國立成功大學醫學院附設醫院
National Cheng Kung University Hospital
生命・愛心・卓越・創新

運用MediSpan臨床決策輔助系統於臨床藥事服務

成大醫院藥劑部 黃千惠組長

2024.11.16

Clinical decision support system (CDSS)

> "As digital tools designed to assist healthcare professionals in clinical decision-making by providing clinical knowledge & patient-specific information."

Patient safety

Reduce medication / prescribing errors and prevent adverse events.

Clinical management

Adherence to clinical guidelines, follow-up and treatment reminders.

Automation

Continuous update documentation, and automating tedious steps to reduce workload.

→ **Improve patient outcomes**

[1] PLoS One. 2022;17(8):e0272846. [2] npj Digital Medicine (2020)3:17

成大醫院商用藥品資訊系統引進歷程

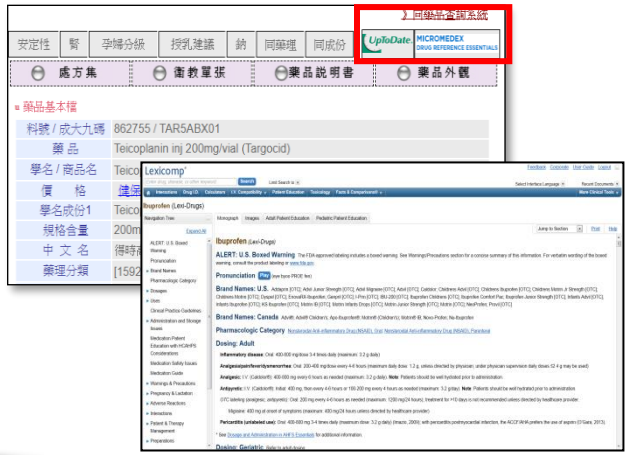
電子資料庫

- 透過網頁或手機APP查詢藥品資料

MICROMEDEX

Wolters Kluwer

UpToDate®

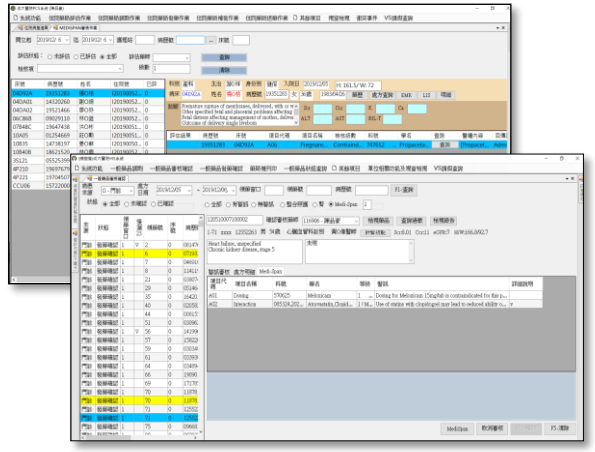


整合式查詢

- 將電子資料庫連結嵌入院內網頁或EMR，縮短查詢所需時間。

IBM Micromedex Drug Ref

IBM



臨床決策輔助

- 將電子資料庫內容植入EMR，供系統檢核使用

Wolters Kluwer Health | Medi-Span®

國立成功大學醫學院附設醫院
National Cheng Kung University Hospital
生命・愛心・卓越・創新

Medi-span臨床解決方案
Drug information solutions

◆**效益：**

- 增加醫療人員對用藥敏感度、優化藥物治療、減少疑義處方

完整資料庫

Lexicomp® UpToDate®

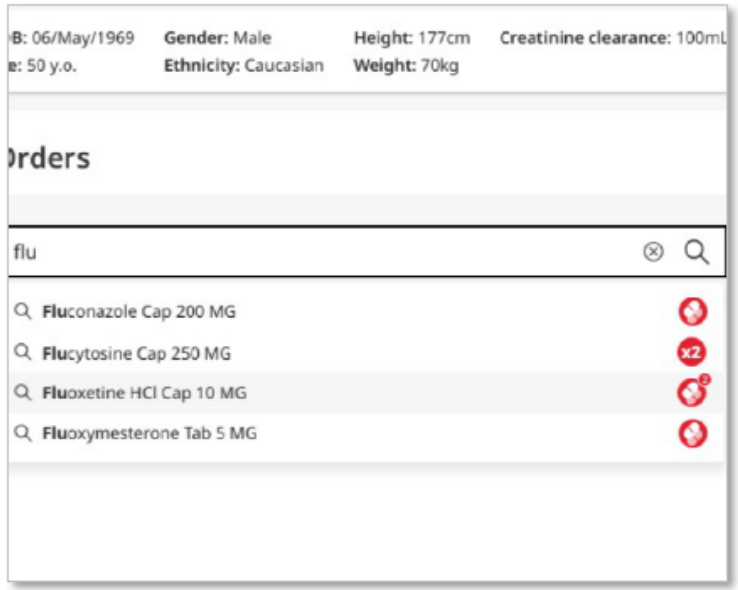
FAST

更新速度快

系統一致性

實證醫學藥物資訊 **Evidence-based, peer-reviewed drug information-recommended within workflow**

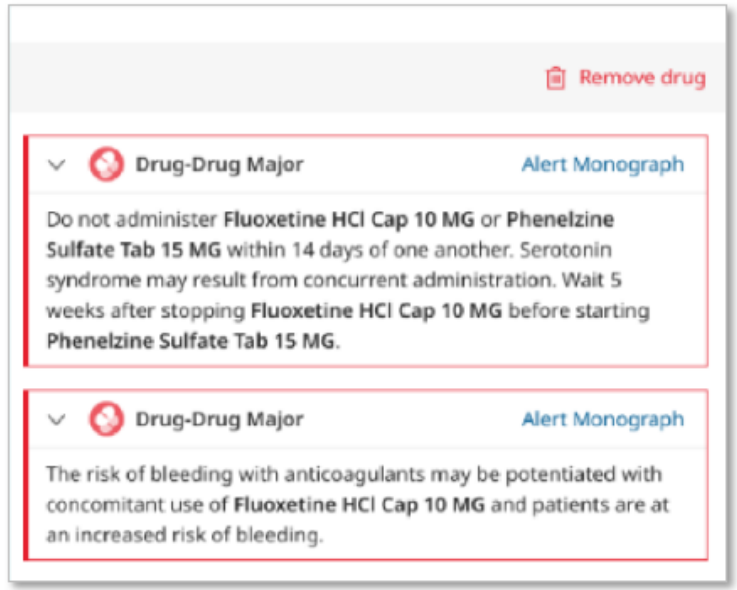
Medi-Span Clinical: 警示顯示的不同方式



SMART VIEWS: ICONS

Displays an interaction or warning, designed by the institution, and indicates type of alert and severity

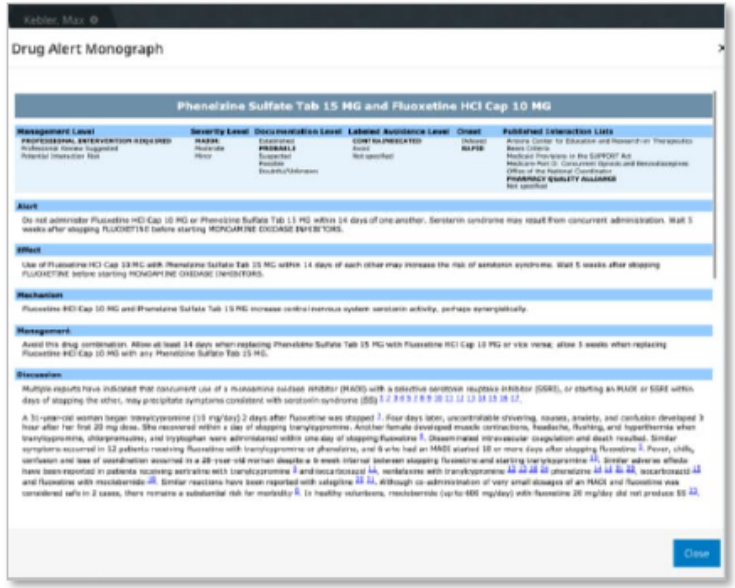
即時篩選



SHORT MESSAGE

A short message that describes the current interaction or adverse effect, depending on alert severity and rules set by the institution

彈性調控訊息



ALERT MONOGRAPH

Displays interaction effects, mechanism, management, and discussion based on the latest evidence, providing real-time guidance

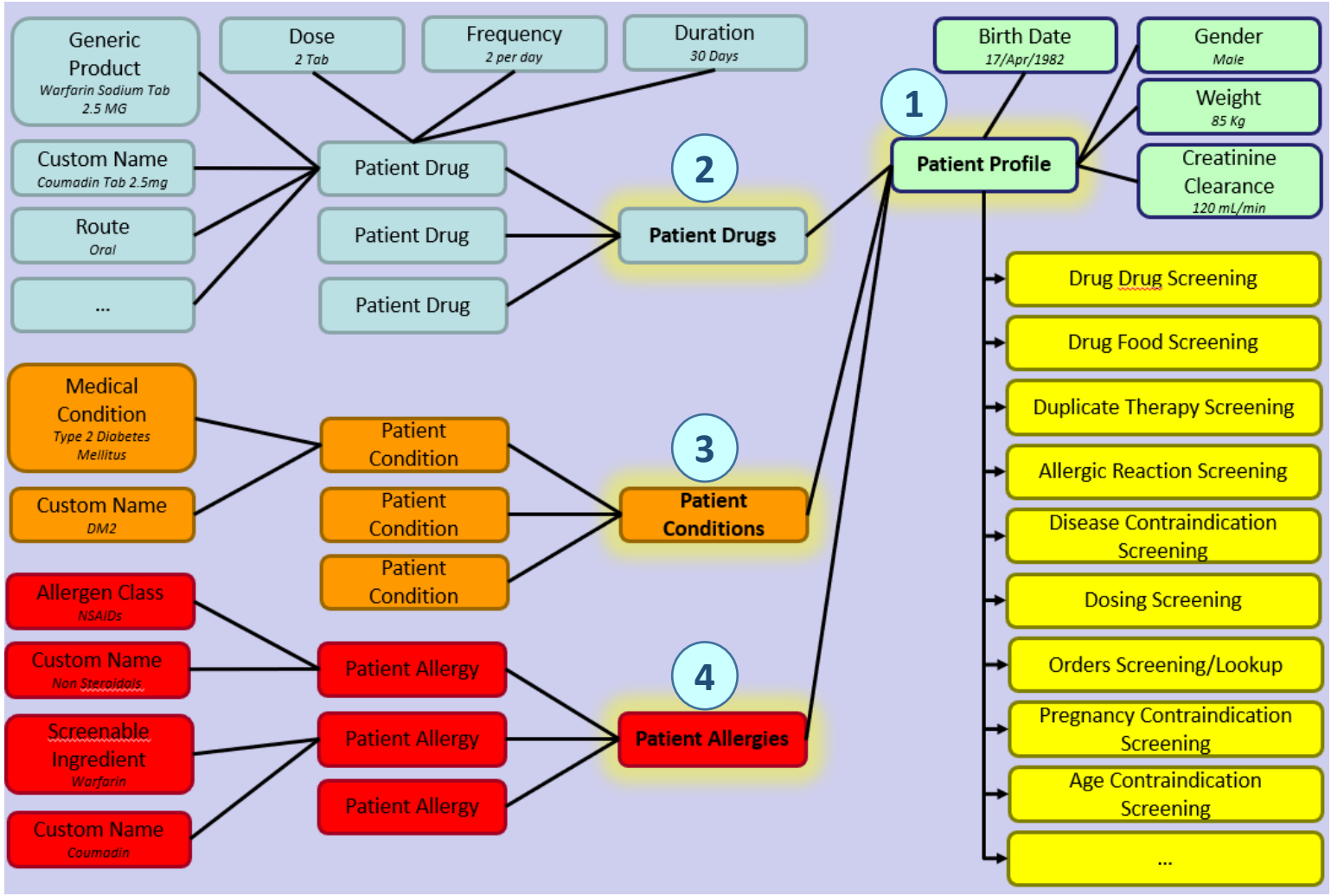
指引實證訊息

Medi-span臨床解決方案系統

◆成大醫院購置模組：

- ✓藥物劑量檢核
- ✓重複用藥檢核
- ✓藥物-藥物交互作用檢核
- ✓藥物過敏檢核
- ✓藥物-疾病禁忌症檢核
- ✓懷孕/哺乳/年紀/性別檢核

Medi-Span：臨床參數



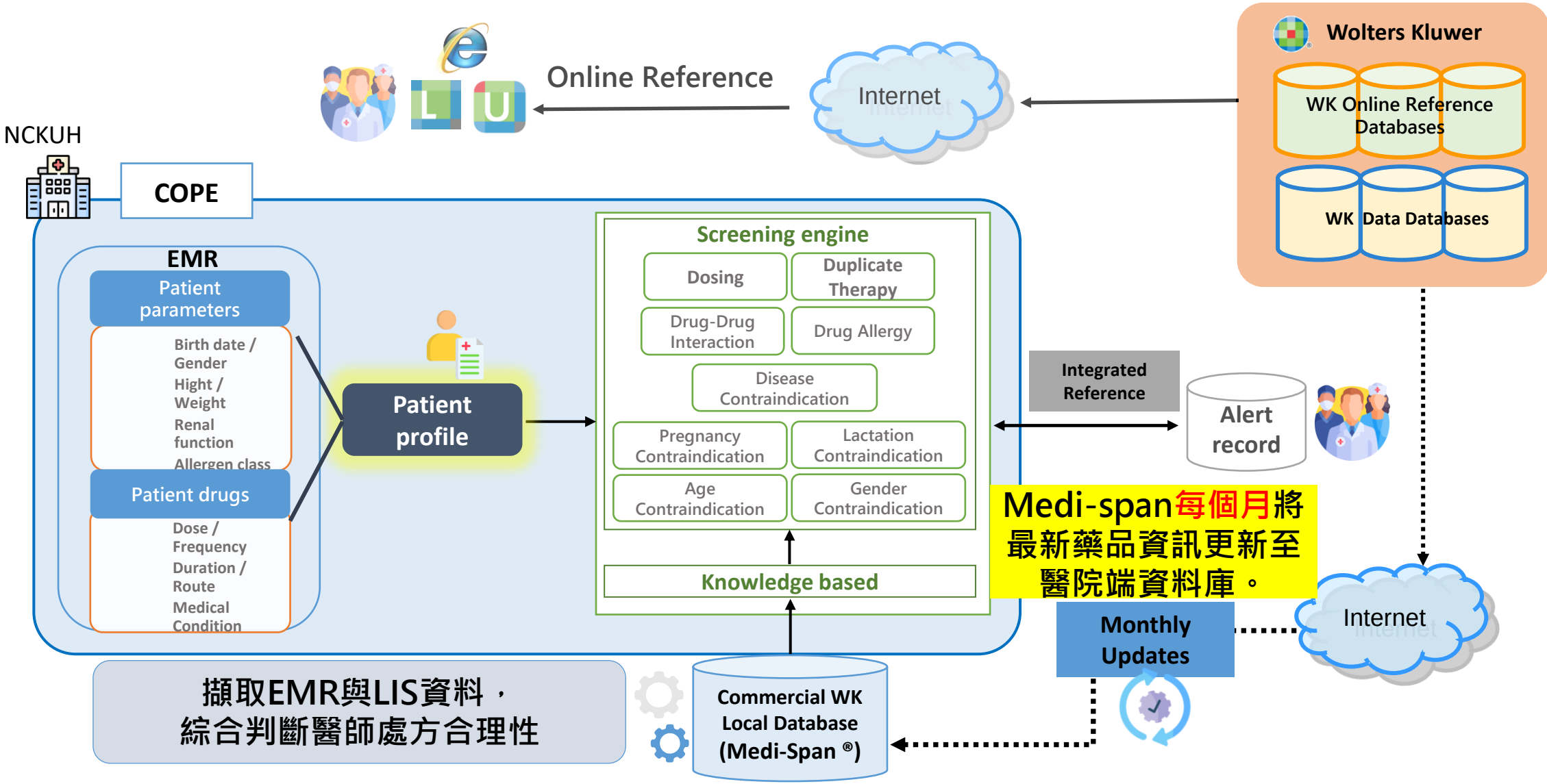
Patient Profile

- Patient ID
- Birth Date
- Gender
- Weight
- BSA
- Creatinine Clearance
- Serum Creatinine
- Urine Output

Patient Conditions

- Diagnosis, ICD-10 (2014)

Medi-Span® : Clinical inputs



[1] https://www.wolterskluwer.com/en/solutions/medi-span

Medi-Span® in NCKUH

2019.01-04
Drug GPI mapping

2019.08-12
Test screening engine and modify

Dosing, Interaction
Drug Allergy, Duplicate therapy
Disease, Age, Gender, Pregnancy,
Lactation Contraindication

2020.01
Alerts to pharmacist

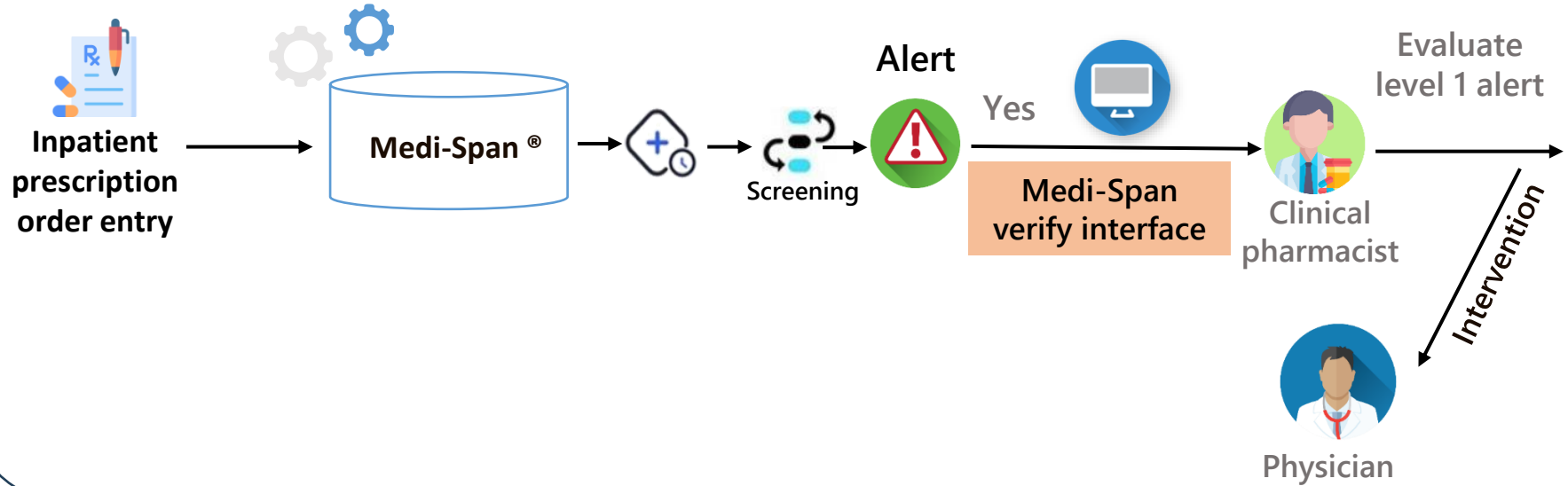
Interaction
Pregnancy Contraindication

2020.12
Alerts to physician

Medi-Span® integrated with CPOE

System and alert error modify

Workflow



Evaluate result	
M01	評估後不需調整
M02	藥師尚未介入已改處方
M03	照會醫師並接受
M04	照會醫師但未接受
M05	問題回報：警訊內容有錯誤
M06	問題回報：警訊不實用，不建議跳出
M07	評估時藥品已 DC

CPOE ：醫令系統(Computerized Provider Order Entry, CPOE)

Medi-Span® 醫囑系統

◆醫囑端：藥物交互作用與懷孕檢核

藥品交互作用、過敏藥、同類藥與藥品極量 檢核

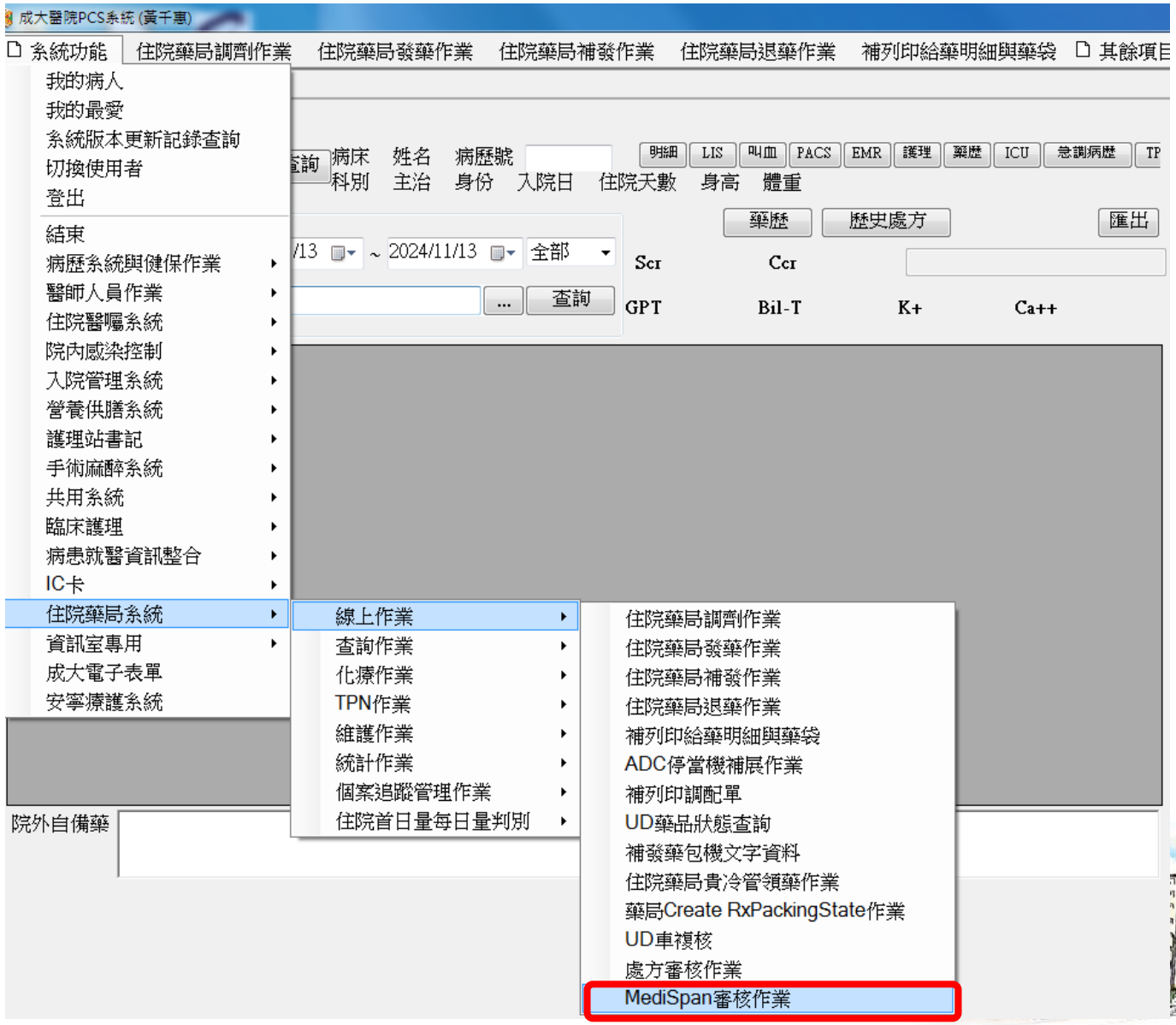
請確認藥品警訊，若有疑義，請電洽藥劑部6515

底色：限制(禁止開立)　過敏藥底色(依嚴重程度)：不清楚/未選取　輕度　中度　嚴重

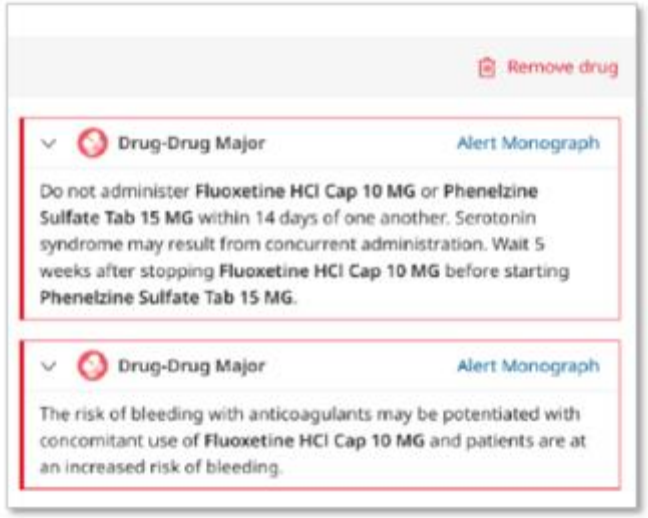
類別		詳	提示說明	理由	
交互作用	警示	詳	您目前所開立的Warfarin 與目前開立的 Amiodarone 檢核出交互作用,請見詳細說明	已調整使用劑量,不修改	
交互作用	警示	詳	您目前所開立的Warfarin 與 之前院內開立之(2024/09/19)(住院)(一般內科)(醫師)所開立: Diclofenac 檢核出交互作用,請見詳細說明	已調整使用劑量,不修改	
MediSpan [Interaction]	警示	詳	Amiodarone may inhibit hepatic metabolism and increase the anticoagulant effect of vitamin K antagonists (e.g. Warfarin 1mg/tab). Bleeding may occur.	已調整使用劑量,不修改	

*欲反回畫面修改請按[理由]欄位後面的button　同類藥併用詳細資料　F12-確認

住院系統建立MediSpan®藥師審核作業



Medi-Span®：警訊分級系統



SHORT MESSAGE

A short message that describes the current interaction or adverse effect, depending on alert severity and rules set by the institution

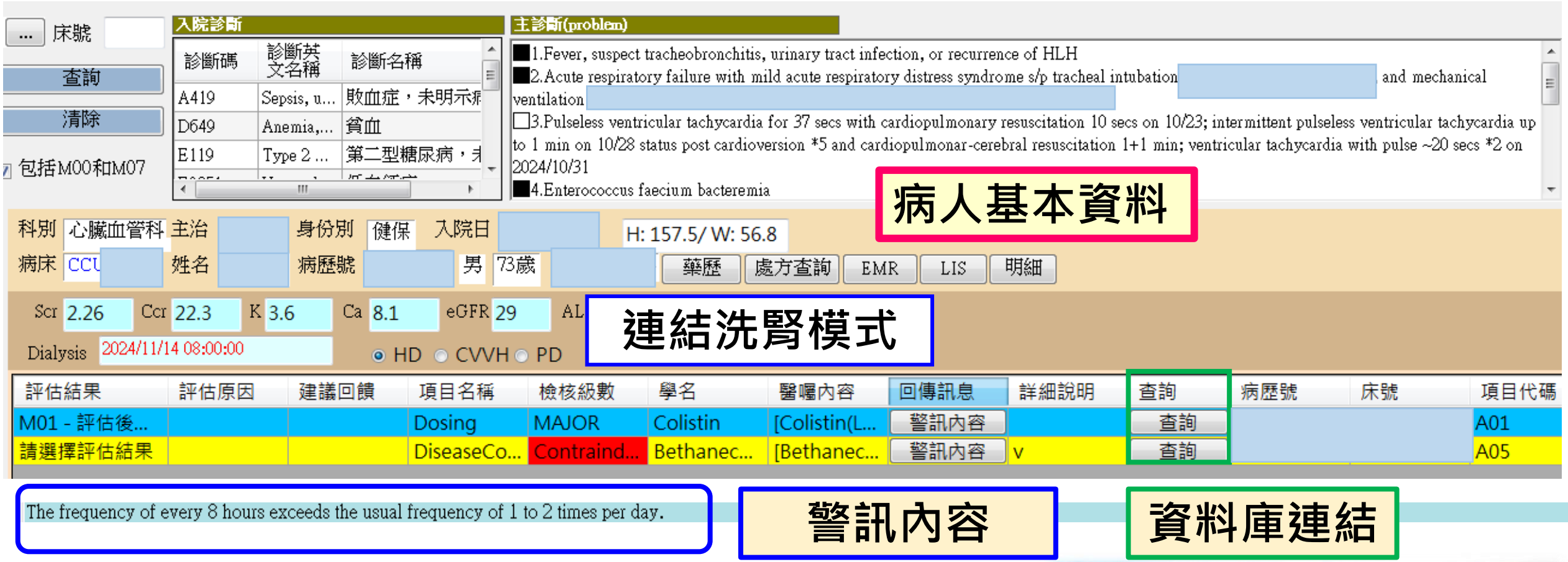
彈性調控訊息

Level 1
- Major / Contraindicated

Level 2
- Moderate / Not Recommended

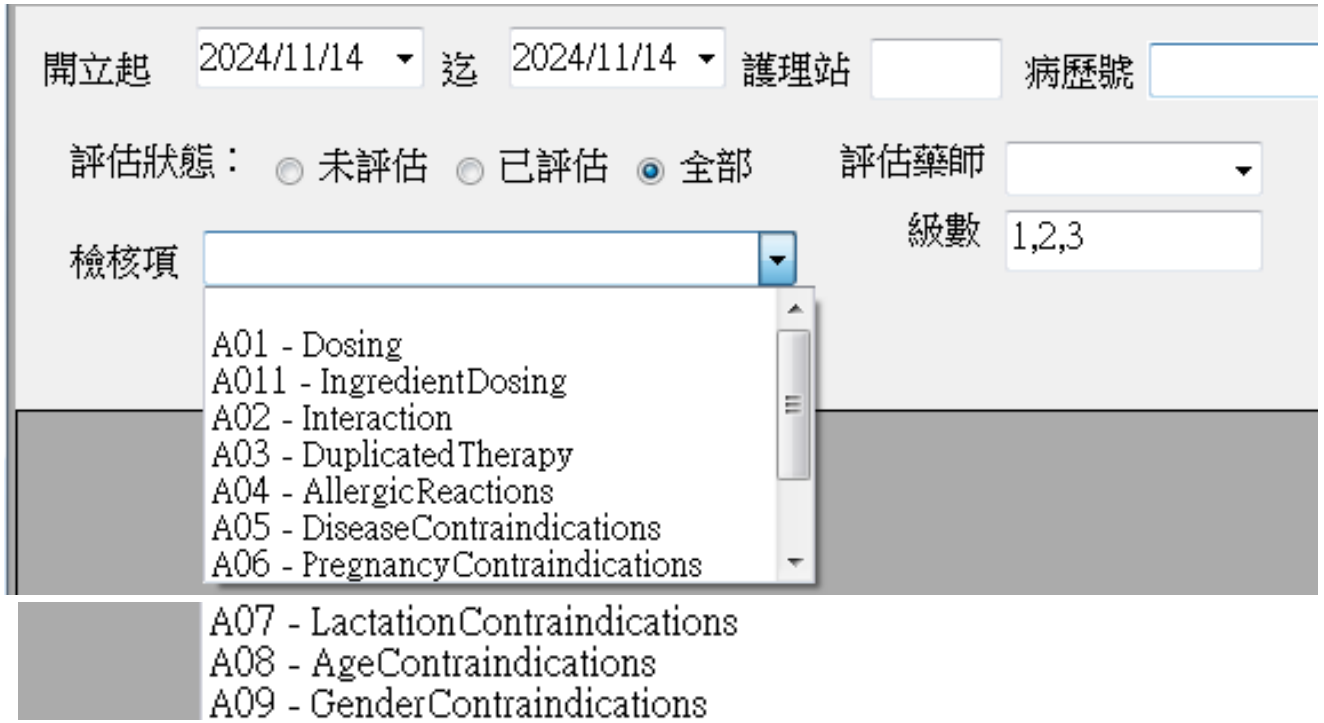
Level 3
- Minor / Extreme Caution / Use Cautiously / Informational

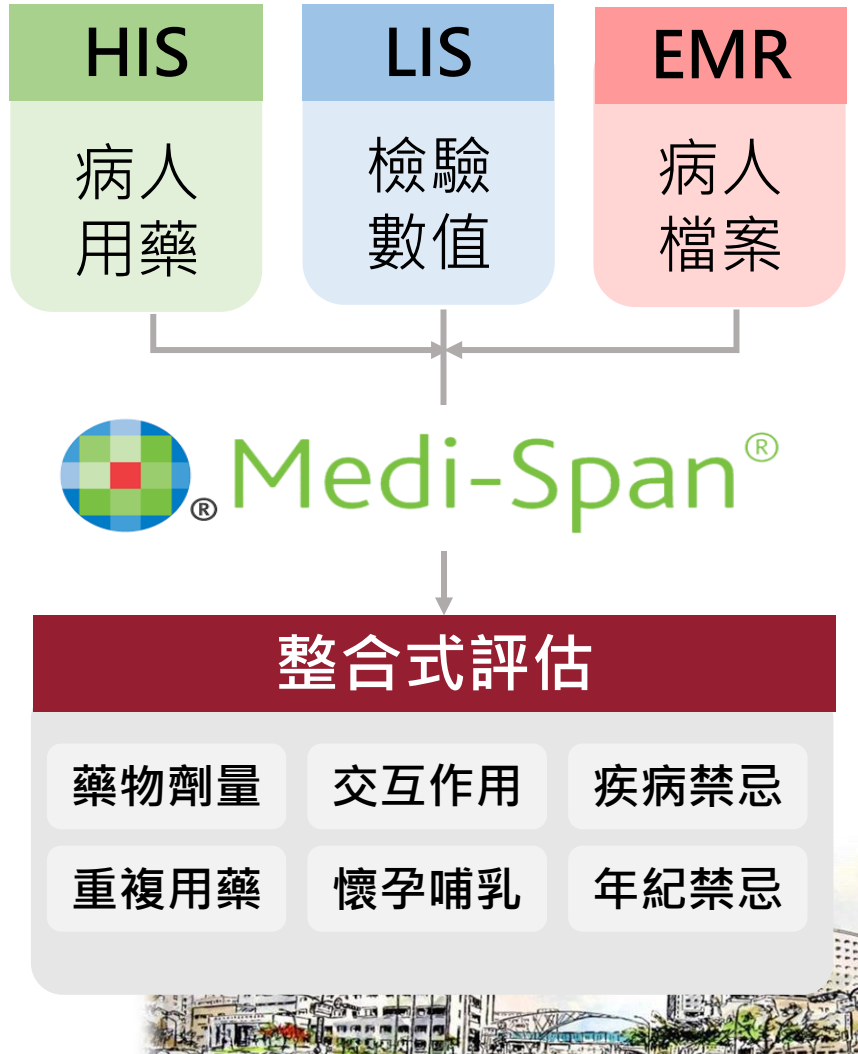
Medi-Span® 藥師審核系統



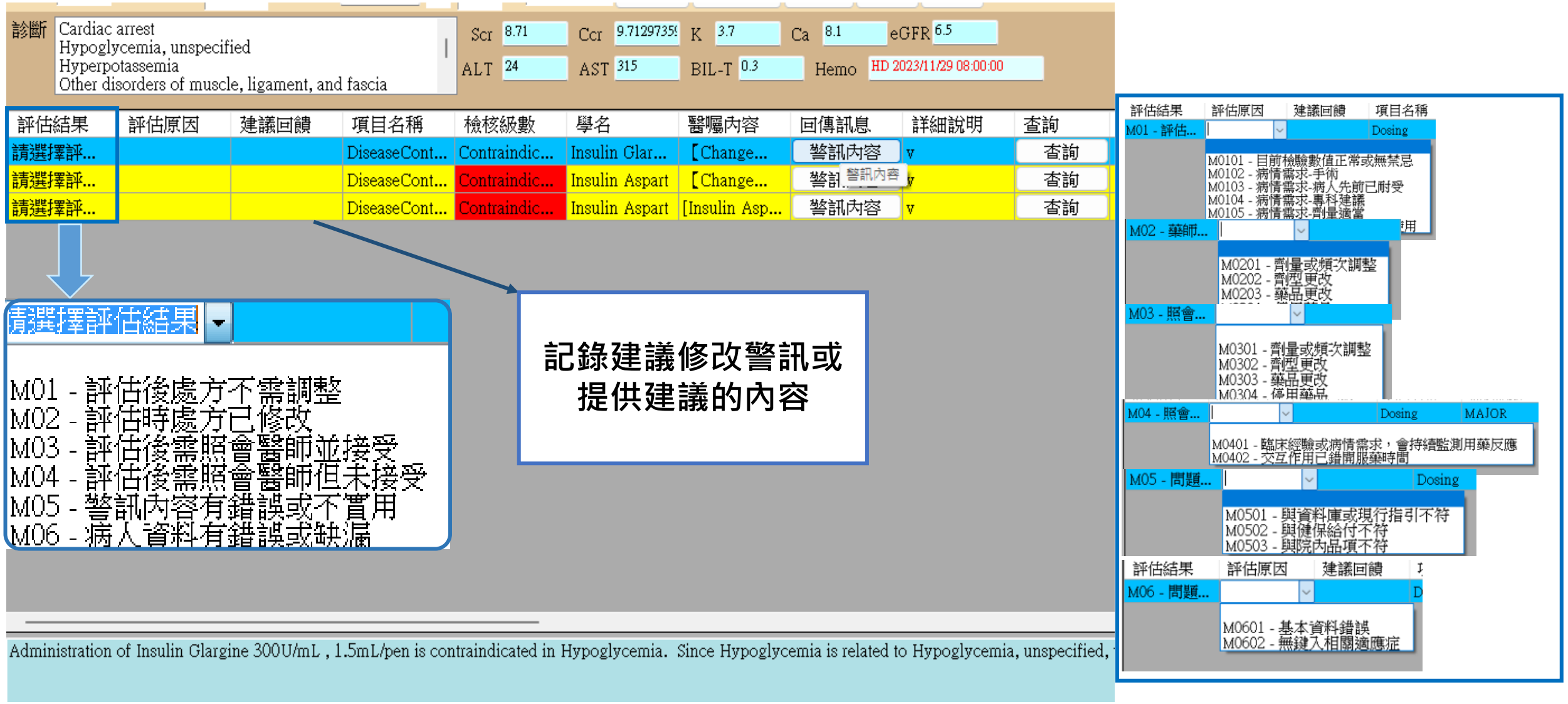
Short message

Medi-Span®-檢核項目類別



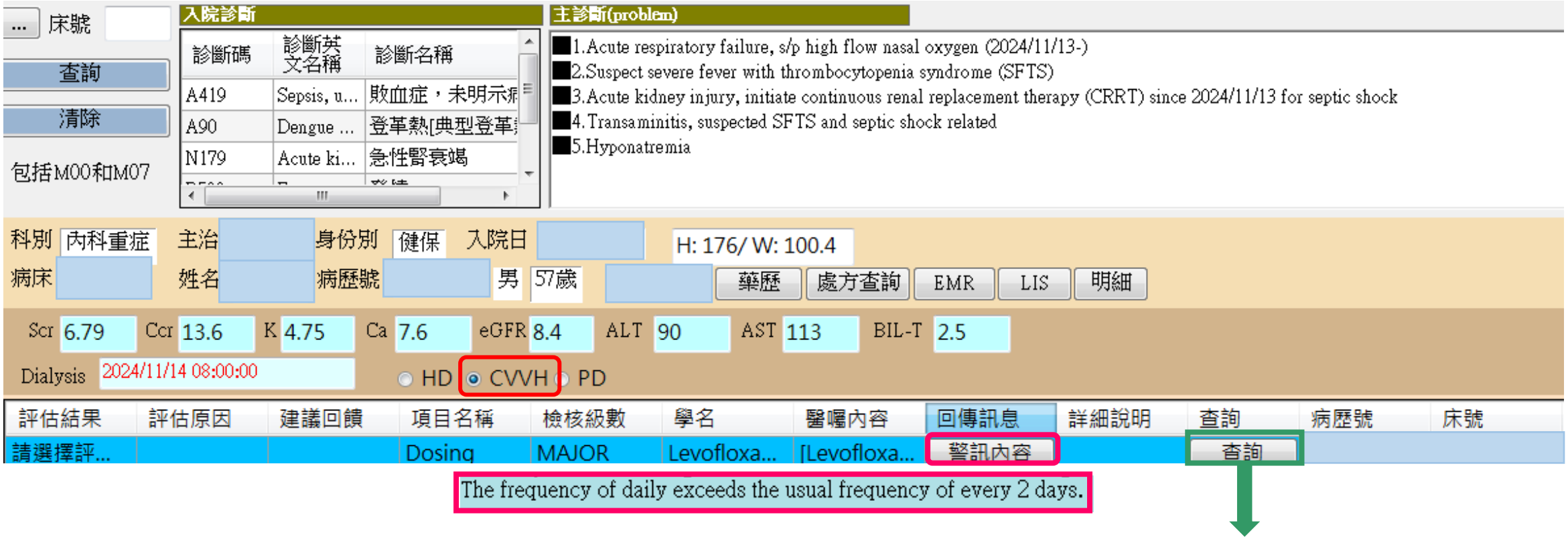


Medi-Span®–藥師審核評估



Medi-Span®檢核：ICU連續性血液透析替代療法

劑量/頻次

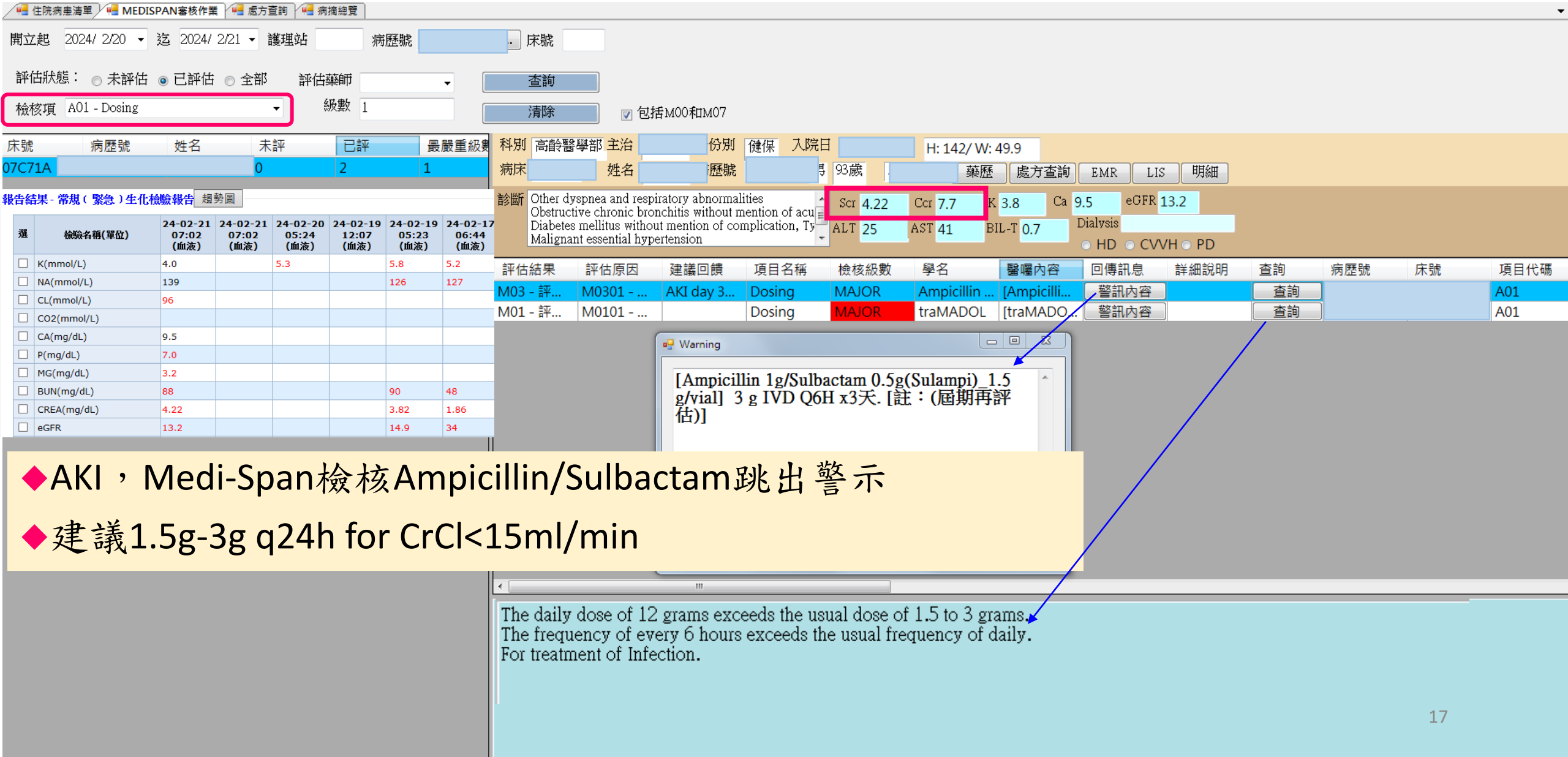


UpToDate®

Dose Adjustments in CRRT (CVVH/CVVHD/CVVHDF)

If usual recommended dose is 250 mg every 24 hours	If usual recommended dose is 500 mg every 24 hours	If usual recommended dose is 750 mg every 24 hours
No dosage adjustment necessary (Ref)	500 mg initial dose, then 250 mg every 24 hours (Ref) **or** 500 mg every 48 hours (Ref)	750 mg initial dose, then 500 mg every 24 hours (Ref) **or** 750 mg every 48 hours (Ref)

Medi-Span 檢核：腎功能劑量/頻次



- ◆AKI，Medi-Span檢核Ampicillin/Sulbactam跳出警示
- ◆建議1.5g-3g q24h for CrCl<15ml/min

Medi-Span 檢核：藥物-藥物交互作用

科別 外傷科　主治　身份別 健保　入院日　H: 170.5/ W: 59.4
病床　姓名　病歷號　男 67歲　藥歷　處方查詢　EMR　LIS　明細

診斷
Acute respiratory failure
Organic personality syndrome
Fracture of vault of skull, closed with subarachnoid, s
Fracture of other facial bones, closed

Scr 0.88　Ccr 68.4　K 4.5　Ca 8.4　eGFR 86
ALT 330　AST 168　BIL-T 0.4　Dialysis
HD　CVVH　PD

評估結果	評估原因	建議回饋	項目名稱	檢核級數	學名	醫囑內容	回傳訊息	詳細說明	查詢	病歷
M02 - 評...	M0201 - ...		Interaction	Major	Ciprofloxa...	[Ciproflox...	警訊內容	v	查詢	1133
M02 - 評...	M0201 - ...		Interaction	Major	Warfarin	【Change...	警訊內容	v	查詢	1133
M02 - 評...	M0201 - ...		Interaction	Major	Ciprofloxa...	[Ciproflox...	警訊內容	v	查詢	1133

Hypoprothrombinemic effects of Warfarin 5mg/tab may be increased by Ciprofloxacin 200mg/100mL/btl. Dosage reduction of Warfarin 5mg/tab may be required.

- Ciprofloxacin and warfarin 交互作用

「詳細說明」：顯示完整資料

Ciprofloxacin 200mg/100mL/btl and Warfarin 5mg/tab

Management Level	Severity Level	Documentation Level	Labeled Avoidance Level	Onset	Published Interaction Lists
Professional Intervention Required	**MAJOR**	Established	Contraindicated	**DELAYED**	Arizona Center for Education and Research on Therapeutics
PROFESSIONAL REVIEW SUGGESTED	Moderate	**PROBABLE**	Avoid	Rapid	**BEERS CRITERIA**
Potential Interaction Risk	Minor	Suspected	**NOT SPECIFIED**		Medicaid Provisions in the SUPPORT Act
		Possible			Medicare Part D: Concurrent Opioids and Benzodiazepines
		Doubtful/Unknown			Office of the National Coordinator
					Pharmacy Quality Alliance
					Not specified

Alert

Hypoprothrombinemic effects of Warfarin 5mg/tab may be increased by Ciprofloxacin 200mg/100mL/btl. Dosage reduction of Warfarin 5mg/tab may be required.

Effect

Hypoprothrombinemic effects of Warfarin 5mg/tab may be increased by Ciprofloxacin 200mg/100mL/btl. Dosage reduction of Warfarin 5mg/tab may be required.

Mechanism

Unknown.

Management

Dosage reduction of Warfarin 5mg/tab may be needed during concurrent administration of Ciprofloxacin 200mg/100mL/btl. Coagulation status should be monitored, at least during the initial period of concomitant use, and the anticoagulant dose should be adjusted, if needed, accordingly. An alternative antimicrobial agent should be considered.

Discussion

Multiple case reports and case series have implicated ofloxacin [1] [15], ciprofloxacin [2] [4] [6] [7] [9] [10] [11] [18] [36], norfloxacin [3] [9], levofloxacin [20] [21] [22] [31] [34], gatifloxacin [23] [29] [32] [33], and moxifloxacin [24] [26] [27] [37] in causing excessive anticoagulation when given with warfarin. Package labeling for moxifloxacin indicates no significant changes in clotting time have occurred in healthy volunteers [35]. In 2004, 64 cases involving ciprofloxacin with warfarin were reported to the FDA Spontaneous Reporting System [18] and 57 to Health Canada [25].

Results from controlled studies are conflicting [12] [13]. Single doses of warfarin alone or on the 4th day of norfloxacin produced no differences in kinetics or anticoagulant effect [5]. In 3 controlled studies, ciprofloxacin did not significantly alter PT in patients on warfarin [8] [14] [16].

In a case report involving a 77-year-old man [36], ciprofloxacin added to a stable warfarin regimen resulted in an increase in INR from 2 to 5.1 after 6 days. He was diagnosed with a cerebral hemorrhage and died within hours.

In a single-dose study, warfarin pharmacokinetics were not altered by levofloxacin [17]. A case-control analysis has shown conflicting results with levofloxacin [30]. 33% of patients receiving levofloxacin with warfarin had high INRs [31]. Seven cases of excessive anticoagulation in patients on warfarin who were given levofloxacin have been reported [20] [21] [22]. In an additional 3 case reports, use of levofloxacin increased INRs to 7- >8.6. One patient died; 2 experienced bleeding and were treated with fresh frozen plasma and vitamin K [34]. Post-marketing reports document that levofloxacin enhances the effects of warfarin and episodes of bleeding have occurred [19]. Eleven cases of elevated INR due to concomitant use of levofloxacin with acenocoumarol have been reported [28] [41].

An 88-year-old man on warfarin for one year was given gatifloxacin [32]. Coadministration resulted in indeterminably high INR values that required vitamin K and fresh frozen plasma.

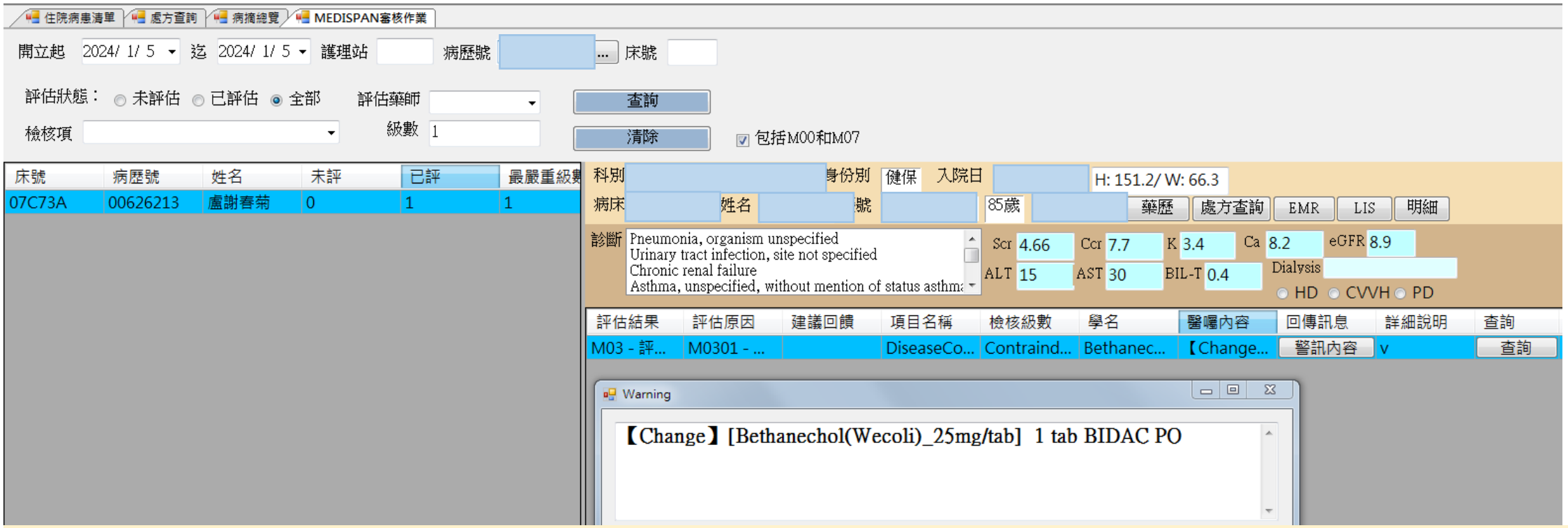
In a retrospective review of 92 patients on stable warfarin for >4 weeks (54 levofloxacin and 38 gatifloxacin), 2% of patients in the levofloxacin group had an INR >4. In contrast, 21% of patients on gatifloxacin had an INR >4; 11% required vitamin K [33]. Levofloxacin slightly increased the INR in a similar review of 21 warfarin-treated patients [38]. Another review of 205 outpatient anticoagulation clinic patients determined that the coadministration of warfarin with ciprofloxacin, moxifloxacin, and levofloxacin resulted in INR increases of 0.38, 0.7, and 0.75, respectively [40].

Coadministration of ciprofloxacin with warfarin in elderly patients with UTIs was associated a 2-fold higher risk of UGI bleeding than other antibiotics (i.e. nitrofurantoin, amoxicillin, norfloxacin) [39].

References

1. Leor J et al. [letter]. Ann Intern Med. 1988; Vol. 109:761.
2. Mott FE et al. [letter]. Ann Intern Med. 1989; Vol. 111:542.
3. Linville T et al. [letter]. Ann Intern Med. 1989; Vol. 110:751.
4. Kamada AK. DICP Ann Pharmacother. 1990; Vol. 24:27.
5. Rocci ML et al. J Clin Pharmacol. 1990; Vol. 30:728.2401751
6. Johnson KC et al. J Fam Pract. 1991; Vol. 33:338.1919447
7. Renzi R. Am J Emerg Med. 1991; Vol. 9:551.1930395
8. Rindone JP et al. Clin Pharm. 1991; Vol. 10:136.2009731
9. Jolson HM et al. Arch Intern Med. 1991; Vol. 151:1003.
10. Linville D et al. Am J Med. 1991; Vol. 90:765.2042696
11. Dugoni-Kramer BM. [letter]. DICP Ann Pharmacother. 1991; Vol. 25:1397.
12. Roush MK et al. [letter]. Arch Intern Med. 1992; Vol. 152:1533.
13. Jolson HM et al. [letter]. Arch Intern Med. 1992; Vol. 152:1533.

Medi-Span 檢核：藥物-疾病禁忌症檢核



◆Medi-Span檢核入院診斷ICD-10有asthma，醫師開立bethanechol時系統跳出警示。

Medi-Span 檢核：Duplicated Therapy(雲端藥歷)

開立起 2024/11/11 迄 2024/11/14 護理站 病歷號 ... 床號

評估狀態： 未評估 已評估 全部 評估藥師

檢核項 A03 - DuplicatedTherapy 級數 1,2,3

查詢 清除

包括M00和M07

入院診斷

診斷碼	診斷英文名稱	診斷名稱
E119	Type 2 ...	第二型糖尿病，未伴
I10	Essential...	本態性(原發性)高血
I255	Ischemic...	缺血性心肌病變

主診斷(problem)

1.Coronary artery disease/ left main coronary artery (LM) + 3-vessel-disease, Syntax score 38, s/p coronary artery (LAD) and drug-eluting stent *2 for left circumflex coronary artery (LCX) and OM
2.old cerebrovascular accident (CVA) 2022/4/28
3.Sick sinus syndrome and atrioventricular (AV) nodal dysfunction s/p permanent pacemaker impl imaging (MRI)) on 2024/3/6
4.Hypertension
5.dyslipidemia 2024/10/30 LDL-C:70mg/dL

床號	病歷號	姓名	未評	已評	最嚴重級數
09B			2	0	

科別 心臟血管科 主治 身份別 健保 入院日 H: 167.3/ W: 67.4

病床 姓名 病歷號 男 78歲 藥歷 處方查詢 EMR LIS 明細

Scr 1.00 Ccr 52.6 K 4.0 Ca 9.3 eGFR 72 ALT 15 AST BIL-T

Dialysis HD CVVH PD

評估結果	評估原因	建議回饋	項目名稱	檢核級數	學名	醫囑內容	回傳訊息	詳細說明	查詢
請選擇評...			Duplicate...		Dexlanso...	[Dexlanso...	警訊內容		查詢
請選擇評...			Duplicate...		Esomepra...	[Esomepr...	警訊內容		查詢

Dexlansoprazole 60mg/cap and Esomeprazole 40mg/tab are in the PPIS AND PCABS class and may represent a therapeutic duplication.

國立成功大學醫學院附設醫院
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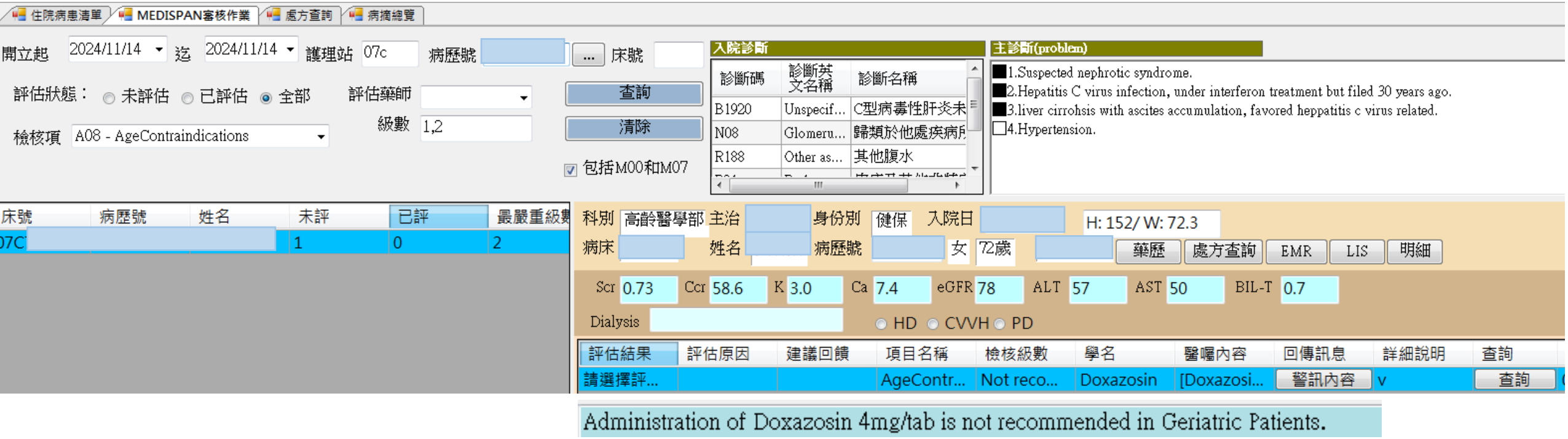
Medi-Span 檢核：Age Contraindications



Severity Level
Contraindicated
NOT RECOMMENDED
Extreme caution
Use cautiously
Informational

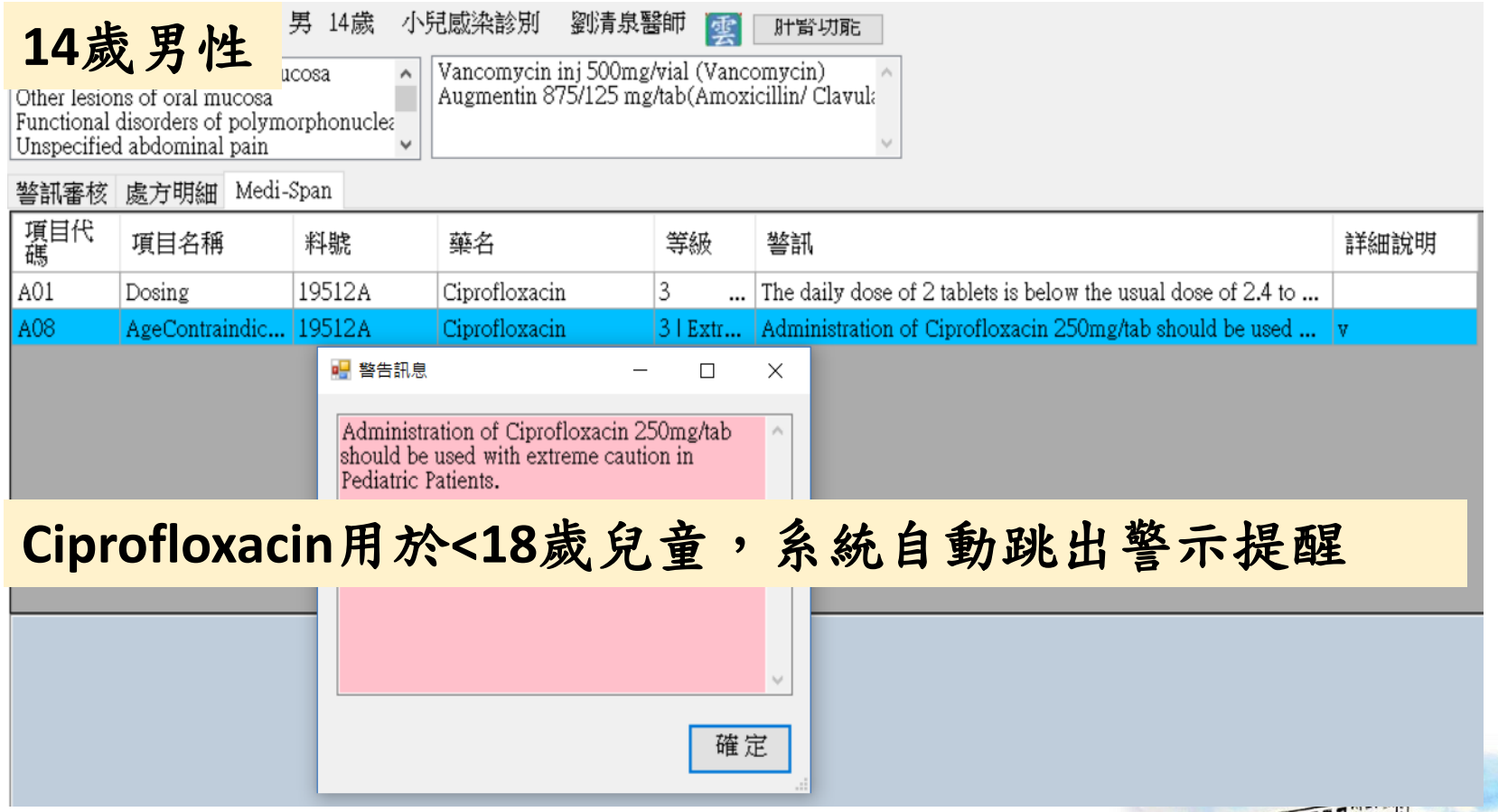
Alert
Administration of Doxazosin 4mg/tab is not recommended in Geriatric Patients.

Comments
This medication is on the Beers list and should be avoided for use as an antihypertensive in patients 65 and older due to its potential for causing orthostatic hypotension. Avoid in patients with syncope and urinary incontinence.

2023 updated AGS Beers
Criteria® for potentially inappropriate medication
Doxazosin : Avoid use as an antihypertensive

Medi-Span 檢核範例: 年紀檢核

14歲男性



Ciprofloxacin用於<18歲兒童，系統自動跳出警示提醒

Medi-Span®於多重用藥連貫性服務

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National Cheng Kung University Hospital
生命・愛心・卓越・創新

成大醫院多重用藥頁籤

多重用藥病人
(1) 口服用藥品項(含自備藥物)≥10項
(2) Age≥65 y/o
(3) eGFR (ml/min/1.73m²)或 CrCl (ml/min)<60

(1) 雲端藥歷未評估，顯示訊息做提醒
(2) 病人入院時雲端藥物評估結果
(3) 出院前代入一個月內雲端與出院帶藥做評估及整合

藥師**照會**醫師後需填寫
臨床藥事照護介入紀錄

MediSpan檢核：多重用藥DDI

病歷號 [redacted] ... 床號 ID 護理站 選擇 檢核日期 2024/11/[redacted]

檢核狀態： 入院第3日 入院後每7日 全部

評估狀態： 已評估 未評估 全部 病人狀態： 住院中 已出院 管灌狀態 是 查詢 清除 匯出 查個人

檢核日	病床號	病歷號	姓名
2024-11-09	[redacted]		

病床 [redacted] 姓名 [redacted] 病歷號 [redacted] 女 78歲 [redacted] 明細 LIS 血 PACS EMR 護理 藥歷 ICU

科別 腎臟科 主治 [redacted] 身份 健保 入院日 [redacted] 住院天數 46 DNR 抗 雲 轉運三級

身高 160.0 cm 體重 40.0 kg BUN 19 Crea 0.44 eGFR ≧90 Ccr 37 AST 14 ALT 37 Bil-T 0.3 七天內轉床紀

處置建議	警訊	Medi	藥品名稱	用量	單位	頻次	用法	備註	MRCI	開始日期
0 - 應持續...	警訊	Medi	Fluconazole cap ...	1	cap	QDPC	PO		3	2024/1...
0 - 應持續...	警訊	Medi	Flucytosine 500m...	2	tab	Q12H	PO	(屆期再評估)	5.5	2024/1...
0 - 應持續...	警訊	Medi	Loperamide 2mg/...	1	cap	BID PRN	PO	如果持續...	3	2024/1...
0 - 應持續...	警訊	Medi	Lorazepam 0.5mg...	1	tab	HS PRN	PO	若仍失眠...	3	2024/1...
0 - 應持續...	警訊	Medi	Mecobalamin 500...	1	cap	BIDPC	PO		4	2024/1...
0 - 應持續...	警訊	Medi	Prednisolone tab ...	1	tab	BID	PO	hypereosi...	4	2024/1...
0 - 應持續...	警訊	Medi	Trazodone 50mg/...	1	tab	HS	PO		4	2024/1...
0 - 應持續...	警訊	Medi	Zinc Gluconate 錠 ...	1	tab	TIDAC	PO		6	2024/1...

清單

項目名稱	檢核級數	回傳訊息
AgeContrai...	Extreme ca...	Administration of Trazodone 50mg/tab should be used with extreme caution in Geriatric Patients.
Interaction	Moderate ...	Plasma concentrations and pharmacologic effects of trazodone may be increased by moderate CYP3A4 inhibitors (eg, Fluconazole 50mg/cap).

Drug Interactions

UpToDate®

Title TraZODone / CYP3A4 Inhibitors (Moderate)

Risk Rating C: Monitor therapy

Summary CYP3A4 Inhibitors (Moderate) may increase the serum concentration of TraZODone. **Severity** Moderate **Reliability Rating** Fair

Patient Management Consider the use of a lower trazodone dose and monitor for increased trazodone effects (eg, sedation, QTc prolongation) if combined with moderate CYP3A4 inhibitors

Medi-Span®於Pre-ESRD藥師門診

- 藥物交互作用

一般藥品審核確認 | 急慢性腎臟病藥事照護作業

病患來源 O - 門診 | 處方日期 2024/11/11 ~ 2024/11/11 | 領藥窗口 | 領藥號 | 病歷號 | F1-查詢

狀態 全部 未確認 已確認 | 科別 | 全部 有警訊 無警訊 整合照護 腎 Medi-Span ALL 全部

來源	狀態	領藥窗口	慢箋23	領藥號	序號	病歷號
門診					0	

1111H0030200002 確認審核藥師 - 黃千惠 | 檢視藥品 | ADR(含藥敏) | 檢視報告 | EMR | LIS

H-302 賴 男 72歲 一般內科 醫師 肝腎切能 CREA:1.88(2024/11/11) eGFR:35(2024/11/11) H/W:143.00/53.6000(2024/11/11)

Chronic kidney disease, stage 3 (moderate
Atherosclerotic heart disease of native cor
Hyperlipidemia, unspecified
Type 2 diabetes mellitus with hyperglycer

NKDA

檢驗值:
CREA:1.88(2024/11/11)

過往疑義

警訊審核 | 處方明細 | Medi-Span

評估結果	建議回饋	項目名稱	藥名	等級	警訊	詳細說明	項目代碼	料號
M01 - 評估後...		Dosing	Sodium bicarbo...	Minor	The daily dose of 1 t...			
估時處方已修改		Interacti...	Atorvastatin	Major ...	Plasma concentratio...	v		
M01 - 評估後...		AgeCon...	Sodium bicarbo...	Extreme ...	Administration of S...	v		

MediSpan 評估確認

Plasma concentrations of statins (i.e. atorvastatin, lovastatin and simvastatin) may be increased when co-administered with imidazoles (itraconazole, ketoconazole and posaconazole). Adverse effects, including myopathy and rhabdomyolysis may occur. Coadministration may be contraindicated in offi

MediSpan® 藥師審核分析

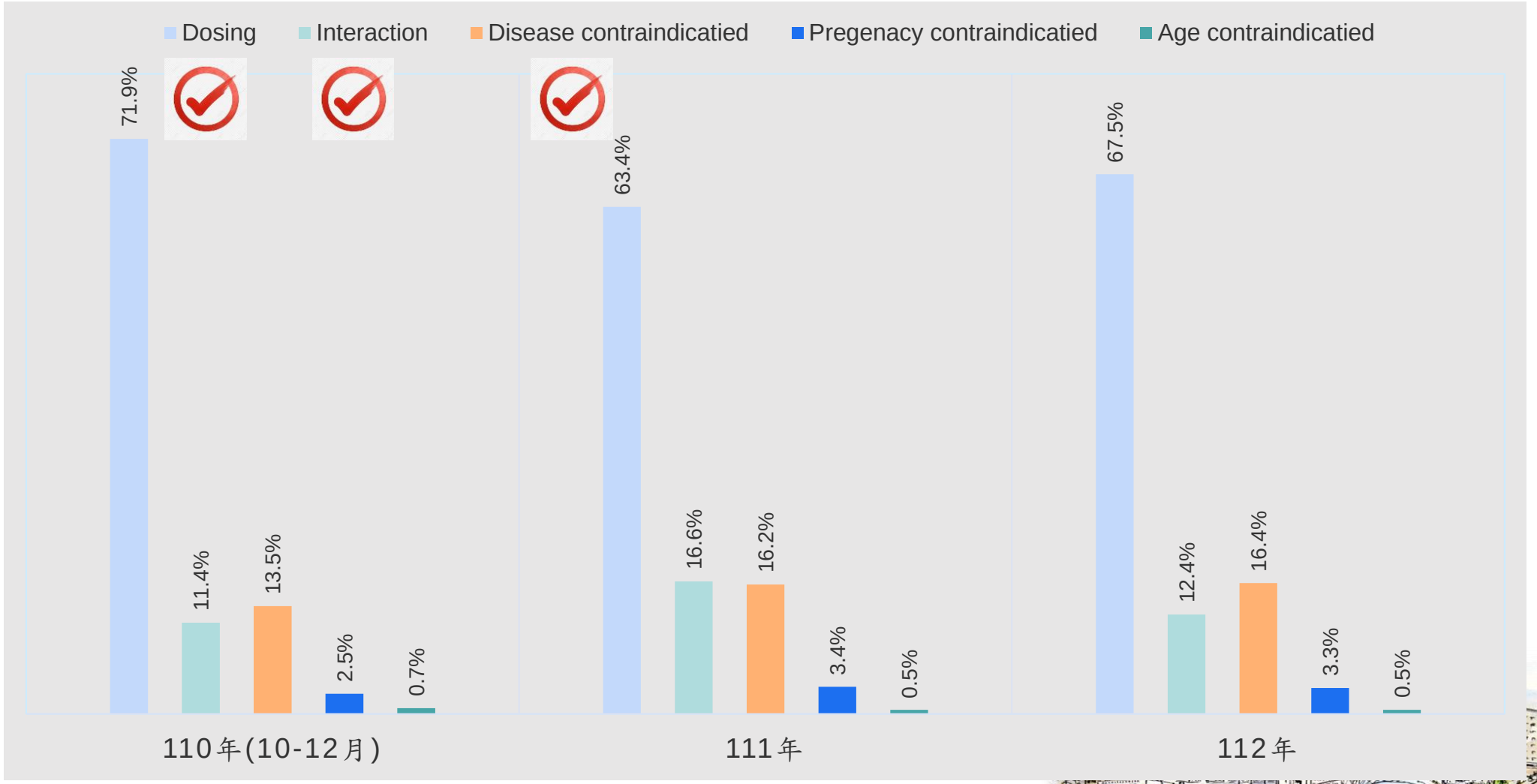
Medi-Span® 111-112年 Level 1 各警訊類別之評估結果(UD)

111 年 (level 1 alert) 評估結果	Dosing	Interaction	Disease contraindicated	Pregnancy contraindicated	Age contraindicated	Total
M01-評估後不需調整	17,364	4,440	4,525	975	146	27,450
M02-藥師尚未介入處方以修改	479	51	51	3	0	584
M03-照會醫師並接受	**292**	**40**	**19**	**0**	**0**	**351**
M04-照會醫師但不接受	**4**	**2**	**0**	**0**	**0**	**6**
M05-警訊內容有錯誤	207	32	54	6	13	312
M06-警訊內容不實用	169	102	60	1	5	337
M07-評估時藥品已DC	5,991	1,737	1,548	324	29	9,629
Total	24,506	6,404	6,257	1,309	193	38,669
照會醫師接受率%	**98.6%**	**95.2%**	**100.0%**	**N/A**	**N/A**	**98.3%**

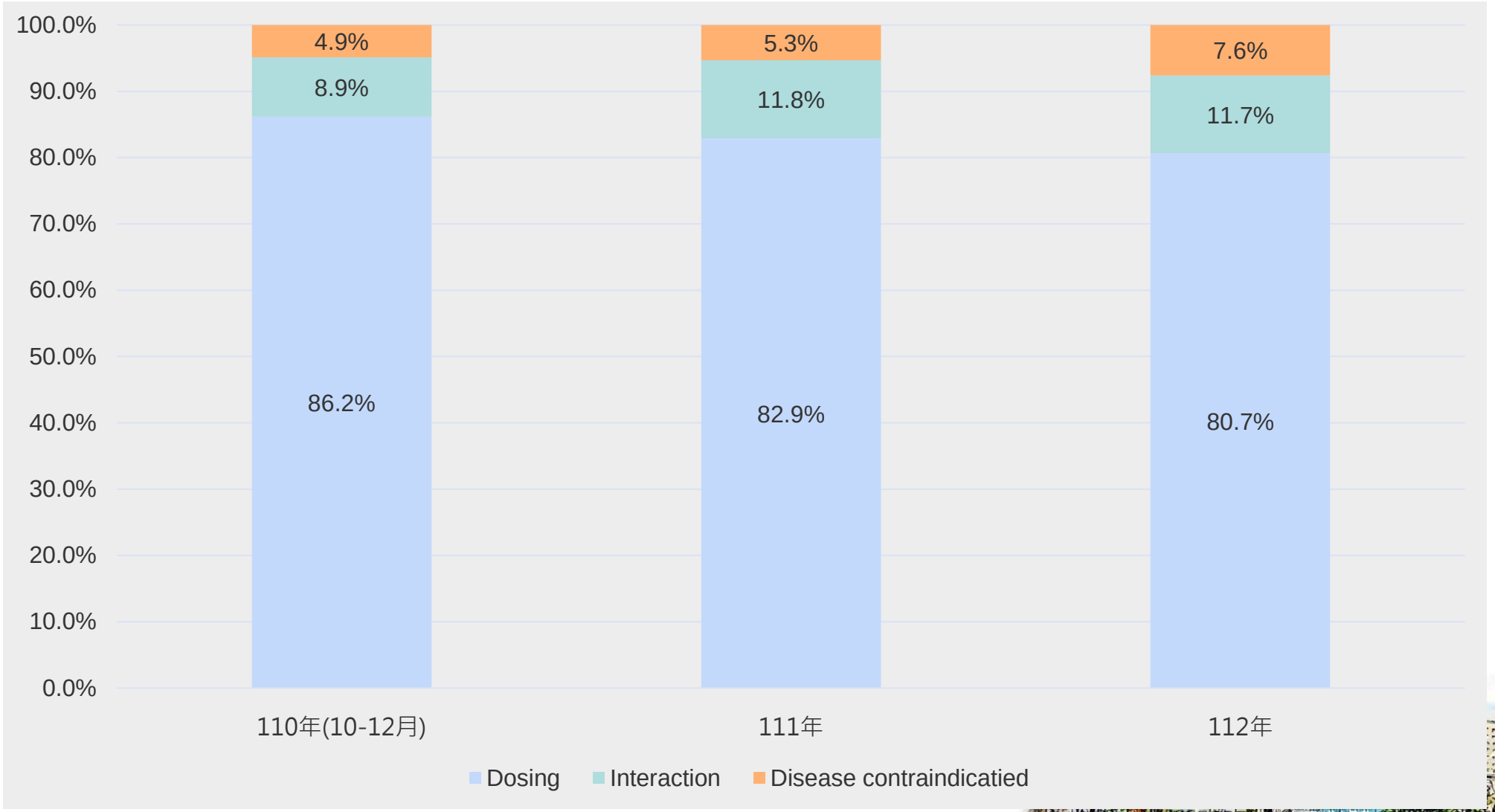
112 年 (level 1 alert) 評估結果	Dosing	Interaction	Disease contraindicated	Pregnancy contraindicated	Age contraindicated	Total
M00-超過3天未評估	273	34	76	4	2	389
M01-評估後不需調整	19,156	3,355	4,780	841	162	28,294
M02-藥師尚未介入處方以修改	440	42	70	1	1	554
M03-照會醫師並接受	541	74	49	0	0	664
M04-照會醫師但不接受	**10**	**6**	**3**	**0**	**0**	**19**
M05-警訊內容有錯誤	189	0	14	1	6	210
M06-警訊內容不實用	76	2	9	1	10	98
M07-評估時藥品已DC	6,669	1525	1,632	472	25	10,323
Total	27,354	5,038	6,633	1,320	206	40,551
照會醫師接受率	**98.2%**	**92.5%**	**94.2%**	**N/A**	**N/A**	**97.2%**

註：112年12月才改評估結果名稱跟定義→ M00-超過3天未評估; M01-評估後處方不需調整; M02-評估時處方已修改; M03-評估後需照會醫師並接受; M04-評估後需照會醫師但未接受; M05-警訊內容有錯誤或不實用; M06-病人資料有錯誤或缺漏; M07-病人異動系統自動DC處方

Medi-Span® 110-112年 level 1 各警訊類別分佈



Medi-Span® 110-112年照會醫師level 1 各警訊類別佔比



Medi-Span® 藥物交互作用警訊優化

藥物品項	項目(Condition)	警訊內容	參考資料	修改內容
Domperidone (Wempty) 1mg/mL,60ml/btl & Verapamil 40mg/tab (Isomil)	•Severity (Domperidone/CYP3A4 Inhibitors (Moderate)	藥師反應Medi-Span未顯示此level 1警訊， 與Lexidrug™嚴重等級不同。	Lexidrug™: Severity → Major Medi-Span®: Severity → Moderate	Moderate → Major
Domperidone (Wempty) 1mg/mL,60ml/btl & Verapamil tab 40mg/tab (Isomil)	•Documentation Level (Domperidone/CYP3A4 Inhibitors (Moderate)	藥師反應Medi-Span未顯示此level 1警訊。	因Documentation Level：Suspected低於Probable， 院內程式設定不顯示。 討論後藥師認為此為重要的DDI警訊，因臨床需求調整讓警訊顯示。	Suspected→Probable
Domperidone (Wempty)1mg/mL,60ml/btl & Amiodarone 200mg/tab (Cordarone)	•Documentation Level (Domperidone/QT-prolonging Agents (Highest Risk)	藥師反應Medi-Span未顯示此level 1警訊。	因Documentation Level：Possible低於Probable， 院內程式設定不顯示。 討論後藥師認為此為重要的DDI警訊，因臨床需求調整讓警訊顯示。	Possible→Probable
Mycophenolate 250mg/cap (CellCept) & Cholestyramine powder 4g/pack (Choles powder)	•Severity (Mycophenolate/Bile Acid Binding Resins)	藥師反應Medi-Span未顯示Lexidrug™為X級警訊。	Lexidrug™:Severity → Moderate (非level 1)。 討論後藥師認為此為重要的DDI警訊，因臨床需求調整讓警訊顯示。	Moderate → Major
Leflunomide 20mg/tab (Arheuma) & Cholestyramine powder 4g/pack (Choles powder)	•Severity (Cholestyramine /Pyrimidine Synthesis Inhibitors)	藥師反應Medi-Span未顯示此level 1警訊， 與Lexidrug™嚴重等級不同。	Lexidrug™: Severity → Major Medi-Span: Severity → Moderate	Moderate → Major

Medi-Span®臨床解決方案系統：成大應用的範圍及演進

臨床藥師常規服務

實習生/
審核處方訓練

住院藥師/
ADC審核處方

門診藥師/審核處方

Potential challenge of Medi-Span®

Alert fatigue

Excessive alerts cause **desensitization**, leading to override (46.2%-96.2%)[2] regardless of the alert's importance.

Interoperability

Inflexible integration with other hospitals or systems may **hinder information sharing**.

Disrupted workflow

Not match the **user's local information** process/**clinical settings** or **needs**.

[1] npj Digital Medicine (2020)3:17. [2] JMIR Med Inform. 2020;8(7):e15653.

"Commercial rule-based CDSS have higher sensitivity but lower specificity"

"Optimizing and/or customizing for intent to enhance usefulness is both common and necessary"

國立成功大學
National Cheng Kung University

Any Questions ?

Medi-Span 警訊修改 追蹤紀錄

◆每月臨床會議討論與追蹤

Medication	Alert contents	Ref.	Remark
Domperidone - Verapamil	Medispan 未顯示警訊	**Lexicomp** Risk Rating X : Avoid combination Severity : Major	**DDI- Domperidone / CYP3A4 Inhibitors (Moderate)** **Severity level : moderate→ major (已跟Medispan反應)**

Limitation – alert example：Hyperkalemia

1. Contraindicated	Alert content	Reason	Discussion
Disease-Hyperkalemia	**Administration of _____is contraindicated in hyperkalemia (ICD-10 E87.5)**	入院診斷高血鉀 (ICD-10 E87.5) 住院期間 不會刪除ICD-10 但K+已恢復正常 or 低 K+需補鉀	院內：**有新增檢驗數值K,INR 與藥品檢核功能**，未來應可應用在Medi-span→**等此功能** Medi-span 目前僅檢核腎功能數值, 未來其他數值欄位納入考量
81 %	**Medication** ✓ **Potassium Gluconate** 錠劑 595mg/tab (Radi-K) ✓ **Potassium Gluconate** oral sol 口服液 20mEq/15mL/amp (K-Glu) ✓ **KCl (Potassium Chloride)** 針劑 20mEq/10mL/amp		
17%	✓ **Spironolactone** 25mg/tab		

Medi-Span

目前僅接收eGFR、Clcr，其他檢驗值項目正在規劃中。

NCKUH

提供其他檢驗值檢核項目(**INR**、**Potassium**、**Bilirubin**)供藥物相容性模組(Drug Compatible)規劃。

警訊修改紀錄

優化前期(2023.03-2023.05)

日期	項目	類別	變更類型	藥品	調整內容
2023-04-12	警訊	DDI	Severity level	Anticoagulants-Salicylates (Warfarin-Aspirin)	Major→ Moderate
2023-05-12 (Medispan updated at April)	警訊	DDI	Documentation level	Potassium Salts (Potassium Gluconate, Potassium Chloride)-Spironolactone	Established → Suspected

優化期間(2023.06-2024.02) → 19個警訊機制

12 個劑量範圍、4個嚴重等級(1個藥物交互作用警訊；2個疾病禁忌症； 1個年齡禁忌症)、

2 個藥物交互作用警訊文獻等級、關閉1個劑量警訊檢核

日期	項目	類別	變更類型	藥品	調整內容	Ref
2024-02-20	警訊	Contraindicated (Age)	Severity level	traMADOL inj 針劑 100mg/2mL/amp (TramTOR)	Contraindicated (12 y/o)→ Not recommended	仿單

優化後期(2024.03-2024.05) →12個警訊機制

7個劑量範圍、4個嚴重等級 (2個藥物交互作用警訊；2個疾病禁忌症)、

1個藥物交互作用警訊文獻等級

劉倚伶 商業臨床決策支持系統於醫學中心的優化與評估
成大臨藥所碩士論文2024.06

升級 Wrapper 版本的優勢 - 對藥師與臨床人員

- **標準化的警示和圖標**：藥師可接收具有一致輸出格式和圖標的標準化警示，有助於快速識別警示的嚴重程度和原因，例如藥物交互作用、過敏或禁忌症。
- **量身定制的篩選**：Wrapper 使用新處方、舊處方籤和當前診斷等分類，確保藥師只看到與當前臨床情況相關的警示，提升工作效率。
- **進階劑量篩選**：Wrapper 支持複雜的劑量指示，如分次劑量、遞減劑量和替代給藥途徑，使藥師在複雜情況下也能確保患者獲得適當的劑量。
- **腎功能和體表面積計算**：自動計算肌酐清除率和腎小球過濾率等關鍵因素，確保對腎功能受損患者進行精確劑量調整，這對藥師至關重要。

Medi-span臨床解決方案系統：成大醫院購置模組

模組名稱	檢核項目
藥物劑量檢核	劑量、頻次、使用期間、使用途徑、腎功能劑量調整…等
重複用藥檢核	同成分重複用藥、同藥理機轉重複用藥
藥物-藥物交互作用檢核	交互作用嚴重度、發生時間快慢、文獻完整度…等
藥物過敏檢核	同成分過敏藥物、同結構類別過敏藥物
藥物-疾病禁忌症檢核	依ICD-10檢核
懷孕/哺乳/年紀/性別檢核	懷孕/哺乳風險、小兒不適當用藥、老年不適當用藥、藥物對生殖力影響…等

Adoption of Healthcare Information Technology

→ **Improve patient outcomes**

處方醫令系統應設有
防止錯誤用藥之警示機制
(**導入智慧化檢核資訊**及時整合病人相關數據，提供醫療決策之參考)

定期檢討警示系統(包含是否有不必要警示導致警示疲勞)，以**避免沒注意**到**提醒**或系統故障時**對病人安全造成風險**

112 年度醫院評鑑基準及評量項目
衛生福利部-111-112年度醫院、診所醫療品質及病人安全工作目標