榮耀六十・卓越踏實

臺北榮總 1958-2019 The 60th Anniversary of TVGH

Future Pharmacy Dialogue

How to Apply the Outcome Measurements in Pharmaceutical Care

The Application of Outcome Measurements in Pharmaceutical Care in an Intensive Care Unit in Taipei Veterans General Hospital

Department of Pharmacy

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臺北榮民總醫院

Outline

- **The Critical Care Services in Taipei Veterans General Hospital**
  - Introduction of our critical care services
  - Implementation of clinical pharmaceutical services in ICU
  - Pharmacy note and quality audit
- **The Reimbursement Scheme for Cognitive Pharmaceutical Services**
- **Pilot Studies**
  - Clinical Outcomes of the Reimbursement for Clinical Pharmaceutical Services in an Intensive Care Unit in VGHTPE
  - Economic Evaluation of the Reimbursement for Clinical Pharmaceutical Services in an Intensive Care Unit in VGHTPE
- **Take Home Message**

Pharmaceutical Services in VGHTPE

- **Inpatient clinical pharmacy services**
  - General wards
    - Allergy-immunology-rheumatology, cardiology, chest medicine, gastroenterology-hepatology, geriatrics, infection, nephrology, metabolism-endocrinology, neurology, oncology, pediatrics, psychology, transplantation and, etc.
  - Intensive care units
    - ICU, CCU, CVSU, NCU, NICU, PICU, RCU, SCU, EICU, etc.

- **Outpatient clinical pharmacy services**
  - Pharmacist-managed anticoagulation clinic
  - Pharmacist-managed transplantation clinic
  - Outpatient pharmaceutical clinical service

Pharmaceutical Services in Intensive Care Units

Original Care Team + **Intensive Care Team**

ICU

- ICU attending physicians
- Residents
- Interns
- Respiratory therapists
- Nutritionists
- Physical therapists
- Social workers

Clinical Pharmacists

Started from SICU in 1993
Participated in all ICU in 2006

臺北榮民總醫院藥學部臨床藥師服務權責區分配表-1　108.4

科別	病房	主治醫師	藥師	PHS
加護病房	CCU	潘如濱	翁如潔	0466
	CVSA, CVSB	黃竣暘	胡慕方	0663
	ICUA + EICU(1-5)	江東鴻	林于瑄	0698
	ICUB + EICU(6-9) + PORCU	蔡佩君	陳佳慧	0464
	ICUC + EICU(10-16)	周賽信	陳美瑜	0680
	NCUA (1-15)	陳明德	林家潔	0469
	NCUB	鍾芷萍	王明紫	0468
	SCU + NCUA (16-24)	許立奇、李怡德、林俊仁、鍾芷萍、劉紅余	陳寬軒	0694
	NICU	鄭玫枝、曾珮真	王莎如	0679
	PICU	宋文豪、李昱璧	張齡方	0473
	RCUA (1-14) + RCUB (21-25)	趙恒勝	顏家拓	0684
	RCUA (15-28) + RCUB (26-30)	張西川、周中偉	樊　蓉	0791
	RCUB (1-20,31,32)	陽光耀、余文光	王怡晴	0683

- Infection
- Ventilation
- Perfusion
- Nutrition
- Sedation

Medication List

Implementation of Clinical Pharmaceutical Services

- **Efficient consistent and transparent documentations**

臺北榮民總醫院 Taipei Veterans General Hospital 登入者： 登出 10.30.1.11:9444(web9Server04)
Released 2019/07/18

查詢病患 | 特殊篩選 | 訪視清單 | 處方判讀 | ME | 服務建議 | 用藥指導 | 用藥諮詢
ADR | 知識庫 | TDM

病患訪視記錄

病患基本資料

病房床號	ICUA - 3	姓名	陳	病歷號		年齡	69	性別	女	科別	MICU
身高	162.000	體重	58.000	BSA	1.615	主治醫師	呂	藥師	顏		
T/P/R	36.6 / 74 / 14	BP	130 / 71	smoking		drinking		訪視日期	2019/07/23	NGT	N

過敏記錄 (1)

主題	詳細內容	註記醫師登號	註記醫師姓名	註記日期	註記時間
CIPRO, TEICO		DOC	張	2014/7/30	下午 03:02:57

用藥記錄 | 入院病摘 | 檢驗數值 | Warfarin 使用評估表 | 訪視記錄 | 歷次 審核資料 | 備註 | 化療 給藥計畫書

用藥記錄

用藥起迄日 -藥品類別- 用藥狀態： 目前使用中 醫事人員系統 DRG

勾	#	藥名/藥品資訊	劑量	途徑	頻次	起日	迄日	狀態	自購
☐	0022	Tatumcef for * inj 2 g "CCPC" (C 處 觀 袋 仿 規 同 孕 註 肝 腎 輸 終 老 重 交 抗	2000 MG	IVA	Q12H	2019-07-22	2019-07-25	REGUL.	

A&P
A： ME重複藥名
P： 新增處方

藥學小工具

Clcr (CG)	BMI	IBW	BSA	Serum Osm
Anion gap	Calcium correction	A1c to glucose	BEE	Ca x P for TPN
ANC	Osmolality for TPN	eGFR (MDRD)	Adjust body weight(ABW)	

Assessment= 65

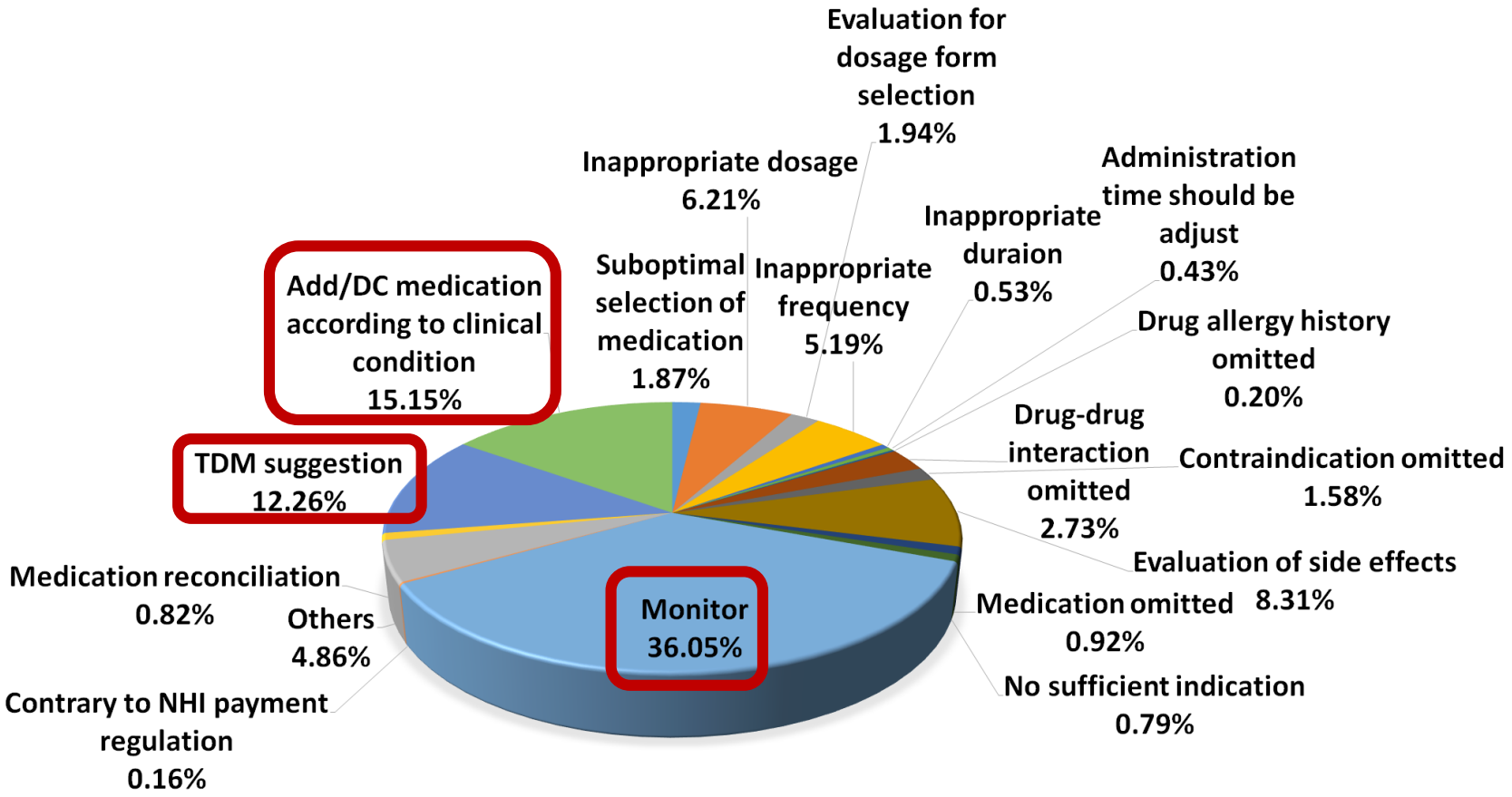
ME適應症缺乏藥物
ME藥物無適應症
ME其他
S選藥不適當
S劑量過量
S劑量不足
S劑型不適當
S劑型轉換
S頻次過高
S頻次不足
S療程過長
S療程不足
S給藥時間不適當
S忽略過敏史
S忽略過敏測試
S未察交互作用
S忽略用藥禁忌
S忽略用藥須知
S副作用/不良反應評估
S適應症缺乏藥物
S藥物無適應症
S依病情需要新增藥品
S依病情需要刪除藥品
S缺乏premedication
S監測
TDM血中濃度偏高
TDM血中濃度偏低
TDM未監測藥物濃度
TDM抽血品項不符
TDM抽血時間點欠妥

Plan= 27

新增處方
修改劑量-調高劑量
修改劑量-調低劑量
修改劑型
修改療程-延長療程
修改療程-縮短療程
修改給藥時間
修改給藥頻次
修改給藥途徑
修改總量
修改濃度
修改輸注時間
修改稀釋溶液
修改給藥說明
更改處方
停止處方
監測肝腎功能
監測lab data
監測血壓/血糖/ECG
監測可能副作用
監測臨床反應
TDM-監測藥物血中濃度
TDM-監測藥物free form濃度
TDM-監測可能副作用
TDM-監測臨床反應
其他
同意目前用藥

Analysis of Pharmacist Interventions

- **Total interventions in 2018: 3043**



Pharmacy Note and Quality Management

Pharmacy Note

病房床號 -　　姓名 李　　病歷號　　記錄時間 2018/02/13 142106

Subjective： 55-year-old female with Malignant neoplasm of brain. 2018-01-15 : Craniotomy for removal of glioma,supratentorial. Seizure with AEDs well control.
RX
Depakine 500 mg qdcc 1/11-2/2

Objective： Albumin 3.4
Depakine total: 75.5 (ref 50-100 ug/ml) 1/28
Depakine free: 16.2 (ref 5-10 ug/ml) 1/28

Assessment： 1. Adverse drug reaction need to be checked since taking DEPAKINE

Plan： 1. Please monitor side effects of DEPAKINE, such as drowsiness.
2. Physician has been informed.

藥師　陳

評分：B

審核意見：
8
1. 建議可與醫師溝通，若已確定要測 free form，應可不須同時測 total form
2. 此病人 free form level 超過建議值，是否仍在可接受範圍或因未出現副作用且病情控制穩定故不須調降劑量？建議應於 SOAP 中交代以更為完整

回覆意見：
謝謝主任審核。
1. 長期以來的溝通使得大部份醫師都能遵守，僅少數醫師及 NP 仍同時開立 free 及 toal，未來將持續加強溝通。
2. 本患者確實需要比較高的濃度才能將癲癇控制良好 (根據國外案例參考值，本例濃度仍在可接受範圍且無不良反應發生)，未來將在 soap 交代清楚。

臺北榮總藥學部 TDM 建議稽核表

藥品：Vancomycin　　濃度報告：37.0
劑量/頻次：1000mg / Q8H　　抽血時間：9/5 10:56
案件執行者：王不　　案件審核者：余

審核評估結果：(請評估建議內容之適當性)

優(5)	佳(4)	可(3)	差(2)	很差(1)
○	✓	○	○	○

審核者意見：1、9/5之抽血時間以有延誤，但SOAP上並無特別說明，請補充說明。
2、建議增列WBC、CRP、BT以利同時評估療效。

審核者簽章/日期：藥學部 師(三)級藥師 余　9/5

執行者回覆：1.當時已和護理師確認，因9/5 AM給藥車多，Vancomycin改至11:00 AM給藥，run至13:00
2.請詢問主審核看意見。

執行者簽章/日期：藥學部 契約藥師 林　9/6

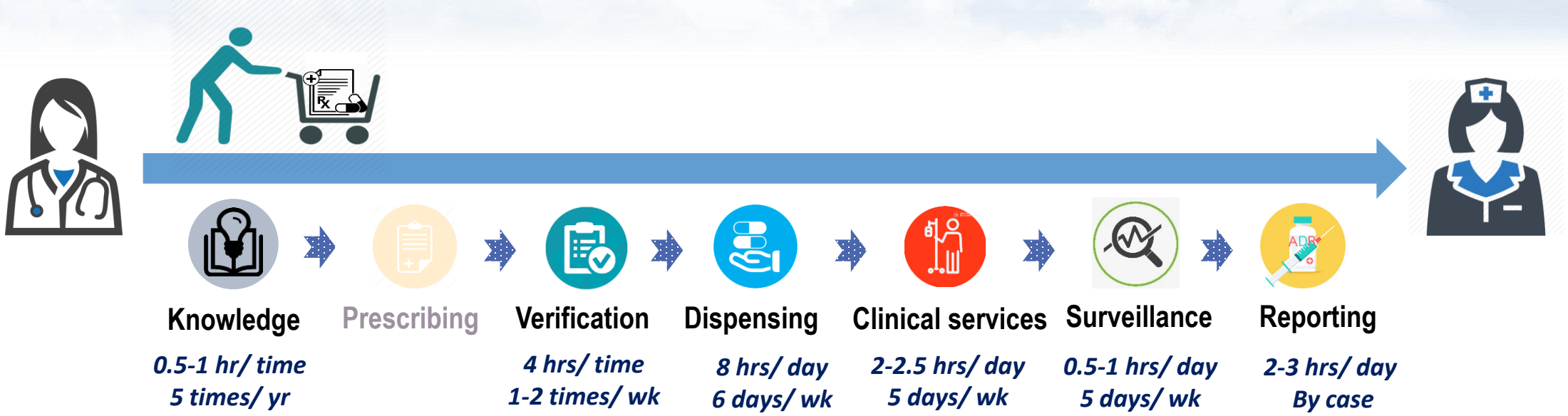
覆核者意見：高trough conc.這當時.充足建議hold一次dose.並確定可達accepted trough level之時間.並再給予調整劑量之建議.

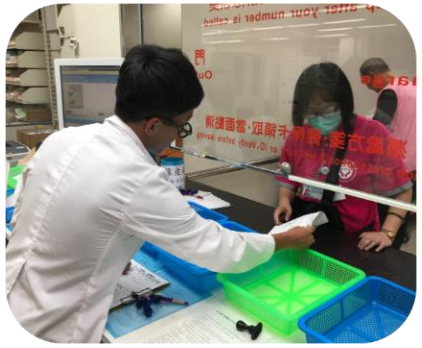
覆核長官簽章/日期：藥學部 藥學科主任 張　9/8

回饋執行者：
感謝長官指導.

執行者簽章/日期：藥學部 契約藥師 林　9/12

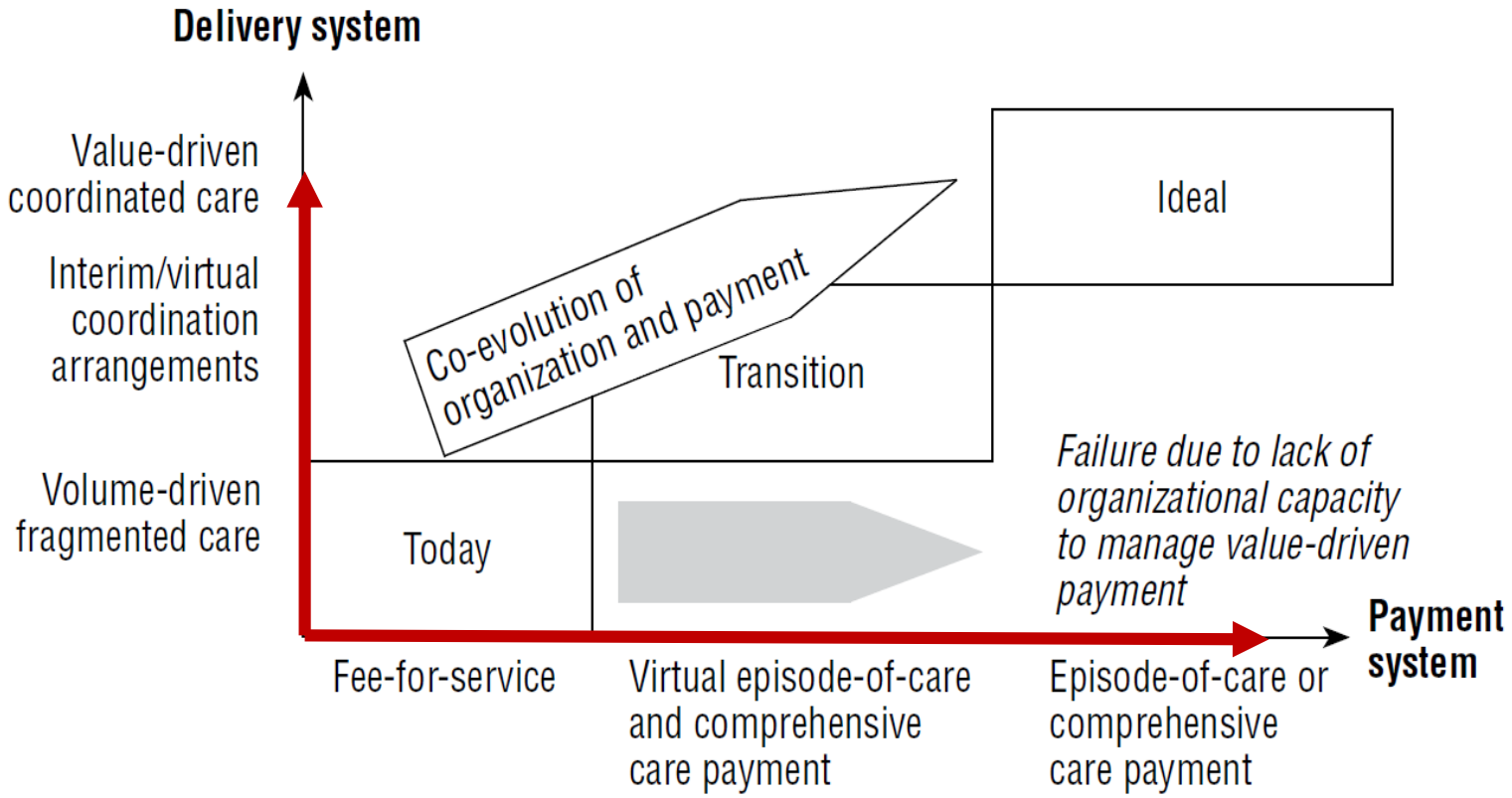
Quality of the Pharmaceutical Services in ICU





Reimbursement for Cognitive Pharmaceutical Services

- **Background**



Source: Reprinted with permission from Miller (2009).

Fee for Intensive Care

2018 →2019

1615 points
→ 1615 points
per patient/day

4277 points
→4491 points
per patient/day

104 points
→ 104 points
for dispensing
per patient/day

Reimbursement for Cognitive Pharmaceutical Services

全民健康保險提升醫院用藥安全與品質方案

107年12月20公告自108年1月1日生效

- 全民健康保險重症加護臨床藥事照護給付方案
  - 目的：

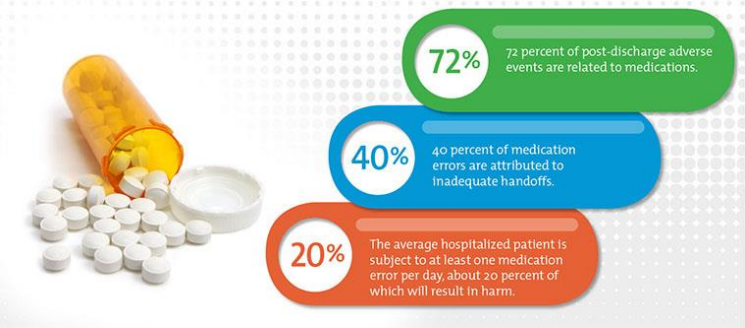
    建立加護病房重症病人臨床藥事照護模式，加強個人化之合理用藥，提升藥事照護品質
  - 執行藥師資格：
    1. 具藥師資格，藥學士畢業於醫院職業年資累計滿2年
    2. 臨床藥學士/碩士班臨床藥學所/醫院藥學組畢業
    3. 過去一年中，須實際參與加護病房團隊照護至少連續6個月，並提出連續6個月，每月至少10筆的加護病房病人實際照護佐證資料

觀察指標

1. 介入類別的分析及醫師及其他醫事人員接受率
2. 避免之醫療費用（cost-avoidance）
- 直接節省之藥費
- 間接節省之醫療費用（e.g. 病房費及護理費）

Benefits for Clinical Pharmaceutical Services

- **Realities in healthcare services**
  - More than 50% of hospital admission are associated with
  - Only 20-30% of DRPs can be prevented



- **Incidence of ADE without pharmacist intervention**

Pharmaceutical intervention	Provelence
Suggestion	
Dosing or frequency /contraindication /Drug-drug interaction/suspected adverse drug reactions	**0.6**
Administration/ indication/ combination/ more appropriate medications or formula	**0.4**
Duration or amount/route or dosage form	**0.1**
reimbursement criteria /medication reconciliation /others	**0.0**
Monitor	
Therapeutic drug monitoring	**0.6**
Therapeutic effect or side effect monitoring	**0.4**

DRP= drug-related problems

Benefits for Clinical Pharmaceutical Services

- **Pharmacist involvement in the multidisciplinary team**
  - A small percentage of clinical pharmacy interventions, but generated substantial savings
  - Reducing the costs of care for the patients without adversely affecting clinical outcomes due to antibiotic therapy

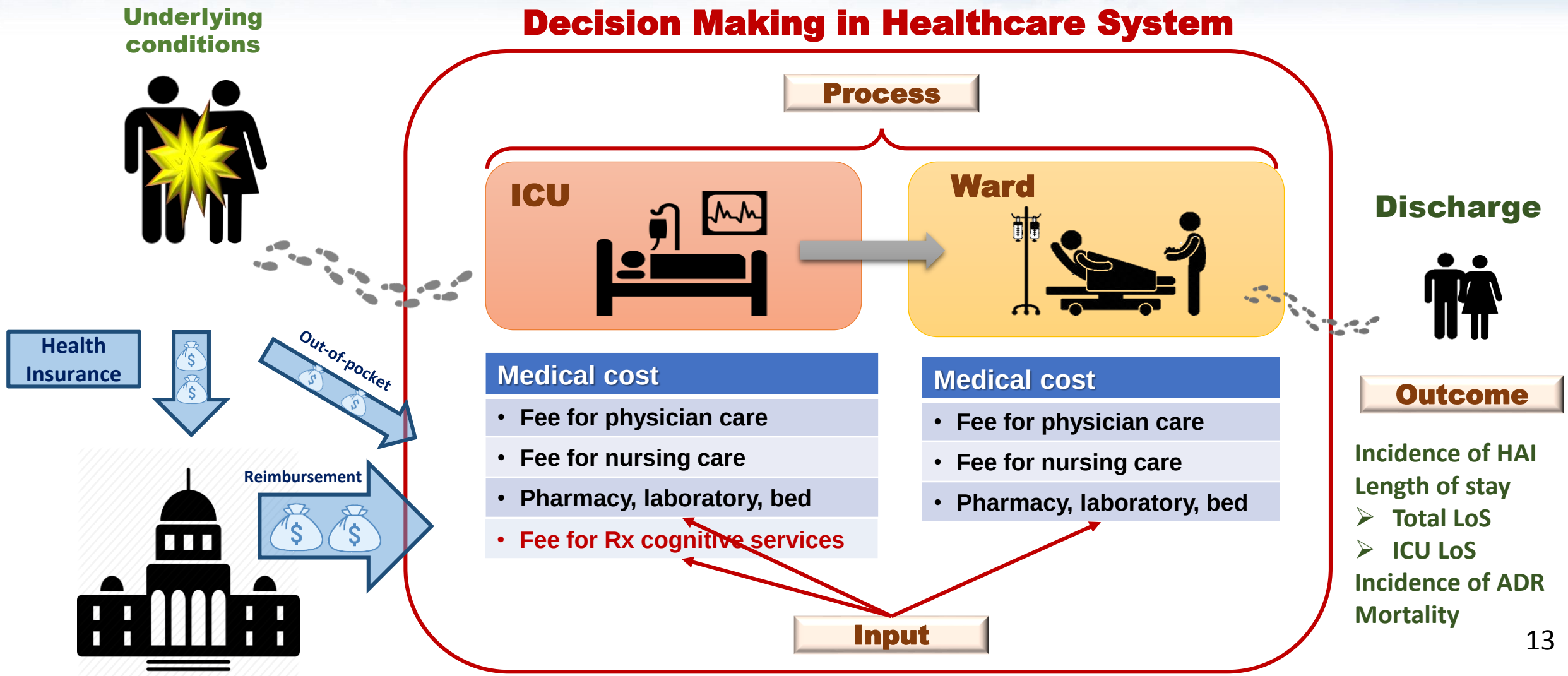
  - It has been proven to be a cost-effective intervention in a ward level
    - Improving patient safety and their satisfaction
    - No evidence was found for 7-day pharmacist presence

Significant outcomes with pharmacist involvement	
↓Length of stay	Mean= -1.74 days [95%CI: 2.76, -0.72]
↑Patient satisfaction	RR=1.49 [95%CI: 1.09, 2.03]

Am J Health Syst Pharm. 2008 Jun 15;65(12):1161-72.

Res Social Adm Pharm. 2018 Oct 19. pii: S1551-7411(18)30652-1.

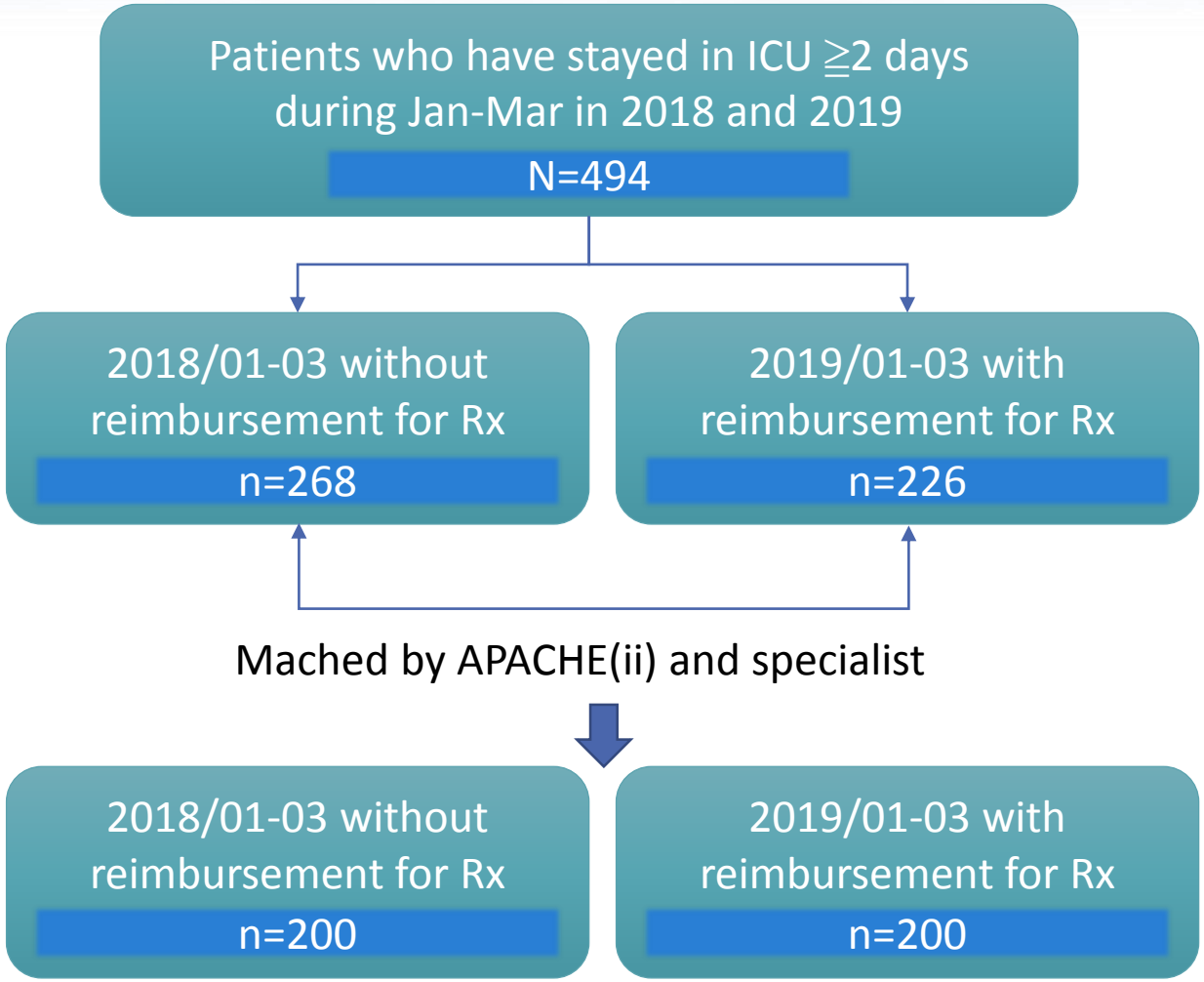
Clinical and Economic Impacts of the Reimbursement for Cognitive Pharmaceutical Services in an Intensive Care Unit in Taiwan



Pilot Study-1 for Clinical Outcomes

- ***Aim***
  - To elucidate whether the new reimbursement improves the patient and financial outcomes via clinical pharmacists‘ performances in an ICU level from the payer’s perspective
- ***Study Design***
  - Retrospective observational matched control study
- ***Method***
  - Patients who admitted to ICU in VGHTPE during 2018 and 2019 Q1 (Jan-Mar)
  - Matched by MICU/SICU and APACHE(ii)
  - Pharmaceutical services: *Verification, SOAP documentation, ME report, TDM with intervention*
  - Outcomes: *ADR, hospital-acquired infections, length of stay, mortality*

Pilot Study-1 for Clinical Outcomes



Baseline Characteristics (n=400)

	2018 Q1 (n=200)	2019 Q1 (n=200)	p
Sex			
Male	129 (64.5%)	128 (64.0%)	0.917
Age			
Mean ± SD	67.50 ± 16.256	66.12 ± 16.901	0.590
Specialists			
MICU SICU	81 (40.5%) 119 (59.5%)	81 (40.5%) 119 (59.5%)	---
APACHE (ii)			
<15 15-24 25-34 >= 35	40 (20.0%) 85 (42.5%) 59 (29.5%) 16 (8.0%)	40 (20.0%) 85 (42.5%) 59 (29.5%) 16 (8.0%)	---

Pilot Study-1 for Clinical Outcomes

Pharmaceutical interventions (n=400)

	2018 Q1 (n=200)	2019 Q1 (n=200)	P-value
ME reporting	8 (4.0%)	4 (2.0%)	0.190
SOAP ABX related intervention	14 (7.0%) 9 (64.3%)	46 (23.0%) 27 (58.7%)	<0.01
Informed TDM TDM with intervention	1 (0.5%) 0 (0.0%)	4 (2.0%) 1 (25.0%)	0.186

Clinical Outcomes (n=400)

	2018 Q1 (n=200)	2019 Q1 (n=200)	P-value
Mortality	40 (20.0%)	39 (19.5%)	0.500
Hospital-acquired infection	48 (24.0%)	31 (15.5%)	0.022
Reported ADR	5 (2.5%)	0 (0.0%)	0.030
Length of stay Hospital LoS	34.84±32.816	32.58±31.374	0.510

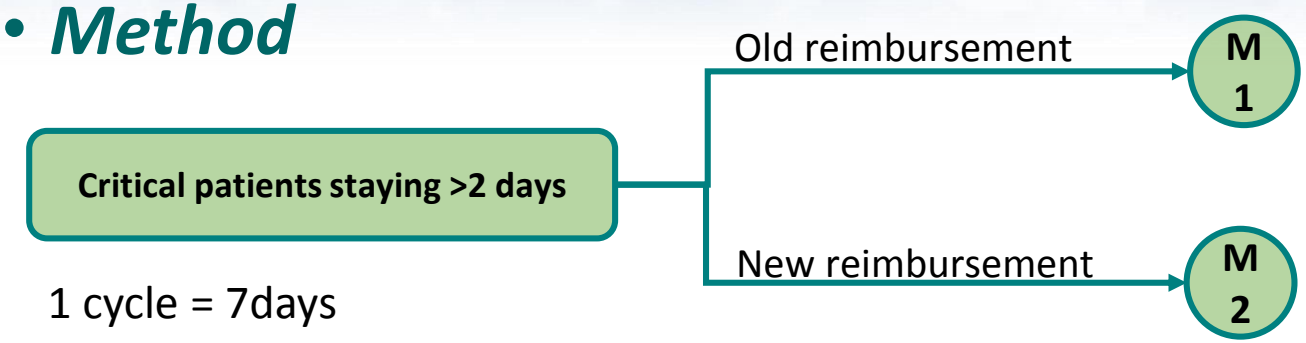
Acceptance rate

Direct costs of the medications (n=400)

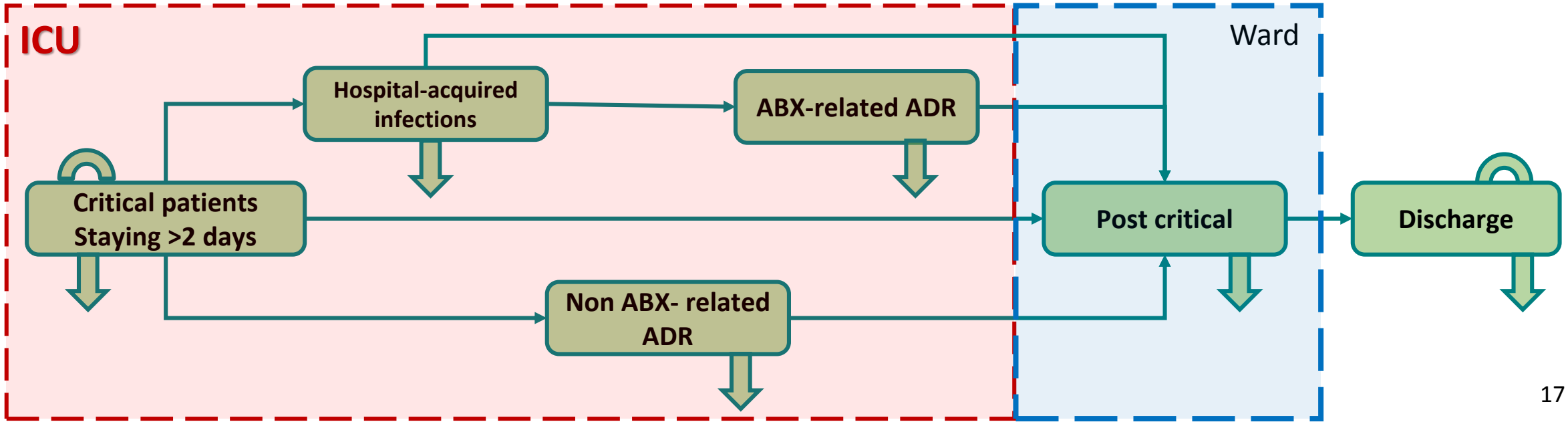
TWD	2018 Q1 (n=200)	2019 Q1 (n=200)
Overall costs		
Mean ± SD	195,210.6 ± 320242.6	218,439.9 ± 510376.2
Median (Q1,Q3)	209,759.0	194,150.0
Sum	39,242,683.0	43,487,401.1
ICU costs		
Mean ± SD	87,772.5 ± 130370.3	104,624.9 ± 178003.9
Interquartile range	92,662.6	88,092.0
Sum	17,627,423.7	20,852,053.5

Pilot Study-2 for Economic Evaluation

- ***Method***



1 cycle = 7days
For 52 cycles



Pilot Study-2 for Economic Evaluation

- **Variables and probability**

Discounting rate= 3%

Variables		2018 Q1	2019 Q1
		Reimbursement (-)	Reimbursement (+)
ICU	Hospital-acquired infection	0.36%	0.32%
	Staying in ICU <7 days	66.80%	61.5%
	Incidences of ADR	7.01%	7.04%
	General death	12.78%	9.62%
	Death due to HAI	2.51%	2.38%
Ward	General death	2.19%	2.08%
Population	General death	0.19%	0.20%

Cost		Reimbursement (-)	Reimbursement (+)
Critical care	2 days	19204	20524
ICU stays	7 days	67214	71834
Ward stays	7 days	15155	15155
ICU with clinical pharmacy services	7 days	67214	73154
Hospital-acquired infection	7 days	70441.8	75061.8
Discharged	1 OPD	335	335

- **Assumption**
  - **Hospital-acquired infections**
    - Ventilator associated pneumonia
    - Catheter related UTI
    - Central line-associated BSI
  - **1 point = 1 TWD**
  - **1 OPD follow-up were assigned for the patients who discharged**

- **Results**

	Difference	*ICER*
△ Cost		
	6951.2	
△ Effects		
Length of stay	↓ 0.6113	***11371.2***
Hospital-acquired infection	↓ 0.04%	***173780.0***
Medication error/ADR	↓ 6	***1158.5***

Discussion

- This is the first study utilizing **Markov model** for evaluating the impact of **Reimbursement for Clinical Pharmaceutical Services** in Taiwan
- **Similar patterns of resources utilization and seasonal variation** of the top 10 primary diagnosis and in ICU from 2004-2008 in Taiwan *Journal of Intensive Care 2014 2 : 8*
- The changing patterns of the **patients' baseline characteristics** in ICU
  - More patients with cancer and transplantation admitted in ICU in 2019
  - Increased the direct of pharmaceutical costs
- The trend of **promoting evidence-based pharmaceutical care** by the new reimbursement scheme
  - Clinical pharmacy interventions (SOAP documentation ↑)
    - Reduced preventable adverse drug events and prescribing errors

Take Home Message

- Cognitive pharmaceutical services
  - One of the sustainable interventions by the efficient use of resources with the provision of satisfied outcomes for patients with complicated conditions
- The new reimbursement scheme
  - Improving patient safety and achieving sustainably cost-effective intervention for critically-ill patients in an ICU level
  - Further studies could be done to survey the satisfaction from the perspectives of patients and multidisciplinary team in Taiwan in the future

Outcome measures measure outcomes, not effects of intervention

Thank You !

榮耀六十・卓越踏實

臺北榮總 1958-2019

The 60th Anniversary of TVGH