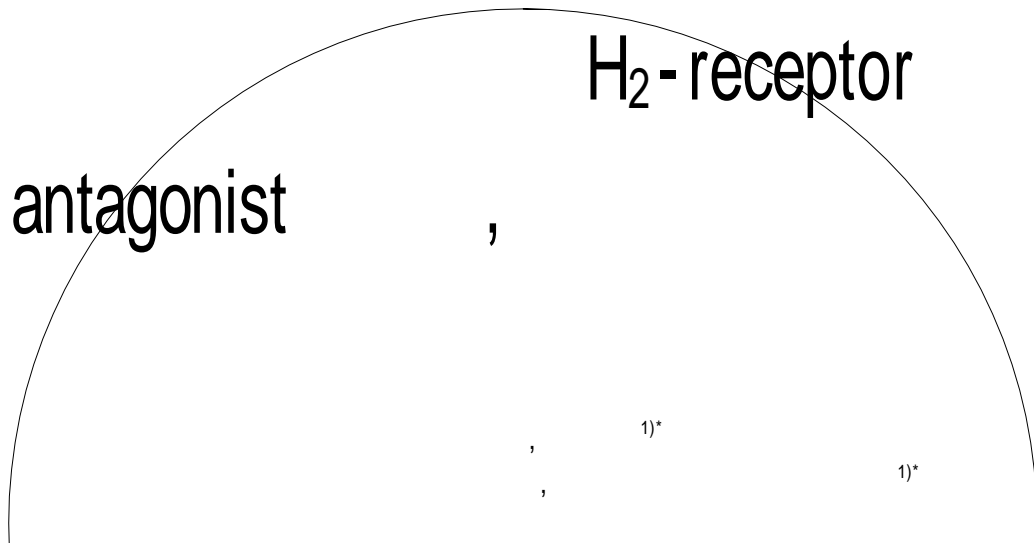


원 저



## Evaluation of Pharmacist Intervention Program for Dosage Adjustment and IV - to - PO Conversion for H<sub>2</sub> - Receptor Antagonist

Bo Young Hwang, Jung Mi Oh<sup>1)\*</sup>

Department of Pharmacy, Kangdong Sacred Heart Hospital, Graduate School of Clinical Pharmacy, Sookmyung Women's University<sup>1)</sup>

### Abstract

**Background:** The purpose of this study was to develop, implement and evaluate the pharmacist intervention program designed to identify and correctly adjust the dosage of H<sub>2</sub> - receptor antagonists (H<sub>2</sub>RA) in renally impaired patients and promote timely conversion of H<sub>2</sub>RA from IV to PO therapy.

**Methods:** The study population consisted of renally impaired patients who

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\* : , 27 | 53-12  
Tel) 02-710-9560, E-mail) jmoh@sdic.sookmyung.ac.kr

received H<sub>2</sub>RA therapy from April 9 to May 8, 2001 at Hallym Medical Center. Each morning a specifically developed software program identified patients with serum creatinine (Scr) greater than 1.2 mg/dl or age greater than 65 years. The pharmacist, then screened the pharmacy profiles of the identified patients to determine if the patient was on H<sub>2</sub>RA. For these patients on H<sub>2</sub>RA with renal impairment the creatinine clearance (CrCl) was calculated using Cockcroft & Gault equation. The pharmacist determined the proper dosage for each identified patients based on the calculated CrCl and the oral dosage that would be appropriate for whom IV therapy was no longer indicated.

**Result :** A total of 149 cases (101 patients) were monitored during the study period. The dosage was inappropriately prescribed for renal function in 61 of 149 cases (41%), and of those, pharmacist made recommendations for 58 cases of which 33 cases (57%) were accepted by the physicians. The administration route of H<sub>2</sub>RA was inappropriately used as IV in 22 of 53 cases (42%), and pharmacist made recommendations for those 22 cases of which 15 cases (68%) were accepted.

**Conclusion :** Monitoring of patients with renal dysfunction by a pharmacist improved the dosing of H<sub>2</sub>RA and a dosing program of patients with renal impairment would be of benefit to other clinicians and institutions seeking to optimize patient care.

**Key Words :** H<sub>2</sub> - receptor antagonist, IV to PO conversion, Dosage adjustment, Renal dysfunction

Cimetidine, ranitidine, famotidine nizatidine 가(Drug Usage Evaluation, DUE),  
H<sub>2</sub>-receptor antagonist(H<sub>2</sub>RA) (gastric  
parietal cell) H<sub>2</sub> 가  
histamine  
(1-3). H<sub>2</sub>RAs 가 (7-11).  
(2). H<sub>2</sub>RA 가  
H<sub>2</sub>RA  
가 H<sub>2</sub>RA  
가 가  
H<sub>2</sub>RAs  
H<sub>2</sub>RAs  
2 Scr 가  
(mg/dl) estimated creatinine clearance  
(ml/min) 가  
H<sub>2</sub>RAs  
5-7 가  
가 (4). 1.  
H<sub>2</sub>RA  
가 가 2001 4 9 5 8  
가 가 Scr 1.2  
(5). mg/dl 가 65 H<sub>2</sub>RAs  
가 가  
H<sub>2</sub>RA  
H<sub>2</sub>RAs 15  
(5-6).

2.

가

가  
 , Scr 1.2 mg/dl 가 65  
 가 Scr  
 가

H<sub>2</sub>RAs(ranitidine, cimetidine, famotidine, nizatidine)가 24 order sheet /

가 IV H<sub>2</sub>RA 가  
 가 가 ,  
 , , , , , , ,  
 , H<sub>2</sub>RA , Scr, ,

3. 가

가 , IV H<sub>2</sub>RA ,  
 , H<sub>2</sub>RA

Cockcroft & Gault estimated  
 creatinine clearance (1-3).

4.

(communication sheet)

가  
 H<sub>2</sub>RA가 IV H<sub>2</sub>RA 가  
 가 가 IV H<sub>2</sub>RA 가  
 , 가 가 ,

1.

가  
 (nasogastric, NG tube)  
 가 가  
 H<sub>2</sub>RA 가 IV  
 2001 4 9 5 8 18  
 Scr 1.2 mg/dl 65  
 1 H<sub>2</sub>RA 149  
 (101 )  
 63 H<sub>2</sub>RA가 42%  
 5 ( , , ,  
 , ) . H<sub>2</sub>RA

Table 1. Dosage regimens of H<sub>2</sub>-receptor antagonists.

Drugs	Calculated CLcr	IV regimen	Oral regimen
Cimetidine	0-5 ml/min	200mg q12h	200mg q12h
	6-15 ml/min	200mg q8-12h	200mg q8-12h
	16-35 ml/min	200-300mg q8h	200-300mg q8h
	36-75 ml/min	200-300mg q6h	200-300mg q6h
Ranitidine	<30 ml/min	50mg q24h	150mg q24h
	30-60 ml/min	50mg q12h	150mg q24h
	>60 ml/min	50mg q6-8h	150mg q12h or 300mg q24h
Famotidine	<10 ml/min	20mg q24h or 40mg q 48h	20mg q24h
	10-50 ml/min	20mg q12h	20mg q12h
Nizatidine	<20 ml/min		150mg q48h
	20-50 ml/min		150mg q24h

Sources : McEvoy GK., 1997  
 Lipsy RJ, Fennerty B, Fagan TC.,1990  
 Drug Facts and Comparisons 2000.

70±11( : 88 (59%) ,  
 가 56 (85 ) ,  
 27-92) .  
 가 45 (64 ) H<sub>2</sub>RA cimetidine 100%  
 가 . Cimetidine  
 가 .  
 가 101 68% . Famotidine  
 73% ,  
 44% ,  
 48 (32%) . Scr , ranitidine  
 1.2±0.7( : 0.4 - 4.9)mg/dl estimated 65% , 48%  
 creatinine clearance 50.7±17.6( : 11.1-100.0)  
 ml/min (Table 2). , nizatidine 57%  
 (Table 3).

2. H<sub>2</sub>-receptor antagonists

H<sub>2</sub>RA H<sub>2</sub>RA  
 가 . H<sub>2</sub>RA  
 H<sub>2</sub>RA 149 149 53 (36%)

Table 2. Patient characteristics.

Characteristics		Mean ± S.D. (Range)	N(%)
Age (years)		70 ± 11 (27 92)	
Sex	Male		56 patients(55) 85 cases(57)
	Female		45 patients(45) 64 cases(43)
Primary indication for therapy	Prophylaxis		101(68)
	Treatment		48(32)
Serum creatinine concentration (mg/dl)		1.2 ± 0.7 (0.4 4.9)	
Estimated creatinine clearance (ml/min)		50.7 ± 17.6 (11.1 100.0)	
Services	Chest surgery		12 (8)
	ENT		3 (2)
	General Surgery		19 (13)
	Neurosurgery		44 (30)
	Orthopedics		8 (5)
	Internal Medicine		63 (42)
Concomitant other GI drugs	Antacid		11 (7)
	Sucralfate		5 (3)
	Antacid & Sucralfate		2 (1)
	Proton pump inhibitor		1 (<1)
	H <sub>2</sub> -receptor antagonist		1 (<1)
Concomitant drugs	Phenytoin		16 (11)
	Theophylline		7 (5)
	Propranolol		8 (5)
	Warfarin		1 (<1)
	Lidocaine		1 (<1)
	Theophylline & warfarin		1 (<1)
	Theophylline & phenytoin		2 (1)

Total # of patients = 101, Total # of orders = 149 cases

Table 3. Appropriateness of dosage and route of H<sub>2</sub> receptor antagonists.

Drugs	Appropriateness of Dosage of H <sub>2</sub> RA*			
	PO H <sub>2</sub> RA*		IV H <sub>2</sub> RA*	
	Total no. of monitored orders	No. of appropriate orders(%)	Total no. of monitored orders	No. of appropriate orders(%)
Cimetidine	7	7 (100)	0	-
Ranitidine	43	28 (65)	44	21 (48)
Famotidine	11	8 (73)	9	4 (44)
Nizatidine	35	20 (57)	0	-
Total	96	63 (66)	53	25 (47)

Drugs	Appropriateness of Route of H <sub>2</sub> RA*	
	Total no. of monitored orders	No. of appropriate orders(%)
Cimetidine	0	-
Ranitidine	44	26 (59)
Famotidine	9	5 (56)
Nizatidine	0	-
Total	53	31 (58)

\* H<sub>2</sub>RA refers to H<sub>2</sub> receptor antagonists

31 (58%) 가 가 22 (42%) 가 가 33 (57%) 가 가 58 (Table 4).

가 ranitidine famotidine  
 ranitidine 59% , famoti- ranitidine  
 dine 56% 가  
 (Table 3). 50%

3. , ne 50%  
 가 , famotidine  
 H<sub>2</sub>RA , , 33%,  
 61 (41%) 가 가가 75% 가  
 3 nizatidine 67%  
 58 (Table 4).

Table 4. Acceptance rate of dosage adjustments for renal function.

Drugs	PO H <sub>2</sub> RA*		IV H <sub>2</sub> RA*	
	No. of recommendations	No. of recommendations accepted (%)	No. of recommendations	No. of recommendations accepted (%)
Cimetidine	0	-	0	-
Ranitidine	14	7 (50)	22	11 (50)
Famotidine	3	1 (33)	4	3 (75)
Nizatidine	15	10 (67)	0	-
Total	32	18 (56)	26	15 (58)

\* H<sub>2</sub>RA refers to H<sub>2</sub> receptor antagonists

4.

(Table 5).

H<sub>2</sub>RA가  
 149 53 (36%) H<sub>2</sub>RA가  
 22 (42%) 가 가  
 H<sub>2</sub>RA 가 22  
 H<sub>2</sub>RA (6-9, 11-13,  
 15 17, 18).  
 (68%)  
 H<sub>2</sub>RA가 (Table 5).  
 ranitidine  
 67% , famotidine 75% 가

Table 5. Acceptance rate of IV-to-PO conversion.

Drugs	No. of recommendations	No. of recommendations accepted (%)
Cimetidine	0	-
Ranitidine	18	12 (67)
Famotidine	4	3 (75)
Nizatidine	0	-
Total	22	15 (68)



(74%)

. 2001 (19) \$7082  
 vancomycin . Peterson (13) 272  
 가 1 가 Scr 1.5mg/dl  
 가 88%  
 가 , H<sub>2</sub>RAs H<sub>2</sub>RA 가 H<sub>2</sub>RA  
 가 40  
 cimetidine, ranitidine, famotidine  
 가 34%  
 가  
 (IV-to-PO convert- , 49%  
 sion) (16).  
 H<sub>2</sub>RA가  
 42% 가 가 가  
 가 H<sub>2</sub>RAs , 59% 가 1981 Lenox Hill  
 가 Hospital  
 가 가  
 가 50%  
 (14). Savisky  
 41% 가 가  
 가 40% H<sub>2</sub>RA가  
 (15).  
 H<sub>2</sub>RA가  
 57% 가  
 . Goldberg (12) 68% 가  
 가  
 2 가 Dannenhoffer (11)  
 1485 가  
 가 191 tidine ranitidine cime-  
 가 141 가 80%

가

		Savisky (15)	
가	\$41,000	가	
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