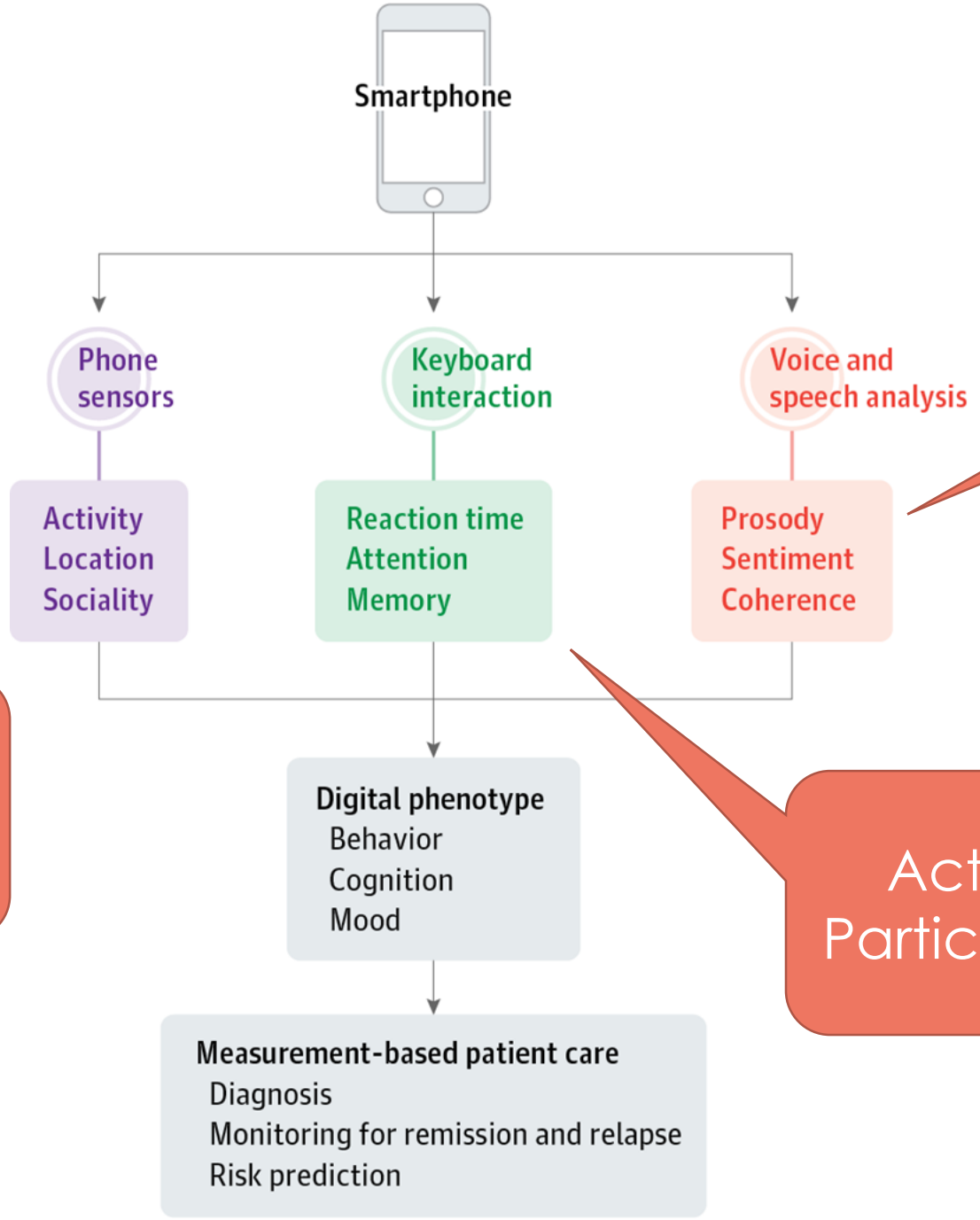
Digital Phenotyping

Technology for a New Science of Behavior

Thomas R. Insel, MD[1]

Author Affiliations | Article Information

JAMA. 2017;318(13):1215-1216. doi:10.1001/jama.2017.11295



Computational Empathy

Collecting Data Unconsciously

Actively Participation

Actionable digital phenotyping: a framework for the delivery of just-in-time and longitudinal interventions in clinical healthcare

Aditya Vaidyam[1], John Halamka[2], John Torous[1]

精神醫學部, 急診醫學部

[1]Department of Psychiatry, [2]Department of Emergency Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA, USA

Correspondence to: John Torous, MD. 330 Brookline Ave, Boston, MA 02115, USA. Email: jtorous@bidmc.harvard.edu.

Abstract: Designed to improve health, today numerous wearables and smartphone apps are used by millions across the world. Yet the wealth of data generated from the many sensors on these wearables and smartwatches has not yet transformed routine clinical care. One central reason for this gap between data and clinical insights is the lack of transparency and standards around data generated from mobile device that hinders interoperability and reproducibility. The clinical informatics community has offered solutions via the Fast Healthcare Interoperability Resources (FHIR) standard which facilities electronic health record interoperability but is less developed towards precision temporal contextually-tagged sensor measurements generated from today's ubiquitous mobile devices. In this paper we explore the opportunities and challenges of various theoretical approaches towards FHIR compatible digital phenotyping, and offer a concrete example implementing one such framework as an Application Programming Interface (API) for the open-source mindLAMP platform. We aim to build a community with contributions from statisticians, clinicians, patients, family members, researchers, designers, engineers, and more.

Keywords: mHealth; Fast Healthcare Interoperability Resources (FHIR); Application Programming Interface

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Published online 2019 Nov 6. doi: 10.2196/16399: 10.2196/16399

PMCID: PMC6868504
PMID: 31692450

Intelligent Sensing to Inform and Learn (InSTIL): A Scalable and Governance-Aware Platform for Universal, Smartphone-Based Digital Phenotyping for Research and Clinical Applications

Monitoring Editor: Gunther Eysenbach

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[1] Applied Artificial Intelligence Institute (A2I2), Deakin University, Geelong, Australia,
[2] Black Dog Institute, UNSW Sydney, Randwick, Australia,
[3] Mindgardens Neuroscience Network, Sydney, Australia,
Kit Huckvale, Black Dog Institute, UNSW Sydney, Hospital Road, Randwick, 2031, Australia, Phone: 61 2 9382 4530, Fax: 61 2 9382 8510, Email: c.huckvale@unsw.edu.au.

數位表型 App

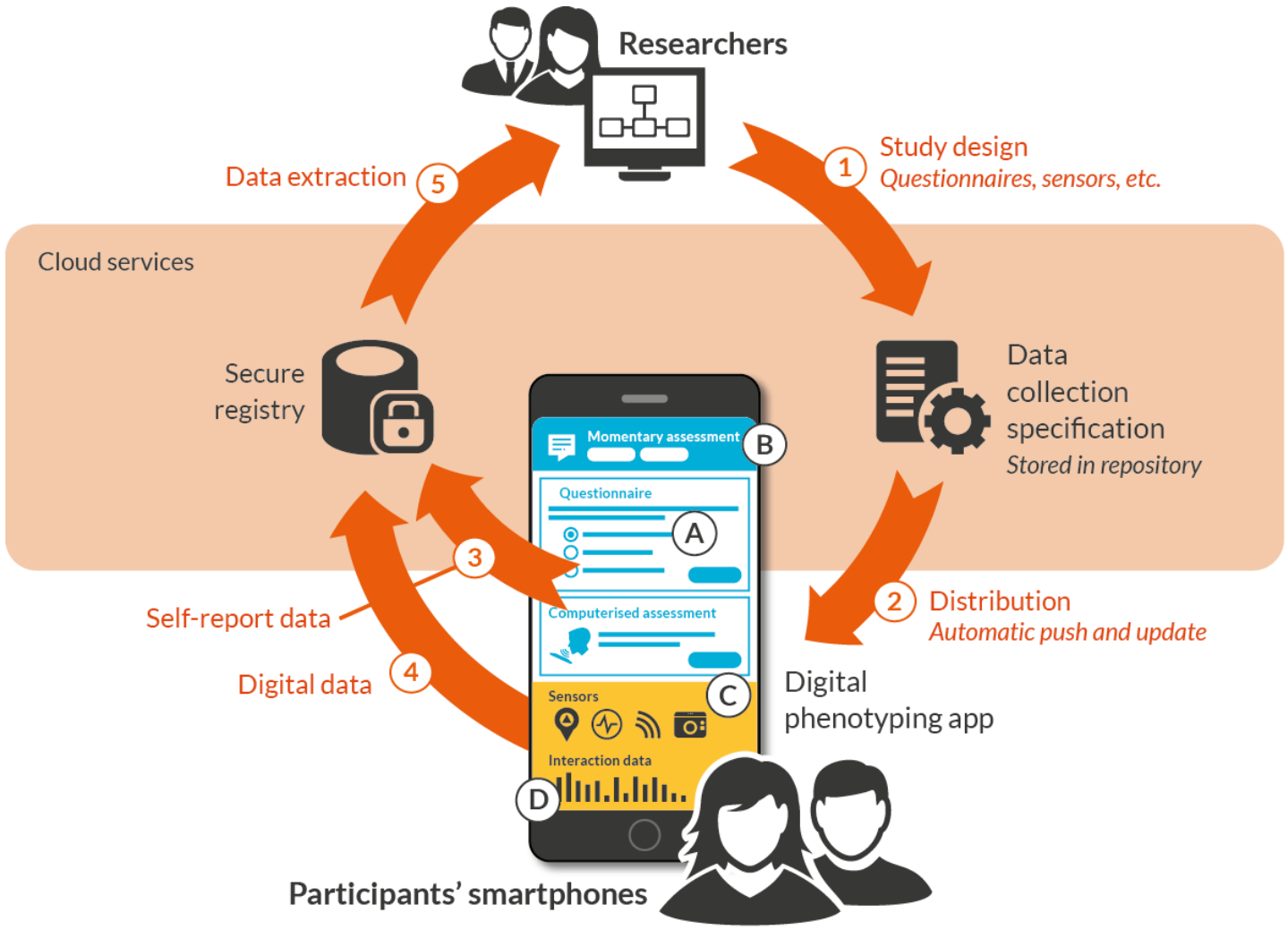
Researchers
Study design
Questionnaires, sensors, etc.
1
Data extraction
5
Cloud services
Secure registry
Data collection specification
Stored in repository
Momentary assessment
B
Questionnaire
A
Computerised assessment
Sensors
C
Interaction data
D
3
Self-report data
4
Digital data
2
Distribution
Automatic push and update
Digital phenotyping app
Participants' smartphones

Figure 2. kHealth System.

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Clinical & Phenotypic Data Capture vision statement

Read the 5-year vision statement of the Clinical & Phenotypic Data Capture work stream or read the full GA4GH Connect Strategic Plan.

Existing Standards

Human Phenotype Ontology (HPO)
SNOMED CT
The HL7 Fast Health Interoperable Resources (FHIR) standard

HL7® FHIR®

human phenotype ontology

SNOMED CT
The global language of healthcare