

翻轉低效重症照護流程

- × ÷ + 創新方程式



醫療人工智慧發展中心

CiC 醫療創新中心
Clinical Innovation Center

重症醫學部外科加護中心

國立陽明交通大學 National Yang Ming Chiao Tung University

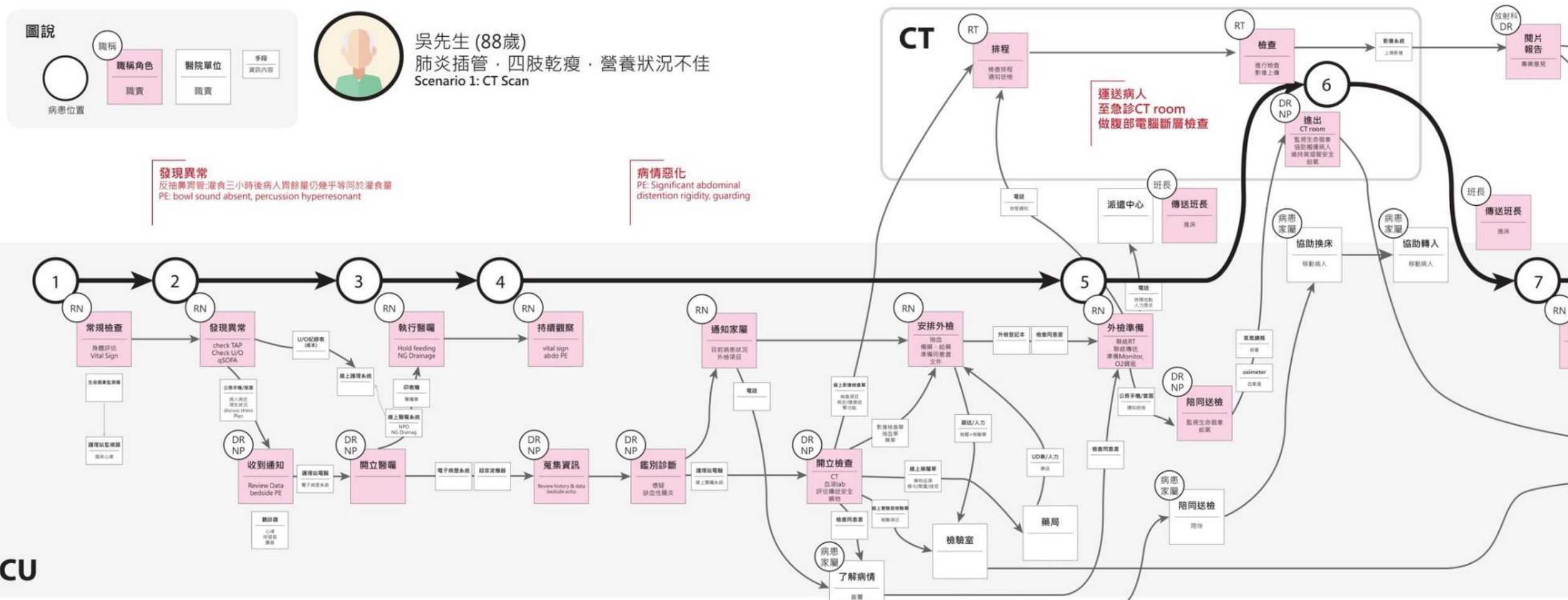
醫務管理研究所

尹彙文 M.D., Ph.D., EMBA, CEO

ICU Grand Round

Sep 12, 2023

歐庚輝先生臨床流程中千絲萬縷的問題



面對高齡重症照護的變動性Aged, ER, ICU, OR, Uncertainty，將長時間且複雜的工作流程具象化，如地圖的快速定位，分析Activities活動、Environment環境、Interaction互動、Objects物件、User使用者，幫助臨床醫療人員解決問題痛點和創造新的價值。

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ARTICLES & MULTIMEDIA ▼

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SPECIALTIES & TOPICS ▾

FOR AUTHORS ♥

CME ➤



The Hard Work of Health Care Transformation

Richard M.J. Bohmer, M.B., Ch.B., M.P.H.

N Engl J Med 2016; 375:709-711 | August 25, 2016 | DOI: 10.1056/NEJMp1606458

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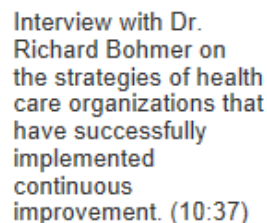
Article

References

Metrics

Governments and regulators influence the performance of health care organizations and practitioners primarily through positive and negative financial incentives, regulatory constraints on their licenses to practice, and support of performance-improvement activities through education, research, and measurement programs. The financial approaches aim to motivate change in the way organizations and practitioners configure their systems and deliver care, under the assumption that once they're motivated to seek surplus or avoid sanction, they'll be willing and able to make local operational changes to reduce cost and improve safety, patient experience, and outcomes. Unfortunately, experience shows that although a changed market may be a helpful precondition to local performance improvement, it hardly guarantees effective operational change.

AUDIO INTERVIEW



2023

來

更努力是沒有用的

2030

來醫療

效率靠科技(工具)
品質靠人文(利他)



我們需要改造的是

醫院數位基建和病人就醫旅程

錯

昔日金科玉律(SOP)





1

重新定義 ICU (One Hospital, One Central ICU)

2

- × ÷ + 創新方程式(LV care)

3

老故事 新劇本 (捍衛護士 Barbie)

4

AI-CU BI-CU RI-CU (親鄰ICU)

Video

不用**昨天**的學問

教**今天**的學生

治療**明天**的病人

重新定義

【ICU的 **來**：ICUF 2030】



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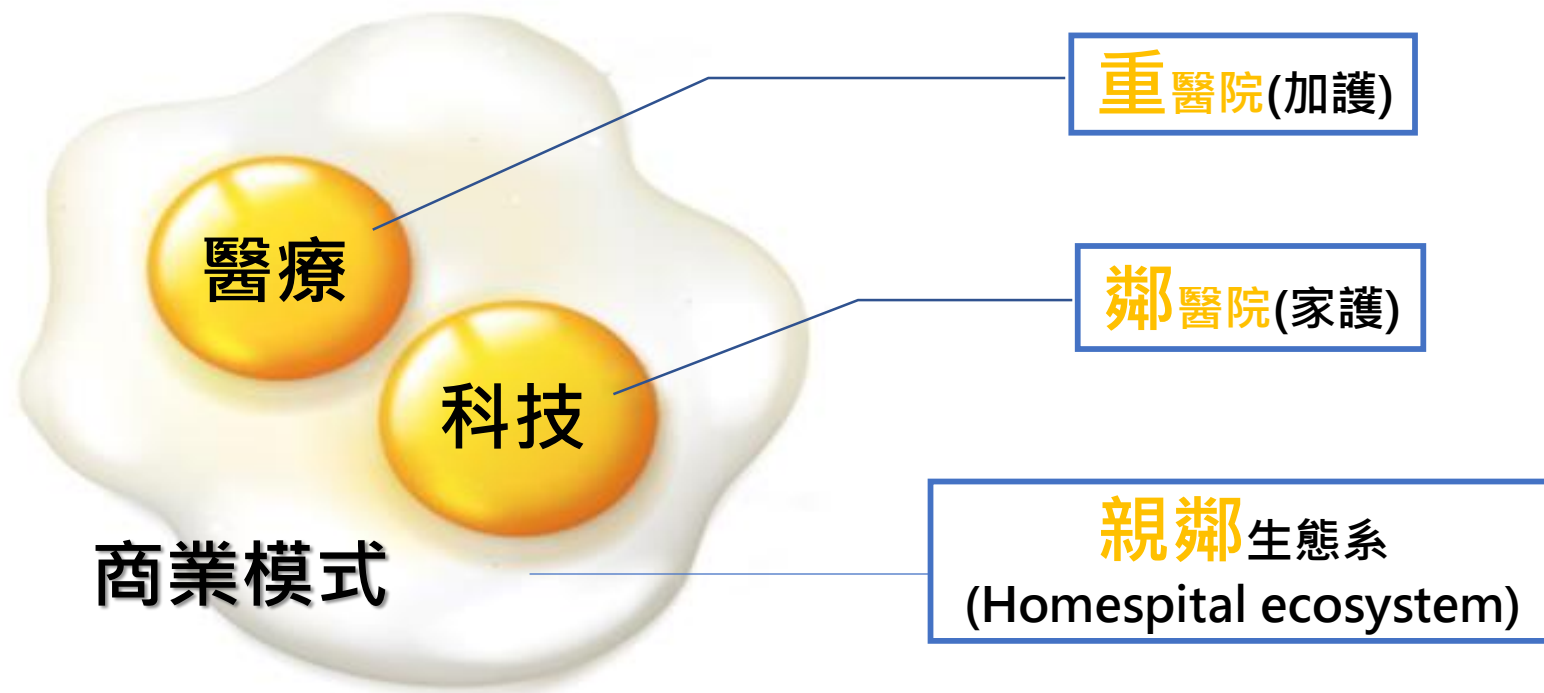
重症醫學部外科加護中心

國立陽明交通大學 National Yang Ming Chiao Tung University
醫務管理研究所

Year 2025

Hospitals will be **ICUs** and **Surgery**

Ronald D. Miller, M.D.; 2005



Device

Data

Decision

Delivery

不用2023的磚塊/規格 蓋2030的醫院



工程 流程 排程 旅程

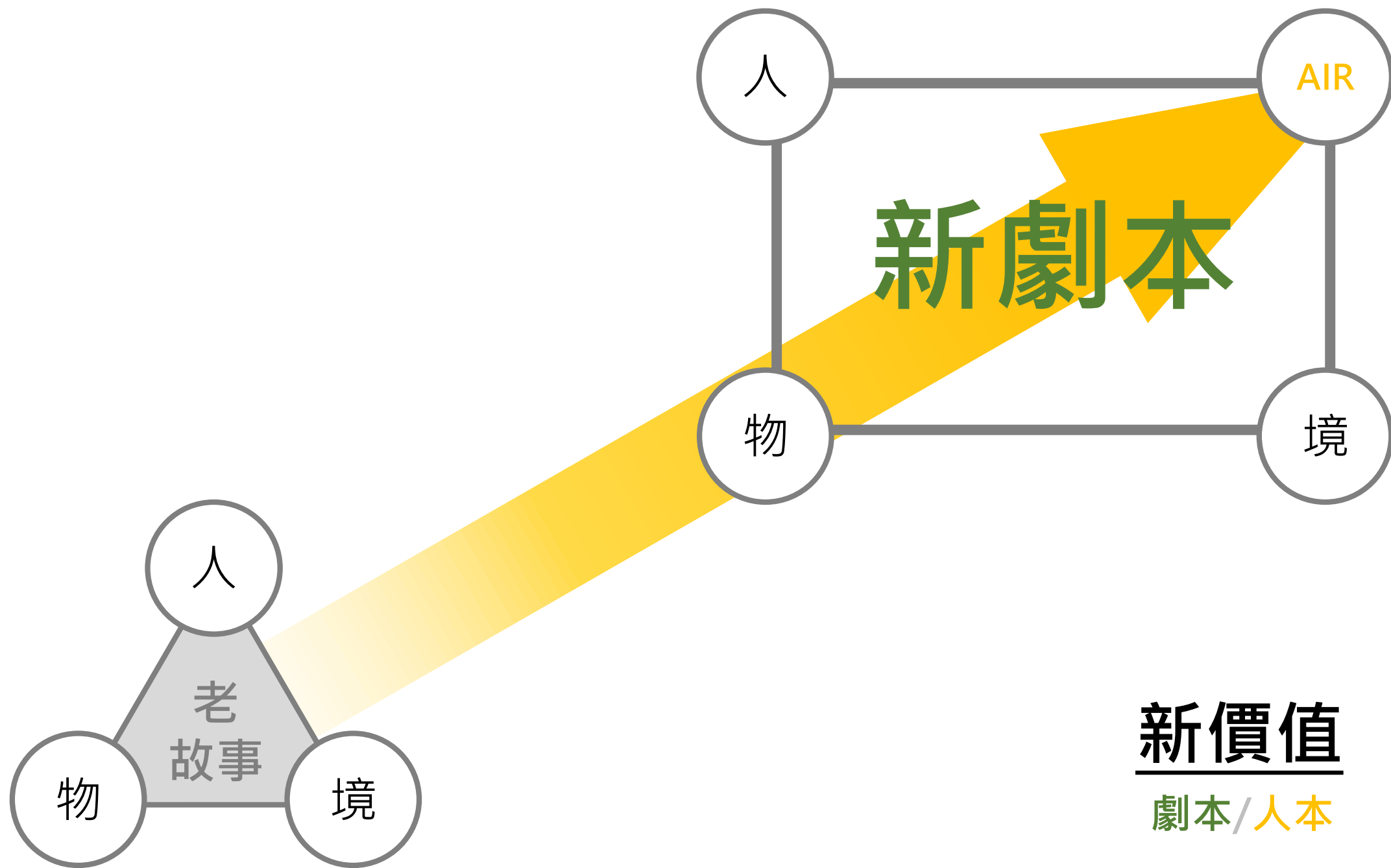
Device Data Decision Delivery

Workforce Workflow Workplace Workhour

團結力量大
紀律如何創新

定勢效應《美國隊長》
菜鳥怎麼把旗子拿下來





重新定義 ICU

病人不動 醫護動
病房不換 設備換
病床不移 陪親移



監控

ICU
Monitor



中控

BICU
power BI



智控

AICU
CDSS



移控

RICU
MOBOT



群控

CICU
COBOT



數位明醫的親鄰醫願 視病猶親/護若比鄰



舉辦溝通工作坊增強醫生的**溝通力**與**同理心**

Words, words, words 溝通工作坊



經過溝通工作坊練習的醫生，更能了解病患出院時的顧慮。因此能用同理心囑咐病患出院後的注意事項，讓病患寬心。

尊嚴毛毯讓病患感受到**尊嚴**與**窩心**

Dignity blanket 尊嚴毛毯



A moment of high touch at discharge

手術中維持病患尊嚴的毛毯，在病人要出院時，透過主治醫生的手將它送給病人，並給予真切的祝福，小小驚喜充滿感動。

TOP 工作坊

Technology Operation Performance

顛覆
SOP

翻轉
假設

解構
流程

數位
轉型

看見未來，智慧設計

ICUF 2020s工作坊系列



ICU設計規劃: 使用者經驗引導創新

未來加護病房(ICUF)設計工作坊



中榮



亞東



彰基



慈濟



成大



義大



台大



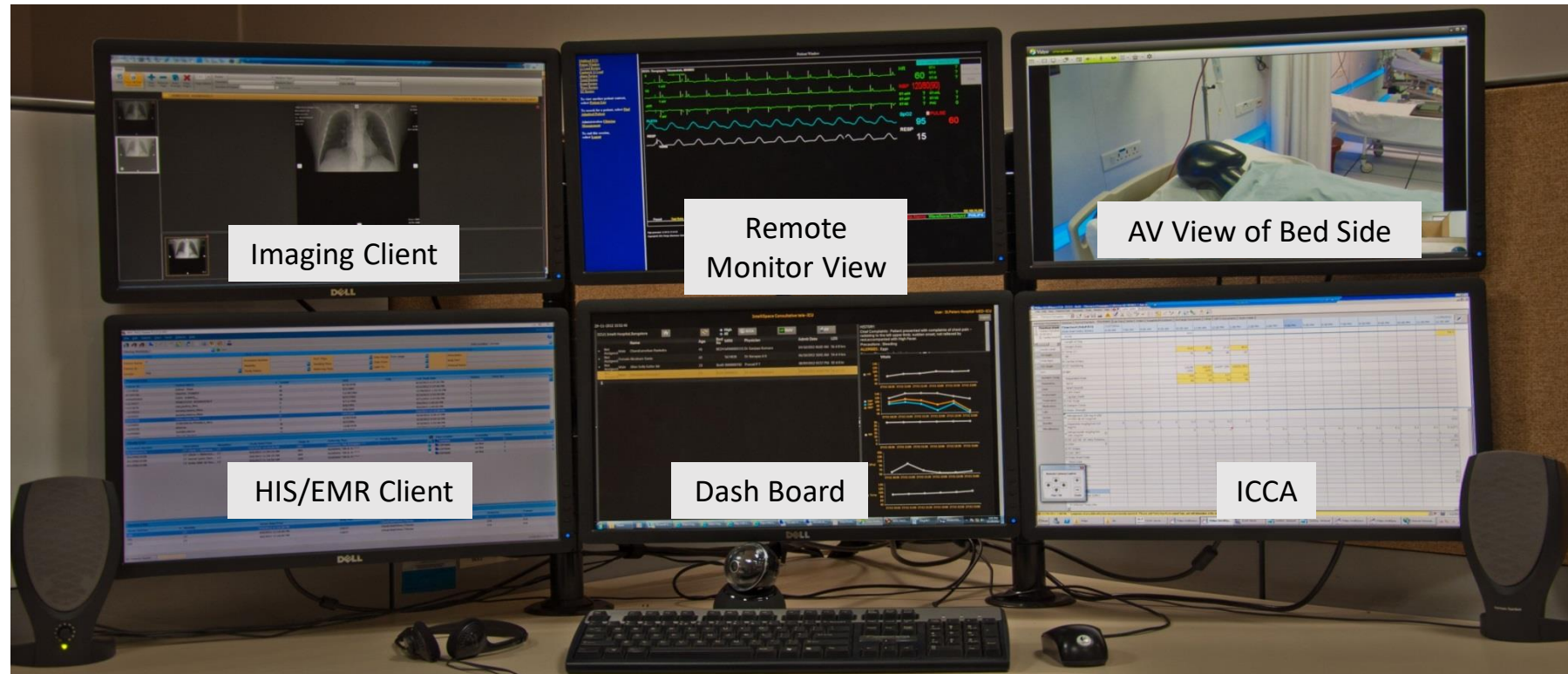
高醫



國泰

未來醫院急重症照護系統

ICU Command Center



人不在心在
遠距、中控、行動、即時、智慧

Patient Journey

醫師資訊

鄭○○醫師，早安 😊
 腫瘤內科 02 診
 今日掛號 120 人
 藥費 52,369 (剩33%)
 訊息 出院病歷簽章尚欠1份

病患資訊

病患清單

病患資訊

腫瘤內科02診第6號
 病歷號 34985218
 身分證字號 A136957256
 姓名 陳○○
 年齡 65
 性別 男
 身高 171 cm
 體重 63 kg
 主診斷 肺腺癌 (ICD 162.9)

抽菸 20 pack-year
 酒精 無
 運動 健走
 藥物過敏 無
 旅遊 東京 墨爾本 上海 北京
 普吉島 沖繩

註記 DNR

病患就醫歷程



病歷

主訴 Fever up to 39°C
 10 days after
 chemotherapy

檢查 BP: 120/70 mmHg
 BT: 38.5°C
 HR: 96 /min
 RR: 20/min
 Chest BS clear
 Abdomen soft no
 tenderness
 Extremities neg.

診斷 1. AdenoCa of
 lung (ICD 162.9)
 2. Fever (ICD 780.6)

計畫 1. 檢查
 Fever routine, CXR
 2. 治療
 Symptomatic Tx.
 3. 衛教

處方

藥物治療

2017/6/11

藥名	途徑	劑量	頻次	時間
Cisplatin	iv	60 mg/m ²		d1
Irinotecan	iv	60 mg/m ²		d1
Etoposide	iv	120 mg/m ²		d1-3

放射治療

治療劑量	治療頻次	治療總計量
1.5Gy	BID	45Gy

檢查驗清單

日期	時間	項目	狀況
5/20	14:00	WBC	已發報告
		Hb	已發報告
6/20	10:00	CXR	已完成
6/25	15:30		已排成

影像報告

PACS

X-ray 2017/6/21



CT
MRI

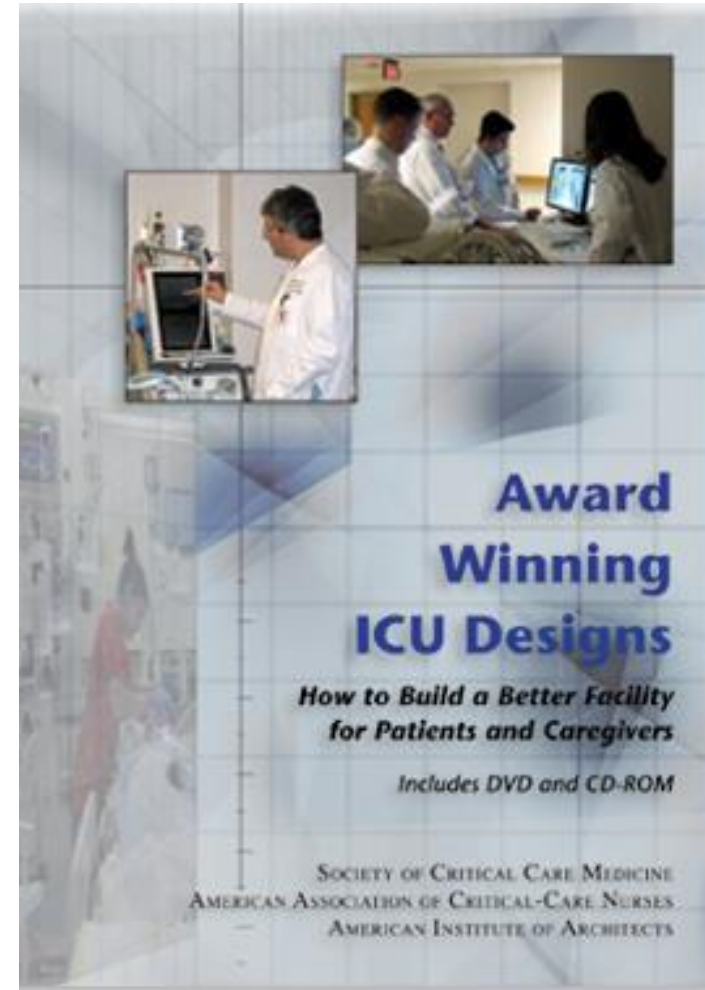
檢查驗報告

日期	項目	報告參考值
5/20	WBC	1500
	Hb	10.5

美國加護病房設計競賽

Award Winning ICU Designs

美國重症醫學會(SCCM)
美國重症護理學會(AACN)
和美國建築師學會(AIA)
從1992年起舉辦加護病房
設計競賽，促進重症病人
的照護品質



Winner of the 2009 ICU Design Citation Award

Memorial Sloan-Kettering Cancer Center

New York City, New York, USA

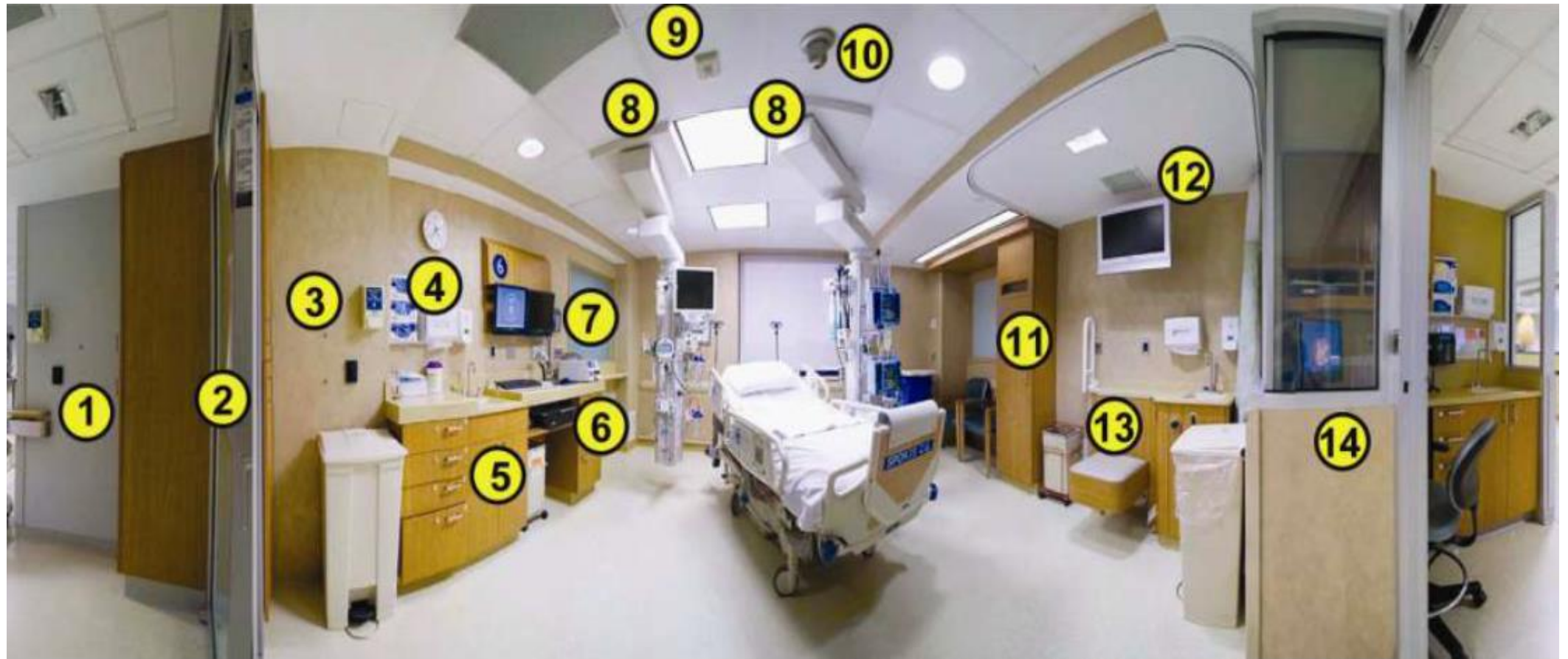


Photo: MSKCC & Neil Halpern, M.D., ICU Medical Director

- | | | |
|-----------------------------------|-----------------------------|--------------------------------|
| 1 Nurse server | 6 Computer & double monitor | 11 Patient closet & DVD player |
| 2 E-glass slide, break away doors | 7 Lab label printer | 12 Flat screen TV |
| 3 Inside opening of nurse server | 8 Twin BOOMS | 13 Toilet |
| 4 Wireless clock | 9 Wireless IR transmitter | 14 Nursing work area |
| 5 Storage cabinets | 10 Web cam | |

實証設計(Evidence-based design)



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OCCASIONAL NOTES

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Healing by Design

Medical care cannot be separated from the design of the hospital. The design of the hospital is a critical component of medical care, and architectural design is a key factor in the healing process. The design of the hospital can influence the quality of care, the safety of the patient, and the healing by focusing on recent developments in hospital design.

The number of U.S. hospitals grew steadily from 1945 to 1974, but there has been a continuous decline in numbers, to the point that the number of hospitals is now declining. Nonetheless, construction of new hospitals is expanding. The Department of Commerce reported that the number of hospitals increased by 1998.²

During the period from 1945 to 1974, hospital architects focused on providing adequate space for new technology and on maximizing functional efficiency for the hospital staff.^{3,4,5,6} The hospitals built during this period were efficient, but little attention was paid to the spatial qualities that are an essential component of good architecture. More recently, hospital design has begun to focus on patients and their families — the consumers of hospital services. This redirected focus has resulted from the increasing

- 醫院規劃具體影響服務的品質
- 醫院建築是療癒過程重要的影響因子
- 醫院設計要考慮病患與家屬的需求、醫院與人/自然的聯結、標示指引、空間的擴充性與未來發展需要

COMMENTARY

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Single-Patient Rooms for Safe Patient-Centered Hospitals

Michael E. Detsky, MD

Edward Etchells, MD, MSc

IN THE 19TH CENTURY AND FIRST HALF OF THE 20TH CENTURY, hospital accommodations consisted of large multi-bed wards with as many as 20 patients, and semi-private or private rooms for those who could pay. Patients received care in these facilities for decades after the design had become obsolete. Almost 90 years ago, it was proposed that single-patient rooms were the ideal setting to provide patient care.¹ In the last half of the 20th century, new hospitals were built featuring mostly single-, double-, and 4-bed rooms. It is likely that these hospitals may not be able to adequately provide safe patient-centered care over the next 50 years of their life span. Most modern hospitals have public value statements regarding safety, dignity, privacy, and patient-centered care. A tangible way to show commitment to these values would be to give patients their bed with their own bathroom in a single-patient room.

The Benefits of Single-Patient Rooms

Considerable quasi-experimental and descriptive evidence of the benefits of single-patient rooms on safety, utilization, and satisfaction is available. Single-patient rooms reduce nosocomial infection rates² provided that other basic elements of infection control are in place.^{3,4} A review of 16 studies showed reductions in both airborne-related

and contact-related nosocomial infections.² The evidence is more compelling for reducing airborne infections, while some studies show no effect of single-room isolation on contact related to nosocomial methicillin-resistant *Staphylococcus aureus* colonization.³ Single-patient rooms are easier to clean and decontaminate than multi-bed rooms. In addition, health care professionals may be more likely to perform hand hygiene when moving between rooms rather than between beds, particularly if hand wash stations are well positioned; the evidence that supports this hypothesis is conflicting.

Patient transfers within the hospital can potentially lead to patient harm due to reduced monitoring, missed treatments, and psychologic stress, and consume considerable hospital staff resources. Single-patient rooms can reduce the need for these transfers. For instance, once a patient is admitted to a single-patient room, there is no need to move this patient because of infection control, end-of-life care, or administrative transfers to optimize utilization of multi-bed rooms. Acuity-adaptable rooms are single-patient rooms in which necessary medical care can be provided regardless of patient acuity; intensive care to palliative care can

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Corresponding Author: Edward Etchells, MD, MSc, Sunnybrook Health Sciences Centre, 2075 Bayview Ave, Room C410, Toronto, ON, Canada M4N 3M5 (edward.etchells@sunnybrook.ca).

CHEST[®]

Official publication of the American College of Chest Physicians

Relationship between ICU design and mortality

David E. Leaf, Peter Homel and Phillip H. Factor

Chest; Prepublished online January 15, 2010;
DOI 10.1378/chest.09-1458

Background: Architectural design of health-care facilities can influence patient safety; however, it is unknown whether patient outcomes are significantly affected by ICU design.

Methods: Six hundred sixty-four patients admitted to the medical ICU (MICU) of Columbia University Medical Center during 2008 were included in this retrospective study. Patient outcome measures, which included hospital mortality, ICU mortality, ICU length of stay (LOS), and ventilator-free days, were compared based on random room assignment. Rooms that were not visible from the MICU central nursing station were designated as low-visible rooms (LVRs), whereas the remaining rooms were designated as high-visible rooms (HVRs).

Results: Overall hospital mortality did not differ among patients assigned to LVRs vs HVRs; however, severely ill patients (those with Acute Physiology and Chronic Health Evaluation II scores > 30) had significantly higher hospital mortality when admitted to an LVR than did similarly ill patients admitted to an HVR (82.1% and 64.0%, $n = 39$ and 75 , respectively; $P = .046$). ICU mortality showed a similar pattern. ICU LOS and ventilator-free days did not differ significantly between groups.

Conclusions: Severely ill patients may experience higher mortality rates when assigned to ICU rooms that are poorly visualized by nursing staff and physicians. *CHEST* 2010; 137(5):1022–1027

Abbreviations: APACHE = Acute Physiology and Chronic Health Evaluation; HVR = high-visible room; LOS = length of stay; LVR = low-visible room; MICU = medical ICU

ICU Architectural Design Affects the Delirium Prevalence: A Comparison Between Single-Bed and Multibed Rooms*

Critical Care Medicine
October 2014 • Volume 42 • Number 10

Pedro Caruso, MD, PhD^{1,2}; Lilian Guardian, BSN¹; Tatiane Tiengo, BSN¹; Lucio Souza dos Santos, MD¹;
Pedro Medeiros Junior, MD, PhD¹

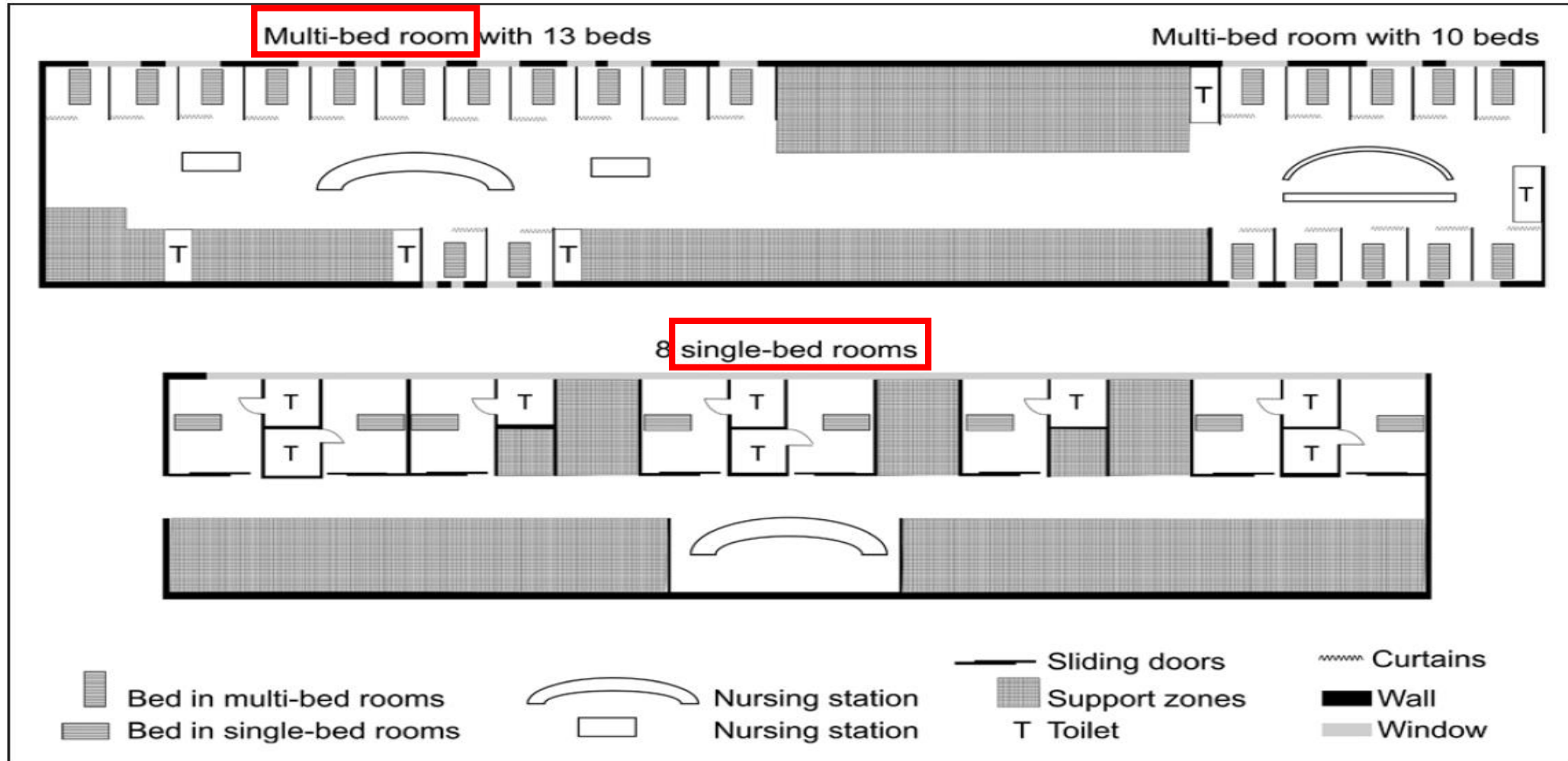


Figure 1. Layout of the single-bed and multibed rooms.

TABLE 2. Delirium Prevalence and Characteristics of Patients Admitted to Single-Bed or Multibed Rooms

Prevalence and Characteristics	All Patients <i>n</i> = 163	Multibed Room <i>n</i> = 142	Single-Bed Room <i>n</i> = 21	<i>p</i>
Delirium prevalence (%)				
All patients	163 (13.0)	142 (15.1)	21 (6.8)	< 0.01
Medical admissions (<i>n</i> = 333)	72 (21.6)	62 (25.6)	10 (11.0)	< 0.01
Postoperative admissions (<i>n</i> = 920)	91 (9.9)	80 (11.4)	11 (5.0)	< 0.01
Coma/delirium-free days				
All patients (<i>n</i> = 163)				0.80
Medical admissions (<i>n</i> = 72)				0.79
Postoperative admissions (<i>n</i> = 91)				0.65
No. of days with delirium				0.33
First day in delirium				0.71
Delirium motoric subtype (%)				0.34
Hypoactive	108 (66.3)	94 (66.2)	14 (66.7)	
Mixed	30 (18.4)	28 (19.7)	2 (9.5)	
Hyperactive	25 (15.3)	20 (14.1)	5 (23.8)	

1. 通鋪高噪音
2. 單人房有窗光線較亮
3. 同樣有窗的情形下，單人房控制性較佳 (光線節律-生物節律-睡眠品質及情緒較好)
4. 單人房隱私高，減少焦慮及壓力
5. 通鋪病人與家屬互動率較低

Postoperative type of admission included scheduled and emergency surgeries.

翻轉低效重症照護流程

- × ÷ + 創新方程式



Catalyst

| Innovations in Care Delivery

ARTICLE

Low-Value Care De-implementation: Practices for Systemwide Reduction

Corinna Sorenson, PhD, MHSA, MPH, Mark Japenga, MPAff, Hannah Crook

Vol. 3 No. 5 | May 2022

DOI: 10.1056/CAT.21.0387

NEJM Catalyst Innovations in Care Delivery, 3(5), CAT-21

原 著

探討低價值醫療利用之相關因素—以高階影像檢查為例

吳潔人^{1,2} 郭年真^{2,*}

摘 要

目的：低價值醫療在臨床照護帶來極小好處且可能造成醫源性傷害，目前全球醫療體系與國內醫療機構皆在面對此項艱鉅挑戰。

方法：透過 2010-2014 年衛生福利資料科學中心全民健康保險資料庫檢視「非複雜性頭痛開立低價值頭部影像檢查」、「暈厥開立低價值頭部影像檢查」及「簡單性暈厥開立低價值頸動脈超音波檢查」三項低價值影像檢查利用情形，使用多階層羅吉斯回歸探討在控制醫療機構及病人特質後，低價值影像利用的相關因素。

結果：低價值醫療利用率分別為 8.98%、14.08% 及 5.80%。病人的看診醫師影像費用佔所得越高（OR:1.342-4.690）、男性（簡單性暈厥開立低價值頸動脈超音波檢查 OR=0.825）、年齡較小（OR:1.198-1.410）及急診醫學科（OR:2.746-4.127，簡

REVIEW ARTICLE

AI IN MEDICINE

Jeffrey M. Drazen, M.D., *Editor*, Isaac S. Kohane, M.D., Ph.D., *Guest Editor*,
and Tze-Yun Leong, Ph.D., *Guest Editor*

Artificial Intelligence in U.S. Health Care Delivery

Nikhil R. Sahni, M.B.A., M.P.A.–I.D., and Brandon Carrus, M.Sc.

From the Department of Economics, Harvard University, Cambridge (N.R.S.),
and the Center for U.S. Healthcare Improvement, McKinsey and Company,
Boston (N.R.S., B.C.) — both in Massachusetts.

Mr. Sahni can be contacted at nikhil_sahni@mcKinsey.com
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N Engl J Med 2023;389:348-58.

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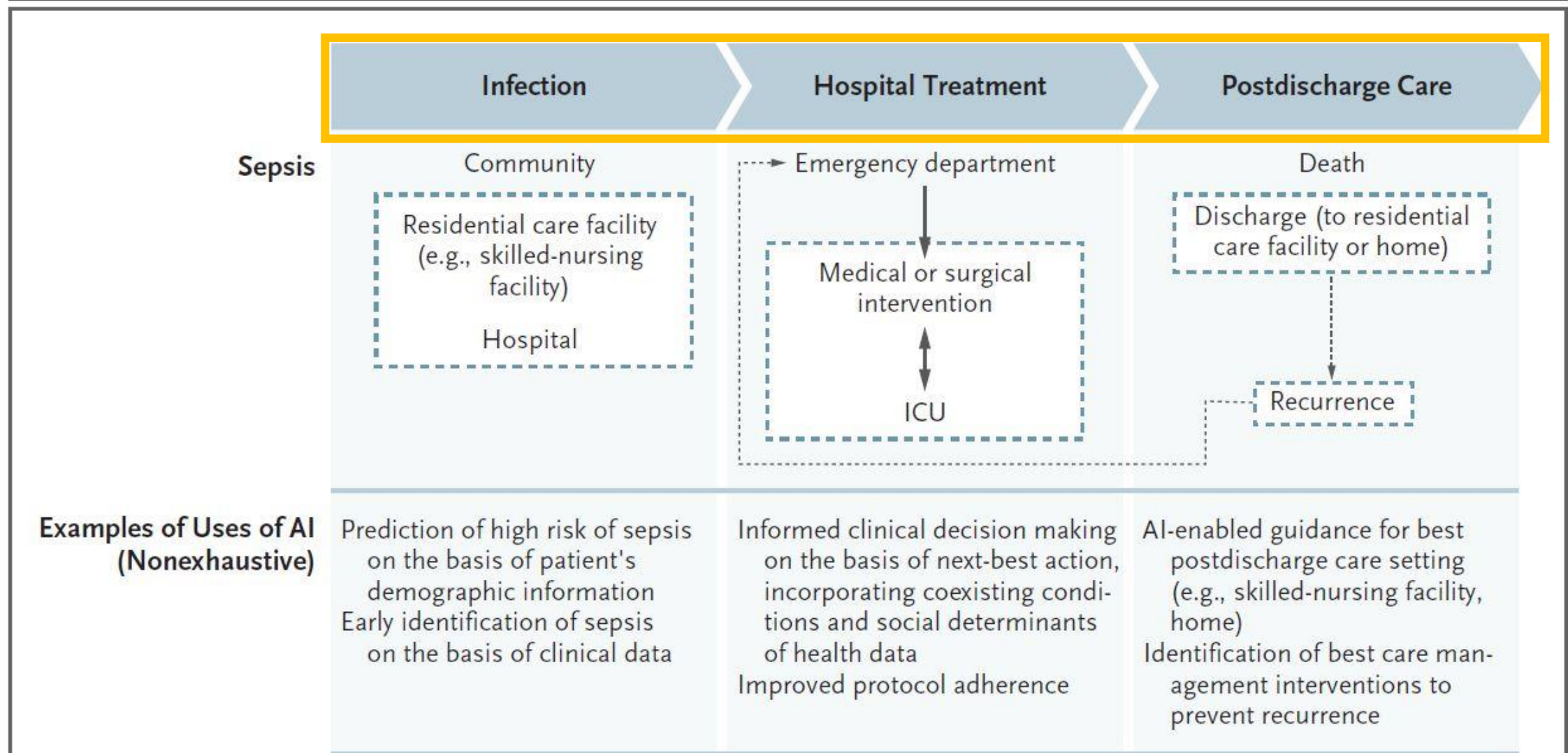
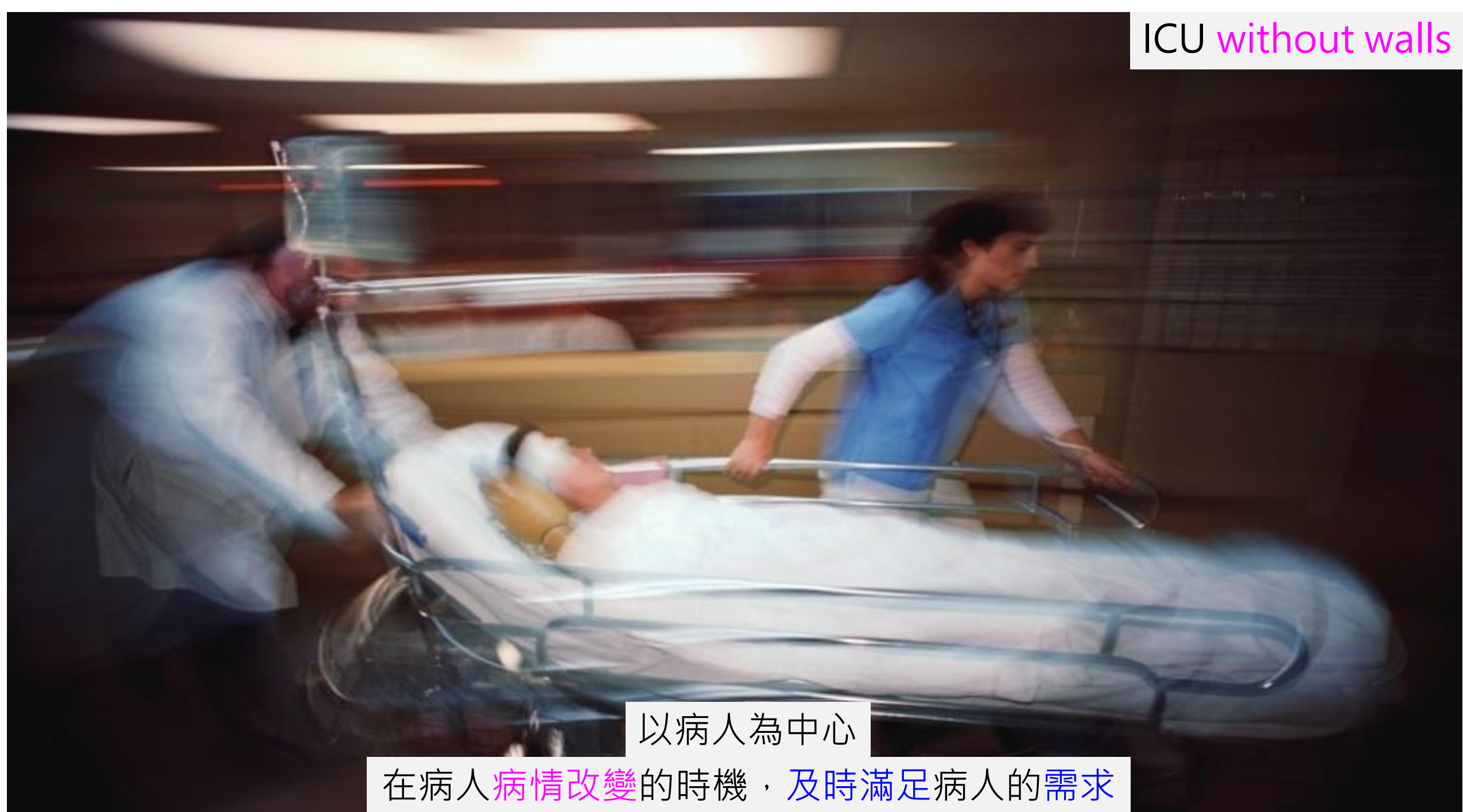


Figure 4. Use of AI to Predict and Manage Sepsis.

In the quality and safety domain, AI has been used in the detection of risk of sepsis and the care of patients with this condition. Boxes indicate areas of greatest potential AI impact. ICU denotes intensive care unit.

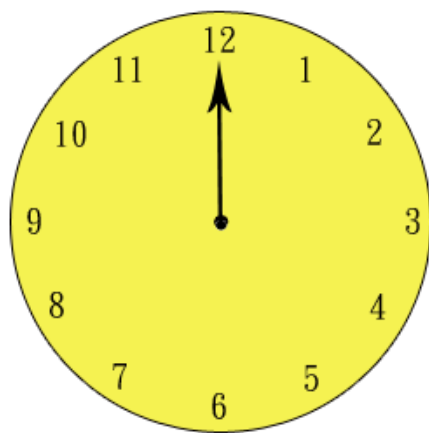


以病人為中心

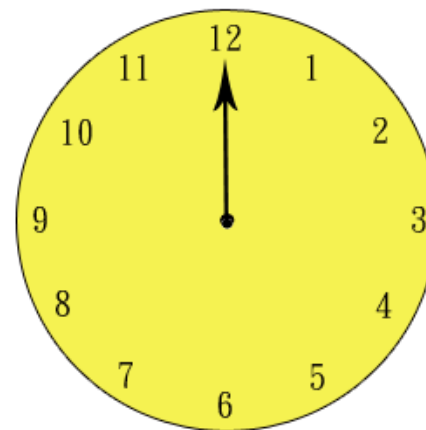
在病人病情改變的時機，及時滿足病人的需求

ICritical Uncertain

It is changing **uncertainly!**



(Patient)
定時炸彈



(Doctor)
剪斷引信

病情(車子)**快速行進中**搶救修復



T O M C R U I S E



老歌新唱情不變



REVIEW ARTICLE

CURRENT CONCEPTS

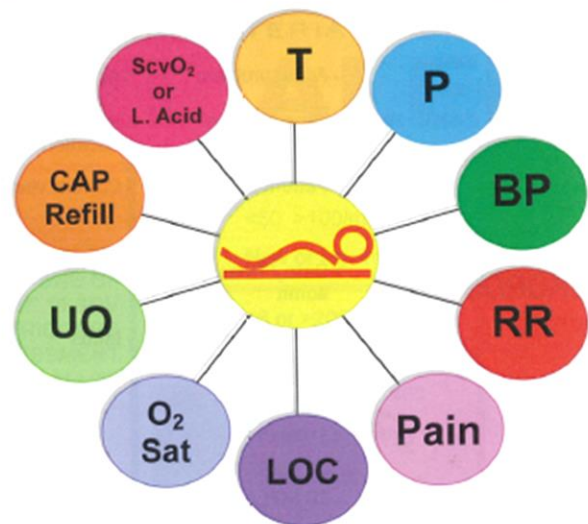
Rapid-Response Teams

Daryl A. Jones, M.D., M.B., B.S., Michael A. DeVita, M.D.,
and Rinaldo Bellomo, M.D., M.B., B.S.

RAPID-RESPONSE TEAMS HAVE BEEN INTRODUCED TO INTERVENE IN THE care of patients with unexpected clinical deterioration. These teams are key components of rapid-response systems, which have been put in place because of evidence of “failure to rescue” with available clinical services, leading to serious adverse events.¹ A serious adverse event may be defined as an unintended injury that is due in part to delayed or incorrect medical management and that exposes the patient to an increased risk of death and results in measurable disability.² Rapid-response systems aim to improve the safety of hospital-ward patients whose condition is deteriorating. These systems are based on identification of patients at risk, early notification of an identified set of responders, rapid intervention by the response team, and ongoing evaluation of the system’s performance and hospital-wide processes of care.¹ Rapid-response systems have been implemented in many countries and across the United States.^{3,4}

特戰部隊
大聯盟

10 SIGNS OF VITALITY



- Temperature
- Pulse
- Blood Pressure
- Respiratory Rate
- Pain
- Level of Consciousness
- Arterial Oxygen Saturation
- Urine Output
- Capillary Refill
- ScvO₂ or Lactic Acid

RRS PROGRAM
YOUR FACILITY NAME AND LOGO

Table 1. Comparison between a Traditional Code Team and a Rapid-Response Team.*

Feature	Traditional Code Team	Rapid-Response Team
Typical criteria for calling the team	No recordable pulse, no recordable blood pressure, absence of respiratory effort, unresponsive	Low blood pressure, rapid heart rate, respiratory distress, altered consciousness
Typical conditions that the team assesses and treats	Cardiac arrest, respiratory arrest, airway obstruction	Sepsis, pulmonary edema, arrhythmias, respiratory failure
Typical team composition	Anesthesia fellow, ICU fellow, internal-medicine house staff, ICU nurse	ICU fellow, ICU nurse, respiratory therapist, internal-medicine house staff
Typical call rate (no./1000 admissions)	0.5–5	20–40
Typical in-hospital mortality (%)	70–90	0–20

* ICU denotes intensive care unit.

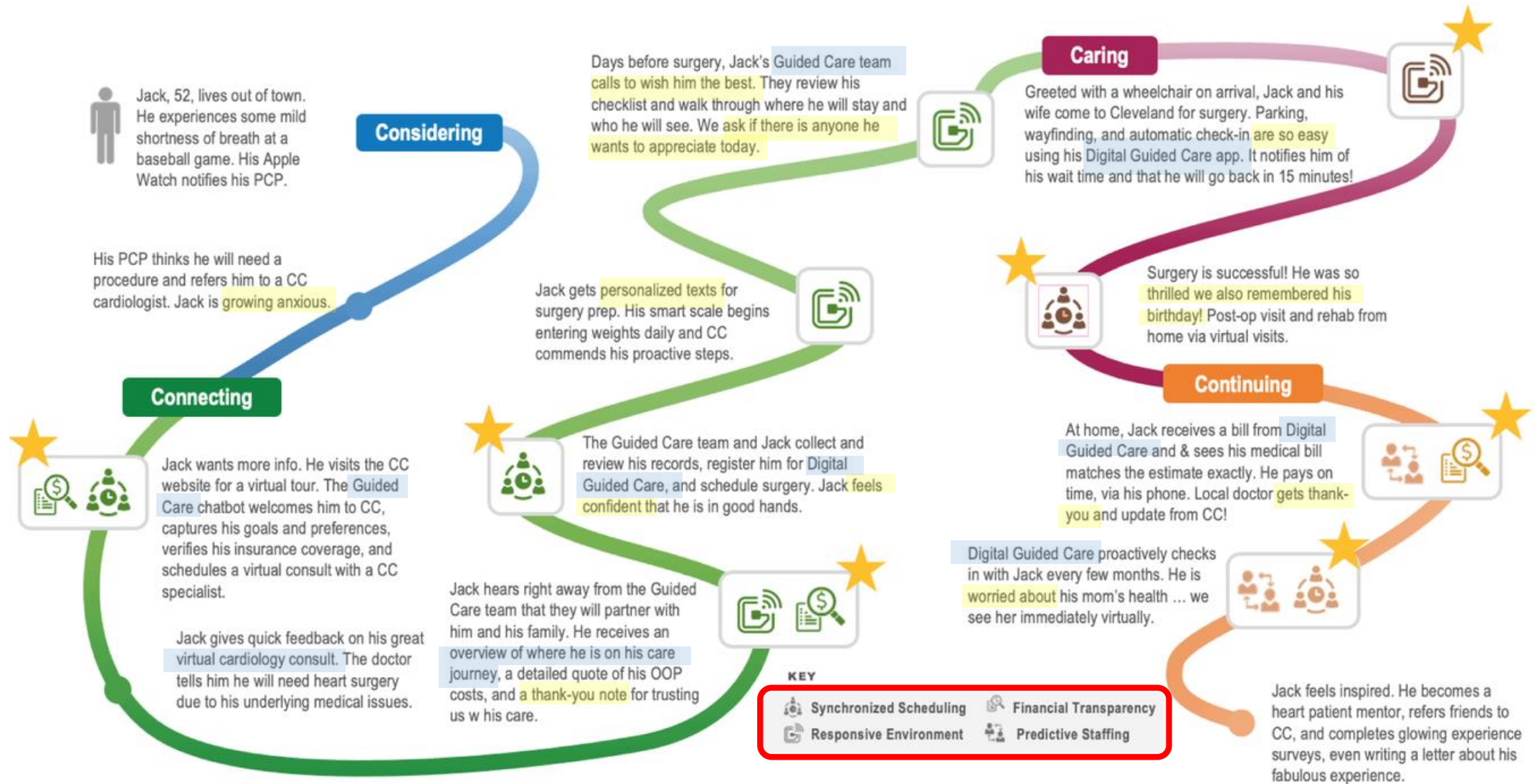
COMMENTARY

Guided Care: What Patients and Employees Actually Want from an Access Strategy

Adrienne Renee Boissy, MD, MA, Julie M. Rish, PhD

DOI: [10.1056/CAT.21.0315](https://doi.org/10.1056/CAT.21.0315)

Future state of experience journey with **Guided Care** concept

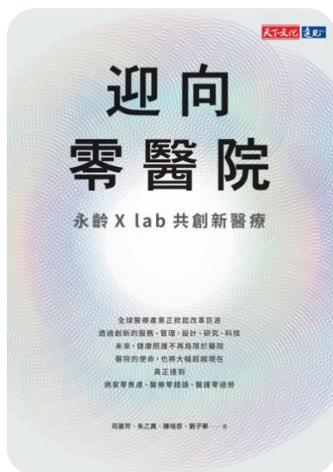


Abbreviations: PCP = primary care physician; OOP = out-of-pocket; CC = Cleveland Clinic.

Virtual Hospital 2013
Mercy Virtual Care

One Homespital,
One Intelligent Care Union

親鄰醫院



北榮重症資訊整合

N

Nursing
護理

I

IT
資訊

C

Critical care
重症

E

Engineer
醫工

Quality
醫品病安



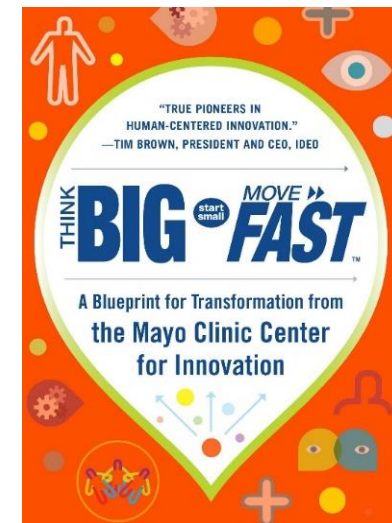
ALL STAR TEAM

NICE 團隊





THINK **BIG** start small *MOVE* **FAST**™



跨步要大



起步要輕



腳步要快

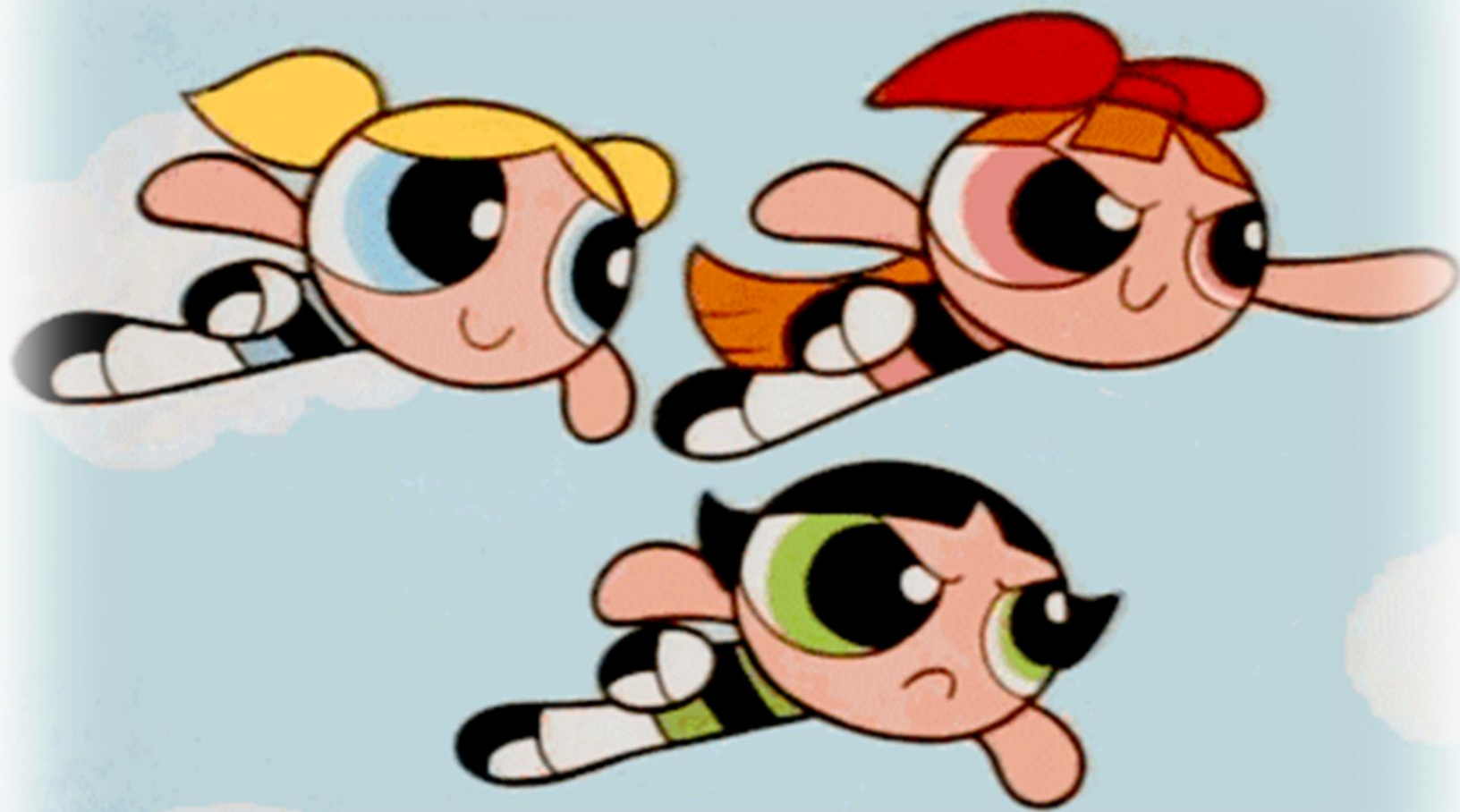


創新沒有實證可循

自己的醫院自己設計

獨行快 衆行遠

雁群藉著V字隊形，
整個雁群比每隻雁鳥單飛時，
至少增加71% 的飛行距離



親鄰捍衛護士

Double SMART Barbie

