Appendix 1, Hypothetical Power Analysis

RRT in on-pump group	*Proportion Diff*	*Power*	*N Per Group*
0.12	-0.025	0.8	2409
0.12	-0.025	0.9	3224
0.12	-0.030	0.8	1638
0.12	-0.030	0.9	2193
0.12	-0.035	0.8	1178
0.12	-0.035	0.9	1577
0.12	-0.040	0.8	882
0.12	-0.040	0.9	1181
0.12	-0.045	0.8	681
0.12	-0.045	0.9	912

RRT in on-pump group	*Proportion Diff*	*Nominal Power*	*N Per Group*
0.13	-0.025	0.8	2604
0.13	-0.025	0.9	3485
0.13	-0.030	0.8	1774
0.13	-0.030	0.9	2375
0.13	-0.035	0.8	1279
0.13	-0.035	0.9	1711
0.13	-0.040	0.8	960
0.13	-0.040	0.9	1284
0.13	-0.045	0.8	743
0.13	-0.045	0.9	994

RRT in on-pump group	*Proportion Diff*	*Nominal Power*	*N Per Group*
0.14	-0.025	0.8	2793
0.14	-0.025	0.9	3739
0.14	-0.030	0.8	1907
0.14	-0.030	0.9	2552
0.14	-0.035	0.8	1377
0.14	-0.035	0.9	1842
0.14	-0.040	0.8	1035
0.14	-0.040	0.9	1385
0.14	-0.045	0.8	803
0.14	-0.045	0.9	1075

The sample size was calculated for hypothetical randomized clinical trial with RRT as the primary endpoint and equal allocation of patients within on and off pump group. Sample sizes are summarized according to the combination of following scenarios based on the data in our cohort:

Proportion of RRT in on-pump group: 0.12, 0.13, 0.14
Risk reduction in off-pump group: -0.025 -0.03 -0.035 -0.04 -0.045
Power: 0.8, 0.9.

We provide the Table above as a reference. The number of patients required for an appropriately clinical trial could be substantially reduced by utilizing study entry criteria that enrich the test population for those patients at highest risk, thereby increasing the event rate and decreasing the requisite number of patients.

Appendix 2, Propensity Score Distribution

		Propensity score distribution				
GFR strata	Trt group	min	20th%	50th%	80th%	max
15-29	On-Pump	0.0579	0.177	0.240	0.325	0.876
	Intent-to-off pump	0.0917	0.209	0.292	0.408	0.814
30-59	On-Pump	0.0477	0.154	0.195	0.257	0.796
	Intent-to-off pump	0.0797	0.172	0.227	0.315	0.783
60-89	On-Pump	0.068	0.147	0.18165	0.241	0.756
	Intent-to-off pump	0.078	0.163	0.21245	0.303	0.799
≥90	On-Pump	0.0713	0.139	0.175	0.234	0.743
	Intent-to-off pump	0.0717	0.156	0.207	0.302	0.816

Appendix 3

The propensity models include each of the following variables: age, gender, race (white, black, Asian, and other), body surface area (BSA), left ventricular ejection fraction (EF), past or present smoker, hypertension, hypercholesterolemia, cerebrovascular disease, cerebrovascular accident, peripheral vascular disease, immunosuppressive treatment, chronic lung disease (severe, moderate, mild, none), diabetes (insulin, non-insulin, none), renal function (eGFR90-, eGFR60-89, eGFR 30-59, eGFR15-29), arrhythmia (atrial fibrillation, Sust VT/VF, Heart block), endocarditis (active, treated, none), angina (stable, unstable), history of myocardial infarction(<21 days, ≥21 says, none), percutaneous coronary intervention<=6 hr, pre-operative intra-aortic balloon pump or administration of inotropes, congestive heart failure (NYHA class IV, NYHA class I-III, no heart failure), left main disease, number diseased coronary vessels (0,1,2,3), aortic stenosis , mitral Stenosis , aortic insufficiency(moderate to severe), mitral insufficiency(moderate to severe), tricuspid insufficiency(moderate to severe), preoperative medications (Beta Blockers , Any Anticoagulants, ACE or ARB Inhibitors, steroid, lipid lowing) previous CABG, previous valve, previous PCI, number of previous cardiovascular interventions (0, 1, 2 or more), acuity status (urgent, elective), concomitant CABG, and year of surgery

Appendix 4. Characteristics of Patients at on- pump versus off-pump centers

Characteristics	Baseline		
	On-Pump Centers (n=265,497)	Off-Pump Centers (n=26,904)	Standardized Difference, %
Age, median (IQR)	65 (58, 73)	66 (58, 74)	6.2
Female, %	26.8	27.2	7.1
BSA, median (IQR)	2.0 (1.8, 2.2)	2.0 (1.8, 2.2)	8.8
Hypertension	82.3	81.7	0.2
Diabetes	38.0	37.4	4.9
CLD	21.9	20.7	
eGFR			
≥90	24.1	22.5	2.6
60-89	51.6	52.1	1.1
30-59	22.9	23.8	2.7
15-29	1.4	1.6	4.0
Prior CV Surgery	4.7	4.6	3.9
Pior MI	43.5	42.5	0.6
CHF	12.2	13.2	0.7
Ejection Fraction, median (IQR)	55 (45, 60)	55 (45, 60)	6.8
Left Main >50%	30.5	29.7	5.4
CAD, # vessels			
1	3.8	5.5	33.6
2	18.8	21.7	17.1
3	77.5	72.8	34.6
Procedure Status			
Elective	48.8	51.4	7.2
Urgent	51.2	48.5	7.2

Appendix 5. Unadjusted and adjusted risk difference between on-pump and off-pump centers for AVR+CABG procedures

	Unadjusted Risk Difference				Adjusted risk difference			
Event	**On-Pump Centers** %	**Off-Pump Centers** %	Risk Difference (95 CI)*	P-value	**On-Pump Centers** %	**Off-Pump Centers** %	Risk Difference (95 CI)*	P-value
Death or RRT	5.1	5.4	-0.30 (-1.22, 0.62)	0.51	5.1	8.0	-2.87 (-6.66, 0.93)	0.14
Death	3.8	4.0	-0.18 (-0.98, 0.61)	0.65	3.8	5.9	-2.10 (-5.51, 1.31)	0.23
RRT	2.4	2.3	0.10 (-0.52, 0.71)	0.76	2.4	2.8	-0.39 (-2.29, 1.50)	0.69

*:Number of patients with the outcome per 100 patients treated at centers with a preference for on-pump CABG minus the number of patients with the outcome per 100 patients treated at centers with a preference for off-pump CABG

Table 5, Summary of Previous Studies

Study	Total	Baseline CKD
	n	n (%)
Ascione et. al (1999)[1]	50	0(0)
Nathoe et. al. (2003)[2]	281	0(0)
Tang et al (2002)[3]	40	0(0)
Legare et al (2003)[4]	300	11(3.7)
Puskas et. al (2003) [5]	197	4(2)
Straka et. al (2004) [6]	388	3(0.8)
Khan et al (2004) [7]	104	0(0)
Gerola et al. (2004)[8]	160	0(0)
Wan et al (2004)[9]	37	0(0)
Staton et. al. (2005)[10]	197	0(0)
Jensen et. al. (2006)[11]	120	0(0)
Motallebzadeh et. al.(2006)[12]	210	0(0)
Sajja et. al. (2007)[13]	116	116(100)
Magee et. al. (2008)[14]	3014	67(2.2)
Paulitsch et. al. (2009)[15]	92	0(0)
Shroyer et al (2009) [16]	2203	173(7.9)
Hueb et. al. (2010)[17]	308	0(0)
Moller et. al. (2010)[18]	339	13(3.8)
Total	8156	387(4.7)

References

1. Ascione, R, Lloyd, CT, Underwood, MJ, Gomes, WJ, Angelini, GD: On-pump versus off-pump coronary revascularization: evaluation of renal function. *Ann Thorac Surg,* 68**:** 493-498, 1999.
2. Nathoe, HM, van Dijk, D, Jansen, EW, Suyker, WJ, Diephuis, JC, van Boven, WJ, de la Riviere, AB, Borst, C, Kalkman, CJ, Grobbee, DE, Buskens, E, de Jaegere, PP: A comparison of on-pump and off-pump coronary bypass surgery in low-risk patients. *N Engl J Med,* 348**:** 394-402, 2003.
3. Tang, AT, Knott, J, Nanson, J, Hsu, J, Haw, MP, Ohri, SK: A prospective randomized study to evaluate the renoprotective action of beating heart coronary surgery in low risk patients. *Eur J Cardiothorac Surg,* 22**:** 118-123, 2002.
4. Legare, JF, Buth, KJ, King, S, Wood, J, Sullivan, JA, Hancock Friesen, C, Lee, J, Stewart, K, Hirsch, GM: Coronary bypass surgery performed off pump does not result in lower in-hospital morbidity than coronary artery bypass grafting performed on pump. *Circulation,* 109**:** 887-892, 2004.
5. Puskas, JD, Williams, WH, Duke, PG, Staples, JR, Glas, KE, Marshall, JJ, Leimbach, M, Huber, P, Garas, S, Sammons, BH, McCall, SA, Petersen, RJ, Bailey, DE, Chu, H, Mahoney, EM, Weintraub, WS, Guyton, RA: Off-pump coronary artery bypass grafting provides complete revascularization with reduced myocardial injury, transfusion requirements, and length of stay: a prospective randomized comparison of two hundred unselected patients undergoing off-pump versus conventional coronary artery bypass grafting. *J Thorac Cardiovasc Surg,* 125**:** 797-808, 2003.
6. Straka, Z, Widimsky, P, Jirasek, K, Stros, P, Votava, J, Vanek, T, Brucek, P, Kolesar, M, Spacek, R: Off-pump versus on-pump coronary surgery: final results from a prospective randomized study PRAGUE-4. *Ann Thorac Surg,* 77**:** 789-793, 2004.
7. Khan, NE, De Souza, A, Mister, R, Flather, M, Clague, J, Davies, S, Collins, P, Wang, D, Sigwart, U, Pepper, J: A randomized comparison of off-pump and on-pump multivessel coronary-artery bypass surgery. *N Engl J Med,* 350**:** 21-28, 2004.
8. Gerola, LR, Buffolo, E, Jasbik, W, Botelho, B, Bosco, J, Brasil, LA, Branco, JN: Off-pump versus on-pump myocardial revascularization in low-risk patients with one or two vessel disease: perioperative results in a multicenter randomized controlled trial. *Ann Thorac Surg,* 77**:** 569-573, 2004.
9. Wan, IY, Arifi, AA, Wan, S, Yip, JH, Sihoe, AD, Thung, KH, Wong, EM, Yim, AP: Beating heart revascularization with or without cardiopulmonary bypass: evaluation of inflammatory response in a prospective randomized study. *J Thorac Cardiovasc Surg,* 127**:** 1624-1631, 2004.
10. Staton, GW, Williams, WH, Mahoney, EM, Hu, J, Chu, H, Duke, PG, Puskas, JD: Pulmonary outcomes of off-pump vs on-pump coronary artery bypass surgery in a randomized trial. *Chest,* 127**:** 892-901, 2005.
11. Jensen, BO, Hughes, P, Rasmussen, LS, Pedersen, PU, Steinbruchel, DA: Health-related quality of life following off-pump versus on-pump coronary artery bypass grafting in elderly moderate to high-risk patients: a randomized trial. *Eur J Cardiothorac Surg,* 30**:** 294-299, 2006.
12. Motallebzadeh, R, Bland, JM, Markus, HS, Kaski, JC, Jahangiri, M: Health-related quality of life outcome after on-pump versus off-pump coronary artery bypass graft surgery: a prospective randomized study. *Ann Thorac Surg,* 82**:** 615-619, 2006.

13. Sajja, LR, Mannam, G, Chakravarthi, RM, Sompalli, S, Naidu, SK, Somaraju, B, Penumatsa, RR: Coronary artery bypass grafting with or without cardiopulmonary bypass in patients with preoperative non-dialysis dependent renal insufficiency: a randomized study. *J Thorac Cardiovasc Surg,* 133**:** 378-388, 2007.
14. Magee, MJ, Alexander, JH, Hafley, G, Ferguson, TB, Jr., Gibson, CM, Harrington, RA, Peterson, ED, Califf, RM, Kouchoukos, NT, Herbert, MA, Mack, MJ: Coronary artery bypass graft failure after on-pump and off-pump coronary artery bypass: findings from PREVENT IV. *Ann Thorac Surg,* 85**:** 494-499; discussion 499-500, 2008.
15. Paulitsch, FS, Schneider, D, Sobel, BE, Rached, R, Ramires, J, Jatene, F, Stolf, N, Hueb, W, Lopes, NH: Hemostatic changes and clinical sequelae after on-pump compared with off-pump coronary artery bypass surgery: a prospective randomized study. *Coron Artery Dis,* 20**:** 100-105, 2009.
16. Shroyer, AL, Grover, FL, Hattler, B, Collins, JF, McDonald, GO, Kozora, E, Lucke, JC, Baltz, JH, Novitzky, D: On-pump versus off-pump coronary-artery bypass surgery. *N Engl J Med,* 361**:** 1827-1837, 2009.
17. Hueb, W, Lopes, NH, Pereira, AC, Hueb, AC, Soares, PR, Favarato, D, Vieira, RD, Lima, EG, Garzillo, CL, Paulitch Fda, S, Cesar, LA, Gersh, BJ, Ramires, JA: Five-year follow-up of a randomized comparison between off-pump and on-pump stable multivessel coronary artery bypass grafting. The MASS III Trial. *Circulation,* 122**:** S48-52, 2010.
18. Moller, CH, Perko, MJ, Lund, JT, Andersen, LW, Kelbaek, H, Madsen, JK, Winkel, P, Gluud, C, Steinbruchel, DA: No major differences in 30-day outcomes in high-risk patients randomized to off-pump versus on-pump coronary bypass surgery: the best bypass surgery trial. *Circulation,* 121**:** 498-504, 2010.