



Complete Summary

GUIDELINE TITLE

Blood urea sampling methods.

BIBLIOGRAPHIC SOURCE(S)

Blood urea sampling methods. Nephrology 2005 Oct;10(S4):S64-6.

Blood urea sampling methods. Westmead NSW (Australia): CARI - Caring for Australians with Renal Impairment; 2005 Jul. 6 p. [16 references]

GUIDELINE STATUS

This is the current release of the guideline.

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SCOPE

DISEASE/CONDITION(S)

End-stage kidney disease (ESKD)

GUIDELINE CATEGORY

Evaluation
Management
Treatment

CLINICAL SPECIALTY

Nephrology
Nursing

INTENDED USERS

Allied Health Personnel
Clinical Laboratory Personnel
Nurses
Physicians

GUIDELINE OBJECTIVE(S)

To examine the available literature regarding different methods of sampling urea concentrations

TARGET POPULATION

Patients with kidney disease on hemodialysis

INTERVENTIONS AND PRACTICES CONSIDERED

Evaluation

1. Pre-dialysis urea sampling technique
2. Post-dialysis urea sampling technique

Management/Treatment

Hemodialysis

- Slow flow/stop pump sampling method
- The Australia and New Zealand Dialysis and Transplant Registry (ANZDATA) post-dialysis sampling time recommendation
- The Hemodialysis [HEMO] study post-dialysis preferred sampling method

MAJOR OUTCOMES CONSIDERED

Urea clearance (Kt/V)

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Databases searched: Medical Subject Headings (MeSH) terms and text words for dialysis were combined with MeSH terms and text words for blood sampling and adequacy, and then combined with the Cochrane highly sensitive search strategy for randomised controlled trials. The search was carried out in Medline (1966 – February Week 4 2004). The Cochrane Renal Group Trials Register was also searched for trials not indexed in Medline.

Date of searches: 4 March 2004.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

Level I: Evidence obtained from a systematic review of all relevant randomized controlled trials (RCTs)

Level II: Evidence obtained from at least one properly designed RCT

Level III: Evidence obtained from well-designed pseudo-randomized controlled trials (alternate allocation or some other method); comparative studies with concurrent controls and allocation not randomized, cohort studies, case-control studies, interrupted time series with a control group; comparative studies with historical control, two or more single arm studies, interrupted time series without a parallel control group

Level IV: Evidence obtained from case series, either post-test or pretest/post-test

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Comparison with Guidelines from Other Groups
Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Recommendations of Others. Recommendations regarding blood urea sampling methods pre- and post-dialysis from the following groups were discussed: Kidney Disease Outcomes Quality Initiative, British Renal Association, Canadian Society of Nephrology, European Best Practice Guidelines, and International Guidelines.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Definitions for the levels of evidence (I–IV) can be found at the end of the "Major Recommendations" field.

Guidelines

No recommendations possible based on Level I or II evidence.

Suggestions for Clinical Care

(Suggestions are based on Level III and IV sources)

- Pre- and post-dialysis samples for urea measurement must be drawn at the same midweek treatment.
- The pre-dialysis sample should be drawn from the arterial needle without saline or heparin contamination. If there is a suggestion that the blood is contaminated, first withdraw 10 mL of blood before taking the sample (e.g., central venous catheter).
- It is suggested that the slow flow/stop pump sampling technique (described below) be used where possible to provide uniformity across dialysis units.
- The post-dialysis sample should be drawn from the arterial line port or arterial needle at 20 seconds after initiating slow (or zero) blood pump flow with attention to accuracy of timing. The 2–3 minute post-dialysis sampling practice is an acceptable alternative. Unit practice should be consistent, documented, and compared with standards with similar methodology.

Pre-dialysis Urea Sampling

- It is self-evident that sampling immediately before (not after) the commencement of dialysis is necessary to ensure valid dialysis dose estimates. Distorting factors for urea levels may be saline or heparin contamination of the sample, taken from the arterial needle or the central venous catheter limb.

Post-dialysis Urea Sampling

- Rapid post-dialysis blood urea level changes arise from 'rebound' due to recirculation and regional blood flow distribution. The optimal time for sampling for single pool urea clearance estimates (30–50 minutes) is not practical in daily dialysis practice. Comparison of delivered dose with intended prescription requires adherence to methods used in studies forming the basis for these standards.
- Current practices are not uniform but comparison with the outcomes of the recent multicentre prospective randomized trial (the Hemodialysis [HEMO] Study) warrants support for its carefully validated methodology.
- The Australia and New Zealand Dialysis and Transplant Registry (ANZDATA) post-dialysis sampling time recommendation has been 2 minutes after initiation of slow blood flow. This avoids the urea level dilution from any angio-access recirculation and from cardiopulmonary recirculation of dialysed blood directly from the heart to the dialysis access (without passage through the arteriovenous circulation to remove urea generated in the rest of the body).
- The HEMO study post-dialysis preferred sampling method involves withdrawal of blood 15–20 seconds after three steps:
 1. Initiating slow blood pump flow (50–100 mL/minute)
 2. Stopping dialysate flow (or setting at the slowest flow the machine will allow)
 3. Turning the ultrafiltration rate to zero to minimise dialysis treatment effects

The angio-access recirculation rebound effect is at least partly removed but the cardiopulmonary recirculation effect is not, if the 20 second sampling technique is used. This potentially results in slight overestimation of urea reduction rate (URR) or Kt/V.

- Sampling after 20 seconds will include unpredictable effects on rebound from cardiopulmonary recirculation and regional blood distribution, and hence underestimate urea clearance to an unknown and inconsistent degree. Nevertheless, this may work in the patient's favour by ensuring that the dose delivered is at least that calculated.
- Increased use of high efficiency/high flux dialysers of larger surface area and high blood flow rates delivering rapid urea clearance require the use of equilibrated Kt/V standards or of Kt/V and URR standards that recognise the inherent overestimation of single pool urea clearance arising from increased urea rebound with these techniques.

Pre-dialysis Sampling Technique

The sample is drawn:

- a. Directly from arterial needle before introduction of any saline or heparin or
- b. From central venous catheter after withdrawing at least 10 mL of blood.

Post-dialysis Sampling Technique

Slow/stop pump techniques:

- a. Decrease ultrafiltration rate (UFR) to zero, set lowest dialysate flow rate, turn blood flow to 50–100 mL/minute
- b. After 20 seconds draw sample from arterial port or stop pump after 20 seconds and draw sample from arterial needle or arterial port after clamping arterial and venous lines.

An alternative technique is to withdraw a sample from the arterial port or needle after 2 minutes of slow flow. This results in a higher post-dialysis urea level with lower Kt/V values.

Definitions:

Levels of Evidence

Level I: Evidence obtained from a systematic review of all relevant randomized controlled trials (RCTs)

Level II: Evidence obtained from at least one properly designed RCT

Level III: Evidence obtained from well-designed pseudo-randomized controlled trials (alternate allocation or some other method); comparative studies with concurrent controls and allocation not randomized, cohort studies, case-control studies, interrupted time series with a control group; comparative studies with historical control, two or more single arm studies, interrupted time series without a parallel control group

Level IV: Evidence obtained from case series, either post-test or pretest/post-test

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate management of dialysis adequacy in patients with kidney disease

POTENTIAL HARMS

Not stated

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

Implementation and Audit

An audit of dialysis centres in Australia and New Zealand would be useful in defining current practice. Standardisation of methodology between units would allow more direct comparisons to be made.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Living with Illness

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

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ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2005 Oct

GUIDELINE DEVELOPER(S)

Caring for Australasians with Renal Impairment - Disease Specific Society

SOURCE(S) OF FUNDING

Industry-sponsored funding administered through Kidney Health Australia

GUIDELINE COMMITTEE

Not stated

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

David Harris, Convenor (Westmead, New South Wales); Merlin Thomas (Prahran, Victoria); David Johnson (Woolloongabba, Queensland); Kathy Nicholls (Parkville, Victoria); Adrian Gillin (Camperdown, New South Wales)

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

All guideline writers are required to fill out a declaration of conflict of interest.

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the [Caring for Australasians with Renal Impairment \(CARI\) Web site](#).

Print copies: Available from Caring for Australasians with Renal Impairment, Locked Bag 4001, Centre for Kidney Research, Westmead NSW, Australia 2145

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- The CARI guidelines. A guide for writers. Caring for Australasians with Renal Impairment. 2008 Jul. 6 p.

Electronic copies: Available from the [Caring for Australasians with Renal Impairment \(CARI\) Web site](#).

PATIENT RESOURCES

None available

NGC STATUS

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