

# Use of Information technology and Cloud history to improve medication safety in TCVGH & Taiwan

資訊科技, 雲端病歷增加病人用藥安全

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Joint Commission of Taiwan, Workgroup on patient safety improvement project

## Outline of presentation



- Medication safety issues in Taiwan
- Current environment: The NHI MediCloud: cloud medication / medical record services provided by NHI of Taiwan
- HIT tools that help in Medication processes in TCVGH (Taichung Veterans General Hospital) & how they integrate with MediCloud
- Critical successful factors of Medicloud
- Current issues and challenges

### Taichung Veterans General Hospital



•Superintendent Wayne H-H Sheu MD, PhD

•Facility 1,576 beds

• Employees 3,968 members

Outpatients Service: 7,558 patients/day

Emergency Service: 185 patients/day

Admission Service :4,945 patients/ month

•Surgery Service: 3,741 patients/month

Compassion | Quality | Innovation | Accountability



## VGHTC EMR system



- In house development since 1987
- Outpatient Ordering since 1989. Filmless in 1993, Smart Hospital award 2015
   (Joint commission of Taiwan), Candidate in 2019
- Well adopted by users and adopted by two other medical centers in Taiwan in recent years



### Taiwan Patient safety Reporting system



- Volunteer reporting system sponsored by Ministry of Health and Welfare & executed through Joint Commision since 2003
- Total of 753 institutions + 10,347 clinics)
   2019 Q1
- 337 of institutions reported in this report

台灣病人安全通報系統 Taiwan Patient safety Reporting system

2019 年第 1 季報表資料



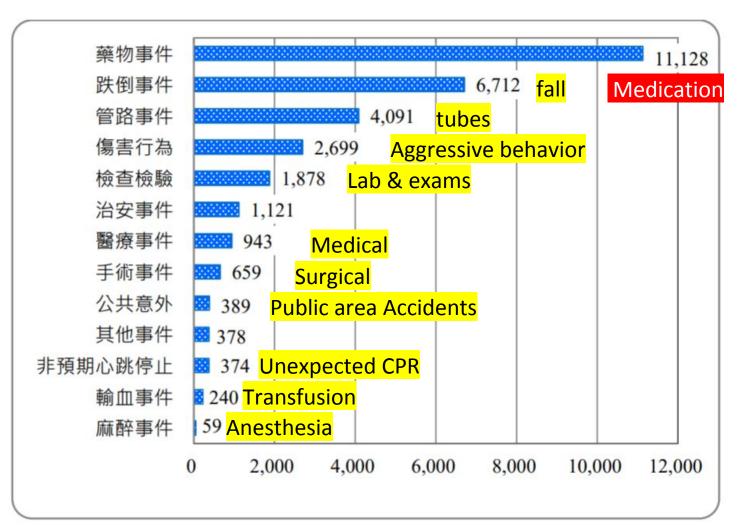




圖 2-1-1:整體通報事件類別

(N = 30,671; N 為本季通報事件數)

Taiwan Patient safety reporting system 2019

## **Error** in Medication processes



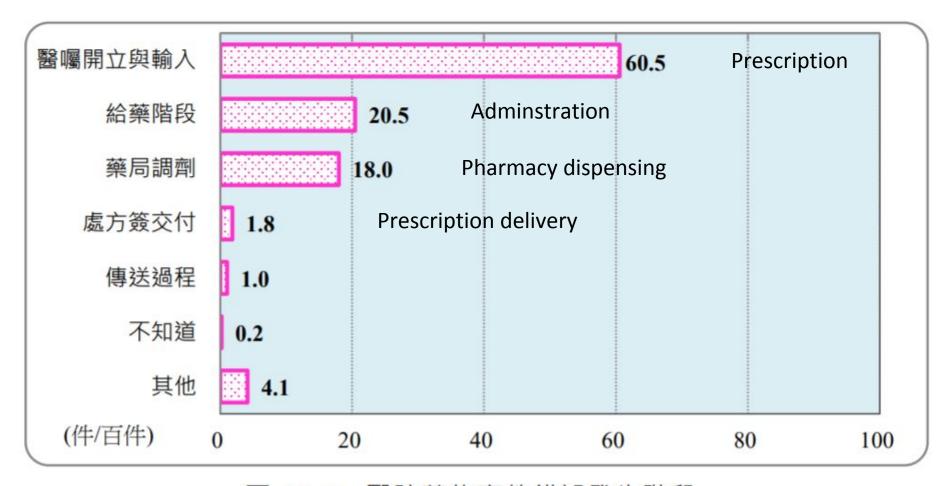
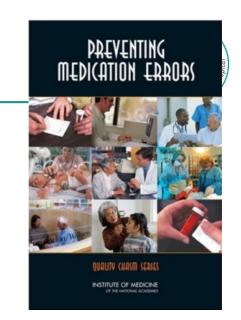


圖 4-1-1:醫院藥物事件錯誤發生階段

Taiwan Patient safety reporting system 2019

## IOM 2006 Preventing Medication Errors

## Effective Use of Well-Designed Technologies



- Computerized provider order entry with clinical decision support
- Medication Administration:
  - Use of electronic Medication Administration Record
  - machine-readable identification, eg. bar coding,
  - Use Smart pump

### **Cloud medication History since 2013**





## 健保票端藥歷系統

### 可即時查詢個人過去3個月的用藥紀錄

#### **们** 跨院醫療藥歷跟著跑 冤煩惱

台灣醫療院所多,民衆如果沒有在 固定的醫療院所看病,個人用藥資料 就會分散在不同的院所內,容易發生 民衆因跨院所就醫而重複用藥,造成 使用藥物過量或藥物之間可能會有交 互作用產生不良反應的問題。

2 "健保雲端藥歷系統" 資料最即時

為提升民衆用藥品質,並加強醫師及藥師替民衆用藥把關,健保署於102年7月起結合雲端科技技術,建置以病人為中心的「健保雲端藥歷系統」,提供特約醫事服務機構醫師於臨床處置、開立處方,及藥師用藥諮詢時,可即時查詢病人過去3個月的用藥紀錄。

3 醫病關係更密切

民衆看病時,可以主動提醒醫師或藥師幫忙瞭解最近的用藥資料,或者由家屬提醒醫師查看病人過去的服藥紀錄,讓醫師開藥更周延,病人用藥後也得到健康。





衛生福利部中央健康保險署 National Health Insurance Administration, Ministry of Health and Welfare

健保用心,讓您安心



## New environment (2016) — National Health Insurance (NHI)-Medicloud



### Medicloud user interface

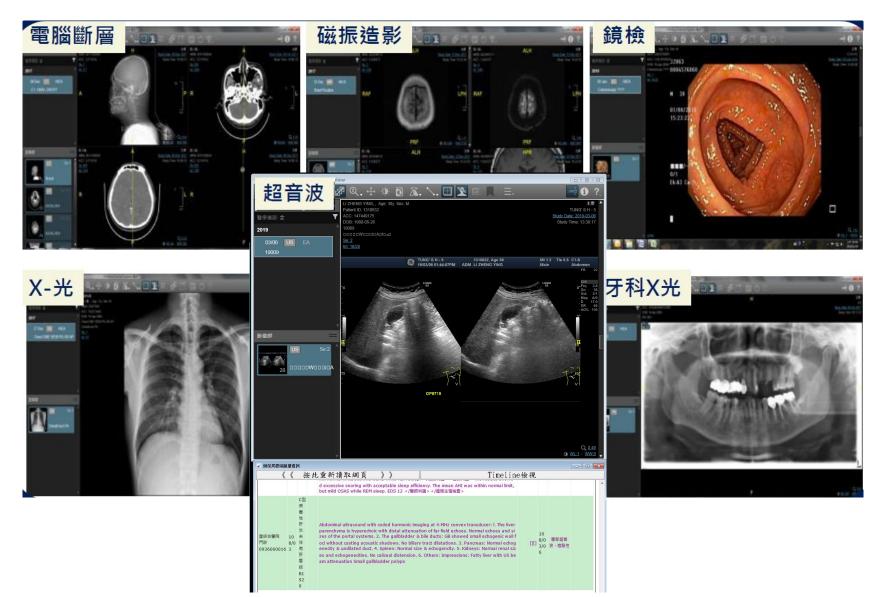


	《《 按此重	新讀取網頁	<b>&gt;</b> >		Timel	ine檢視	,	
	身分證號:	K100***262				***************************************		
<b>西松甘</b>	他保險對象健保卡資料:	請換卡再按我						
旦門共	他原因的 医原子具针		a診療目的之用,否則自負相	1987+4a=7T				
	摘要:		」係提供使用者連線前往疾飛 ■」頁鏡・	1986.公律資はで 第官制署「全國性預防接種資訊	【管理系統」	, 健保對象近期	如無健保就醫	與用藥紀
雲端架	歴 検査検験紀	錄 牙科處置及手	術 中醫用藥	CDC預防接種	回首頁	醫事人員溝	通平台	
、本系統呈 、持慢性病	現之「主診斷」欄位係特 連續處方箋調劑,須於給	約醫事服務機構醫療費用申 發期間屆滿前十日內,始得	日報資料・僅供参考・確實制 月再次調劑・	2、建議須向病人詢問藥品服用 影斷應以病歷記載為主。 成分、同劑型、同劑量藥品後。			藥品項。	
ATC3名	稱	ATC5名稱		成分名稱		就醫	區間 餘	藥
全部		★		★ 全部		★	¥	部
藥品名稱		來源		顯示欄位設定	查詢	清除		
全部		▼	他院 ☑藥局	門前會件	<b>宇定藥品遵</b>	獨應餘用藥日	數	
來源	主診斷	ATC3名稱	成分名稱	義品名稱	給藥 日數	就醫( 藥品 劑)日 用量 (住院 藥起日	期 領藥日用 (住院用	
啟人雞局 篠局 5935011 550	腹痛 R109	陽開機能失調用ı (Di s for functional gas ntestinal disorders	troi Oxethazaine	SOOTHING TABLETS XETHAZAINE) "YUNG HIN"		9 0 108/06	i/1	(
飲人藥局 隨局 5935011 550	腹痛 R109	勝鬨機能失調用藥(Dr s for functional gas ntestinal disorders	troi Mebeverine Hcl	COLONIL F.C. TABLE S 135MG "SWISS"	Т 3	9 0 108/06	i/1	(
飲人藥局 隨局 5935011 550	腹痛 R109				3	3 108/06 3 0	i/1	(
苗安雞局 陰局 5935012 333	老年性白内障 H259	眼科 ( Ophthalmolog ls )	Sulfamethoxazole	SINOMIN OPHTHALM C SOLUTION	I 3	1 108/06 1 8	i/0	(
哲安築局 第局 5935012 333	老年性白內障 H259	眼科 ( Ophthalmolog ls )	pica Pirenoxine (=Catal	in) KARY UNI OPHTHALM	П 3	1 108/06	i/0	(
第安葉局	老年性白内障 H259				3	3 8 108/06	i/0	

雲端樂歷	Y	檢查檢驗紀錄	檢查檢驗結	果 牙科處置及手術	中醫用藥 CDC預防接種	1	回首頁 事人員溝通	<b>₩</b> ₩
檢查檢驗類別 全部	IJ	·	特殊檢查檢點	京分類項目	檢查檢驗項目 全部 ▼	CT/M DM/血 慢性質	事人只為地 IRI/PET專區 I脂專區 ISI關病專區 ISII專區	
醫令名稱 全部				•	対器區間 マ部 マ	☑本 ☑	2他 ☑他	顯示欄 查詢
來源	費用年月	主診斷	檢查檢驗 項目	檢查檢驗結果/ 報告結果/ 病理發現及診斷	参考值		院所上傳	EEC影像 資料連結
台中榮總 門診 0617060018	108/0	其他感染症和寄生蟲病之個人史 Z8619	癌胚胎抗原檢驗	7.68 NG/ML	[Reference Range < 5.0 ng/ml][Reference Range < 5.0 ng/ml]			
台中榮總 門診 0617060018	108/0 8	其他感染症和寄 生蟲病之個人史 Z8619	麩胺轉酸?	111 U/L	[(4-63)][(4-63)]	108/0 8/13		
台中榮總 門診 0617060018	108/0 8	其他感染症和寄 生蟲病之個人史 Z8619	血清麩胺酸丙酮 酸酶氨基?	39 U/L	[(M:10-50,F:10-35)][(M:10-50,F:10-3 5)]	108/0 8/13		
台中榮總 門診 0617060018	108/0 8	其他感染症和寄生蟲病之個人史 Z8619	血清麩胺酸苯醋 酸酶氨基?	25 U/L	[(8 - 38 )][(8 - 38 )]	108/0 8/13		
台中榮總 門診 0617060018	108/0 8	其他感染症和寄 生蟲病之個人史 Z8619	B型肝炎表面抗原	0.364 coi	[1.<1:Non-Reactive2.≥1:Reactive][1.<<1:Non-Reactive2.≥1:Reactive]			
台中榮總 門診 0617060018	108/0 7			檢查目的及臨床診斷: Res ult: Sinus rhyth	00	108/0 7/29		
童綜合醫院 門診 0936060016	108/0 5	C型病毒性肝炎未 伴有肝昏迷 B1920	總路固醇	196 mg/dL	[0.00][200.00]	108/0 5/29		
童綜合醫院 門診 0936060016	108/0 5	C型病毒性肝炎未 伴有肝昏迷 B1920	血清麩胺酸丙酮 酸轉氨基西每	41 IU/L	[8.00][40.00]	108/0 5/29		
童綜合醫院 門診 0936060016	108/0 5	C型病毒性肝炎未 伴有肝昏迷 B1920	血清麩胺酸苯醋 酸轉氨基西每	25 IU/L	[8.00][40.00]	108/0 5/29		
童綜合醫院 門診 0936060016	108/0 5	C型病毒性肝炎未 伴有肝昏迷 B1920	三酸甘油脂 TG	129 mg/dL	[0.00][150.00]	108/0 5/29		
童綜合醫院 門診 0936060016	108/0 3	打鼾 R0683		xml version="1.0" e<br ncoding="	00	108/0 3/12		
童綜合醫院 門診 0936060016	108/0	C型病毒性肝炎未 伴有肝昏迷 B1920		Abdominal ultrasound with code	oo	108/0 3/06	腹部超會 波,追蹤性	

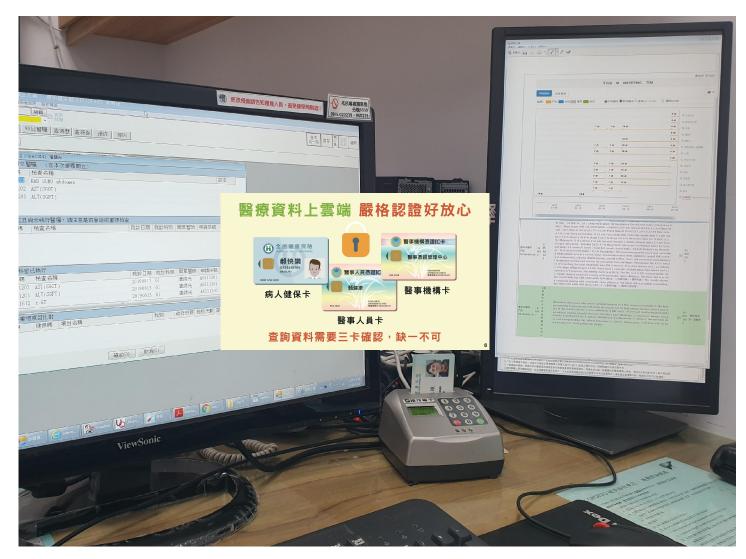
### **Images and Reports**





## **Outpatient view**





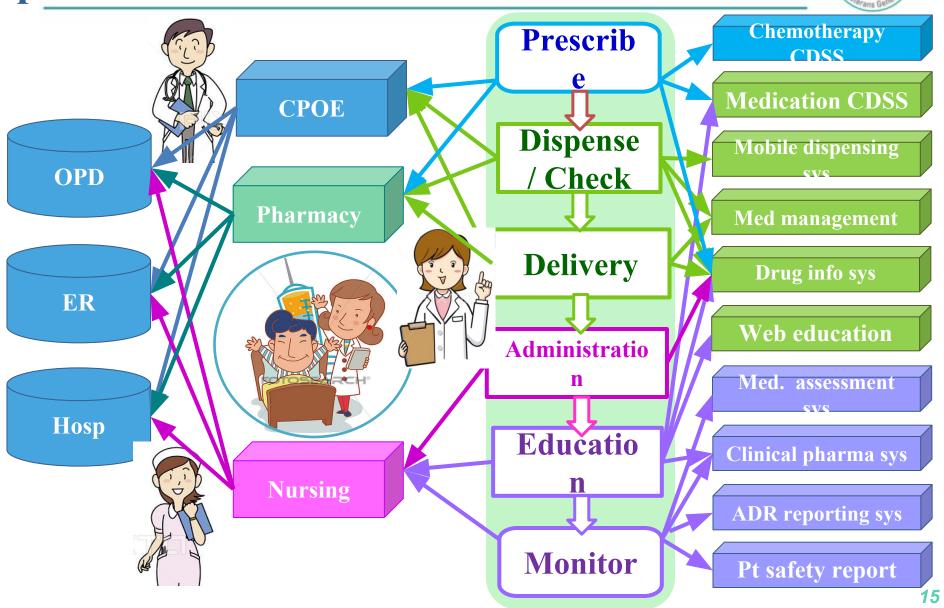
## **Strategy to Improve Safety with Information Technology**



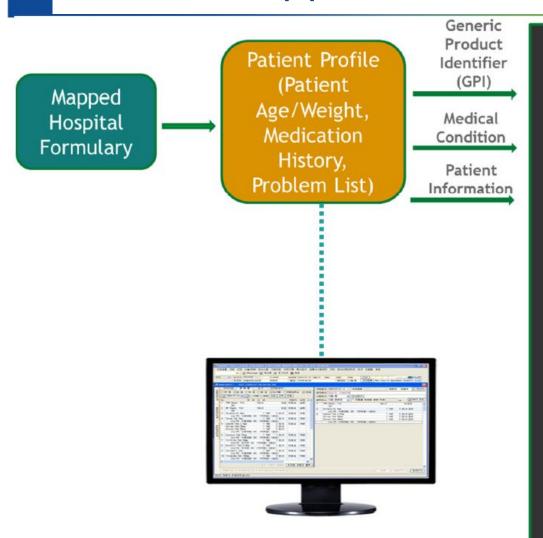
- Improving Communication
- Providing Access to Information
- Assisting with Calculations
- Real time checking
- Continuous Monitoring
- Integrated Decision Support Systems
- Patient participation

## Smart and safe medication processes for patient





### Decision support for medication safety



#### Clinical Screening Modules

- Drug Interactions
- Drug Allergy
- Duplicate Therapy
- Dose Screening
- Pregnancy, Lactation,
   Age & Gender
   Contraindications
- Drug Disease
   Contraindications
- I.V. Compatibility Screening

### Alert & control in CPOE (I)



Categories	Control / Restrain	Alert / suggestion	Information asist
Drug ADR/ allergy	-	Cross hospital alerts	-
	ATC code rules limit	ATC code rules alert for	
	duplication > 10 Days	Duplication ≦10 Days)	
Drug duplication	·		-
	Duplication of the same class		
	Duplication on the same day		
Drug interactions		Alert for DDI, cross	
Drug interactions	-	institutions	-
Liver/Renal		Alert for impaired liver or	CCr / eGFR calculation
functions	-	Renal function	COI / EGI IX Calculation
	Single dose, Daily maximum		
	dose, adjusted for diagnosis,		Total dose calculation
Drug dose /total	body weight		
dose /route/ usage	Limit route, frequency	-	-
	Limit maximum days, no. of		
	orders、total quantity	-	-
	管制用藥證號檢核	-	- 17
Controlled drugs	Non-cancer patient grade 1, 2		
	drug control	_	-

## Alert & control in CPOE (II)



	事審藥品管控	Drug risk tagging	Chemotherapy drug dilution calculation
Special drugs	High risk drugs diagnosis control (eg. DM)	Reminder for checking hepatitis B and limit use of immunosuppressants	Information and alert for special drug
Special patient	Limit of age, sex (Casodex. Prostate ca drug limit to M)	Alert for class X, D for pregnancy age women	-
groups	Drugs limit to specialty, special imported drugs	potential inappropriate meds	
	Drug grinding, cut into half, chewing, IV compatibility	Alert for clinical trial cases Indications & NHI regulations	drug info on web
Others	不可自購品項鎖控	Alternative drug suggestion under shortage	TFDA drug certification info link
	-	Irregular prescription order entry	UpToDate <sup>®</sup> 、 MICROMEDEX <sup>®</sup> info link

## **Integrated Medication CDSS**



#### Linking CPOE CDSS tools & Pharmacist reconciliation & communications



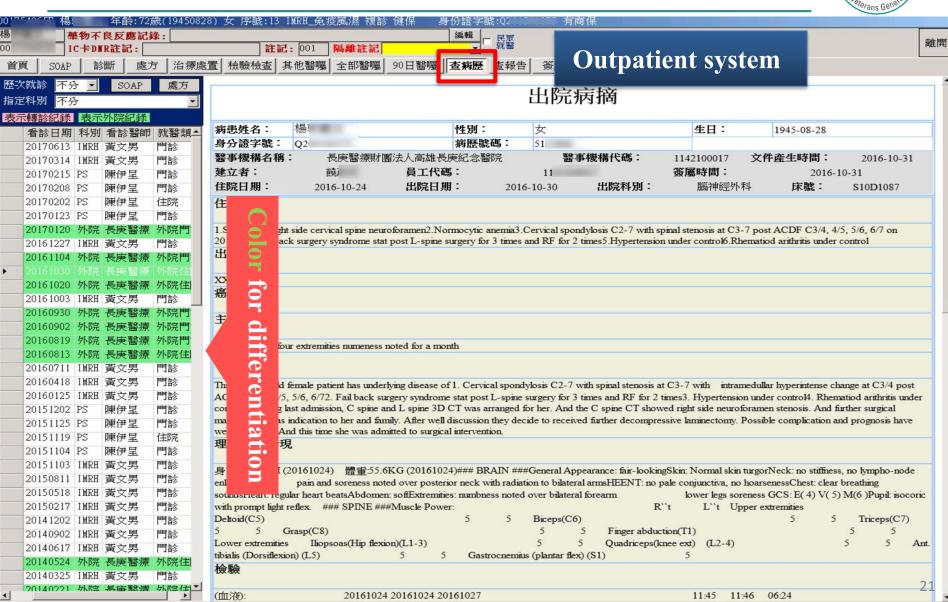
## **Strategy to Improve Safety with Information Technology**



- Improving Communication
- Providing Access to Information
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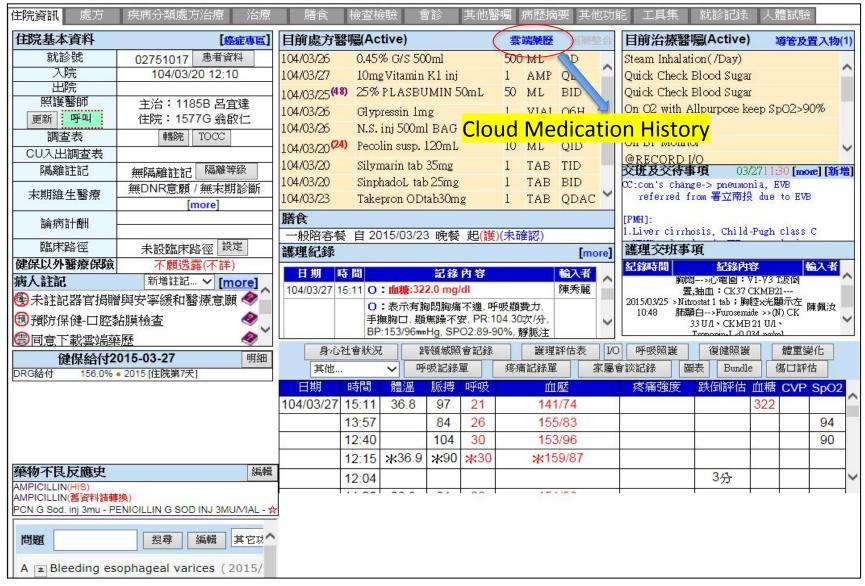
#### Viewing Clinical notes of other hospitals/clinics



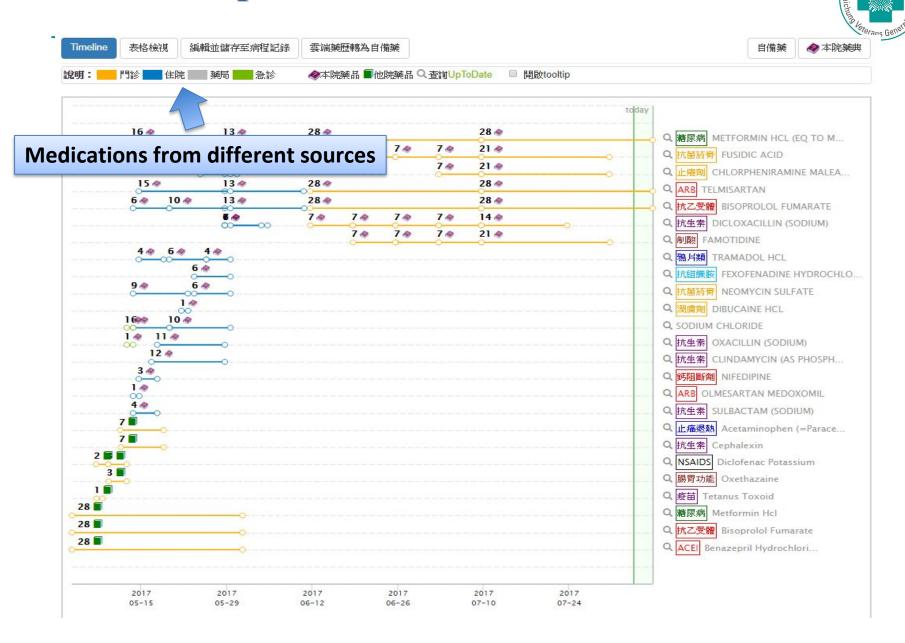


### Information rich cross discipline EMR



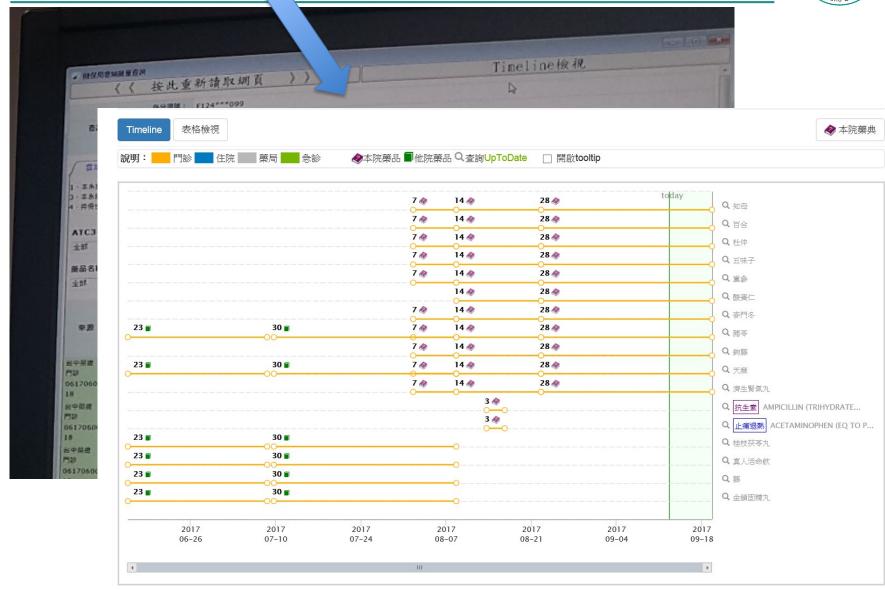


### Timeline representations of medication



### Herbals (TCM) & medications displayed



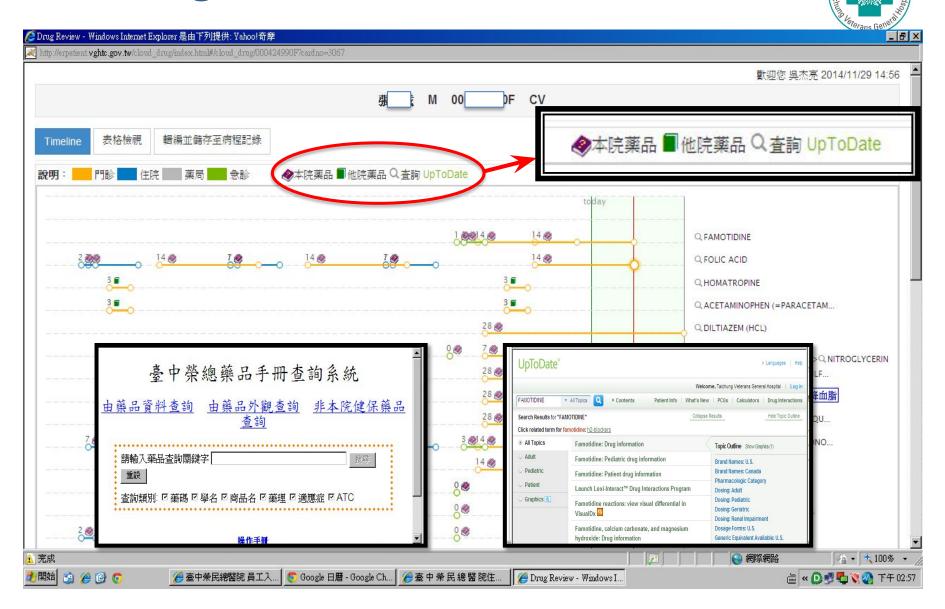


## **Strategy to Improving Safety with Information Technology**

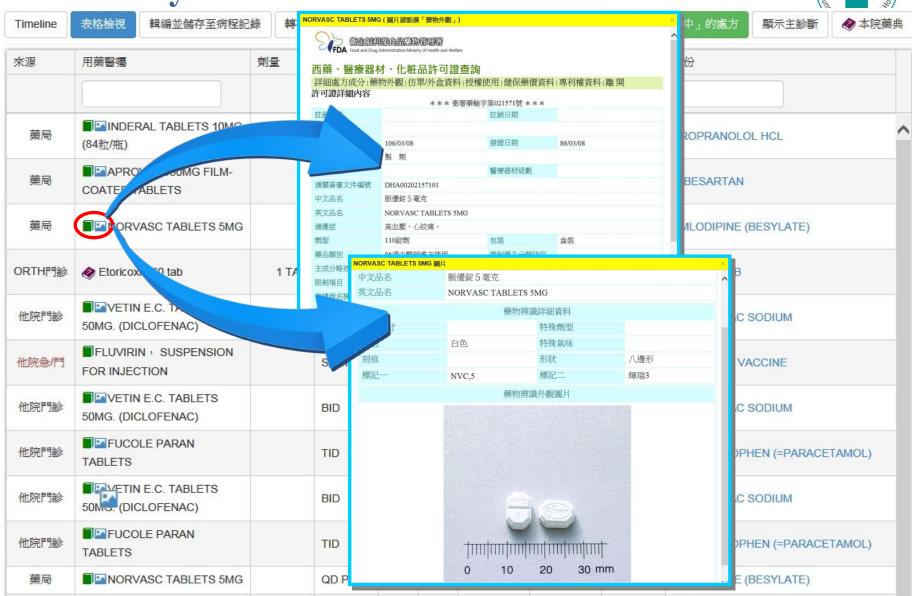


- Improving Communication
- Providing Access to Information
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- Decision Support
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### Linking information for medications



Viewing images and info of drug through National drug database by 'infobutton'



## Infobutton linked to hospital formulary e-handbook (in-patient system)



住院資訊 處方 疾病分類	[處方治療	活 治:	療	膳食	檢查	魚驗 會診 其他	醫囑	病歷摘要 其他功	功能	工具集 就	診記錄	永 人體部
藥物不良反應記錄: HIS:	AMPICIL	LIN · A	AMPIC.	(鑑鑑	閱讀)				雲端藥	歷用棄整合		庆况 SD
全部(使用中) STANDING	PRN	1	STAT	全	部(含已	停用) 未簽章		開新處方	更改齊	見量用法	更改例	用時間
目前用藥醫囑		劑量	單位	途徑	頻次	▼ 生效時間		停用時間	首劑	給付方式	X-T	醫囑備
□ Inj Furosemide-20		20	MG	IVA	BID	104/03/27 16:11	10	04/04/01 16:10		健保		with albu
□ ◆ Utapine tab 25mg 医		0.5	TAB	PO	BID	104/03/27 14:08	10	04/04/26 14:08	Υ	健保		
□ Vitamin K1 inj	72						7	<b>本口</b> 4 40		健保		
□ N.S. Ing BAG		藝碼 AQ0 藝名 QUE	TIAPINE	TAR 251	1C		_	葉品外觀 顔色 淡紅色	_	健保		for drug
☐  Transamin inj	英文商品	- Constitution	PINE TAE	*	110		-	形狀 圓凸形		健保		for hemo
□        25% PLASBUMIN :	中文商品		平膜衣錠	A - A - A - A - A - A - A - A - A - A -			_	剝痕 無		健保		
□	螢幕		ine tab 25					標記1 UN,447		健保		
□ Pecolin susp. 120m	齊	引型 TAB						標記2 25mg		健保		
□ Silymarin tab 35mg	規	R格 QUE	TIAPINE	TAB 25N	ИG					健保		
SinphadoL tab 25m	月	成分 1. <u>9</u>	2000376	20 QUE	TIAPINE F	<u>UMARATE</u>		藥品圖片		健保		
□ ◆ Ompriddoc tab zon	藥理分	類 1. /	Antipsych	otics (精	神治療劑)					182171		
	健傷	R碼 AC49	9574100									
	AT(	C碼 1. <u>1</u>	N05AH04									
適應症 dep							0 10	mm				
	ģ	Quet antip recep dopa	iapine fur sychotic. otors in th	narate is It is an a e brain: s and D2, l	a dibenzo ntagonist a serotonin 5	thiazepine atypical at multiple neurotransmitte 5HT1A and 5HT2, H1 and adrenergic α-1	er	外觀圖片				
	藥重	meta	bolized in	liver via	CYP3A4 t	tein binding: 83%; to form two inactive as metabolites, <1% as		STATE OF THE STATE				

#### 臺中榮總藥品手冊查詢系統



#### 由藥品資料查詢 由藥品外觀查詢 非本院健保藥

請輸入藥品查詢關鍵字 Hemorrhoid

搜尋

查詢類別: ☑藥碼 ☑學名 ☑商品名 ☑藥理 ☑適應症 ☑成分 ☑ATC

#### Flexible, Searchable Formulary e-handbook

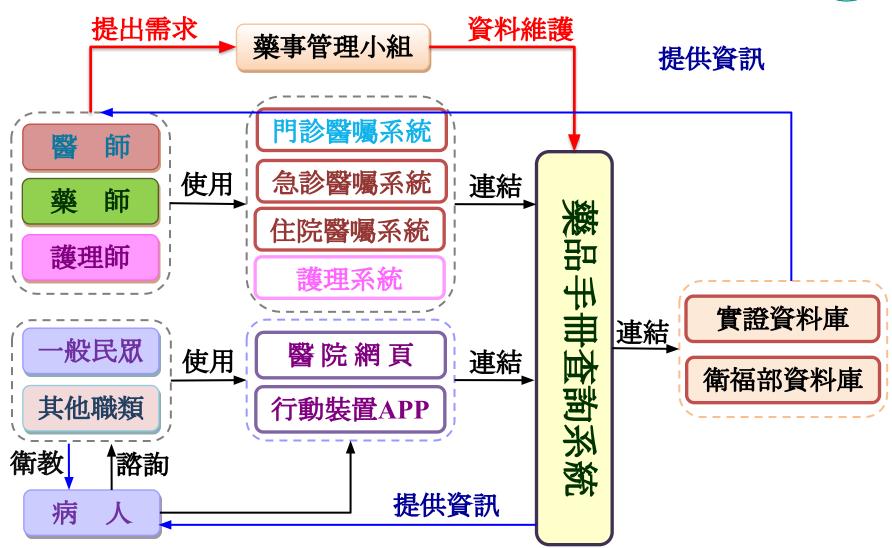
#### 廿5等容彩

共5 津資科				1 01111	u
藥品學名/中英文商品名	劑型	藥理分類	適應症	樂圖	
BENAZON OINT 20GM BENAZON OINT 20GM 平痔隆軟膏 缺	OINT	1. Skin and Mucous Antipruritics/Local Anethetics (皮膚黏 膜止癢局部麻醉劑)	Benazon ointment can be used in various type of hemorrhoids: internal, external, prolapsed, or iching on the affective area. Since the toxicity of bismuth, the manufacturer suggests the duration of therapy of this drug should not over one week.	word or a skill	[ [
ESCIN GEL 15MG/GX 20GM AESCIN GEL 20GM 愛新凝膠	OINT	1. <u>Misc. Skin and Mucous Drugs</u> (其它皮膚黏膜用製劑)	Post-operative edema, chronic venous insufficiency (varicose veins, hemorrhoids, deep venous thrombosis, lower extremity edema).		[
ESCIN 15MG/GM X40GM AESCIN GEL 40G 愛新凝膠 4 0 G M 缺	GEL	1. Misc. Skin and Mucous Drugs (其它皮膚黏膜用製劑)	Post-operative edema, chronic venous insufficiency (varicose veins, hemorrhoids, deep venous thrombosis, lower extremity edema).		[
CINCHOCAINE SUPP. SOKERZ SUPP. 舒克痔栓劑	SUP	1. Skin and Mucous Antipruritics/Local Anethetics (皮膚黏膜止癢局部麻醉劑)	Hemorrhoids, anal fissures, rhahgades, anal pruritus, anal eczema.	Control of	
XylmoL oint 15gm XylmoL oint 15gm 喜癒痔軟膏	OINT	1. Skin and Mucous Anti- inflammatory agent (皮膚黏膜用抗炎 劑)	Hemorrhoids, anal itching, proctitis, anal abscess and rectal prolapse, anal laceration	C AND CO.	

- Drug code
- Generic name
- Product name
- Pharmacology
- **Indications**
- Constituents
- ATC codes

## Formulary Inquiry e-handbook updated, maintained and accessed across many different applications





## Viewing Laboratory Data (including cloud) with medication



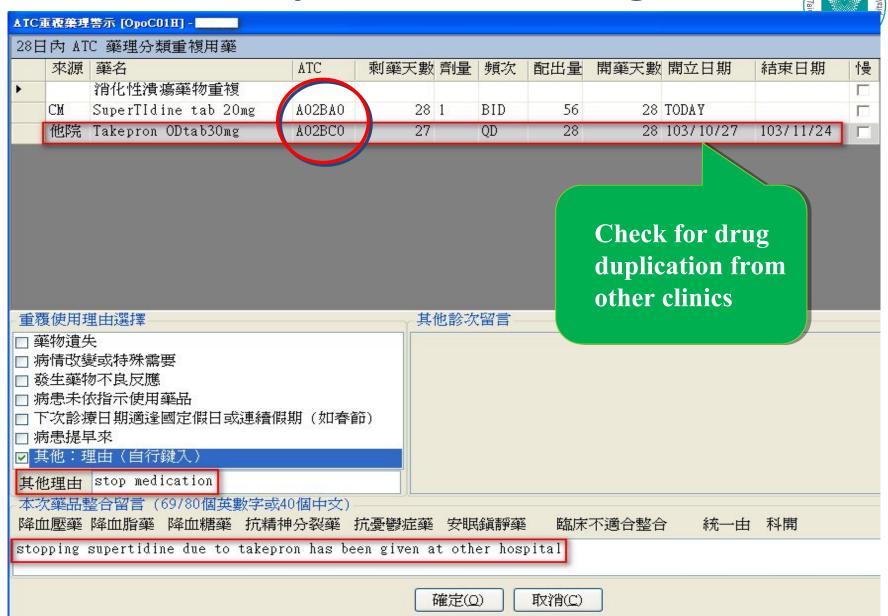


## **Strategy to Improving Safety with Information Technology**



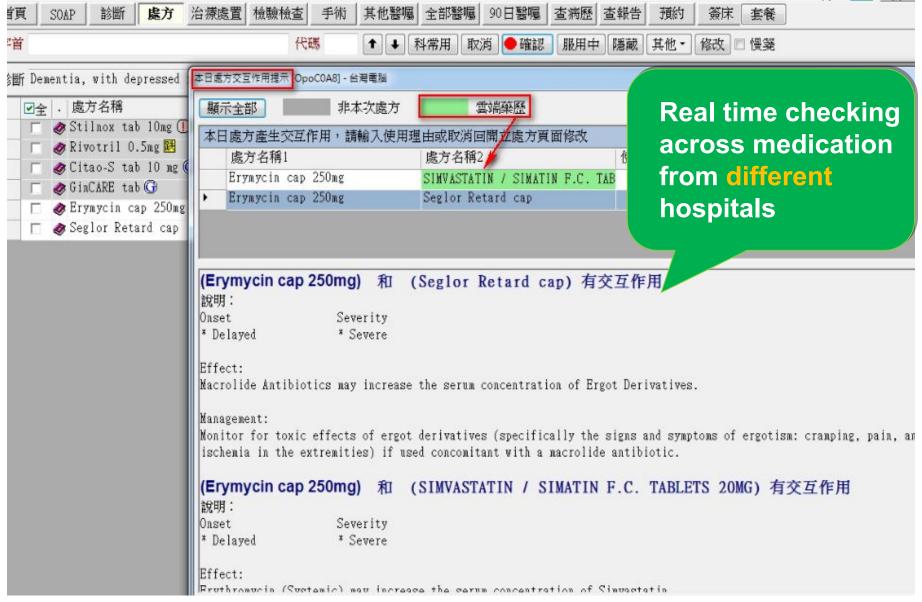
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### Medication duplication checking



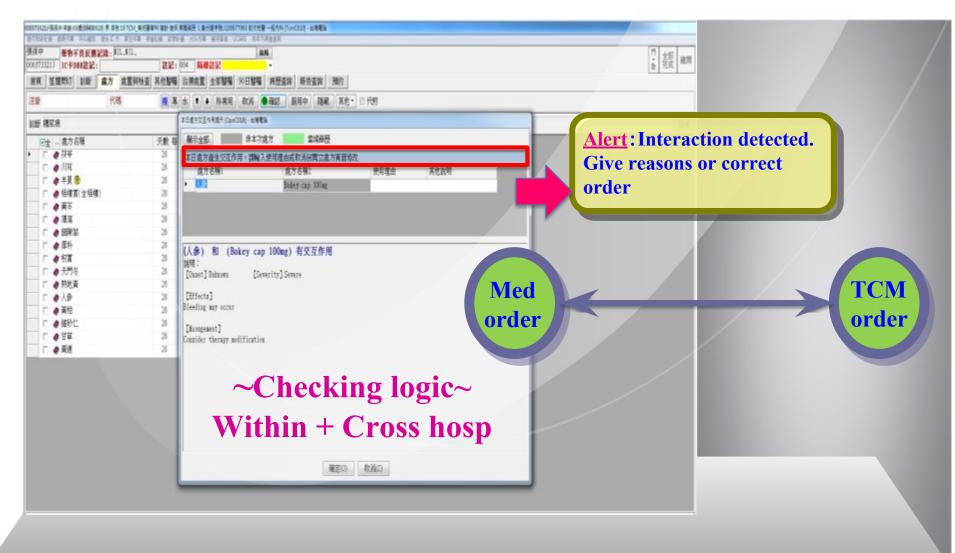
### Medication interaction checking



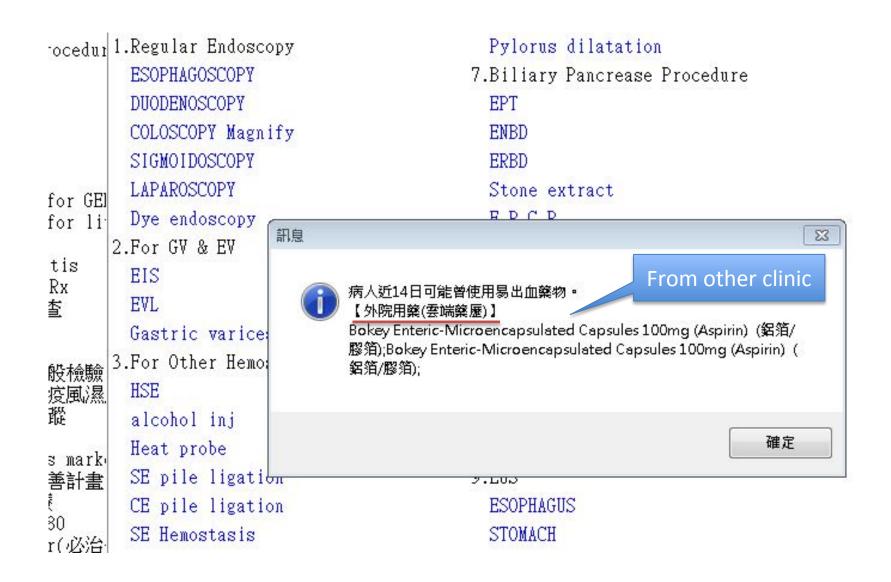


## Interaction checks: Chinese herbs & Meds within & between hosp /clinic

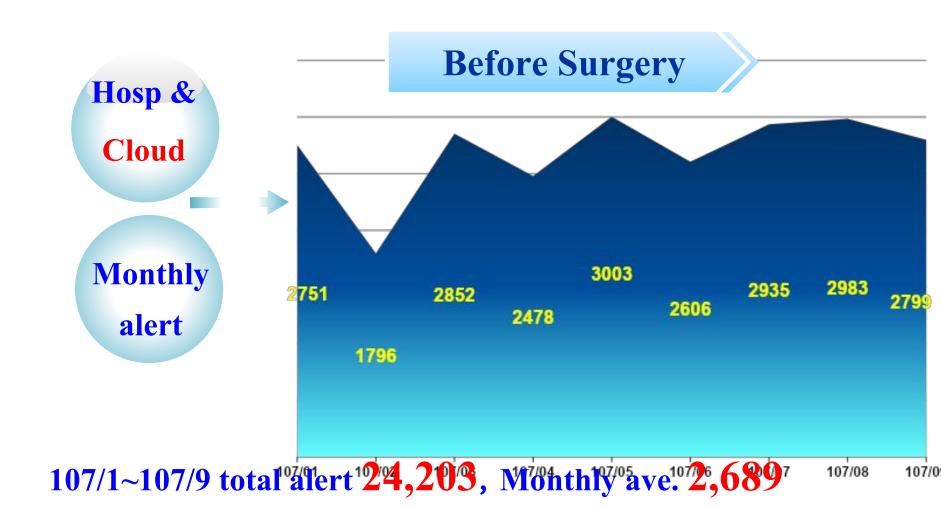




## Check easy bleeding medication including Medicloud during invasive procedures ordering



## Check easy-bleeding medication before surgeries and invasive procedures



### Remind and help user to check Hepatitis B markers when Dignosis of malignancy detected



E香 藥物不良反應記錄: NIL,	or ans dev
i3244B IC卡DIR註記: 註	
i SOAP 診斷 處方 治療處置 檢驗檢查	
: A 100 - AAISST PE	Hepatitis markers not
名稱 診斷碼	echecked within 3 years
☑全   主   疑   診斷名稱	
□ ☑ □ Gastric Cancer慢重	本次間立癌症診斷,系統判斷本院3年內無B肝檢測
□ □ GERD 🖳	『經癌委會決議,化學治療前未檢驗HBsAg,或HBsAg(+)但未開立抗病毒藥
	物,無法開立化學藥物。
	是否自動關立慢性肝炎相關血液檢驗 ??
	是(Y)
	***************************************
集議執行日期: ◎ 本次 ◎ 下次檢驗檢查 日期:	
☑全 醫令名稱 :	急   預   檢體
□ Duodenoscopy (D-SCOPY)+PHOTO	
☐ HP clo test(Urea plate for HP)	
☐ Anti-HBs	Blood
☐ HBsAg	Blood
☐ Anti-HCV	Blood
☐ Anti-HBC IgG	Blood

### Requiring use of anti-viral agents when immunosuppressants prescribed in HBV patient



#### Renal function checking reminder before CT / MRI scans



Cr 檢驗值檢核 [DBPORPORQ01] - 潘錫光									
檢查名稱: CT LIVER									
選」非離子性對比劑適應症選項									
□ 一、病患可能須使用顯影劑,由放射線部	門依專業評估判斷								
□ 曾注射對比劑產生過敏者。									
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□	份等) 病史者。								
□ 具有氣喘病史者。									
□ 腎臟功能不全者(Creatinine >2mg/dl)。									
	嚴重心律不整、惡性高血壓、不穩定性狹心症、心肌梗塞或肺 								
□ 有重要器官衰竭者,如肝臟、肺臟、心臟	、腎臟。								
	□ 糖尿病合併心、腎功能不全者。								
□多發性骨髓瘤。									
□ 多重外傷併有低血容性休克之患者。									
□ 此病患無上述疾病或症狀。									
□  □ 二、病患無須注射顯影劑									
┃□□□、病患不可□服對D·劑或水									
日期   CREAT	藥名 過敏發現時間								
1080709 0.50	35-D 25-90-30-01-D								
1080709 0.49									
	確定 取消開立								

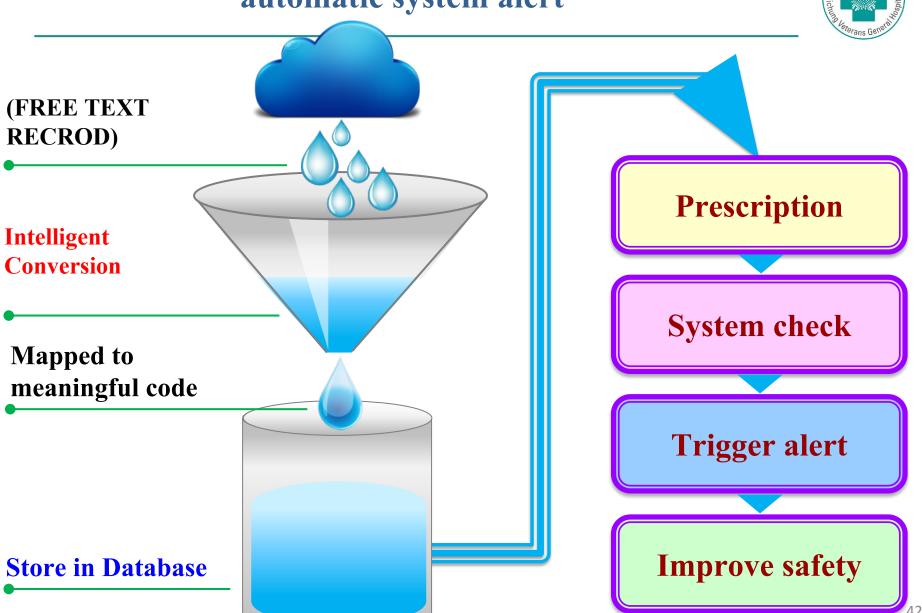
### **Cloud Drug Allergy History**



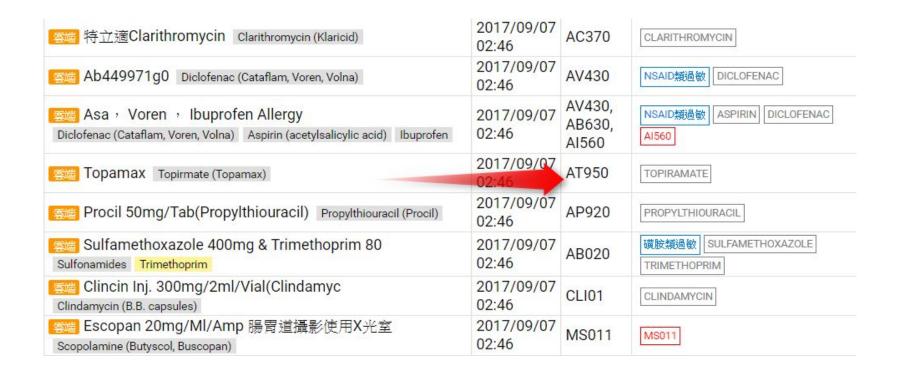
雲端藥歷	特定管制藥品用藥資訊	檢查檢驗 / 書	手術明細記錄 牙科處置及手術	過敏藥	血因子用藥    回首頁
上傳日期	上傳時間	醫療院所	醫事人員身分證號	上傳註記	過敏藥物
104/07/22	21:21:20	本院	Q103***118	註銷	Allergy to Unknow Drug(其他)
104/06/22	21:21:20	本院	Q103***118	新增	Allergy to Unknow Drug(其他)
104/06/22	21:32:33	本院	B221***992	新增	ACETAMINOPHEN NSAIDS
104/06/22	21:59:22	本院	A104***117	新增	病患自述無過數史
104/06/22	22:03:53	本院	T100***346	新增	病患自述無過敏史

# Wrong spellings Wide variety of inputs, drug groups Duplicated records No system alerts

### Conversion of cloud free text allergy history to automatic system alert



# Drug allergy checking from cloud free text records by Natural Language processing



Analyse the free text entry from cloud and EMR, Convert to hospital drug code / generic name, Store in ADR database in EMR

# Alert when allergic drug (or class of drug) is prescribed



### Accurate Intelligent free text allergy conversion system



- August, 2019 recognizable drugs+drug groups number: 940
- From Dec. 2018 to July 2019, (8 months) accuracy 99.6% (177 unrecognized / 50149 total number)

2019/08/05 1249	Metoclopramide rimperan)	primp or metoclo Promera or gastro peran or reglan or Ab033181g0 or 8 b03552212 or pri
2019/08/05 1247	Prochlorperazine	novam or prochlo

### Real time monitoring of drug used against ADR record – improving safety & accuracy



#### 「FREE TEXT 藥物不良反應記錄」轉化藥碼系統

轉化規則 今日急、住有「FREE TEXT ADR記錄」病人

今日門診有「FREE TEXT ADR記錄」病人

過敏處方即時攔截監控系統

#### 近10日內輸入過敏理由的處方清單

10⊟

-

a day ago	郭金 878F 住院 NEPH Tazocin inj 2.25gm IVA 1 VIAL Q8H
•	病患曾用過,未有過敏 Tazoin on 105/7/13, Unasyn 105/7/14~ 吳圖是 <b>藥</b> 師意見
1 days sas	朱 <b>羽</b>
l days ago	CefaDROxil-500 cap
•	無過敏」謝信的。藥師意見
pe Tecovice position	洪 <u>制</u> 04E 門診 FP
days ago	(安星)Progesterone inj 25mg
*	換廠牌 陳明哲 藥師意見
ro Francisco	吳 '′ 001 000 19D 門診 NEUR
1 days ago ❤	Bokey cap 100mg
~	no allergy to bokey 陳 藥師意見
. 6 1 10 10 10 10 10 10 10 10 10 10 10 10 1	朱列 7C 急診 GI
1 days ago	Veterin inj 1gm
~	1.Infetion Dr. suggest 2.自述無過抗生素過敏 謝自 藥師意見

### ADR reporting & verification system

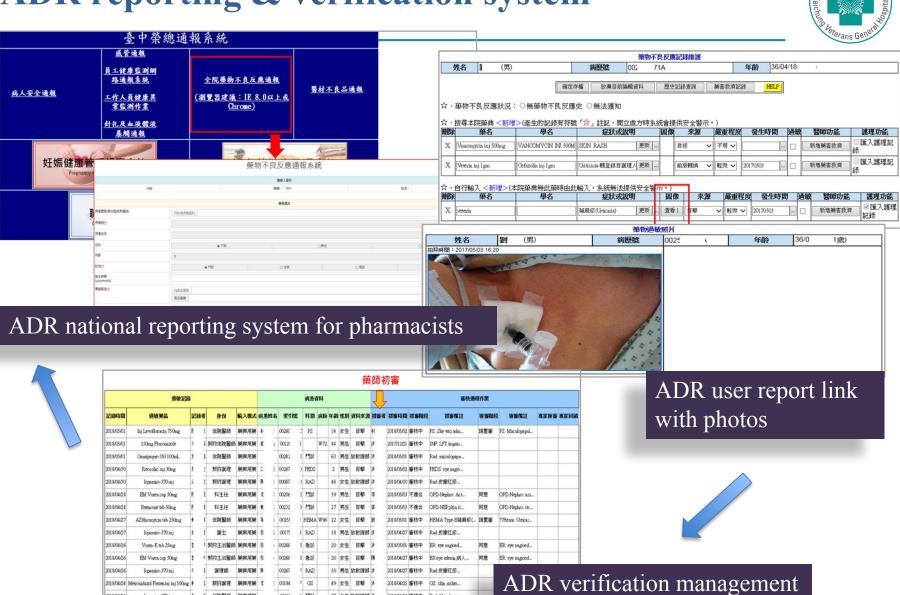
2018/04/24

lopamiro-370 ini

住院製師

00121 1 7500 77 女生 放射線部 法

2018/04/24 審核中 Rad Maculopape.



# **Strategy to Improve Safety with Information Technology**



- Improving Communication
- Providing Access to Information
- Assisting with Calculations
- Real time checking
- Continuous Monitoring
- Decision Support

### Intelligent integrated Patient centered clinical medication management system for pharmacists



ICU & wards / Antibiotics / Fall medications / Med Reconciliation

加護病房 臨床藥事 評估

抗生素 評估

跌倒 評估 用藥整 合評估

醫師

臨床藥事評估作業



臨床藥學電腦管理系統

藥物治療追蹤 服務記錄

臨床藥物動力 學服務記錄 營養治療追蹤 服務記錄

藥物諮詢服務 記錄 藥師

⁄ 病人 用藥安全

護理

其他 醫事人員

營養師、呼吸治療師、 復健師、醫檢師、社工師...等

# Unprescribed (omitted?) drug report to pharmacist during hospitalization



	(FHH信	使用中自備藥	DM	DM_雲端_成份	血糖最小值	血糖最大	降血壓	降血壓_雲端_成份	一天內超過值的血壓值	出血	出血_雲端_成份
727H	(INH		0.		167.	<u>070</u>	nitte	d anti-hype	154/61,167/61,158/5 ertensives <sup>3/61</sup>	1.	Aspirin, Cilostazol
526J	(3NG (3 I	Omitted hypo	ogly	<mark>cemic agents</mark>	S 101.	191	0.	1		1.	Aspirin
900G	(§NI 24 N		0.		180.	329	1.	Amlodipine (Besylate),Atenolo I	157/69,162/78,154/7	0.	
761G	IINN If S		1.	Gliclazide,Metformin Hcl	167.	206	Blo	od pressui	Omitted re	aņ	nticoagulants
161B	(≣NN I∃ S		0.		190.	281	0.			1.	Clopidogrel
112E	(3NN 2- S		0.	Blood sugar	r 155.	205	0.		151/96,143/118	1.	Aspirin, Clopidogrel, Dabigatran Etexilate Mesilate
150J	(3FN 21 S		0.		171.	306	0.		151/86	1.	Aspirin,Dipyridamole
183C	(RFN		1.	Glimepiride,Sitagliptin (As Monohydrate Phosphate Salt)		210	0.			1.	Aspirin
720D	(BNN		0.		107.	149	0.			1.	Aspirin
2561	(INP		0.				0.		175/101,178/92,165/ 93,172/86	1.	Heparin Sodium
252C	(1NP 11 S (3 Y	葉黄素 1 TAB QD PO,善存 1 TAB QD PO,Refresh Tear 1 UNIT QDPRN OU	1.	Gliclazide,Metformin Hcl			1.	Propranolol Hcl	158/97,152/92	0.	
368C	INP INP		1.	Vildagliptin ; Metformin Hcl			0.			1.	Aspirin
798E	(3NP 23 S 91 Y	LantusSoloSTAR300U 6 U QD SC,Repaglinide-1 0.5 TAB BID PO,Diltiazem 1 TAB BID PO,60mg CR Imdur tab 0.5 TAB	0.		109.	123	0.			1.	Aspirin

## Continuous Monitoring: drug-lab Reports

#### 台中榮總藥物使用警示(臨資中心專用)

列印時間:

2014/04/25 10:30:47

臨床資訊中心 製作開發

版本: 73.20130305

为容	病房	病床號	病人科	Caseno	病歷號	用藥年齡	跌倒藥物	跌倒評估分	商品名    成	t份名	
	W95	20	GS	02621969	0000/5539F	90.	score	數	GENTAMICIN INJ 80MG	GENTAMICIN INJ 80MC	
	W96	032	OPH	02632354	0023745341	66.			GENTAMICIN INJ 80MG	GENTAMICIN INJ 80M0	
鉀離子過高用藥警示K>5.5	ICU	16	NEPH	02632183	001002758E	87.			15% KCL INJ 5ML	15% KCL inj 5ML	
	SBR	05	PEDS	02631221	002368043F	-986.			15% KCL INJ 5ML	15% KCL inj 5ML	
									KETO INJ 30MG 1ML	KETOROLAC INJ 30MG	
		09	PEDS	02631945	0023654461	0.			15% KCL INJ 5ML	15% KCL inj 5ML	
	W55	082	CV	02632429	002148493F	64.			RENITEC TAB 5MG	ENALAPRIL TAB 5MG	
抗凝血藥物用藥警示	W55	031	CV	02632554	001170821H	74.			PRADAXA CAP 110 MG	DABIGATRAN ETEXILA	
		163	CV	02614955	0003896141	71.			PRADAXA CAP 110 MG	DABIGATRAN ETEXILA	
	W72	075	REHA	02622886	002082088G	70.			PRADAXA CAP 150 MG	DABIGATRAN ETEXILA	
	W75	061	ORTH	02630888	001676949G	77.			XARELTO TAB 10MG	RIVAROXABAN TAB 1	
		102	ORTH	02631310	001010361E	76.			XARELTO TAB 10MG	RIVAROXABAN TAB 1	
		151	ORTH	02629950	001396398J	88.			PRADAXA CAP 110 MG	DABIGATRAN ETEXILA	
		155	ORTH	02630870	002021703C	71.			XARELTO TAB 10MG	RIVAROXABAN TAB 1	
		211	ORTH	02631377	002129081D	80.			XARELTO TAB 10MG	RIVAROXABAN TAB 1	
腎功能異常用藥警示CREAT>1.6	W102	162	CS	02631689	000836033G	69.			VOREN-K TAB 25MG	DICLOFENAC POTASSI	
	W75	081	ORTH	02625200	000978255C	76.			EXACIN INJ 200MG	ISEPAMICIN INJ 200MG	
	W85	071	G5	02628006	000866645D	74.			GLUCOPHAGE TAB	METFORMIN TAB	
跌倒用藥SCORE>=6	ED1	149		02632388	000201503E	58.	6.		DEPYRETIN TAB 0.5G	ACETAMINOPHEN TAE	
									LEXOTAN TAB 1.5MG	BROMAZEPAM TAB 1.	
	ED2	202		02631961	000741859J	88.	6.		CORDARONE TAB-200	AMIODARONE TAB-20	
									ROSIS TAB-40MG	FUROSEMIDE TAB 40M	
									SPIROTONE TAB 25MG	SPIRONOLACTONE-25	
	ICU2	07	NS	02629246	001120515F	51.	7.	6.	DEPAKIN INJ 400MG	VALPROATE SOD. INJ	
									KEPPRA TAB 500MG	LEVETIRACETAM TAB	
									ROSIS INI-20MG	FUROSEMIDE INJ-20M	

### **Drug-Disease interactions reporting**



201

### 台中榮總藥物使用警示

列印時間:

內容	病房	病床號	病人科	Caseno	病歷號		用藥年齡	Eccr	Creat	成份名
Congestive heart failure用藥警示	PICU	18	PED	02390755	0022	5G	3	28.54	1	NIFEDIPINE CAP 5MG
	W83	095	CRS	02378108	0011	4C	71	20.31	2.1	NIFEDIPINE CAP 20MG
Dementia用藥警示	P21	03	PSY	02387662	0022	ЗН	79			TRIHEXIPHENIDYL HCL TAB 2MG
		093	PSY	02377868	0004	2G	73			BIPERIDEN TAB 2MG
		102	PSY	02387344	0015	ЗН	69			BIPERIDEN TAB 2MG
	P22	065	PSY	02390099	000	91	74			TRIHEXIPHENIDYL HCL TAB 2MG
Parkinsonism用藥警示	W55	171	CVS	02384412	0003	0G	85	21.9	1.8	METOCLOPRAMIDE INJ 10MG
用藥年齡警示AGE>65	ED1	189		02394792	0010	8G	70		1	GENTAMICIN INJ 80MG/2ML
		195	300	02394928	0012	7A	81		2.2	AMIKACIN INJ 500MG/2ML
	ICU2	06	NS	02387615	0013	1)	71	46.96	1	AMIKACIN INJ 500MG/2ML
		17	NS	02393738	0022	ОН	65	62.5	1	GENTAMICIN INJ 80MG/2ML
	TNCU	02	NS	02384221	0022	7G	69	55.22	1	GENTAMICIN INJ 80MG/2ML
	W102	071	CRS	02394342	0022	3J	75		1.3	GENTAMICIN INJ 80MG/2ML
		171	CS	02393550	0007072	-8G	71	55.38	1	GENTAMICIN INJ 80MG/2ML

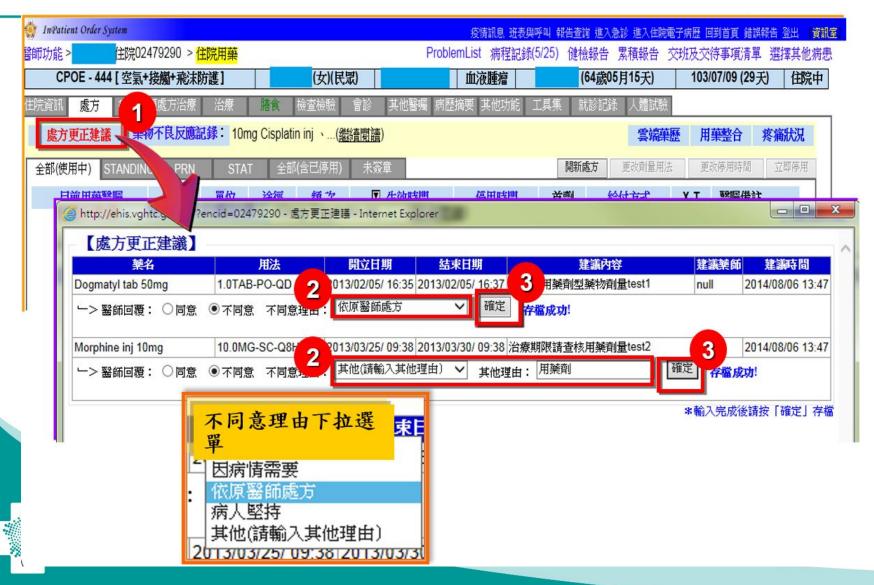
### Dashboard for clinical pharmacists: Work list, High risk patients assessment



ICU & wards / Antibiotics / Fall medications / Med Reconciliation / Drug interactions

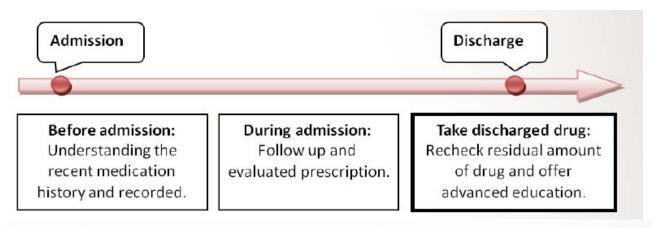
	葉師評估作		臨床藥師記			藥物交互作用結果			文互作用分析管理系統		idg ii 病人清單	illerac	LIUIIS	
起始日期	期: 2019/	09/18	▼ 結束	日期: 2	019/09/1	18 ▼ ਜ਼	定							
抗生素	13 CU#	折病人 12	CU超過7E	目 60 昆	失倒通報 2	已整合 6	未整合 173	高診次1	7					
BR 1	CCU7	ICU 10	ICU2 9	NICU 11	P22 4	PICU 8	RICU 11 S	SBR 3 S	TNCU 7	W1028	W105 9	W1068	W116 1	W131 2
W353	W52 11	W55	21 W62 8	W65	9 W6	6 10 W72 8	W75 14	W76 8	W82 23 W83 6	W85 5	W86 8	W927	W95 2	W96 7
#	病 1 ↑	2 1	姓名	病歷號		入院日期	重要資訊		抗生素		CI	U超過7日		
1	CCU	05	陳	000	011C	20190905	CLCr	27.63	2g Ceftazidime inj 2000 MG Q12H IVA		20	0190905	(11) 陳	合理 已回覆
2	ICU	03	黃	002	246E	2019 <b>0917</b>	CLCr	14.98	Tazocin inj 2.25gm 1 VIAL Q8H IVA 修		⋛利			
3	NICU	08	奠	002	911B	2019 <b>0714</b>	CLCr	0.04	Tazocin inj 2.25gm 0.1 VIAL Q8H IVA		20	0190714 (	(66) 評估	
4	NICU	21	潘	002	5071	20190906	CLCr	0.03	Cefim inj 500mg 37 MG Q12H IVA		20	0190906 (	(12) 評估	
5	PICU	12	奠	002	196J	2019 <b>0701</b>	CLCr	0.12	Cefim inj 500mg 500 MG Q8H IVA		20	0190701 (	(79) 林逸銘	合理 已回覆
6	W105	322	鶷	002	045A	2019 <b>0916</b>	GFR(2)	62.58	4.5g Tapimycin inj 1 VIAL Q8H IVA 修		有			
7	W33	023	伊	000	492H	2019 <b>0917</b>	GFR(2)	85.9	4.5g Tapimycin inj 1 VIAL Q8H IVA 評					
8	W52	291	李	002	383B	20190814	CLCr	17.49	Brosym inj 1gm 👺	A THE REAL PROPERTY AND ADDRESS OF THE PARTY A				
							GPT INR NH3	22 1.05 57	2 VIAL Q8H IVA 修	改 檢視 林宜	<b>正</b> 樂			

# Medication Reconciliation, Pharmacists communicate with Physicians



### High rate of acceptance by physician in medication reconciliation processes





Year	Total patient numbers of medication reconciliation		Advice acceptance rate (from doctor)		
2016	7744	1881	81.7%		
2017	14809	1905	85.4%		
2018	16595	1248	89.7%		



### **Patient Participation**

#### VGHTC Medication info & services APP





夜問診: 1800~2000





臺中榮民總醫院行動掛 號

臺中榮民總醫院資訊室

處方資訊專區\_處方藥品查詢服務

預約服務專區\_慢箋預約領藥服務

進度查詢專區\_領藥進度查詢服務

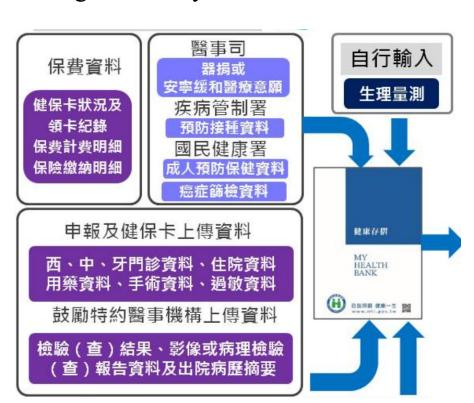
預約查詢專區\_預約慢箋查詢服務

健康管理專區\_家人用藥管理服務

### My Healthbank 健康存摺

- Health insurance administrative data: NHI OPD visits, (+ dental, TCM); Hospitalization; Medication history, Surgery performed, allergy hx
- Optionally uploaded by care providers: Lab results, radiology, pathology & text reports, discharge summary





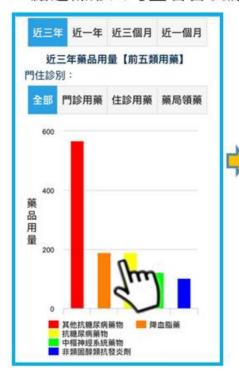


### Look up medication history in 3 years



#### 清楚掌握服用藥品的類別、用量、外觀

- •視覺化呈現近3年至近1個月用量最高前五類藥品
- •點選條形圖可查看各次紀錄





#### 連結至食品藥物管理署 查詢藥品外觀

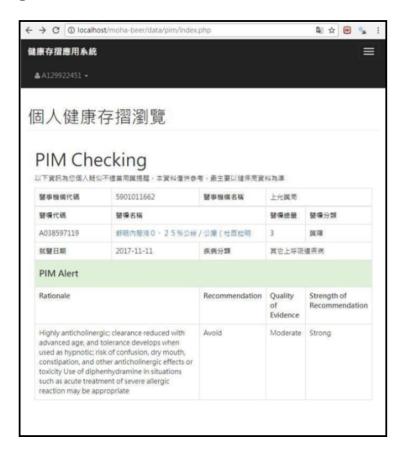




### Value adding by providing SDK (software development kit ) to developers – Future Health Guardian?



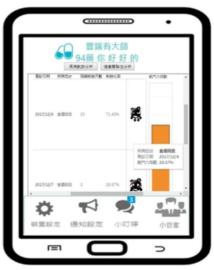
Checking Potential Inappropriate Medication Using Beer's Criterior







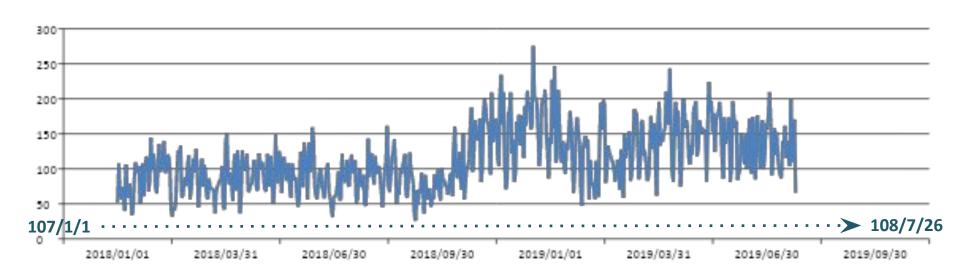




### ADR/Drug allergy alerts number



#### Number of daily allerts

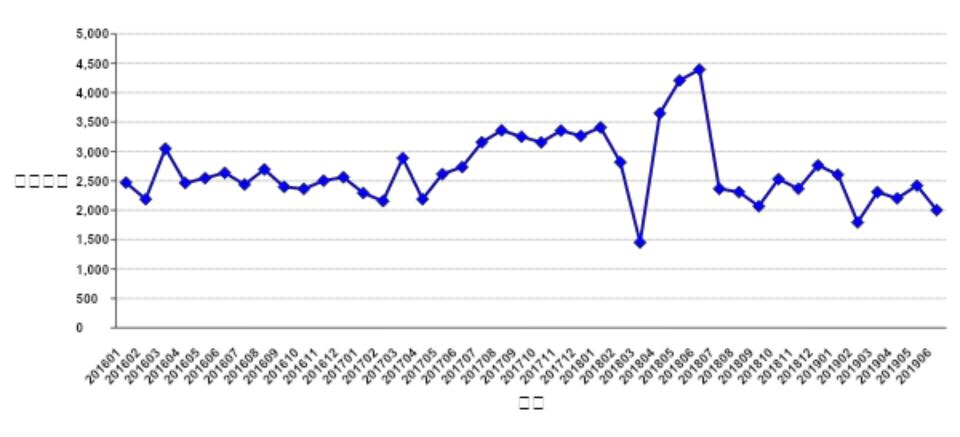


From 2018/1/1 to 2019/7/26

- →Cumulative alerts 64,621
- → Maximum 275
- $\rightarrow$  Average alert / day: 112

# 2016/1~2019/6 drug-drug interaction alerts

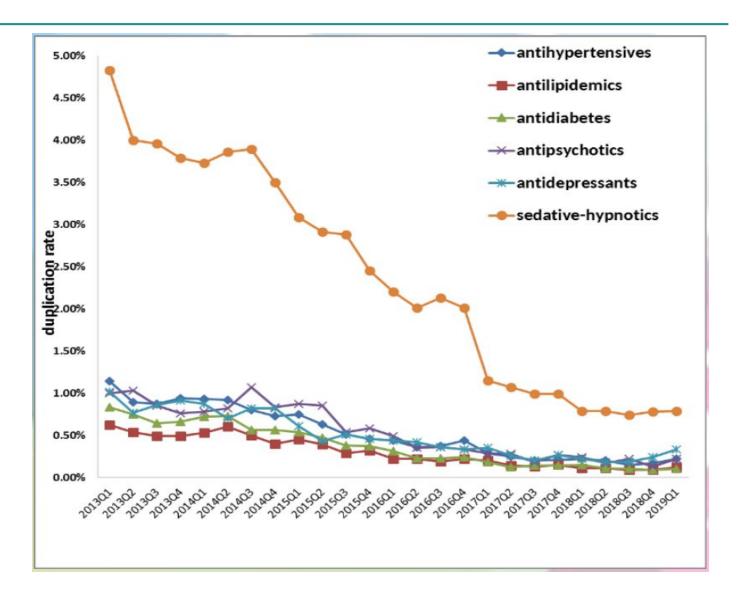




Average DDI alerts per month: 2,676

### **Decrease of Duplication Rates in TCVGH**

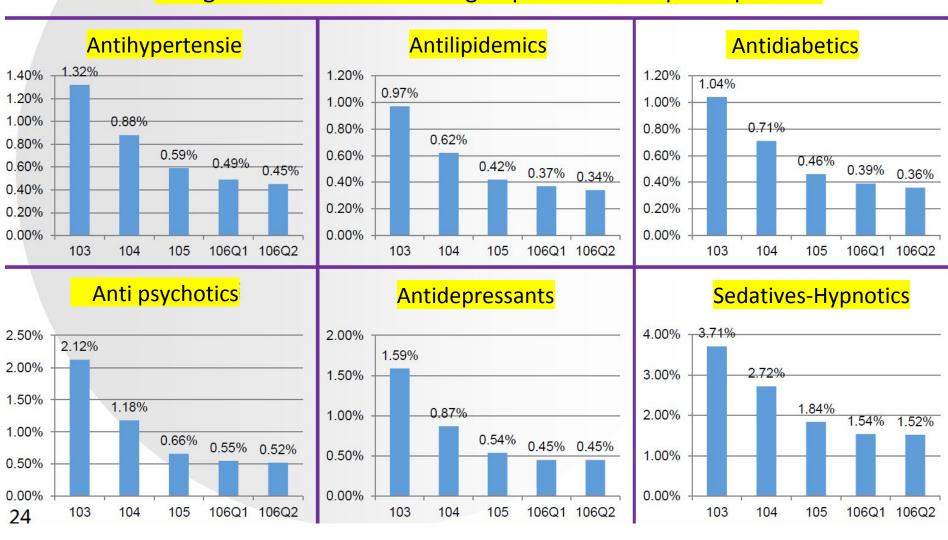




### Nation-wise Drug duplication improvement



#### Progressive decrease of drug duplication in inquired patients



# Critical Successful factors of NHI-Medicloud system



- National insurance system since 1995. 99.6% patient inside the insurance (2018).
- Require electronic claims daily upload. Clinics and hospitals must comply
- Accreditation program for Joint Commision of Taiwan encourage best practices
- Open and sharing culture of Taiwan health providers, learning from each other. Yearly demonstrations by best hospitals throughout Taiwan.

### **Current Issues and challenges**



- Privacy concerns of patients, limit to months to few years of data from medicloud
- Upload data quality issues
  - More precise Data Standards to promote interoperability between institutions. Eg. LOINC, (Logical Observation Identifiers, Names and Codes) etc.
- Limit applications in clinics lack incentives and vendors with medical domain knowledge. Eg. Drug-drug interaction..etc

### **Conclusions**



- Information Technology is playing important role in improving medication safety
- **Medicloud** service by Taiwan NHI provide exciting opportunities for medication safety improvement, both in hospital /provider practice and for individual consumers
- In Taiwan, more vigorous implementation of interoperable standards for EMR provide opportunities of improvement
- Use of AI, NLP technology provide exciting prospects
- IT tools should be safe & well designed. Continue improvement is important.

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### Thank You

