Molto tempo e' passato, o meglio, molto progresso e' stato fatto da quando si usavano per la dialisi questi tipi di apparecchi

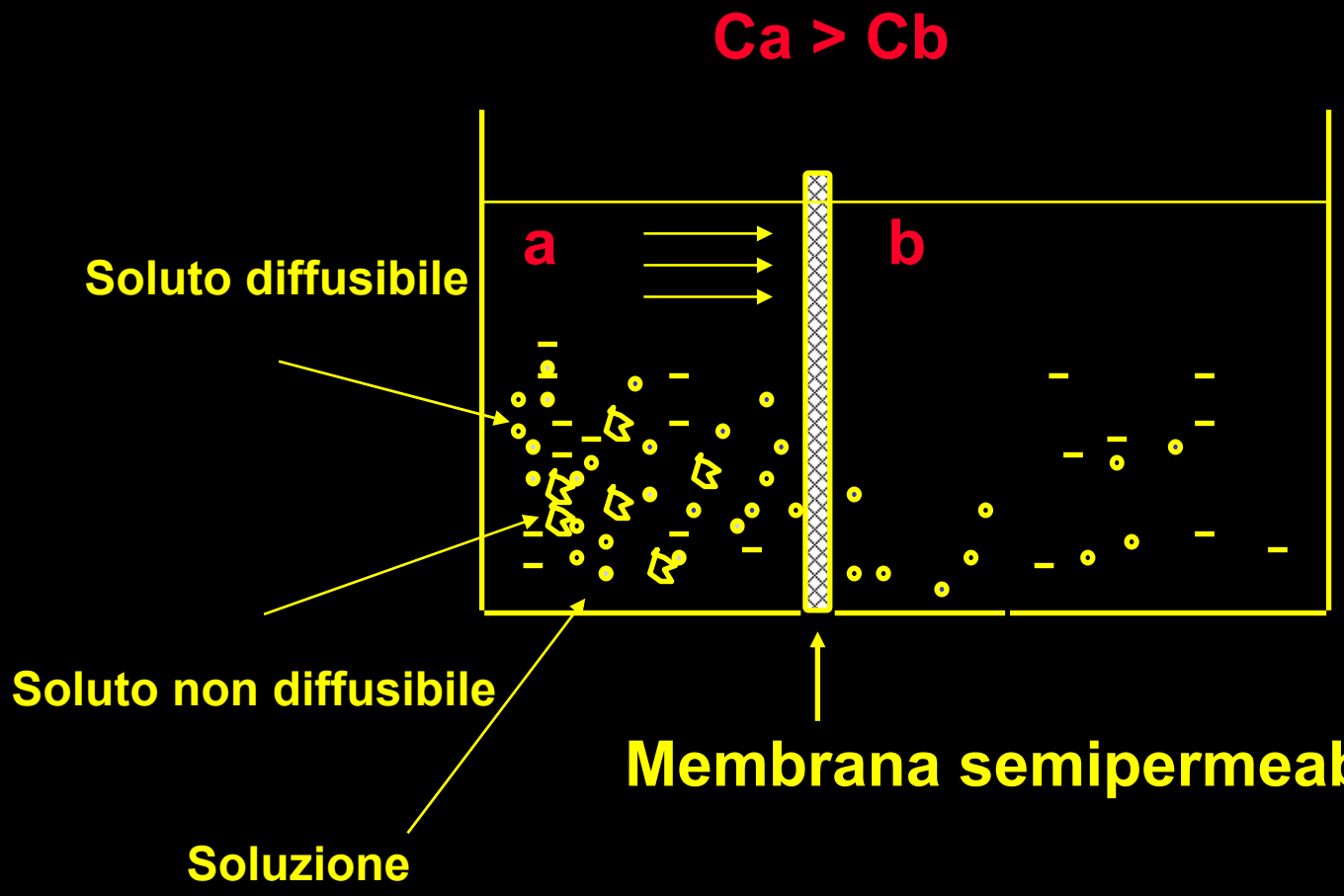
Rene Kill in uso presso la nostra Divisione negli anni 60

DIALISI

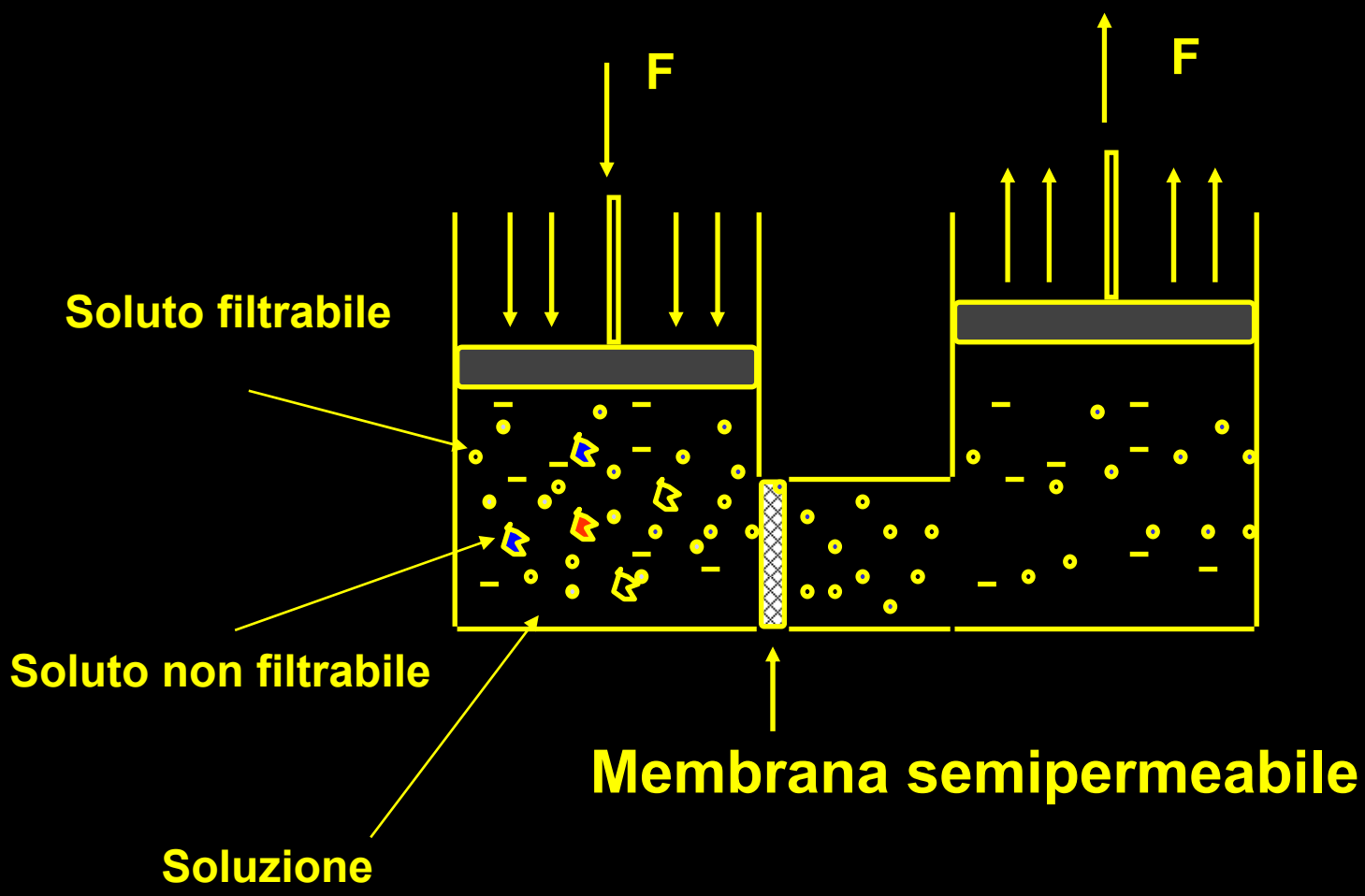
Forze fisiche della Dialisi

- Diffusione (da una soluzione piu' concentrata ad una meno concentrata)
- Convezione (sottrazione di una certa quantita' di acqua plasmatica che ha la stessa concentrazione di soluti che il plasma)
- Osmosi (richiamo di acqua da parte di una soluzione molto concentrata, spesso avviene contemporaneamente alla diffusione)

Emodialisi Standard = Diffusione



Emofiltrazione = Convezione



La dialisi oggi

Modelli di Clearance

Clearance Settimanale in dialisi

Paziente anurico

3 sedute a 200 di Cl.Urea x 4 ore = 48000/sed

=

Cl sett = 144000 / 10080 (min/sett)

= 14.28 ml/min

Clearance dialitiche

- L' US National Cooperative dialysis Study ha dimostrato che un KT/V < 0.8 era sinonimo di dialisi inadeguata con elevata incidenza di morbidita' e morbilita'
- Un KT/V >1 viene considerato adeguato anche se il livello ottimale dovrebbe attestarsi a circa 1.2

Review of significant findings

- Both sex had low fat stores
- Significant correlation between UGR and body fat (%) as well as arm circonference suggesting that patients who eat more proteins (and presumably calories) have better muscle and fat stores
- BUN concentration (high TAC) was associated with a greater probability of failure
- Low PCR was associated with a greater probability of failure suggesting that under nutrition may be associated with greater morbidity
- Hospitalization was associated with a greater probability of failure
- The shorter time on dialysis was also associated with a greater probability of failure

idney Intern. Vol 23 Suppl. 13 (1983)

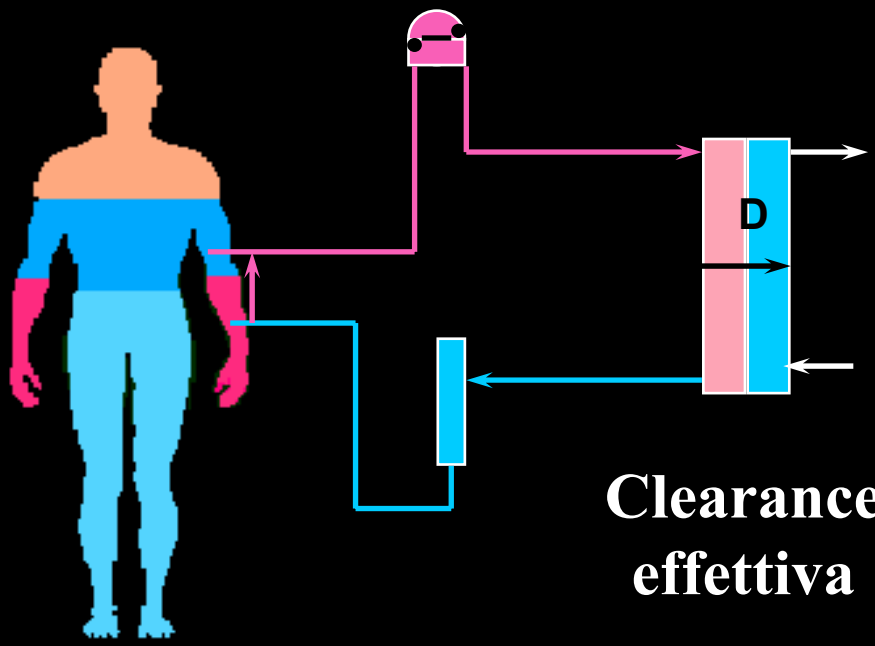
The Urea reduction ratio and Serum Albumin Concentration as Predictors of Mortality in Patients Undergoing Hemodialysis

Results:

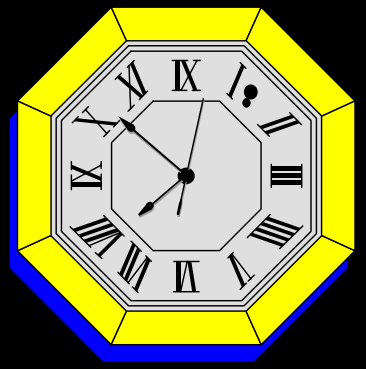
- **Urea reduction ratio (URR) below 60% had higher risk of death (55% of patients)**
- **Serum albumin (SA) concentration was a more powerful (21 times greater) predictor of death than the urea reduction ratio**
  - **(OR for death 1.48 for SA of 3.5 to 3.9 mg/dl**
  - **(OR for death 3.13 for SA of 3.0 to 3.4 mg/dl**
- **60% of patients had values below 4.0 mg/dl**
- **Diabetic patients (35%) had lower serum albumin concentration and urea reduction ratios than nondiabetic patients**

Owen W.F, Lew N.L, Lowrie E.G, Lazarus J.M. - Harvard Med - Boston

Kt / V : Indice di qualità di trattamento



Clearance effettiva



Tempo effettivo : t

Volume distribuzione dell'urea
V= 58% peso secco

$$Kt/V = \frac{\text{Clearance} \times \text{tempo}}{\text{Volume}}$$

Modeling of KT/V

Accumulation = Input - Output

(Change in Urea content) = (generation) - (removal)

$$\frac{d\,(V * C)}{dt} = G - K * C$$

- **K = 0.20 L/min** **200 ml/min**
- **t = 210 min** **3.5 ore**
- **KT = 42** **V= 40 L (peso 70 Kg * .58)**
- **KT/V = 1.05**

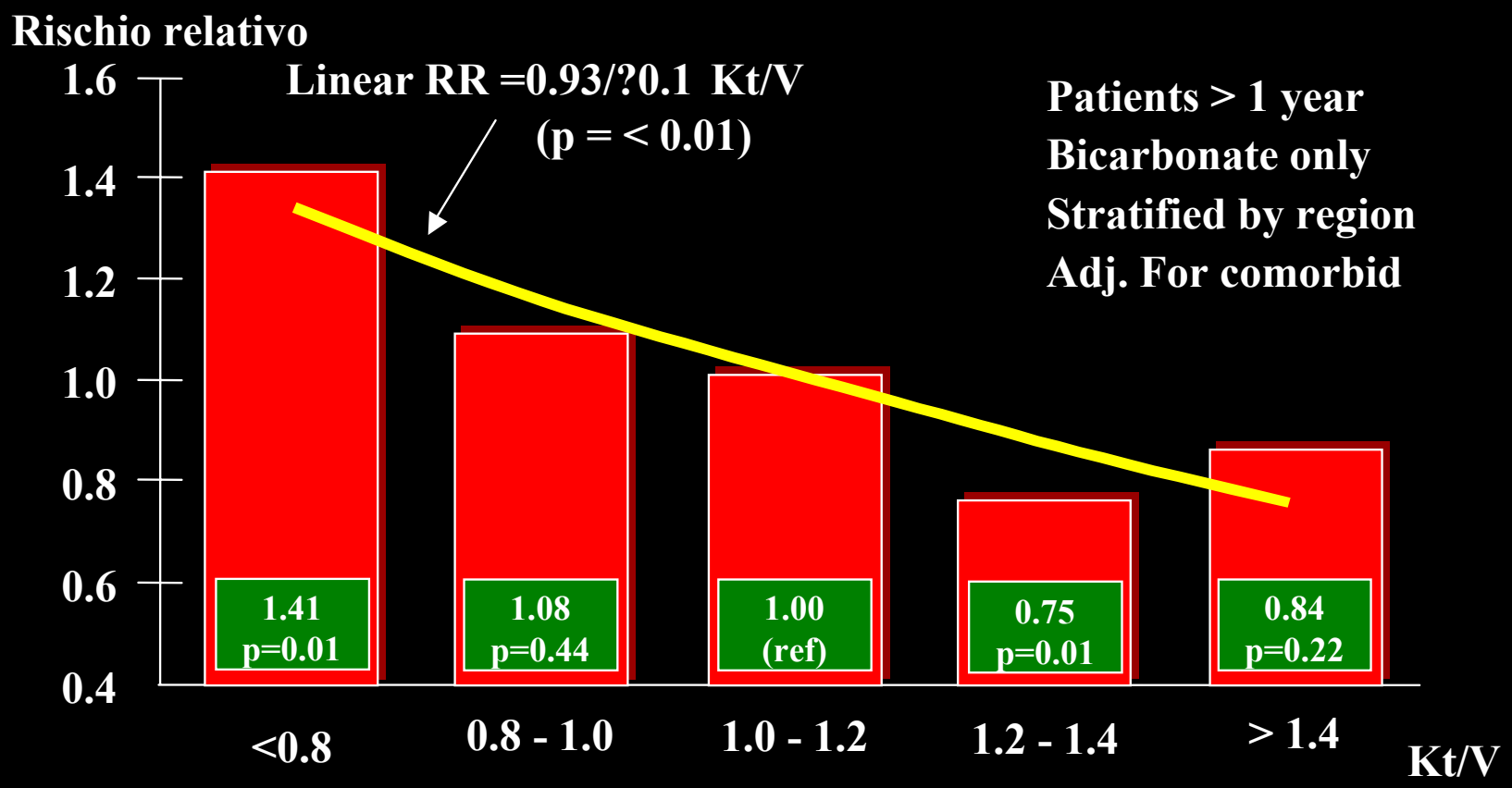
Sargent J.A, Gotch A.A: Mathematical Modeling of dialysis therapy
Kidney Intern. Vol 23 Suppl. 13 (1983)

Calcolo della Prescrizione dialitica

Calcolo KT/V dalla riduzione dell' Urea

- **Daugirdas = - ln(BUN dopo/prima -0.03-(UF/p) UF= Ultrafiltr, P=peso post dial**
- **Jindal = 0.018* PRU - 1.2 (PRU= riduzione in % BUN)**
- **Lowrie = - Ct/C0**
- **Basile = 0.023 * PRU -0.284**
- **Ljelu = 0.018 * PRU**

Mortalità e KT/V



USRDS Case Mix Adequacy Study, 1990/91, n = 2,410

Dal calcolo del KT/V si puo' risalire al PCR

Il PCR e' il Protein Catabolic Rate o quantita' di proteine catabolizzate

In pazienti stabili e misurato in condizioni standard, equivale alla quantita' di proteine introdotte

Si ottiene dal calcolo della generazione dell'urea (azotemia) tra una dialisi e la successiva e presuppone che un grammo di N sia equivalente a 6.25 gr di proteine

$$PCR\ g/die = 9.35 * G + 0.00029 * \boxed{V}$$

Sargent J.A, Gotch A.A: Urea kinetics: A giude to nutritional management of renal failu
m J Clin Nutr 31 1696 1978

1: Kidney Int. 2002 Dec;62(6):2238-45.

Related Articles

Mortality risk in hemodialysis patients and changes in nutritional indicators: DOPPS.

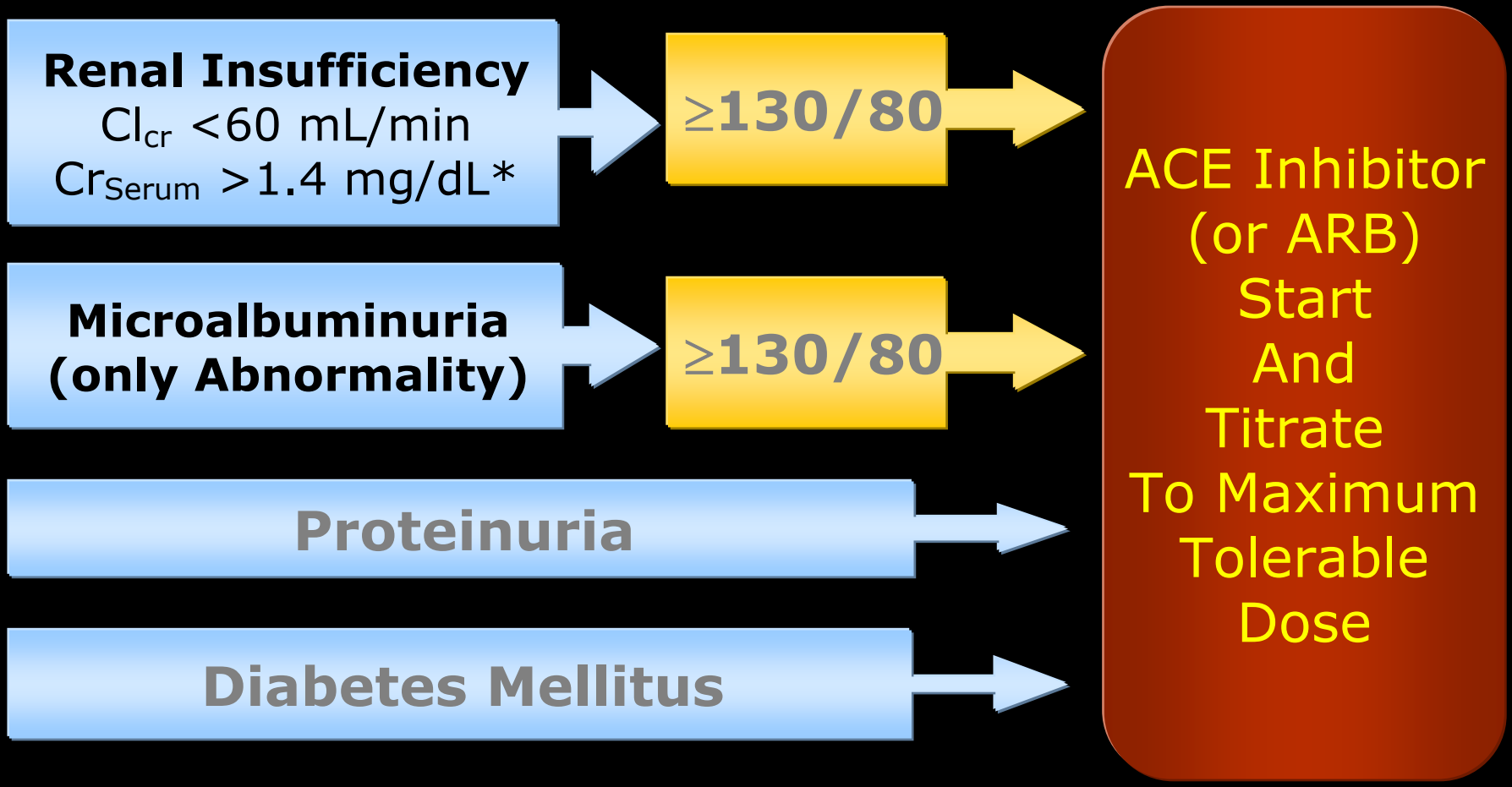
Pifer TB, McCullough KP, Port FK, Goodkin DA, Maroni BJ, Held PJ, Young EW.

University Renal Research and Education Association, Department of Medicine, Veterans Affairs Medical Center, and Division of Nephrology, University of Michigan, Ann Arbor, Michigan, USA. tpifer@urrea.org

BACKGROUND: Nutritional status is strongly associated with outcomes among hemodialysis patients. We analyzed the independent predictive v of several readily measured nutritional indicators, including a modified subjective global assessment (mSGA), body mass index (BMI), serum albur serum creatinine, normalized protein catabolic rate (nPCR), serum bicarbonate, lymphocyte count, and neutrophil count, using baseline and six-mo follow-up measurements. METHODS: The study sample consisted of 7719 U.S. adult hemodialysis patients enrolled in the international Dialysis Outcomes and Practice Patterns Study (DOPPS), a prospective observational study that includes a random sample of hemodialysis patients from 1 dialysis facilities in the United States. Cox regression was used to estimate the relative risk of mortality associated with differences in measuremen baseline and six months later. Each analysis was adjusted for age, race, sex, and 15 summary comorbid conditions. RESULTS: Lower baseline measurements of mSGA, BMI, serum albumin, serum creatinine, and lymphocyte count were independently associated with significantly higher ris mortality. During six-month follow-up, decreases in BMI, serum albumin, and serum creatinine were also associated with significantly higher morta risk. The risk of mortality increased with higher baseline and six-month increases in neutrophil count. CONCLUSIONS: This study confirms that se readily-measured nutritional indicators predict mortality among hemodialysis patients and that changes in indicator values over six months provid additional important prognostic information. Interventions that modify these indicators of nutritional status may have an important impact on the survival of hemodialysis patients.

PMID: 12427151 [PubMed - indexed for MEDLINE]

Chronic Renal Disease: Initial Treatment Recommendations



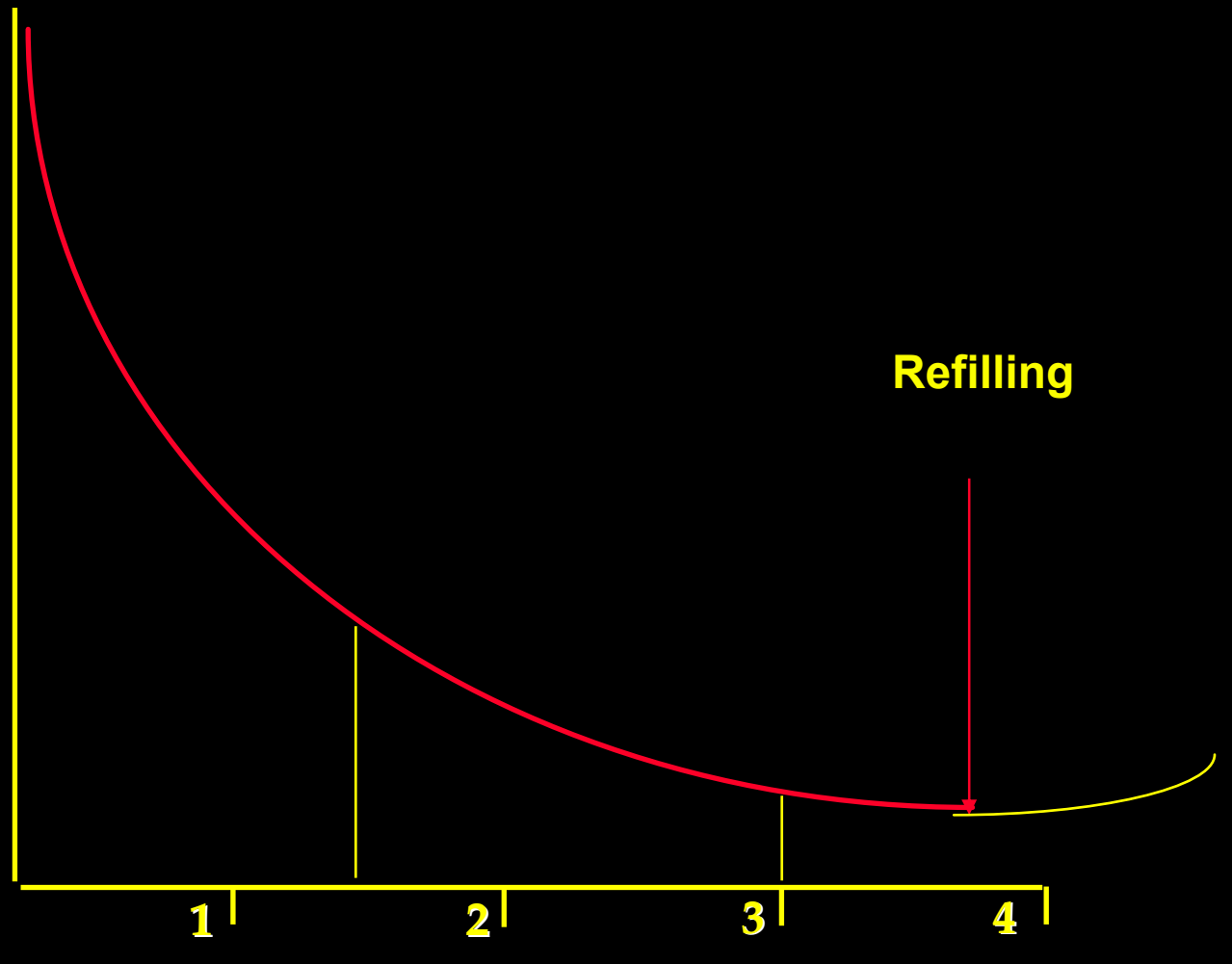
*for women, CR_{Serum} >1.2 mg/dL

Table 10. Stages of Chronic Kidney Disease

Stage	Description	GFR (mL/min/1.73 m^2)
1	Kidney damage with normal or ↑ GFR	≥90
2	Kidney damage with mild ↓ GFR	60–89
3	Moderate ↓ GFR	30–59
4	Severe ↓ GFR	15–29
5	Kidney failure	<15 (or dialysis)

Chronic kidney disease is defined as either kidney damage or GFR <60 mL/min/1.73 m^2 for ≥3 months. Kidney damage is defined as pathologic abnormalities or markers of damage, including abnormalities in blood or urine tests or imaging studies.

Lo shift di una qualunque sostanza in dialisi



- Anoressia, Nausea
- Disgeusia
- Intolleranza ai Na, e all'acqua
- Eccessiva restrizione proteica

- Perdita di nutrienti con il dialisato
- Perdite di sangue in HD

- Malassorbimento dei grassi
- Anormalita' endocrine

- Riduzione della introduzione alimentare

Malnutrizione

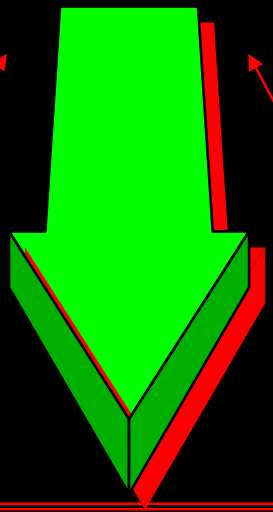
- Effetti catabolici da malattie intercorrenti

- Anormalita' del metabolismo muscolare

- Catbolismo indotto dalla dialisi

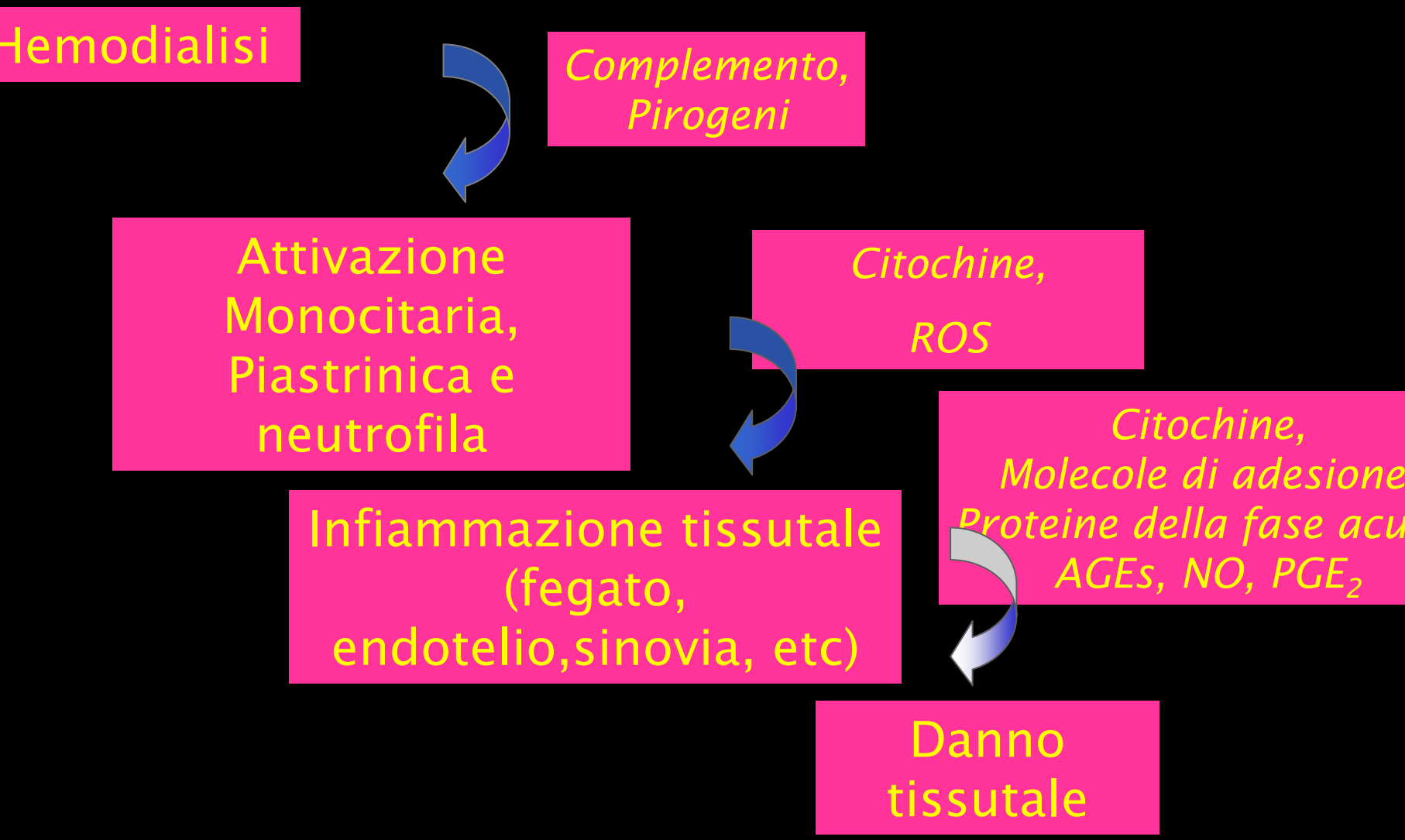
- Anormalita' metaboliche dei nutrientii

- Tossine uremiche



Aumentata morbidita' e mortalita'

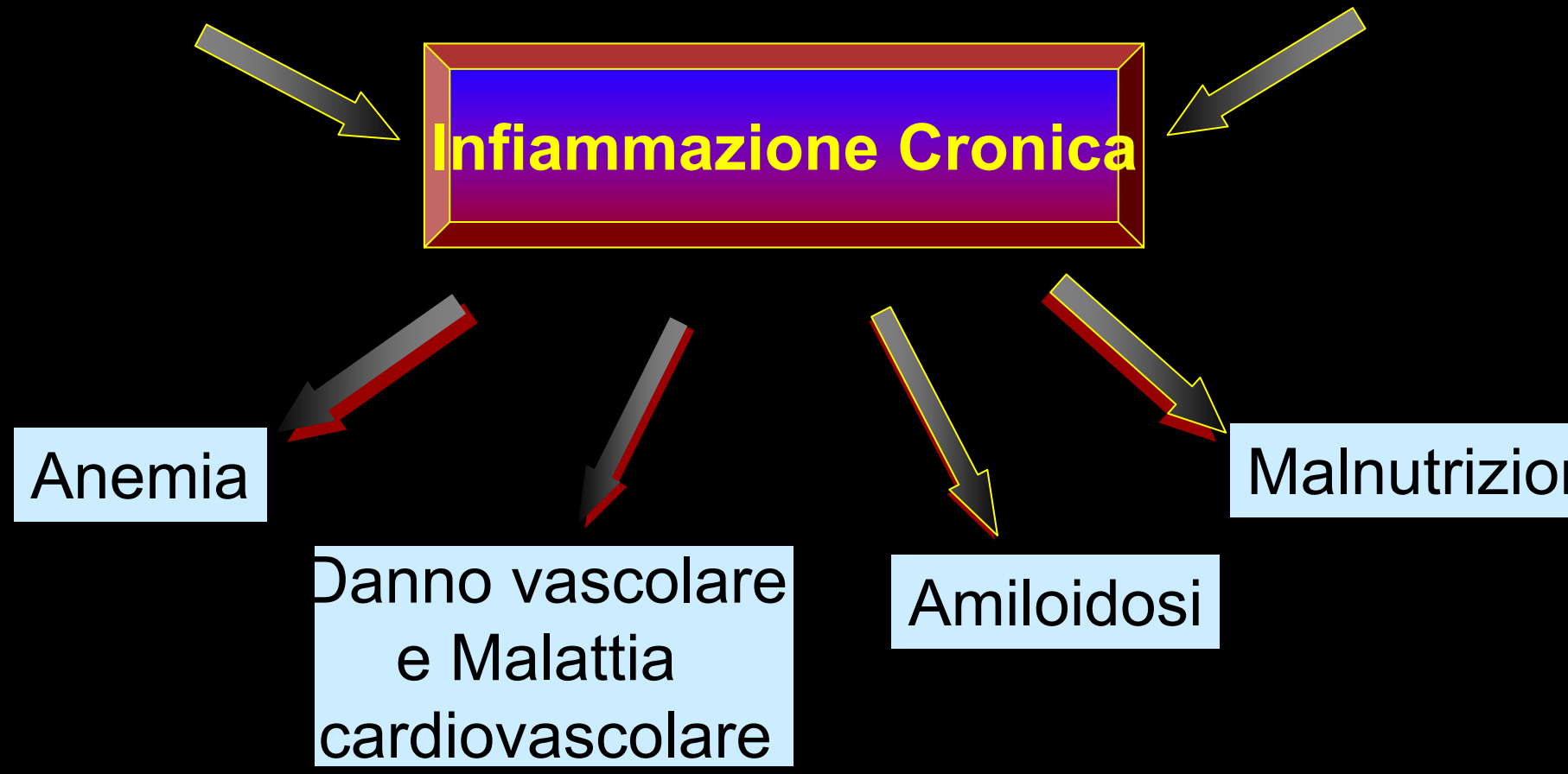
Infiammazione „Accelerata" Nei Pazienti in Emodialisi



<u>Biocompatibilità Globale</u>

- qualità dei liquidi di dialisi
- Membrane e Filtri
- Monitor e ultrafiltri

<u>Uremia e co-morbidità</u>



Inadeguata introduzione di nutrienti

–La inadeguata introduzione di nutrienti e' probabilmente la causa piu' importante. Da ricordare che l'anoressia spesso conduce ad un insufficiente introduzione rispetto alla necessità. Una aumentata prevalenza di acidosi metabolica e altre comorbidità possono produrre anoressia nei pazienti dializzati inoltre alcuni pazienti possono avere difficoltà nel procurarsi o preparare i cibi per una disabilità fisica o psichica legata a depressione o età o dentatura od addirittura a condizioni sociali di indigenza. Le ragioni sociali possono, almeno in parte, spiegare la notevole diversita' tra dati di prevalenza di malnutrizione negli studi condotti sulla popolazione dialitica italiana e statunitense .

Effetto dell'acidosi:

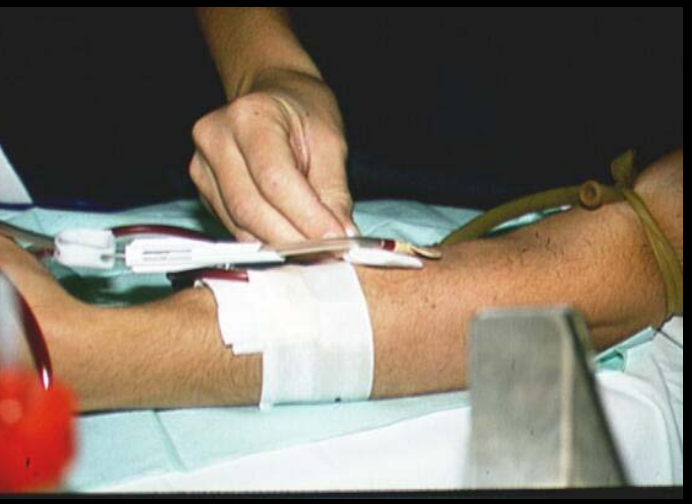
E' sempre piu' evidente che uno stato di acidosi metabolica e' un'importante stimolo al catabolismo proteico forse ancora di piu' che l'uremia di per se; lo stato di acidosi e' anche responsabile di un aumento della mortalita' del paziente uremico in dialisi. Uno studio retrospettivo condotto su 12000 pazienti ha evidenziato come la mortalita' si riducesse con il miglioramento della acidosi; un altro studio condotto da Lowirie ha evidenziato come l'anion gap si correlasse con la mortalita' anche dopo aggiustamento per i vari indici nutrizionali. Inoltre la correzione della acidosi con bicarbonato in un periodo di sei mesi ha normalizzato la concentrazione degli aminoacidi a catena ramificata intracellulari.

•Lowrie EG, Lew NL: Commonlv measured laboratorv variables in hemodialvsis patients: Relationshipí among them and io death risk. Semin Nephrol 1992: 12:276-283.

•Lowrie EG: Chronic dialvsis treatment: Clinical outcome and related processes of care. Am J Kidnev Dís 1994;24:255-266.

• LiSfberg E, Wemerman J, Bergström J: Branchedchain amino acids in muscle increase during correction of metabolic acidosis in hemodialysis (HD) patients. J Am Soc Nephrol 1993;4:363

Catabolismo della emodialisi



–L'emodialisi può essere catabolica di per se stessa; (attivazione del complemento) Questo effetto e' stato notato soprattutto con membrane in Cuprophan, mentre altre membrane del tipo polisulfone, PAN etc sembrerebbero avere un minore effetto sulla cascata del complemento

–Locatelli et al hanno sottolineato l'importanza delle membrane biocompatibili, ma non sono stati in grado di definire se il miglioramento di alcuni parametri, tra cui quello nutrizionale, fosse in relazione alla membrana o all'uso di tecniche miste diffusive-convettive.

Rimozione dei nutrienti

- La dialisi rimuove non solo cataboliti e sostanze tossiche di rifiuto, ma anche molti nutrienti. In relazione alla membrana e alla tecnica dialitica usata si possono perdere notevoli quantita' di nutrienti.
- Aminoacidi: Kopple ha dimostrato una perdita di 4.5-7.7 g dì; altri autori hanno segnalato una perdita fino a 12 gr a dialisi, ed anche 2-3 gr di peptidi.
- La perdita di aminoacidi durante la dialisi non sembrerebbe essere molto influenzata dal tipo di membrana usato.
- Le microperdite di sangue connesse alla procedura emodialitica comportano una ulteriore perdita di proteine di circa 1g .
- La quantita' di vitamine idrosolubile perse durante la dialisi non e' molto significativa, sia per la modesta concentrazione plasmatica, che per il peso molecolare superiore a quello del cut off delle diverse membrane di dialisi. Le perdite sono piu' rilevanti per le vitamine B1, B2, B6, Ac ascorbico e folico.

two fundamentally different types of malnutrition

- The first is related to **low protein and energy intake**. In this context, co-morbid conditions are uncommon and serum albumin may be normal or only slightly decreased. This type of malnutrition may be amenable to adequate nutritional and dialysis support.
- The second type of malnutrition is associated with inflammation and atherosclerotic cardiovascular disease (**MIA syndrome**). Co-morbid conditions are common and serum albumin levels are usually decreased. This type of malnutrition is much more difficult to reverse with nutritional support and dialysis therapy, unless the underlying co-morbid conditions and chronic inflammatory response are adequately treated
- Obviously, these two types of malnutrition are often combined in the clinical setting.

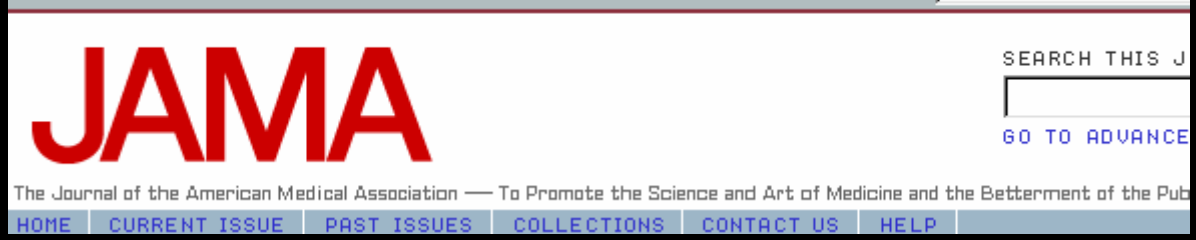
Malnutrizione, Infiammazione, Aterosclerosi (MIA)

- Le diverse forme di malnutrizione spesso coincidono nel paziente in dialisi nella forma conosciuta come sindrome Malnutrizione, Infiammazione, Aterosclerosi (MIA)

Stenvinkel P, Heimburger O, Lindholm B, et al. Are there two types of malnutrition in chronic renal failure? Evidence for relationships between malnutrition, inflammation and atherosclerosis (MIA syndrome). Nephrol Dial Transplant 2000;15:953-960

Paradosso dei fattori di rischio

- Infatti la mortalita' in dialisi assume un andamento a J quando si considerano i lipidi, il colesterolo e BMI, configurando il "paradosso della dialisi".
- In altre parole la riduzione del BMI, e la riduzione del colesterolo sono in generale predittivi di aumento della morbilita' e della mortalita'
- Invece l'aumento del BMI, l'ipercolesterolemia e l'ipertensione sembrerebbero, **in dialisi**, esercitare un effetto protettivo ed essere alla base della cosiddetta "epidemiologia inversa" (reverse epidemiology)

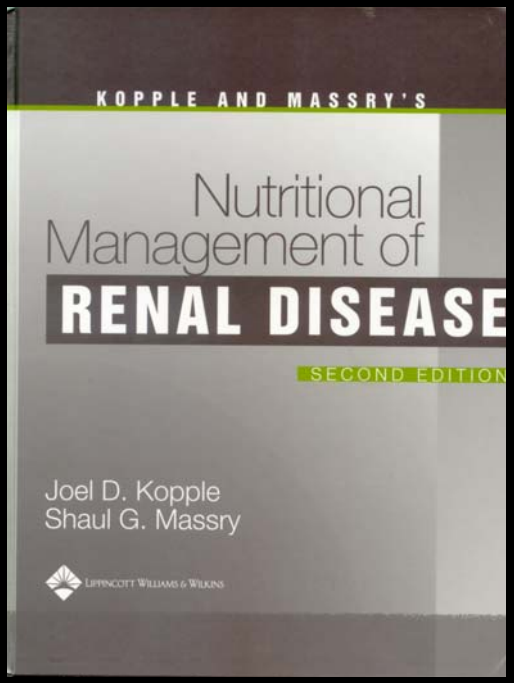


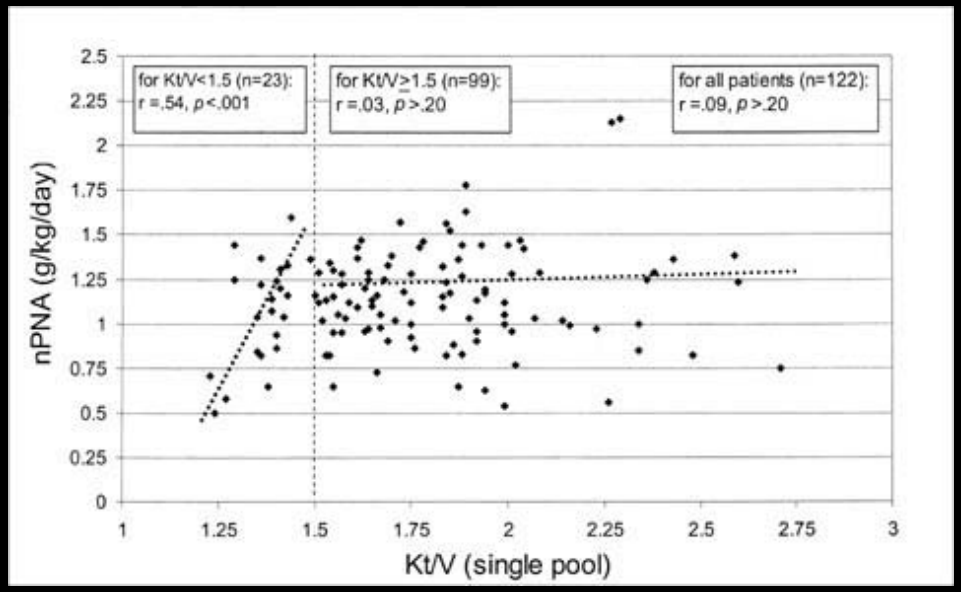
•Association between cholesterol level and mortality in dialysis patients: role of inflammation and malnutrition.

Liu Y, Coresh J, et al.

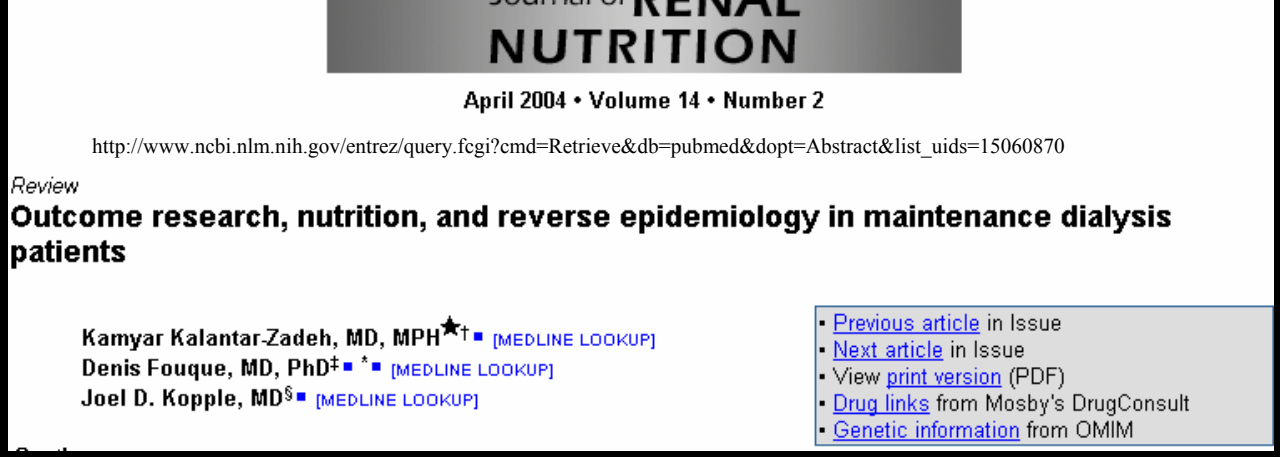
Johns Hopkins University, Baltimore, Md 21205, USA.

CONCLUSIONS: The inverse association of total cholesterol level with mortality in dialysis patients is likely due to the cholesterol-lowering effect of systemic inflammation and malnutrition, not to a protective effect of high cholesterol concentrations. These findings support treatment of hypercholesterolemia in this population.





Exploring the association between nPNA and Kt/V_{sp} in 122 MHD patients with a Kt/V_{sp} value > 1.20. No significant correlation existed between these 2 urea kinetic indices despite their known mathematical association (r = .09, P > .20). However, by dividing the patients into 2 distinct subgroups based on a Kt/V_{sp} cutoff of 1.50, there was a strong, significant correlation between Kt/V and nPNA for the lower Kt/V_{sp} values < 1.50 (r = .54, P < .001), whereas there was essentially no correlation at higher Kt/V_{sp} values (r = .03, P > .20).



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April 2004 • Volume 14 • Number 2

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=15060870

Review

Outcome research, nutrition, and reverse epidemiology in maintenance dialysis patients

Kamyar Kalantar-Zadeh, MD, MPH [MEDLINE LOOKUP]
Denis Fouque, MD, PhD [MEDLINE LOOKUP]
Joel D. Kopple, MD [MEDLINE LOOKUP]

•A substantial amount of this risk of high morbidity and mortality of maintenance dialysis patients can be explained by protein energy malnutrition, chronic inflammation, or concurrent combination of both, known as **malnutrition-inflammation complex syndrome (MICS)**. Elements of overnutrition, such as increased weight or high serum cholesterol levels, which are deleterious in the general population, paradoxically are protective in dialysis patients. Conversely, a low body mass index and low serum levels of cholesterol, creatinine, and possibly homocysteine are risk factors for poor outcome in dialysis-dependent populations. These reverse or paradoxical relationships between nutritional markers and outcome are referred to as *reverse epidemiology*. **The MICS appears to be a main contributor to the reverse epidemiology and poor outcome. Mortality is the most definitive and objective clinical outcome, whereas hospitalization and quality of life (QoL) are additional relevant but somewhat less objective outcome measures in dialysis populations.**

Malnutrizione proteico calorica

- Recenti studi dimostrano che la malnutrizione proteico calorica e la MIA sono in grado di indurre una riduzione della Qualita' della Vita ed un aumento della ospedalizzazione e della mortalita' specialmente per cause cardiovascolari. La PCR e la ipoalbuminemia sono forti predittori di un outcome negativo in dialisi

Bergstrom J. Inflammation, malnutrition, cardiovascular disease and mortality in end-stage renal disease. Pol Arch Med Wewn 2000;104:641-643.

Yeun JY, Levine RA, Mantadilok V, et al. C-Reactive protein predicts all-cause and cardiovascular mortality in hemodialysis patients. Am J Kidney Dis 2000;35:469-476.

Owen WF, Lowrie EG. C-reactive protein as an outcome predictor for maintenance hemodialysis patients. Kidney Int 1998;54:627-636.

Cosa fare per ridurre la malnutrizione?

- Riduzione microperdite
- Bagni con glucosio
- Monitoraggio per diagnosi precoce
- **Aumentare l'efficienza dialitica**
- Cambio schema dialitico
- Supplementazioni per OS o intradialitiche E.V.
- Valutazione dietetica e dietologica (anamnesi alimentare, valutazione stato nutrizionale e composizione corporea) → Dietista Renale

Nephrol Dial Transplant (2002) 17: 563–572

Nephrology Dialysis Transplantation

Special Feature

Nutritional status in dialysis patients: a European consensus

Francesco Locatelli[1], Denis Fouque[2], Olof Heimburger[3], Tilman B. Drüeke[4], Jorge B. Cannata-Andía[5], Walter H. Hörl[6] and Eberhard Ritz[7]

- **The HD procedure** There is **no definite evidence of the amount of dialysis that is needed for the preservation or improvement of nutritional status in HD patients**. Adequate dialysis (at present a KtV)1.2 for HD) should be provided. Whether a higher KtuV can improve nutritional status is not established at present.
- Although no definite evidence is available for the importance of **water quality** for nutritional status and clinical outcome, there are indications that bacterial and pyrogen contamination of the dialysate may contribute to the inflammatory reaction during HD.
- Better nutritional status with more **biocompatible dialysis membranes** has been suggested in some studies, but this has not been confirmed in others. At present, the role of the biocompatibility of the dialysis membrane is not clear and no specific recommendations can be made.

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ORIGINAL ARTICLE

◄ Previous Volume 347:2010-2019 December 19, 2002 Number 25 Next ►

Effect of Dialysis Dose and Membrane Flux in Maintenance Hemodialysis

Garabed Eknoyan, M.D., Gerald J. Beck, Ph.D., Alfred K. Cheung, M.D., John T. Daugirdas, M.D., Tom Greene, Ph.D., John W. Kusek, Ph.D., Micho Allon, M.D., James Bailey, M.D., James A. Delmez, M.D., Thomas A. Depner, M.D., Johanna T. Dwyer, D.Sc., R.D., Andrew S. Levey, M.D., Nathan W Levin, M.D., Edgar Milford, M.D., Daniel B. Ornt, M.D., Michael V. Rocco, M.D., Gerald Schulman, M.D., Steve J. Schwab, M.D., Brendan P. Teehan M.D., Robert Toto, M.D., for the Hemodialysis (HEMO) Study Group

In summary, although the effect of the dose and level of membrane flux may vary among selected subgroups of patients, the primary results of our study indicate that, with a schedule of thrice-weekly dialysis, neither an increased dose of dialysis nor use of a high-flux membrane substantially improves survival, reduces the rate of hospitalization, or maintains serum albumin levels as compared with a standard dose and use of low-flux membranes.

1: Am J Kidney Dis. 2004 Jun;43(6):1014-23.

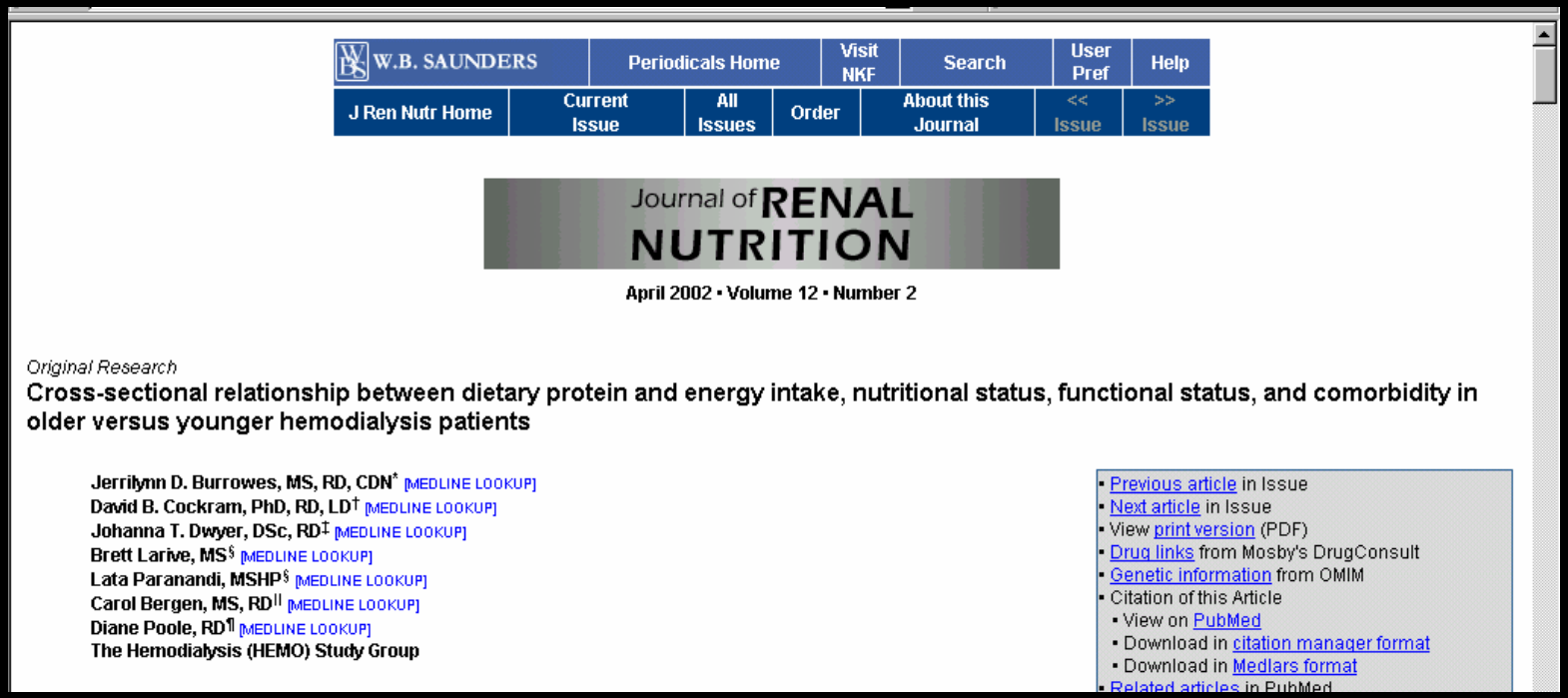
Am J Kidney Dis

High dialysis dose is associated with lower mortality among women but not among men.

Port FK, Wolfe RA, Hulbert-Shearon TE, McCullough KP, Ashby VB, Held PJ.

University Renal Research and Education Association, Ann Arbor, MI 48103, USA. fport@urrea.org

BACKGROUND: Several observational studies reported lower mortality risk among hemodialysis patients treated with doses greater than the standard dose. The present study evaluates, with observational data, the secondary randomized Hemodialysis (HEMO) Study finding that greater dialysis dose may benefit women, but not men. METHODS: Data from 74,120 US hemodialysis patients starting end-stage renal disease therapy were analyzed. Patients were classified into 1 of 5 categories of hemodialysis dose according to their average urea reduction ratio (URR), and their relative risk (RR) for mortality was evaluated by using Cox proportional hazards models. Similar analyses using equilibrated Kt/V were completed for 10,816 hemodialysis patients in the Dialysis Outcomes and Practice Patterns Study (DOPPS) in 7 countries. RESULTS: For both men and women, RR was substantially lower in the URR 70%-to-75% category compared with the URR 65%-to-70% category. Among women, RR in the URR greater-than-75% category was significantly lower compared with the URR 70%-to-75% group ($P < 0.0001$); however, no further association with mortality risk was observed for the greater-than-75% category among men ($P = 0.22$). RR associated with doses greater than the Kidney Disease Outcomes Quality Initiative guidelines (URR > or = 65%) was significantly different for men compared with women ($P < 0.01$). Similar differences by sex were observed in DOPPS analyses. CONCLUSION: The agreement of these observational studies with the HEMO Study supports the existence of a survival benefit from greater dialysis doses for women, but not for men. Responses to greater dialysis dose by sex deserve additional study to explain these differences.



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Original Research

Cross-sectional relationship between dietary protein and energy intake, nutritional status, functional status, and comorbidity in older versus younger hemodialysis patients

Jerrilynn D. Burrowes, MS, RD, CDN* [MEDLINE LOOKUP]
David B. Cockram, PhD, RD, LD† [MEDLINE LOOKUP]
Johanna T. Dwyer, DSc, RD‡ [MEDLINE LOOKUP]
Brett Larive, MS§ [MEDLINE LOOKUP]
Lata Paranandi, MSHP§ [MEDLINE LOOKUP]
Carol Bergen, MS, RD|| [MEDLINE LOOKUP]
Diane Poole, RD¶ [MEDLINE LOOKUP]
The Hemodialysis (HEMO) Study Group

Objective: To evaluate the dietary energy intakes (DEI) and dietary protein intakes (DPI) of older (65 years), middle-aged (50 to 64 years), and younger (< 50 years) maintenance hemodialysis patients enrolled in the Hemodialysis (HEMO) Study, and to describe the relationship between age, nutritional status, functional status, and comorbidity. **Design:** A cross-sectional analysis of the first 1,397 participants in baseline (before randomization) was performed.

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Conclusion: Middle-aged and older maintenance dialysis patients may be at greater risk for developing protein-energy malnutrition than their younger counterparts. Inadequate DEI and DPI reported in middle-aged and older patients were associated with lower levels of biomarkers of nutritional status, lower functional status, and higher comorbidities than in the younger patients.

Cosa fare per ridurre la malnutrizione?

- Riduzione microperdite
- Bagni con glucosio
- Monitoraggio per diagnosi precoce
- Aumentare l'efficienza dialitica
- **Cambio schema dialitico**
- **Supplementazioni per OS o intradialitiche E.V.**
- **Valutazione dietetica e dietologica (anamnesi alimentare, valutazione stato nutrizionale e composizione corporea)** → **Dietista Renale**

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Short daily hemodialysis rapidly improves nutritional status in hemodialysis patients

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Short daily hemodialysis rapidly improves nutritional status in hemodialysis patients.

Background. Malnutrition is a common problem in maintenance hemodialysis patients and is associated with increased mortality and morbidity. Interventions such as oral or intravenous nutritional supplements have often failed to improve nutritional status. We studied the effect of a daily dialysis program on nutritional parameters.

Methods. Eight patients treated with standard hemodialysis (SHD) 4 to 5 hours three times per week were converted to daily hemodialysis (DHD) 2 to 2.5 hours six times per week. Serum albumin, prealbumin, and total cholesterol were evaluated every three months. Anthropometry and dietary evaluation were performed every six months.

Results. Serum albumin rose from 39.0 ± 2.6 to 42.0 ± 3.1 and 43.0 ± 2.6 g/L, prealbumin from 0.36 ± 0.04 to 0.41 ± 0.05 and 0.42 ± 0.1 g/L, total cholesterol from 1.7 ± 0.4 to 1.9 ± 0.4 and 1.8 ±0.3 g/L at baseline and at 6 and 12 months, respectively, after switching patients to DHD. Daily protein intake increased from 1.29 ± 0.20 g/kg/day to 1.48 ± 0.60 and 1.90 ± 0.70 ($P < 0.05$). These changes were accompanied by a dry body weight increase of 2.4 ± 1.6 kg ($P < 0.005$) at month 6 and 4.2 ± 2.8 kg at one year ($P < 0.05$). Lean body mass increased from 47.7 ± 4.9 kg to 49.1 ± 5.9 ($P < 0.05$) and 50.5 ± 6.2 ($P < 0.05$).

Conclusions. Daily hemodialysis appears to be a suitable method to improve nutritional status in maintenance dialysis patients.

Galland R, Traeger J, Arkouche W, Delawari E, Fouque D. Short daily hemodialysis and nutritional status. Am J Kidney Dis. 2001 Jan;37(1 Suppl 2):S

Supplementi enterali

Anche i supplementi enterali sono stati sperimentati nei pazienti malnutriti in dialisi. In questo caso il vantaggio e' che e' possibile somministrare nutrienti al di fuori della dialisi per tutti i giorni della settimana, ma lo svantaggio risiede nella quantita' di liquidi introdotti.

Come per la NP i supplementi orali non sono in grado di colmare tutto il deficit nutrizionale, ma l'uso di supporti bilanciati in termini di proteine e calorie e' sicuramente un buon sistema per migliorare il quadro metabolico in pazienti anoressici, malnutriti, catabolici e severamente malati

[iFedje L, Moore L, McNeely M: The role for oral nutritional supplements in the malnutrition of renal disease. J Renal Nutr 6:198-202, 1996
•Cuppari L, Medeiros EAM, Papin HF, et al: Effectiveness of oral energy—protein supplementation in severely malnourished hemodialysis patients. J Renal Nutr 4:127-135, 1994

LA GESTIONE DIETETICA DELL'IPERFOSFATEMIA

- Il controllo della iperfosforemia in dialisi e' ancora uno dei grandi problemi nutrizionali che riguardano la dialisi.
- La iperfosforemia dipende infatti largamente dall'introito alimentare che a sua volta puo' essere influenzato dai chelanti e dalla rimozione dialitica.

L’intake proteico e di fosforo

- In maniera più specifica, è stato visto che in una dieta in grado di assicurare un’intake proteico ottimale di 1-1.2 g/kg/die, l’intake obbligato di P è di 778-1444 mg/die.
- Considerando che la quota media di fosforo rimossa con l’emodialisi è di 250-300 mg/die e che, se vengono utilizzati i chelanti del fosforo, la quota effettiva d’assorbimento dell’elemento dalla dieta può scendere fino al 40%, è stato stimato che un’intake di 750 mg è il valore critico borderline al di sopra del quale il bilancio del P risulta positivo.
- Il problema è che a questo valore corrisponde una dieta con un apporto proteico di 40-50 g/die.
- **Si capisce bene allora che un bilancio del P neutro è difficile da raggiungere quando l’intake proteico è superiore ai 50 g/die, che equivale a valori > 0.8 g/kg/die per un paziente di 60 kg di peso.**

La dieta e la fosforemia

- Tuttavia non puo' essere sottaciuta la notevole importanza che la manipolazione dietologica riveste in questo settore. Il consenso europeo sulla nutrizione in dialisi sottolinea come una corretta dieta sia in grado di ridurre l'uso dei chelanti ed assicurare non solo una adeguata introduzione di proteine, ma anche una ridotta introduzione di fosforo.
- Una eccellente review del gruppo di Pisa focalizza questo argomento in maniera esaustiva e con esempi pratici. In questo articolo si offrono infatti esempi di come scegliere cibi con basso rapporto tra proteine e fosforo in modo da poter ottenere un giusto equilibrio senza dover ricorrere ai chelanti.

•Cupisti A, Morelli E, D'Alessandro C, Lupetti S, Barsotti G: Phosphate control in chronic uremia: don't forget diet. J Nephrol. 2003 Jan-Feb;16(1):29-33.

Contenuto in proteine e fosforo di alcuni alimenti
Gli alimenti contrassegnati in rosso sono quelli con piu' alto contenuto di fosforo e quindi assunti con molta moderazione.
Ne discende anche che non sempre e' possibile sostituire la carne con i formaggi in quanto a parita' di proteine questi ultimi contengono mediamente molto fosforo.

Descrizione	proteine g/100	fosforo mg/100
Caciocavallo	37,7	590
Caciotta fresca	17,3	250
Caciotta stagionata	27,7	675
Caciottina mista	26,9	300
Capocollo	20,8	263
Cappelletti	13,35	153,59
Carciofi	2,7	67
Carne di Maiale (media)	20,033	187
Carne in scatola (media)	12,6	100
Carne Ovina (media)	18,667	194,667
Carni varie (media)	16,64	240,7
Ceci secchi	20,9	415
Cernia	17	128
Certosino	17,5	263
Cinghiale	0	0
Cocomero	0,4	2
Coniglio magro	19,9	220

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Clinical Brief

The role of the dietitian in a multicenter clinical trial of dialysis therapy: The Hemodialysis (HEMO) Study

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and the Hemodialysis (HEMO) Study Group

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Abstract

TOP

The Hemodialysis (HEMO) Study is a randomized multicenter prospective clinical trial, supported by the National Institute of Diabetes, Digestive, and Kidney Diseases of the National Institutes of Health. The trial is designed to assess the effects of a standard versus higher dialysis dose and low versus high dialysis membrane flux on morbidity and mortality of chronic hemodialysis patients. The role of the dietitian in the HEMO Study is to support and maintain the nutritional status of randomized participants. To ensure participant safety, nutritional status is closely monitored by a variety of biochemical and participant-reported parameters. Serum albumin and equilibrated normalized protein catabolic rates are obtained monthly. Appetite assessment and dietary energy and protein intakes using a 2-day diet diary assisted recall are ascertained at baseline and on a yearly basis. Consumption of vitamins, minerals, and nutritional supplements, including oral enterals, tube feedings, and parenteral nutrition, is obtained at least once a year. In addition, anthropometry is performed at baseline and on a yearly basis. Prespecified changes in serum albumin level or body weight trigger action by the dietitian to prevent protein calorie malnutrition. The HEMO Study dietitians play a vital role in carrying out the nutrition program for the trial. The HEMO Study should provide important information about the natural

The dietitian/nutrition advisor will advice the HD patients on an appropriate energy intake of 35 kcal/kg IBW/day. Reduced intakes (30-35 kcal/kg IBW/day may be appropriate in the elderly and/or with reduced activity

(CAPD=incluse calorie da dialisato)

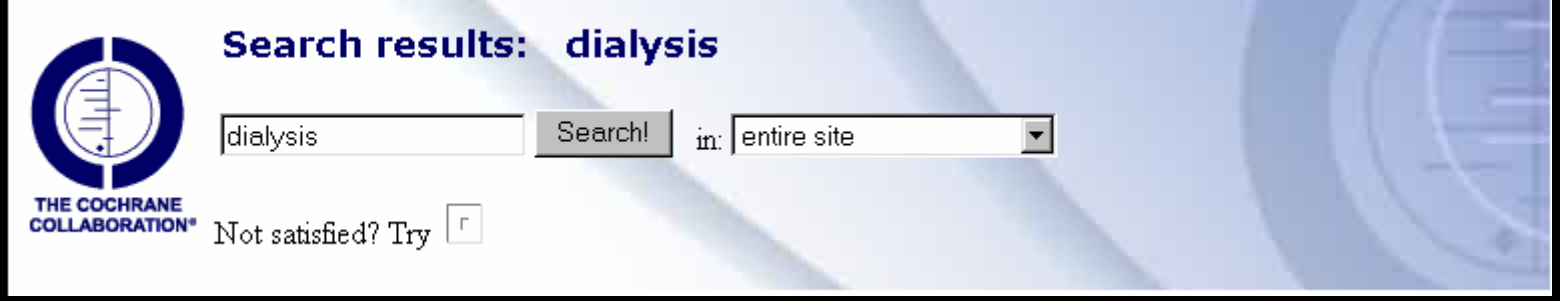
- The recommended DPI for clinically stable MHD is 1,2 g/kg body weight/d
- The recommended DPI for clinically stable CPD is 1,2 to 1,3 g/kg body weight/d
- At least 50% HBV)
- (*Evidence and Opinion)*

Fosforo 1000-1400 mg/day (32-45mmol/day)

Potassio 2000-2500 mg/d (50-65 mmol/die)

ESPEN HD (2000)

- Proteine: almeno 1,2 g/kg (1,2-1,4) calcolate sul peso ideale. Almeno il 50% di elevato valore biologico. La dose dialitica dovrà essere adeguata a controllare l'accumulo dei cataboliti e dell'acidosi in caso di maggiori apporti proteici. Un apporto di 1,0-1,1 g/kg richiede un attento monitoraggio dello stato nutrizionale.
- **Calorie**: l'apporto calorico dovrebbe essere maggiore di 35 kcal/kg e dovrebbe essere aumentato in caso di attività fisica. I fabbisogni energetici sono correlati alla massa muscolare. Apporti energetici maggiori sono necessari in caso di ipercatabolismo, come infezioni o chirurgia.
- **Fosforo**: dovrebbe essere limitato. Comunque, la restrizione rende spesso la dieta poco palatabile. Le Associazioni Dietetiche europee e americane raccomandano un apporto pari a 17/mg/kg di peso ideale. Una dieta ricca di proteine e povera di fosforo si ottiene con l'esclusione di alcuni cibi e un attento monitoraggio dei livelli plasmatici.
- Vitamine: possibili carenze sono imputabili a perdite attraverso la membrana di dialisi e per la manipolazione dietetica (K-P). Sono stati descritti bassi livelli di vitamina C e B_6. Sono suggeriti supplementi di vit. C (30-60 mg), B_6 (10-20 mg) e acido folico (1 mg). Generalmente sono supplementate B_1 e B_2; è controindicata la supplementazione della A.



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15. Should Economic Appraisal Be Combined Within Systematic Reviews In The Cochrane Library?
16. Vaccines for preventing hepatitis B in health-care workers (Cochrane Review)

Here are the results of your search:

- **Leg cramps**
- **Acute renal failure**
- **Natriuretic peptides (Benefits)**
- **Synthetic dialysis membranes (Comment)**
- **Synthetic dialysis membranes (Harms)**
- **Two systematic reviews found insufficient evidence of the effects of synthetic membranes on mortality** in critically ill people with acute renal failure compared with cellulose based membranes**.**
- **High dose continuous renal replacement therapy (Comment)**
- One RCT has found that high dose continuous renal replacement therapy (haemofiltration) reduces mortality compared with standard dose continuous renal replacement therapy. A small prospective study found that intensive (daily) intermittent haemodialysis...
- **Continuous renal replacement therapy (Benefits)**
- **Natriuretic peptides (Harms)**
- **Dopamine (Benefits)**
- **Synthetic dialysis membranes (Benefits)**
- **Loop diuretics (Comment)**
- **Natriuretic peptides (Comment)**
- **Natriuretic peptides (Harms)**
- **What are the effects of treatments for critically ill people with acute renal failure?**
- **Natriuretic peptides (Comment)**
- **High dose continuous renal replacement therapy (Harms)**

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Brief Summary

GUIDELINE TITLE

NKF-K/DOQI clinical practice guidelines for hemodialysis adequacy: update 2000.

BIBLIOGRAPHIC SOURCE(S)

NKF-K/DOQI clinical practice guidelines for hemodialysis adequacy: update 2000. Am J Kidney Dis 2001 Jan;37(1 Suppl 1):S7-S64. [259 references]

BRIEF SUMMARY CONTENT

MAJOR RECOMMENDATIONS

Evidentiary Basis For Recommendations:

When all components of the rationale for a guideline are based on published evidence, the guideline has been labeled "**Evidence**."

When some or all components of a rationale are based on opinion, the guideline has been labeled "**Opinion**."

4. **Minimum Delivered Dose of Hemodialysis (Adults-Evidence, Children-Opinion).** The dialysis care team should deliver a fractional clearance of urea as a function of its distribution volume (Kt/V) of at least 1.2 (single-pool, variable-volume) for both adult and pediatric hemodialysis patients. For those using the urea reduction ratio, the delivered dose should be equivalent to a Kt/V of 1.2, i.e., an average urea reduction ratio of 65%. Urea reduction ratio can vary substantially as a function of fluid removal.

5. **Prescribed Dose of Hemodialysis (Opinion).** To prevent the delivered dose of hemodialysis from falling below the recommended minimum dose, the prescribed dose of hemodialysis should be Kt/V 1.3. In terms of urea reduction ratio, a Kt/V of 1.3 corresponds to an average urea reduction ratio of 70%, but the urea reduction ratio corresponding to a Kt/V of 1.3 can vary substantially as a function of