Title: Implementation of a dosage adjustment program in patients with renal failure
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Key words: Dosage adjustment, renal failure, creatinine clearance

Purpose
Implementation of a dosage adjustment program for selected drugs prescribed for patients with diminished renal function.
This dosage adjustment program will lead to a decrease in the incidence of adverse drug reactions and in toxicity, as well as to direct cost savings due to the decrease in medication use and in iatrogenic events.
Method
The program was implemented in a private, acute-care hospital with an average of 337 available beds attended by more than 1,000 physicians of 33 different specialties. The study period covered in this communication was from October 1, 2002, through April 30, 2003. During this period there were 11,123 releases, 56,178 stays and 8,374 surgical interventions, and the mean stay was 5.1 days. The hospital has a computer system that processes all medical orders for Pharmacy (61% of prescriptions are entered in the computer by the physician), Laboratory, Complementary Explorations and Radiology. The clinical course, exploration and radiology reports, operating sheet and pharmacotherapeutic profile are also computerized. The system prints the registration sheets for the administration of drugs by nursing in the hospital units after each updating. Each day a member of the Pharmacy Service went to the Biochemistry Laboratory and collected all the results of serum creatinine (Cr) analyses done since the previous review. When the Cr level was above normal (>120 µmol/l), the weight was requested from the hospital unit and creatinine clearance (CrCl) was calculated according to the Cockroft-Gault formula. The pharmacotherapeutic profiles of these patients were reviewed and a dosage recommendation entered in the clinical chart on the basis of renal function, for those drugs needing adjustment. In those cases where it was considered necessary for reasons of toxicity, the physician was contacted, the dosage was adjusted and a note to this effect was entered in the clinical course. A list was made with the dosage recommendations for the drugs prescribed on the basis of renal function in these patients.
Dosage adjustment of aminoglycosides and vancomycin was not included in this program because this is already done on a routine basis when these drugs are prescribed, independently of Cr values.
Results
11,123 patients were attended in the hospital during the study period.
Characteristics of the population studied (mean ± SD): age: 76.3 ± 11.5 years, Cr: 200.2 ± 122.8 µmol/l, CrCl: 37.0 ± 39.6 ml/min.

Total no. Cr analyses	14,470	No. Cr results >120 µmol/l	1,614 (11.2%)
No. patients studied	1,573	No. drugs/patient	8.6
No. drugs reviewed	13,607	No. drugs requiring dosage adjustment	531 (3.9%)
No. recommendations made	531	No. patients with recommendation	304
No. physician-accepted and -implemented recommendations	328 (61.77%)	No. changes by Pharmacy initiative	24 (4.5%)

The drugs most frequently recommended for a dosage adjustment were: amoxicillin/clavulanic acid (25%), allopurinol (11%), metoclopramide (11%), ranitidine (7%), hydrochlorothiazide (6%) and imipenem (5%).
Conclusions
1. The percentage of acceptance of the recommendation for dosage adjustment was 62%.
2. The percentage of analyses with Cr values >120 µmol/l was 11.2%, which indicates a high prevalence of renal failure among hospitalized patients, who will need pharmaceutical intervention.
3. The implementation of the program was satisfactory and it has had a great impact in improving patient care.
4. The program has been incorporated in the daily pharmacy work for application in all patients who may need it.

IMPLEMENTATION OF A DOSAGE ADJUSTMENT PROGRAM IN PATIENTS WITH DIMINISHED RENAL FUNCTION

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PURPOSE

To implement a dosage adjustment program for selected drugs prescribed for patients with impaired renal function in order to minimize drug associated risks.

METHOD

- Setting: 337-bed acute-care private hospital, attended by more than 1.000 physicians (33 specialties), computerized medical record with physician order entry.
- Study period: 7 months (01/10/02 - 30/04/03)
- Patient selection: daily review of new serum creatinine (Cr) analyses, and selection of patients with Cr above120 mcmol/l.

  For every selected patient:
- Calculation of creatinine clearance (CrCl) using Cockroft-Gault formula.
- Pharmacologic profile review and selection of drugs needing adjustment, based on our own database developped using specialized bibliography:
  - Aronoff et al. Drug prescribing in renal failure. 4ª ed. American College of Physicians. Philadelphia, 1999.
  - Olyaei AJ, De Mateos AM, Bennet WM. Prescribing in renal disease. In: Brenner & Rector's. The Kidney. 6ª ed. W. B. Saunders Company, 2000.
  - Gilbert DN, Moellering CR, Sande MA. The Sandford Guide To Antimicrobial Therapy. 33 Ed. Antimicrobial Therapy Inc. Hyde Park, Usa. 2003.
  - MICROMEDEX® Healthcare Series: MICROMEDEX, Greenwood Village, Colorado (Vol. 118 expires 12/2003).
- Posologic recommendation as a Pharmacy note entered in the computerized clinical record. If necessary, the drug was discontinued or dosage was changed after physician was contacted by phone.
- Daily review of physicians' acceptance of Pharmacy recommendations.
- For drugs requiring serum drug concentration monitoring (aminoglycosides or vancomycin) dosage adjustment was done on a rutine basis through a different program using SIMKIN ® pharmacokinetics simulation software).

RESULTS

- 11.123 patients attended during the study period
- Total number of creatinine analyses (Cr): 14.470
- Total number of creatinine analyses (Cr)> or = 120 mcmol/l: 1.614 corresponding to 1.573 patients
- age (mean ± SD): 76,3 ±11,5 years
- Cr (mean ± SD): 200,2 ±122,8 µmol/liter
- CrCl (mean ± SD): 37,0 ±39,6 ml/minute

Drugs/patient	**8,6**
Drugs reviewed	**13.607**
Drugs requiring dosage adjustment	**531 (3,9%)**
Recommendations made	**531**
Patients with recommendation	**304**
Recommendations implemented by physician	**328 (61,8%)**
Changes implemented by Pharmacy initiative	**24 (4,5%)**

Drugs most frequenty adjusted	**%**
Amoxycillin/clavulanic	20
Metoclopramide	14
Allopurinol	8
Ranitidine	8
Imipenem/cilastatin	7
Hydrochlorothiazide	5

CONCLUSIONS

- Acceptance of Pharmacy dosage recommedations (62%) was similar to that reported by other authors.
- Patients with Cr>120 mcmol/l (11,2%) indicates a high prevalence of patients requiring renal dosing adjustment.
- Implementation of the program was satisfactory and it has been incorporated to the daily pharmacy activities.
- Implementation of the program has a considerable impact in improving patient care

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Enviado: Martes, 02 de Septiembre de 2003 03:59 p.m.
Asunto: 32nd European Symposium on Clinical Pharmacy, 29 October - 1 November 2003

ESCP
European Society of Clinical Pharmacy

32nd Symposium on Clinical Pharmacy

The Pharmacist in the Health-Care Team:
Standards of Practice and Systems of Care

29 October - 1 November 2003
Valencia, Spain

Dear Cristina Roure,

Your Abstract number: **74**

We are happy to inform you that your abstract ***Implementation of a dosage adjustment program in patients with renal failure*** has been accepted for presentation during the ESCP 32nd European Symposium on Clinical Pharmacy that will be held in Valencia from29 October to 1 November 2003.

At the moment the reviewing committee is considering if your abstract should be assigned to poster presentation (PP), poster discussion forum (PDF), oral communication (OC) or service profile (SP). By mid September you will be notified on the type of presentation including the specifications for this presentation.

Please remember registration to ESCP 32nd European Symposium on Clinical Pharmacy is mandatory for the publication of your abstract in the Book of Abstracts and further inclusion in "Pharmacy World and Science" – PWS – tour Scientific Journal.
We are very happy to offer you the possibility to register to the Symposium at the EARLY BIRD (deadline was July 18) until July 31, 2003.!
Should you have not registered by 22 September your abstract will have to be withdrawn.
In case someone else will present your abstract during the Symposium, please inform the ESCP International Office. The replacing person will have to be registered no later than 22 September.

Please note your number of abstract that is going to be used as reference in any future communication.
We look forward to welcoming you in the sunny Valencia.

Kind regards,

Marie-Caroline Husson
REC member Publications

Joaquim Bonal
Chair of the Scientific Committee

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