

Study	Population	Exclusion	Incidence	RRT?
Tuttle 2003	120 pts who underwent cardiac surgical procedures. Prospective observational study	?	42% (CABG); 53% (valve replacement with or without CABG)	
Metha 2002	552 ARF pts. multicentre cohort study.	previous dialysis, kidney transplantation, urinary tract obstruction, hypovolemia	?	?
Metnitz 2002	17126 medical and surgical ICU pts. Prospective multicentre cohort study	< 18 y, lack of data hospital outcome, lack of SAPS II score. Only the first ICU admission was included, peritoneal dialysis, plasmapheresis, CRF	4.9%	All
Lewis 2000	222 oliguric ATN pts. Anaritide (n=108) vs placebo (n=114)	postrenal or obstructive cause, preexisting renal failure, renal transplant, prior dialysis or imminent need for dialysis, syst BP < 90, expected fatal outcome	?	64% (anaritide) and 77% (placebo)
Hirschberg 1999	72 ARF pts. RhIGF (n=35) vs placebo (n=37)	ARF . 6 days, expected fatal outcome, APII > 37, renal failure other than ATN, preexisting renal failure, syst BP<90	?	57% (rhIGF-I) and 46% (placebo)
Gastaldello 2000	159 ARF pts. Low-flux polysulfone (n=53), high flux polysulfone (n=53), cellulose diacetate (n=53)	acute glomerulonephritis, renal transplantation, isolated ultrafiltration for fluid overload, preexisting renal failure	?	All
Phu 2002	70 ARF pts. Hemofiltration (n=34) vs peritoneal dialysis (n=36)	pregnancy, < 15 y, previous RRT	?	All
Ponikvar 2001	72 ICU pts. High-flux (n=34) vs low-flux (n=38) dialyzer	documented chronic renal failure	?	All
Albright 2000	66 ARF pts cellulose acetate (n=33) vs polysulfone membrane (n=33) RCT	preexisting renal failure, prior ARF requiring hemodialysis	?	All
Himmelfarb 1996	153 ARF pts, biocompatible (BCM, n=72) vs bioincompatible (BICM, n=81) membrane	renal transplantation; prior chronic renal failure	?	All
Acker 2000	59 ICU pts with ARF effect of thyroxine	acute pre-renal failure, other causes of ARF except ATN	?	64% in thyroxine group 48% in control group
Behrend 1999	106 CCU patients from 04/96 till 10/97	?	2392 CCU admissions during same period	intermittent IHD 14 pts, CVVH 3 pts, PD 1pt
Chertow 1998	42773 pts cardiac surgery	screat at least 3 mg%	1.10%	All
Cole 2000	All ICU	CHD	?	All
Conlon 1999	2672 pts cardiac surgery	dialysis prior to surgery	7,9% ARF and ARF with dialysis 0,7%	0,7% from total population
Corwin 1987	ARF 151 pts	?	210 pts for consultation for ARF between 03/80 and 06/81	?
Corwin 1987	patients post-cardiac surgery case control study of 42 ARF with and non-ARF patients	?	ARF 7% of all cardiac operations during 1985	15% IHD
Cosentino 1994	All ICU	?	?	All
De Mendonca 2000	All ICU	ICU < 48 h, CHD	25 % of ICU population	?
Gettings 1999	ICU trauma	?	0.55%	

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Jones 1998	All ICU	?	?	All
Levy 1996	2 cohorts 183 ARF post contrast versus 174 non-ARF	?	?	12% RRT in ARF
Liano 1998	All ICU and non-ICU	screat at least 3,4 mg%	7% of ICU admissions 1991	?
Mangano 1998	2222 CABG	screat at least 177 umol/L	7.70%	1.40%
McCarthy 1996	All ICU	screat at least 5 mg%	?	All
Metha 2001	All ICU	previous IHD, prerenal	?	All
Neveu 1996	All ICU, 345 pts	screat at least 300 µmol/l	between 02/91 and 08/91 20 multidisciplinary ICU units	Sepsis 74 pts; 59 IHD, 15 CRRT; non sepsis 95; 82 IHD, 13 CRRT
Obialo 1999	ICU 100 pts	age < 18, all acute on CRF, all pre-renal failure and pre-existing CRF (Screat at least 1,7 mg/dl)	?	10%
Rich 1990	Coronary angiography 203 patients	20 patients with insufficient data or cardiogenic shock	?	?
Ronco 2000	All ICU	?	?	
Schaeffer 1991	All ICU	CHD and transplantation	?	All
Schwilk 1997	All ICU	?	4.29%	All
Shiffi 2002	All ICU	CRF screat > 3mg%	?	All
Weisberger 1999	multi centre study contrast ATN diabetic (71) vs (185) non-diabetic	pre-and post ARF or other causes of ARF	?	?
Allbright 2000	adults requiring HD for ARF between 1/1/95 and 31/12/96	pre-existing renal failure (Screat at least 3mg/dl) or prior ARF;	?	All IHD
Frost 1991	ARF need for dialysis between 1997 and 1998 nephrology department	?	?	All IHD
Paganini 1996	ICU with ARF and requiring dialysis	?	?	All dialysis
Breckwoldt 1992	patients requiring aortic aneurism surgery	emergency surgery within 24 hrs or incomplete data	?	
Lassnigg 2000	Adults undergoing elective cardiac surgery; n=126 Screat < 2mg/dl	3 patients with bleeding, requiring reoperation	?	None
Fiacodori 2000	intermediate nephrology care	ventilation, prerenal,	?	64,1%
Allgran 1997	All ICU (RCT n=504)	ventilation, prerenal, postrenal, vascular obstruction, systemic or glomerular disease, prior dialysis, expected dialysis within 24h, treatment restrictions: CRF (screat at least 3 mg%, renal transplantation, systolic BP < 90	?	placebo 42% on day 14; anaritide 44% on day 14
Shilliday 1997	renal unit (RCT n=92)	prerenal, postrenal, loop or osmotic diuretic within preceding 12 h, furosemide > 100 mg preceding 48h	?	placebo 40%; Frusemide 31%; Torasemide 47%
Heering 1999	all ICU	ESRD, death within 48 h	?	All
Bouman 2002	All ICU (RCT n=106)	CRF (cr.cl < 30 ml/min); renal artery lesion; glomerulonephritis; vasculitis; postrenal; CHILD C livercirrhosis; AIDS; non-witnessed arrest; hematological malignancy with neutrophiles < 500; no CVVH machine available	1.8%	100 of the 106 included patients

Study	Definition	Mortality Control	Mortality Experimental
Tuttle 2003	> 25% increase in Screat level 48h after surgery compared to baseline level	2% one month after surgery	
Metha 2002	For pts with no history of kidney disease BUN > 40 mg/dl (14.3 mmol/L) or Screat > 2.0 mg/dl (177 μmol/L). For others a sustained rise in Screat of 1 mg/dl (88.4 μmol/L) or more compared to baseline	53% in hospital	
Metnitz 2002	the need for renal replacement therapy	62.8% (hospital mortality)	
Lewis 2000	urine output < 400 ml/d. At least 0.5 mg/dl/d increase in serum creatinine level with a fractional excretion of urinary sodium > 1%.	21d dialysis free 85% (placebo)	79% (Anaritide)
Hirschberg 1999	Rise in Screatinine from a baseline value of less than 1.8 to 3.0 mg/dl or greater or an acute decrease in CrCl to 25 ml/min or less following surgery, trauma, hypotension or sepsis	30% (placebo)	29% (rhIGF-I)
Gastaldello 2000	need for dialysis	64% (LF-PS)	57% (HF-PS) 55% (CDA)
Phu 2002	need for urgent RRT	15% (HF)	47% (PD)
Ponikvar 2001	need for dialysis	79.4% (high flux)	81.6% (low flux)
Albright 2000	need for dialysis	24% day 30 (CA)	27% day 30 (PS)
Himmelfarb 1996	need for dialysis	43% (BCM)	54% (BICM)
Acker 2000	Doubling of Screat within 24 hrs	13%	43%
Behrend 1999	If Screat < 2mg% increase in Screat of at least 0.9mg% , If Screat > 2 mg% increase in Screat of at least 1.5 mg%	50% hospitalisation CCU	
Chertow 1998	mortality 30 days post surgery	63.70%	
Cole 2000	need for RRT	Hospital 49,2%	
Conlon 1999		ARF 14%; ARF and dialysis 28%	
Corwin 1987	Screat > 50% after exclusion of prerenal failure	55%	
Corwin 1987	Screat at least 50% after exclusion of prerenal failure	no ARF 5%	ARF 24% (oliguric ARF 36%; non-oliguric 20%)
Cosentino 1994	need for RRT	IHD 70,6%	CRRT 90,7% combination 80,4%
De Mendonca 2000	screat at least 3,5 mg% and/or oliguria less than 500 ml per day	43%	
Gettings 1999		BUN at least 60 mg% 79,7%	BUN < 60 mg% 61%
Jones 1998	CVVHD	52%	
Levy 1996	Screat > 25% and > 177 μmol in 48hrs post contrast injection	7% without ARF	34% with ARF

Study	Definition	Mortality Control	Mortality Experimental
Liano 1998	screat at least 3,5 mg% and/or urea at least 100 mg% in patients without CRF; In CRF: (screat at least 1,7 mg%) increase in screat and/or urea >100% above baseline	ICU 71%;	nonICU 31,5%
Mangano 1998		27% (in hospital mortality)	
McCarthy 1996	need for RRT	1977-1979 68%	1991-1992 48%
Metha 2001	BUN \geq 40 mg% or screat \geq 2 mg% or sustained rise screat at least 1mg%; CRF screat at least 2 mg%	IHD ICU 41,5%; H 47,6%	CRRT ICU 59,5%; H 65,5%
Neveu 1996	Surea>36 mmol/L or Screat>310 μ mol/l (nonCRF); 100% increase in Surea or Screat in CRF >150 μ mol/L or oliguria < 400ml/24h	Sepsis 74,5%	non-sepsis 42,5%
Obialo 1999	Screat >2 mg% on presentation (no CRF) or increase with 0,5 mg%	39%	
Rich 1990	Increase in Screat of at least 44 μ mol/l above baseline within 48 hrs after procedure	7.10%	
Ronco 2000		20 ml/kg/h 59% (15 d after stopping RRT)	35 ml/kg/h 43% 45 ml/kg/h 42%
Schaeffer 1991	screat at least 500 μ mol/L or oliguria < 400 ml/day	56.70%	
Schwilk 1997	screat at least 2,8 mg% or BUN at least 70 mg% and decrease urine output; MODS and increase screat at least 2,2 mg% or BUN at least 56 mg%; oligo anuria despite hydration	57%	
Shiffel 2002	increase at least 1 mg% or screat at least 4 mg%	46% IHD 3xwk (mortality 14 d after stopping RRT)	28% IHD daily
Weisberger 1999	S creat rise with > 1 mg% over 48 hours	21 day mortality non-diabetic 27%	diabetic 24%
Allbright 2000	need for HD	cellulose acetate 24% at 30 days	polysulfone 27% at 30 days(NS)
Frost 1991	need for RRT	46% overall	
Paganini 1996	need for dialysis	69% according to severity score	
Breckwoldt 1992		infrarenal clamping 1,2%	suprarenal clamp 2,6%
Lassnigg 2000	changes in creatinine clearance; delta Creat max;	placebo 40 pts:1 dead (hospital)	Dopamine 42 pts:0 dead Furosemide 41 pts:4 dead
Fiacodori 2000	screat at least 50% above baseline in 24-48h; CRF: increase \geq 1 mg%	Hospital 39.3%	
Allgran 1997	increase of screat of at least 1 mg% in less than 48h	day 21 26% (placebo)	day 21 29% (anaritide)
Shilliday 1997	screat at least 2.03 mg%,	day 21 50% (placebo)	day 21 66% (frusemide) day 21 70% (torasemide)
Heering 1999	fluid overload with inadequate urine output, despite diuretics and adequate BP; screat at least 265 μ mol/L; K > 5 mmol/L due to anuria	ICU 63% (lactate CVVH)	ICU 59% (acetate CVVH); ICU ? (bicarbonate CVVH)
Bouman 2002	urine output < 30 ml/h for at least 6 h despite fluid and vaspressors, cr.cl < 20 ml/min calculated in 3 h portion, mechanical ventilation	Late low volume CVVH: 25% (day 28)	Early low vol CVVH: 31.4% Early high vol CVVH: 24.7%

References:

- Acker CG, Singh AR, Flick RP, Bernardini, Greenberg A, Johnson JP. A trial of thyroxine in acute renal failure. *Kidney International* 2000;57:293-298
- Albright RC Jr, Smelser JM, McCarthy JT, Homburger HA, Bergstrahl EJ, Larson TS. Patient survival and renal recovery in acute renal failure: randomized comparison of cellulose acetate and polysulphone membrane dialyzers. *Mayo Clin Proc* 2000;75:1141-1147
- Allgren RL, Marbury TC, Rahman SN, et al. Anaritide in acute tubular necrosis. *NEJM*;1997;336:828-834
- Behrend T, Miller SB. Acute renal failure in the cardiac care unit : etiologies, outcomes and prognostic factors. *Kidney Int.* 1999;56(1):238-243
- Bouman CSC, Oudemans-van Straaten HM, Tijssen JGP et al. Effects of early high-volume continuous venovenous hemofiltration on survival and recovery of renal function in intensive care patients with acute renal failure. A prospective randomized trial. *Crit Care Med* 2002;30(10):2205-2211
- Breckwoldt WL, Mackey WC, Belkin M, O'Donnell TF Jr. The effect of suprarenal cross-clamping on abdominal aortic aneurysm repair. *Arch Surg* 1992;127(5):520-524
- Brivet FG, Kleinknecht DJ, Loirat P, et al. Acute renal failure in intensive care units – causes, outcome, and prognostic factors of hospital mortality: a prospective, multicenter study. *Crit Care Med* 1996;24:192-198
- Chertow GM, Levy EM, Hammermeister KE et al. Independent association between acute renal failure and mortality following cardiac surgery. *Am J Med* 1998;104:343-348
- Cole L, Bellomo R, Silvester W, Reeves JH. A prospective multicenter study of the epidemiology, management and outcome of severe acute renal failure in a closed ICU system. *Am J Resp Crit Care Med* 2000;162:191-196
- Conlon PJ, Stafford-Smith M, White WD et al. Acute renal failure following cardiac surgery. *Nephrol Dial Transplant* 1999;14:1158-1162
- Corwin HL, Teplick RS, Schreiber MJ, Fang LS, Bonventre JV, Coggins CH. Prediction of outcome in acute renal failure. *Am J Nephrol* 1987;7(1):8-12
- Cosentino F, Chaff C, Piedmonte M. Risk factors influencing survival in ICU acute renal failure. *Nephrol Dial Transplant* 1994;9 (suppl. 4): 179-182
- De Mendonca A, Vincent JL, Suter PM et al. Acute renal failure in the ICU: risk factors and outcome evaluated by the SOFA. *Intensive Care Med* 2000;26:915-921
- Fiaccadori E, Maggiore U, Lombardi M, Leonardi S, Rotelli C, Borghetti A. Predicting patient outcome from acute renal failure comparing three general severity of illness scoring systems. *Kidney International* 2000;58:283-292

Frost L, Pedersen R, Bentzen S, Bille H, Hansen H. Short- and long-term outcome in a consecutive series of 419 patients with acute dialysis-requiring renal failure. *Scand J Urol Nephrol* 1993;27:453-462

Gastaldello K, Melot C, Kahn R-J, Vanherweghem J-L, Vincent J-L, Tielemans C. Comparison of cellulose diacetate and polysulphone membranes in the outcome of acute renal failure. A prospective randomised study. *Nephrol Dial Transplant* 2000;15:224-230

Gettings LG, Reynolds HN, Scalea T. Outcome in post-traumatic acute renal failure when continuous renal replacement therapy is applied early vs late. *Intensive Care Med* 1999;25:805-813

Heering P, Ivens K, Thumer O, et al. The use of different buffers during continuous hemofiltration in critically ill patients with acute renal failure. *Intensive Care Med* 1999;25:1244-1251

Himmelfarb J, Tolkoff R, Chandran P, Parker RA, Wingard RL, Hakim R. A multicenter comparison of dialysis membranes in the treatment of acute renal failure requiring dialysis. *J Am Soc Nephrol* 1998;9:257-266

Hirschberg R, Kopple J, Lipsett P, et al. Multicenter clinical trial of recombinant human insulin-like growth factor I in patients with acute renal failure. *Kidney International* 1999;55:2423-2432

Jones CH, Richardson D, Goutcher E et al. Continuous venovenous high-flux dialysis in multiorgan failure: a 5 year single center experience. *American Journal of Kidney Diseases* 1998;31:227-233

Lassnigg A, Donner E, Grubhofer G, Presterl E, Druml J, Hiesmayr M. Lack of renoprotective effects of dopamine and furosemide during cardiac surgery. *J Am Soc Nephrol* 2000;11:97-104

Levi EM, Viscoli CM, Horwitz RI. The effect of acute renal failure on mortality. *JAMA* 1996;275:1489-1494

Lewis J, Salem MM, Chertow GM, Weisberg LS, McGrew F, Marbury TC, Allgren RL. Atrial Natriuretic Factor in oliguric acute renal failure. *AJKD* 2000;36(4):767-774

Liano F, Junco E, Pascual J, et al. The spectrum of acute renal failure in the intensive care unit compared with that seen in other settings. *Kidney International* 1998;53, (suppl. 66):16-24

Mangano CM, Diamondstone LS, Ramsay JG et al. Renal dysfunction after myocardial revascularization: risk factors, Adverse outcomes and hospital resource utilization. *Ann Intern Med* 1998;128:194-203

McCarthy JT. Prognosis of patients with acute renal failure in the intensive care unit: a tale of two eras. *Mayo Clinic Proc* 1996;71:117-126

Metha RL, Pascual MT, Soroko S, Chertow GM. Diuretics, mortality, and nonrecovery of renal function in acute renal failure. The PICARD study group. *JAMA* 2002;288(20):2547-2553

Metha RL, McDonald B, Gabbai FB, et al. A randomized clinical trial of continuous versus intermittent dialysis for acute renal failure. *Kidney International* 2001;60:1154-1163

Metnitz PGH, Krenn CG, Steltzer H, Lang T, Ploder J, Lenz K, Le Gall JR, Druml W. Effect of acute renal failure requiring renal replacement therapy on outcome in critically ill patients. *Crit Care Med* 2002;30:2051-2058

Neveu H, Kleinknecht D, Brivet F, Loirat P, Landais P. Prognostic factors in acute renal failure due to sepsis. Results of a prospective multicentre study. *Nephrol Dial Transplant* 1996;11(2):293-299

Obialo CI, Okonofua EC, Nzerue MC, Tayade AS, Riley LJ. Role of hypoalbuminemia and hypocholesterolemia as copredictors of mortality in acute renal failure. *Kidney Int* 1999;56(3):1058-1063

Paganini EP, Sandy D, Moreno L, Kozlowski L, Sakai K. The effect of sodium and ultrafiltration modelling on plasma volume changes and haemodynamic stability in intensive care patients receiving haemodialysis for acute renal failure: a prospective, stratified, randomized, cross-over study. *Nephrol Dial Transplant* 1996;11:32-37

Phu NH, Hien TT, Mai NTH, et al. Hemofiltration and peritoneal dialysis in infection-associated acute renal failure in Vietnam. *N Engl J Med* 2002;347(12):895-902

Ponikvar JB, Rus RR, Kenda RB, Bren AF, Ponikvar RR. Low-flux versus high-flux synthetic dialysis membrane in acute renal failure: prospective randomized study. *Artificial Organs* 2001;25(12):946-950

Rich MW, Crecelius CA. Incidence, risk factors and clinical course of acute renal insufficiency after cardiac catheterisation in patients 70 years of age or older. A prospective study. *Arch Intern Med* 1990;150(6):1237-1242

Ronco C, Bellomo R, Homel P, et al. Effects of different doses in continuous veno-venous haemofiltration on outcomes of acute renal failure: a prospective randomized trial

Schaefer JH, Jochimsen F, Keller F, Wegscheider K, Distler A. Outcome prediction of acute renal failure in medical intensive care. *Intensive Care med* 1991;17:19-24

Schiffl H, Lang SM, Fisher R. Daily hemodialysis and the outcome of acute renal failure. *New Engl J Med* 2002;346:305-310.

Schwilk B, Wiedeck H, Stein B, Reinelt H et al. Epidemiology of acute renal failure and outcome of haemodiafiltration in intensive care. *Intensive Care Med* 1997;23:1204-1211

Shilliday IR, KJ Quinn, Allison MEM. Loop diuretics in the management of acute renal failure: a prospective, double-blind, placebo-controlled, randomized study. *Nephrol Dial Transplant* 1997;12:2592-2596

Tuttle KR, Worrall NK, Dahlstrom LR, Nandagopal R, Kausz AT, Davis CL. Predictors of ARF after cardiac surgical procedures. *Am J Kidney Dis* 2003;41(1): 76-83

Weisberg LS, Allgren RL, Genter FC, Kurnik BR. Cause of acute tubular necrosis affects its prognosis. The Auriculin Anaritide Acute Renal Failure Study Group. *Arch Intern Med* 1997;157(16):1833-1838