열린 마음, 나누는 사랑

The Implementation and Evaluation of Renal Function based Dosage Adjustment System in Seoul National University Bundang Hospital

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Introduction

- Electronic medical record (EMR) coupled with clinical decision support systems (CDSS) is highly effective in reducing the frequency of medication error, thereby improving the safety of the patients.

- A number of important therapeutics agents are excreted from kidney thus, renal patients are likely to necessitate the adjustment of the dosage for these agents.

- However, the implementation of such assistant function has not been reported nor evaluated in CDSS.

Objective

The purpose of this study is to develop knowledge based renal dose adjustment system which can be applied into electronic medical record at real time in Korean clinical practice

Methods

Establish drug dosing guideline

- Screening : all medications prescribed in patients with renal impairment
- 255 medications were finally selected
- The guideline reviewed by physicians
- The finalized guideline was then applied in the dosage adjustment system

Classification renal impairment

- Cockroft-Gault Equation **GFR(*mL/min*) <10, 10-50, >50**
- At the time of physician's prescription

  CLcr , dosing guideline, potential renal insufficiency
- Real-time displayed relevant dosing guideline
- Allows the physician to change or discontinue order or ignore

Methods

- Creatinine Clearance (ml/min)
  collecting 24 hour urine
  calculated by Cockroft-Gault equation
- Adjusted doses were decided by experts
- Produced dose adjustment system were applied into BESTCARE (Seoul National University Bundang Hospital Electronic Medical Record System)
- Efficiency in real practice was analysed retrospectively.

Results

The current system is operated from August of 2006.

Revised for the further reduction of the false positive alerts and the ratio for the override

The Dosing guideline data

Class	2005. 2.		Percent Excreted Unchanged	Half-Life (Normal/ ESRD)	Plasma Protein Binding	Volume of Distribution	Dose for Normal Renal Function	Adjustment for Renal Failure			
									GFR, mL/mim		
	code	name of medicine	%	h	%	L/Kg		Method	>50	10-50	<10
Analgesics	CDI	Codeine	Hepatic	2.5-3.5/No data	7	3.0-4.0	30-60mg q4-6h	D	30-60mg q4-6h	22.5-45mg q4-6h	15-30mg q4-6h
	F1	Fentanyl	Hepatic	2-7/No data	80-84	2.0-4.0	Anesthetic induction	D	100%	75%	50%
	F5	Fentanyl									
	MP15	Morphine	Hepatic	1-4/Unchanged	20-30	3.5	20-25mg q4h	D	20-25mg q4h	15-18.75mg q4h	10-12.5mg q4h
	MP5I	Morphine									
	MPI	Morphine									
	MPS1	Morphine									
	MPS3	Morphine									
	PTZ2	Pentazocine	Hepatic	2-5/No data	50-75	5	50mg q4h	D	50mg q4h	37.5mg q4h	25mg q4h
	PTZI	Pentazocine									
	AAP3	Acetaminophen	Hepatic	2.0/2.0	20-30	1.0-2.0	650mg q4h	I	650mg q4h	650mg q6h	650mg q8h
	AAP6	Acetaminophen									
	AAR8	Acetaminophen									
	AAPS	Acetaminophen									
	ASAM1	Aspirin microcoated	Hepatic(renal)	2-3/Unchanged	80-90	0.1-0.2	650mg q4h	I	650mg q4h	650mg q4-6h	Avoid

The Dosing guidelines in pharmacy master

SD 분당서울대학교병원:약제관리 시스템 [약제부 최경숙] 1호기 사용중입니다. - [SD7910S1 신장애시 용량]

기초정보관리(O) 오더조회(P) 외래조제관리(Q) 입원조제관리(R) 외래주사조제관리(S) 병실주사조제관리(T) 반납관리(U) 타과의뢰(V) 자료조회(W) 정보변경(X) 도움말(Y) 종료(Z)

약품코드 CMT4 Cimetidine 400mg

약효군 Antihistamine

조회(F) 출력 저장 종료 삭제

약효군	약품코드	조제약품명
	PTZI	Pentazocine 30mg
Anticoagulant	DTPR1	Dalteparin 10000U/1m
	NDP3	Nadroparin 2850IU
	NDP4	Nadroparine 3800iu
	NDP6	Nadroparine 5700iu
	TNX	Tranexamic 250mg
	TNX5I	Tranexamic 500mg
Anticonvulsant	GBP100	Gabapentin 100mg cap
	GBP	Gabapentin 300mg
	PMD	Primidone 250mg
	TPRM2	Topiramat 25mg sprnk
	TPRM5	Topiramat 50mg sprnk
	TPRM1	Topiramate 100mg
	VGB	Vigabatrin 500mg
Antihistamine	CTR	Cetirizine 10mg
	CMT2	Cimetidine 200mg
	CMT4	Cimetidine 400mg
	EBS	Ebastine 10mg
	EBSS	Ebastine 1mg/ml
	FMTD	Famotidine 20mg
	FMTDI	Famotidine 20mg
	FXFN	Fexofenadine 120mg
	FXFN18	Fexofenadine 180mg
	FXFN3	Fexofenadine 30mg
	HXZ	Hydroxyzine 10mg
	HXZS	Hydroxyzine sy 2mg/m
	NZT1	Nizatidine 150mg
	NZT3	Nizatidine 300mg
	RNT	Ranitidine 150mg
	RNTI	Ranitidine 50mg
	RNT75	Ranitidine 75mg tab
Antihypertensive	ATN2	Atenolol 25mg
	ATN	Atenolol 50mg
	BTX20	Betaxolol 20mg
	BSPL	Bisoprolol 5mg tab
	CTP1	Captopril 12.5mg

기본정보

Percent Excreted Unchanged (%)	50-70
Half-Life (Normal / ESRD) (h)	1.5-2/5
Plasma Protein Binding (%)	20
Volume of Distribution (L/Kg)	0.8-1.3

- Dose Normal Renal Function

400mg bid or 400-800mg q hs GERD 800mg bid or 400mg qid

- Adjustment for Renal Failure

Method D : dosage reduction I : interval extension

D

- Supplement for Dialysis

Hemo	None
CAPD	None
CAVH	200mg bid or 200~400mg q hs

- GFR, mL/min

		최대용량		참고사항	함량		규격		포장	
> 50	400mg bid or 400-800mg q hs	2400	mg		2400	mg	12	tab	12	tab
10 - 50	200mg bid or 200~400mg q hs	400	mg		400	mg	1	tab	1	tab
< 10	100mg bid or 100~200mg q hs	200	mg		200	mg	.5	tab	.5	tab

비고

renal impairment: CrCL less than 30mL/min,50 % dose severe renal impairment: caution recommended, 300 mg bid or tid

약제부 최경숙

Dose adjustment system in Ward as a unit

SD1574S1 퇴원환자진행조회

퇴원환자진행조회 | 재원환자조회

조회일자 2006-04-11

조회(S) 저장(E) 종료(X)

전 체							
04층	041	042	42B	42D			
05층	051	052					
06층	061	062					
07층	071	072					
08층	081	082					
09층	091	092					
10층	101	102					
11층	111	112					
12층	121	122					
13층	131	132					
중환자실	CICU	MICU	NICU	SICU	NPDH		
수술장	HEART	OR	ORA	ORB	ORC	ORBLD	ORSL
마취과	ANPAC	ANPAR	PC				
ANA	AN1	AN2	AN21	AN3	AN4	AN5	AN6
ANB	AN7	AN8	AN9	AN10	AN11		
ANC	AN12	AN13	AN14	AN15	AN16		
AND	AND1	AND2	AND3	AND4	ANXR	ANOB	
기타	ADR1	ADR2	CVCAG	DA00	PLEND		

구분
- (●) 기본
- ( ) 상세

No	병동-병실	환자번호	환자명	성별	연령	신장 (cm)	체중 (kg)	SCR	CockCraft	MDRD (Green)	MDRD (Leavy)
1	112 / 04	10469536		F	72세	163	67.6	0.8	67.83	74.94	71.02
2	112 / 04	12423853		F	70세	147.7	46.3	1.8	21.26	29.56	26.22
3	112 / 04	13593104		F	50세	160.3	62.8	0.9	74.14	70.44	
4	112 / 05	13629685		F	35세	162.9	54	0.8	83.67	86.76	92.96
5	112 / 05	13750844		F	50세	160.7	57.8				
6	112 / 06	11172866		F	57세	150.6	38.4	9.0	4.18	4.81	
7	112 / 06	12657492		F	73세	151.5	55.8	0.8	55.17	74.73	76.61
8	112 / 07	13189132		F	72세						
9	112 / 08	10073719		F	69세	69.1	70.1	1.1	53.42	52.34	52.72
10	112 / 08	10665194		F	63세	163	66.3	0.8	75.34	77	72.36
11	112 / 08	12458385		F	78세	148	52	1.4	27.19	38.65	36.56
12	112 / 08	13386591		F	61세	153	56.6	0.8	65.98	77.5	72.74
13	112 / 08	13714545		F	70세	145	50.7	1.4	29.93	39.51	37.32

real-time alert window

Bestcare_분당서울대학교병원 종합의료정보시스템 - Microsoft Internet Explorer

Patient [redacted] 사용자 : 인증Test 접속일자 : 2006-08-30 EMRSM3 Mypage Logout

10017896 [redacted] 여/75세 081/06/02 kg B+ 입원일 2006-06-28 [36/64] POD [999] 보험 처방약품 | 환자정보 | Alert | Reminder

관절센터 지정의 [redacted] 주치의 ▸진단명 spinal stenosis of lumbar spine ▸수술명

Bestcare_약물 정보 확인 - Microsoft Internet Explorer

약물 Alert (Renal dosing system:시범 적용 약물(250개)만 해당)

구분	약품명	비고
과 용 량	Citopcin 100mg bag (Ciprofloxacin)	입력량(1500mg)이 기준량(1000mg)을 초과하였습니다.
RENAL	Citopcin 100mg bag (Ciprofloxacin)	[redacted]환자의 08/30일 SCr (0.9)로 예측되는 CrCl(Cr) = 48.77ml/min으로 [키 : 152.4cm, 체중 57.2kg - 06/08/30기준] 이때 권장되는 Citopcin 100mg bag (Ciprofloxacin) 의 용량 및 용법은 200-300mg q12h 입니다

경고
1. EMR에서 제공하는 약물 부작용 경고 내용은 진료의 단순한 참고 자료이며, 제공되는 자료에는 임상적 한계가 있으므로 의사 처방으로 발생되는 모든 결과는 진료 의사의 책임입니다.
2. 상호작용과 소아금기에 해당하는 약품에 대하여만 검색제외등록을 할 수 있습니다.

검색제외등록 D/C 수정 서명 닫기

수행기록 투약 검사 수혈 처치 투약일괄적용 검사희망일 적용 2006-08-30 입원지시 퇴원지시 투약묶음 투약해제 검사묶음 검사해제 수액,TPN 항생제 항암제

타과 전체복사 선택복사 선택 닫기 서명 D/C

17 : 61

Conclusions

- Produced dose adjustment system were successfully applied into BESTCARE (Seoul National University Bundang Hospital Electronic Medical Record System) from August, 2006.
- Real-time alert window was effectively realized to clinician's monitor at office simultaneously if inadequate doses were prescribed.
- This help physician's dose adjustment and prevent overdose in renal patients.
- The current system may be practically useful in the improvement of the safety in renal insufficient patients resulting in the realization of the effective Pharmacotherapy.

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