

Drug Information Training Resource

Drug Dosing in Renal Failure Monograph

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Standard Background Questions:

- **Is the patient currently taking the drug in question, if so what dose and route of administration**
- **Age and weight of patient**
Renal excretion of drugs is age dependent. Drug dose may be calculated in mg/kg
- **Degree of renal failure**
GFR or recent serum creatinine levels are required. Need to establish if renal failure is chronic or acute
- **Is renal replacement therapy is being used – if so what type**
Drug removal by dialysis needs to be taken into account. Amount of removal varies with mode of dialysis. Type of dialysis may help indicate if acute or chronic renal failure
- **Indication for the drug**
The clinical situation will influence the drug dose e.g patient critically ill with septicaemia will need higher antibiotic doses than mild chest infection.
- **Other medical problems**
Other organ impairment e.g. hepatic failure may also affect drug dose
- **The original diagnosis that resulted in renal failure**
Type of renal disease may affect any remaining renal function the patient has
- **Other medication**
The drug effects may be additive e.g. the patient may be taking several nephrotoxic or sedative drugs
- **Is the patient on a restricted fluid or sodium intake**
This may affect the way the drug can be administered

Background Issues:

- **Inherent toxicity of the drug**
Some drugs cause serious adverse effects in patients with renal failure e.g. sedation with morphine, lactic acidosis with metformin. Others rarely cause harm even with dose accumulation. Use nephrotoxic drugs with caution in lowest possible doses
- **Pharmacokinetic parameters of the drug**
Renal failure may affect all pharmacokinetic parameters. Note if metabolites are active. This data will be useful to estimate the dose required and predict the effect of the drug on the patient.
- **Quality of the data available on the drug**
Is the data valid and comprehensive? Need to critically appraise the information and have an understanding of the principles involved

Resources

Books

British National Formulary. London, UK; British Medical Association and Royal Pharmaceutical Society of Great Britain.

<http://www.bnf.org/>

Portable textbook that briefly describes the principles of dose reduction in renal impairment, and degrees of renal failure. It lists drugs to be avoided or used with caution. Not very detailed, but useful for a first screen. Doesn't include information on dosing in patients on dialysis. Updates available six monthly.

Bunn R and Ashley C, eds. The Renal Drug Handbook. Oxon, UK: Radcliffe Medical Press, 1999.

Very useful and comprehensive textbook written by the UK Renal Pharmacy Group. It has a one-page monograph per drug and lists information on dose in normal renal function, pharmacokinetics, dose in various degrees of renal impairment and different types of dialysis, important drug interactions, administration information and other information. Useful as a quick reference guide. Due to date of publication some new drugs are not included.

Aronoff GR, Berns JS, Brier ME, Golper TA, Morrison G, Singer I et al. Drug prescribing in renal failure. 4th ed. Philadelphia: American College of Physicians, 1999.

<http://www.kdp-baptist.louisville.edu/renalfailure/>

Portable textbook that starts with a chapter on pharmacokinetics and principles of dose reduction in renal impairment. It then lists drugs in tabular form pharmacokinetic information, dose in normal renal function, dose adjustment in renal failure and dialysis. Useful as a quick reference guide. Due to date of publication some new drugs are not included.

Schier RW, Gambertoglio JG, eds. Handbook of Drug Therapy in Liver and Kidney Disease. Boston: Little, Brown & Co, 1991.

Good reference book for drug dosing, however due to date of latest publication many new drugs are not included.

Elliott R, ed. Critical Care Therapeutics. London, UK: Pharmaceutical Press, 1999.

Good for general information on treatment of critically ill patients, and includes useful sections on acute renal failure and renal replacement therapy.

WebSites

The Renal Pharmacy Group (UK)

<http://www.renalpharmacy.org.uk/>

This website is of general use – includes a bibliography of renal textbooks, a glossary of renal terms and links to other websites, although it doesn't appear to have been updated for a couple of years.

South West Medicines Information Centre (UK)

<http://www.swmit.nhs.uk/renal.htm>

This MI centre specialises in answering queries about drugs in renal failure. It has a small number of standard answers on specific drugs, useful background questions to ask and a list of key references.

Merck Praxis MD

<http://merck.praxis.md/>

This offshoot of the Merck Medicus website lists a number of Best Practice of Medicine Reports, including an excellent one on Drug Dosing Guidelines in Renal Failure. This is written by a reputable nephrologist who is the co-author of the Drug Prescribing in Renal Failure textbook. It describes the pharmacokinetics of dosing

in renal disease, and other useful information such as drugs with decreased protein binding in uraemia, dose adjustment tables for various drugs and a guide to narcotic use in renal failure.

University of Pennsylvania Medical Center Guidelines for Antibiotic Use

http://www.uphs.upenn.edu/bugdrug/antibiotic_manual/renal.htm

Useful table of antibiotic drug dosing guidelines in renal failure and dialysis

John Hopkins University Aids Service

http://www.hopkins-aids.edu/publications/book/ch4_agents_tab0428.html#tab0428

Useful table of antiretroviral therapy drug dosing guidelines in renal failure and dialysis

Renal Pharmacology

<http://home.eznet.net/~webtent/renalpharmacology.html>

Journal Articles

Davies JG, Kingswood JC, Sharpstone P and Street MK. Drug removal in continuous haemofiltration and haemodialysis.

British Journal of Hospital Medicine 1995;54(10):524-8.

Good review of the principles of drug removal during haemodialysis and haemofiltration for critically ill patients in the ICU setting. The dosing guidelines for administration of loading and maintenance doses are particularly helpful.

Ashley C and Holt S. Renal disease (1) Acute renal failure.

The Pharmaceutical Journal 2001;266:625-8.

http://www.pharmj.com/pdf/education/pj_20010505_renal1.pdf

Good overview of the causes and treatment of acute renal failure

Morlidge C and Richards T. Renal disease (2) Managing chronic renal failure.

The Pharmaceutical Journal 2001;266:655-7.

http://www.pharmj.com/pdf/education/pj_20010505_renal1.pdf

Useful overview of the common signs and symptoms associated with chronic disease and their treatment – good for background information

Currie A and O'Brien P. Renal disease (3) Renal replacement therapy.

The Pharmaceutical Journal 2001;266:679-83.

http://www.pharmj.com/pdf/education/pj_20010519_renal3.pdf

Good overview of the types of renal dialysis available for patients with chronic renal failure

Kappel J and Calissi Piera CMAJ 2002;166(4)

Safe drug prescribing for patients with renal insufficiency

<http://www.cmaj.ca/cgi/content/full/166/4/473>

DeBellis RJ, Smith BS, Cawley PA and Burniske GM. Drug dosing in critically ill patients with renal failure: A pharmacokinetic approach. Journal of Intensive Care Medicine 2000;15(6):273-313.

This is a comprehensive article that describes the principles of drug dosing in normal and critically ill patients with renal failure. It includes useful dose adjustment tables.

Lam YW, Banerji S, Hatfield C and Talbert RL. Principles of drug administration in renal insufficiency. Clinical Pharmacokinetics 1997; 32(1):30-57.

A review article that outlines pharmacokinetic changes that occur with renal insufficiency.

Nankivell BJ. Creatinine clearance and assessment of renal function.

Australian Prescriber 2001;24(1):15-7.

http://www.australianprescriber.com/magazines/vol24no1/renal_function.htm

Useful description of the types of measurements of renal function

Berger A. Renal function and how to assess it. BMJ 2000;321:1444.

Full text <http://bmj.com/cgi/content/full/321/7274/1444>

Brief description of assessing renal function in clinical practice. See also the letters in response to this article.

Chmielewski C. Renal Anatomy and overview of nephron function.

ANNA Journal 1992;19(1):34-8.

Useful article for background information on the structure and function of the kidney

Search Tips

Medline

Recommended MeSH Terms

Kidney Failure – includes Kidney Failure, Acute and Kidney Failure, Chronic when exploded.

Kidney Function Tests- includes GFR and BUN when exploded.

Kidney Diseases- Browse this MeSH to look for specific kidney diseases or explode to include all.

Renal Replacement Therapy – Includes Renal Dialysis, Peritoneal Dialysis, and Hemofiltration when exploded.

Creatinine – Very specific MeSH. May be useful is specifically interested in change in serum creatinine.

Recommended Text Words

Kidney

Renal

Creatinine

Dialysis

Sensitivity Tips

- Explode the drug category to include information about similar drugs
- Combine MeSH and textwords with “OR”

Specificity Tips

- Use the appropriate MeSH term Kidney Failure, Acute or Kidney Failure, Chronic to narrow the search if there are too many hits
- Use the appropriate MeSH term Hemofiltration, Renal Dialysis or Peritoneal Dialysis to narrow search if there are too many hits
- Use “NOT” to exclude irrelevant subjects
- Introduce subheadings e.g. Kidney Failure/ci (chemically induced)