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Methods and formulas used to calculate the GRACE Risk Scores for patients presenting to hospital with an acute coronary syndrome:

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IN-HOSPITAL MODELS

1. 8 Granger reduced model estimates for hospital death
Arch Int Med, Oct 2003
(Can be used to estimate the probability of hospital death.)

2. Translation of 8 estimates into Granger risk score (nomogram)

3. How Granger risk score relates to probability of hospital death
(Note- probability computed directly from model estimates in #1 should be slightly more accurate, as a single score cannot completely replace 8 distinct factors.)

4. Risk score for in-hospital death or MI (nomogram)

POST DISCHARGE MODELS

5. 9 Eagle reduced model estimates for death in 6 months after discharge
JAMA, June 2004
(Can be used to estimate the probability of 6-month death.)

6. Translation of 9 estimates into Eagle risk score (nomogram)

7. Risk score for death or MI in 6 months after discharge (nomogram)

ADMISSION TO 6 MONTHS MODELS

8. Risk score for Fox prediction of death from admission to 6 months later (nomogram)
BMJ, Oct 2006

9. Risk score for Fox prediction of death or MI from admission to 6 months later (nomogram)

Granger Model for In-hospital Death

1. Model estimates from multiple logistic regression model

Intercept	-7.7035
AGE (per 1 yr)	0.0531
PULSE (per 1 BPM)	0.0087
SYSTOLIC BLOOD PRESSURE (per 1 mmHG)	-0.0168
INITIAL SERUM CREATININE, mg,dl	0.1823
KILLIP CLASS (1,2,3, or 4)	0.6931
CARDIAC ARREST at presentation*	1.4586
INITIAL CARDIAC ENZYME Positive*	0.4700
ST SEGMENT DEVIATION*	0.8755

* enter a value of 1 if factor is present, 0 otherwise.

To obtain estimated risk of death from above estimates
Compute XB, where X=individual patient's value for each factor (eg, age=57, pulse=70…), and B=estimates above, including the intercept.
XB is then the summed product of the patient characteristics times the estimates, with the intercept added for every patient.

For example, if a patient is age 57, pulse 70, SBP 110, creatinine 1.2, Killip class III, had cardiac arrest and ST deviation but not initial positive enzymes, XB is:

XB = -7.7035 + 57*.0531 + 70*.0087 - 110*.0168 + 1.2*.1823 + 3*.6931 + 1*1.4586 + 0*.47 + 1*.8755 (= -1.28364).

The probability of in-hospital death is then
P = (ExpXB)/(1 + exp**(XB))** (= .21693),
where exp is 2.71828…, and ** means raised to that power (XB power).

The SAS macro below illustrates this computation for a given patient

```
%macro xb(val1,val2,val3,val4,val5,val6,val7,val8);
data x;
 age=&val1;
 pulse=&val2;
 sbp=&val3;
 creat=&val4;
 killip=&val5;
 carrst=&val6;
 posinit=&val7;
 stchange=&val8;

 xb= -7.7035 + (0.0531*age) + (0.0087*pulse) - (0.0168*sbp) + (0.1823*creat) + (0.6931* killip) +
(1.4586*carrst) + (0.4700*posinit) + (0.8755*stchange);

 p=(exp(xb))/(1 + exp(xb));
run;
proc print data=x; run;
%mend xb;
%xb(val1=57,val2=70,val3=110,val4=1.2,val5=3,val6=1,val7=0,val8=1);
```

2. Nomogram translating Eight Granger Model estimates for in-hospital death into integer GRACE Risk Scores (see pg. 2351 of Granger article)

SAS code for obtaining risk score as in article

```
*****************************************
** Create data for HS Grace score       ***
*****************************************;
*** assign points as in nomogram for Granger ****;

* 1. Killip class I,II,III,IV;

if killip=1 then killips = 0;
else if killip=2 then killips = 20;
else if killip=3 then killips = 39;
else if killip=4 then killips = 59;

* 2. BPSYS is systolic blood pressure (mm Hg);
if  0 <=bpsys <  80 then sysbp2 = 58;
else if 80 <=bpsys < 100 then sysbp2 = 58 -(bpsys-80)*(10/20);
else if 100<=bpsys < 110 then sysbp2 = 48 -(bpsys-100)*(5/10);
else if 110<=bpsys < 120 then sysbp2 = 43 -(bpsys-110)*(4/10);
else if 120<=bpsys < 130 then sysbp2 = 39 -(bpsys-120)*(5/10);
else if 130<=bpsys < 140 then sysbp2 = 34 -(bpsys-130)*(5/10);
else if 140<=bpsys < 150 then sysbp2 = 29 -(bpsys-140)*(5/10);
else if 150<=bpsys < 160 then sysbp2 = 24 -(bpsys-150)*(5/10);
else if 160<=bpsys < 180 then sysbp2 = 19 -(bpsys-160)*(9/20);
else if 180<=bpsys < 200 then sysbp2 = 10 -(bpsys-180)*(10/20);
else if bpsys >=200 then sysbp2 = 0;

* 3. PULSE in beats/minute;
if  0 <=pulse < 50 then pulse2 = 0;
else if 50 <=pulse < 60 then pulse2 = 0  + (pulse-50)*(3/10);
else if 60 <=pulse < 70 then pulse2 = 3  + (pulse-60)*(3/10);
else if 70 <=pulse < 80 then pulse2 = 6  + (pulse-70)*(3/10);
else if 80 <=pulse < 90 then pulse2 = 9  + (pulse-80)*(3/10);
else if 90 <=pulse < 100 then pulse2 = 12 + (pulse-90)*(3/10);
else if 100<=pulse < 110 then pulse2 = 15 + (pulse-100)*(3/10);
else if 110<=pulse < 150 then pulse2 = 18 + (pulse-110)*(12/40);
else if 150<=pulse < 200 then pulse2 = 30 + (pulse-150)*(16/50);
else if pulse >=200 then pulse2 = 46;

* 4. AGE in years;
if  0 <=age < 30 then age2 = 0;
else if 30 <=age < 40 then age2 = 0  + (age-30)*(17/10);
else if 40 <=age < 50 then age2 = 17 + (age-40)*(16/10);
else if 50 <=age < 60 then age2 = 33 + (age-50)*(17/10);
else if 60 <=age < 70 then age2 = 50 + (age-60)*(17/10);
else if 70 <=age < 80 then age2 = 67 + (age-70)*(16/10);
else if 80 <=age < 90 then age2 = 83 + (age-80)*(17/10);
else if age >=90 then age2 = 100;

* 5. Creatinine in mg/dl;
if 0.0 <=creat_mg < 0.2 then crt2 = 0  + (creat_mg-0)*(1/.2);
else if 0.2 <=creat_mg < 0.4 then crt2 = 1  + (creat_mg-0.2)*(2/.2);
else if 0.4 <=creat_mg < 0.6 then crt2 = 3  + (creat_mg-0.4)*(1/.2);
```

```
else if 0.6 <=creat_mg < 0.8 then crt2 = 4  + (creat_mg-0.6)*(2/.2);
else if 0.8 <=creat_mg < 1.0 then crt2 = 6  + (creat_mg-0.8)*(1/.2);
else if 1.0 <=creat_mg < 1.2 then crt2 = 7  + (creat_mg-1.0)*(1/.2);
else if 1.2 <=creat_mg < 1.4 then crt2 = 8  + (creat_mg-1.2)*(2/.2);
else if 1.4 <=creat_mg < 1.6 then crt2 = 10 + (creat_mg-1.4)*(1/.2);
else if 1.6 <=creat_mg < 1.8 then crt2 = 11 + (creat_mg-1.6)*(2/.2);
else if 1.8 <=creat_mg < 2.0 then crt2 = 13 + (creat_mg-1.8)*(1/.2);
else if 2.0 <=creat_mg < 3.0 then crt2 = 14 + (creat_mg-2.0)*(7/1);
else if 3.0 <=creat_mg < 4.0 then crt2 = 21 + (creat_mg-3.0)*(7/1);
else if  creat_mg >=4.0 then crt2 = 28;

* 6. STCHANGE is ST deviation, assigned a value of 1 if present, 0 if absent;
* 7. POSINIT is positive initial cardiac enzymes (1 if present, 0 if absent);
* 8. CARRST is cardiac arrest on presentation (1 if present, 0 if absent);

* Risk score=sum of points for 8 factors;

Death_pt = killips + sysbp2 + pulse2 + age2 + crt2 + 28*stchange
+ 14*posinit + 39*carrst;
```

3. How GRACE Risk Scores Relate to Probability of In-hospital Death

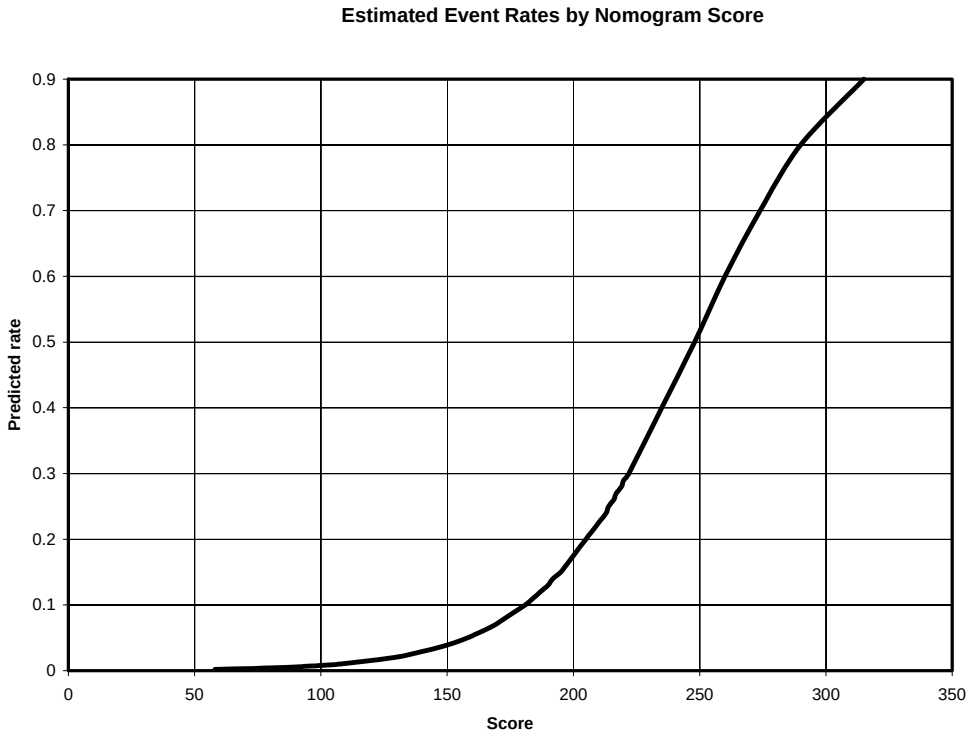

Table of selected individual scores by probability of in-hospital death
(Note- probability computed directly from model estimates in #1 should be slightly more accurate, as a single score cannot completely replace 8 distinct factors.)

Score	Probability	Score	Probability	Score	Probability
58	0.002	184	0.11	214	0.25
79	0.004	187	0.12	216	0.26
91	0.006	190	0.13	217	0.27
100	0.008	192	0.14	219	0.28
107	0.01	195	0.15	220	0.29
129	0.02	197	0.16	222	0.3
141	0.03	199	0.17	235	0.4
151	0.04	201	0.18	248	0.5
158	0.05	203	0.19	260	0.6
164	0.06	205	0.2	274	0.7
169	0.07	207	0.21	290	0.8
173	0.08	209	0.22	315	0.9
177	0.09	211	0.23		
181	0.1	213	0.24		

4. Nomogram for translating eight Granger risk factors into an in-hospital death/MI risk score (as used in Palm Pilot software available on GRACE website)

```
*****SAS code ******************************************************;  In hospital death/MI score (based on palm pilot);
* 1. AGE in years;
if  0 <=age < 30 then age3 = 0;
else if 30 <=age < 40 then age3 = 0  + (age-30)*(1.3);
else if 40 <=age < 50 then age3 = 13 + (age-40)*(1.4);
else if 50 <=age < 60 then age3 = 27 + (age-50)*(1.3);
else if 60 <=age < 70 then age3 = 40 + (age-60)*(1.4);
else if 70 <=age < 80 then age3 = 54 + (age-70)*(1.3);
else if 80 <=age < 90 then age3 = 67 + (age-80)*(1.3);
else if age >=90 then age3 = 80;

* 2. PULSE in beats/minute;
if  0 <=pulse < 50 then pulse3 = 0;
else if 50 <=pulse < 60 then pulse3 = 0  + (pulse-50)*(.3);
else if 60 <=pulse < 70 then pulse3 = 3  + (pulse-60)*(.2);
else if 70 <=pulse < 80 then pulse3 = 5  + (pulse-70)*(.3);
else if 80 <=pulse < 90 then pulse3 = 8  + (pulse-80)*(.3);
else if 90 <=pulse < 100 then pulse3 = 11 + (pulse-90)*(.3);
else if 100<=pulse < 110 then pulse3 = 14 + (pulse-100)*(.2);
else if 110<=pulse < 150 then pulse3 = 16 + (pulse-110)*(.3);
else if 150<=pulse < 200 then pulse3 = 28 + (pulse-150)*(.26);
else if pulse >=200 then pulse3 = 41;

* 3. BPSYS is systolic blood pressure (mm Hg);
if  0 <=sbp <  80 then sysbp3 = 53;
else if 80 <=sbp < 100 then sysbp3 = 53 -(sbp-80)*(.4);
else if 100<=sbp < 110 then sysbp3 = 45 -(sbp-100)*(.5);
else if 110<=sbp < 120 then sysbp3 = 40 -(sbp-110)*(.5);
else if 120<=sbp < 130 then sysbp3 = 35 -(sbp-120)*(.4);
else if 130<=sbp < 140 then sysbp3 = 31 -(sbp-130)*(.5);
else if 140<=sbp < 150 then sysbp3 = 26 -(sbp-140)*(.4);
else if 150<=sbp < 160 then sysbp3 = 22 -(sbp-150)*(.5);
else if 160<=sbp < 180 then sysbp3 = 17 -(sbp-160)*(.4);
else if 180<=sbp < 200 then sysbp3 = 9 -(sbp-180)*(.45);
else if sbp >=200 then sysbp3 = 0;

* 4. Creatinine in mg/dl (same points as for death score);
if 0.0 <=creat_mg < 0.2 then crt2 = 0  + (creat_mg-0)*(1/.2);
else if 0.2 <=creat_mg < 0.4 then crt2 = 1  + (creat_mg-0.2)*(2/.2);
else if 0.4 <=creat_mg < 0.6 then crt2 = 3  + (creat_mg-0.4)*(1/.2);
else if 0.6 <=creat_mg < 0.8 then crt2 = 4  + (creat_mg-0.6)*(2/.2);
else if 0.8 <=creat_mg < 1.0 then crt2 = 6  + (creat_mg-0.8)*(1/.2);
else if 1.0 <=creat_mg < 1.2 then crt2 = 7  + (creat_mg-1.0)*(1/.2);
else if 1.2 <=creat_mg < 1.4 then crt2 = 8  + (creat_mg-1.2)*(2/.2);
else if 1.4 <=creat_mg < 1.6 then crt2 = 10 + (creat_mg-1.4)*(1/.2);
else if 1.6 <=creat_mg < 1.8 then crt2 = 11 + (creat_mg-1.6)*(2/.2);
else if 1.8 <=creat_mg < 2.0 then crt2 = 13 + (creat_mg-1.8)*(1/.2);
else if 2.0 <=creat_mg < 3.0 then crt2 = 14 + (creat_mg-2.0)*(7/1);
else if 3.0 <=creat_mg < 4.0 then crt2 = 21 + (creat_mg-3.0)*(7/1);
else if creat_mg >=4.0 then crt2 = 28;
```

```
* 5. Killip class I,II,III,IV;
if killip=1 then killips3 = 0;
else if killip=2 then killips3 = 33;
else if killip=3 then killips3 = 67;
else if killip=4 then killips3 = 100;

* 6. CARRST is cardiac arrest on presentation (1 if present, 0 if absent);
* 7. POSINIT is positive initial cardiac enzymes (1 if present, 0 if absent);
* 8. STCHANGE is ST deviation, assigned a value of 1 if present, 0 if absent;

* Death/MI risk score=sum of points for 8 factors;
deathmi_pt = killips3 + sysbp3 + pulse3 + age3 + crt2 + 67*stchange + 54*posinit + 98*carrst;
```

How score relates to probability of in-hospital death or MI

Score	Prob	Score	Prob	Score	Prob
<30	2	173-180	13	241-245	24
30-56	3	181-187	14	246-250	25
57-78	4	188-194	15	251-254	26
79-95	5	195-201	16	255-259	27
96-110	6	202-207	17	260-263	28
111-123	7	208-213	18	264-268	29
124-135	8	214-219	19	269-308	30
136-145	9	220-224	20	309-344	40
146-155	10	225-230	21	345-381	50
156-164	11	231-235	22	382-421	60
165-172	12	236-240	23	422-470	70
				>470	80

Eagle Model Predicting Death within 6 Months after Hospital Discharge

5. Model estimates from multiple Cox regression model
Pg. 2730 of JAMA article

Base survival	0.99950
AGE (per 1 yr)	0.05713
PULSE (per 1 BPM)	0.00891
SYSTOLIC BLOOD PRESSURE (per 1 mmHG)	-0.00630
INITIAL SERUM CREATININE, mg,dl	0.15807
Positive initial enzymes (presentation)*	0.47321
ST SEGMENT DEPRESSION (presentation)*	0.36053
Past MI (determined at presentation)*	0.39271
Past CHF (determined at presentation)*	0.76678
In-hospital PCI*	-0.44618

* enter a value of 1 if factor is present, 0 otherwise.

To obtain estimated risk of 6 month post discharge death from above estimates
Compute XB, where X=individual patient's value for each factor (eg, age=57, pulse=70…), and B=estimates above, including the intercept.
XB is then the summed product of the patient characteristics times the estimates, with the intercept added for every patient.

For example, if a patient is age 57, pulse 70, SBP 110, creatinine 1.2, no positive initial enzymes, had ST depression, no past MI, past CHF, had in-hospital PCI, XB is:

XB = 57*.05713 + 70*.00891 - 110*.0063 + 1.2*.15807 + 0*.47321 + 1*0.36053 + 0*.39271 + 1*.76678 - 1*44618 (=4.05792).

The probability of 6 month post discharge death is then
P = 1 - baseline survival(Exp**XB)** (= .0285),
where base survival is .9995, exp is 2.71828…, and ** means raised to that power (so .9995 raised to the (2.71828 raised to the XB power)).

The SAS macro below illustrates this computation for a given patient

```
%macro prob(val1, val2, val3, val4, val5, val6, val7, val8, val9, val10);
data x;
 age=&val1; pulse=&val2; bpsys=&val3; creat=&val4; posinit=&val5;
 stdepr=&val6; mhmi=&val7; mhchf=&val8; nopci=&val9; basesurv=&val10;

 Xbeta = (age* 0.05713) + (pulse* 0.00891) - (bpsys* 0.0063) +
       (creat* 0.15807) + (posinit* 0.47321) + (stdepr* 0.36053) +
       (mhmi* 0.39271)+ (mhchf* 0.76678) - (pci*0.44618);
 exbeta=exp(xbeta);
 cumsurv=basesurv**exbeta;
 p=1-cumsurv;
run;
proc print data=x; run;
%mend prob;

%prob(val1=57, val2=70, val3=110, val4=1.2, val5=0, val6=1, val7=0, val8=1, val9=1, val10=.9995);
```

6. Nomogram translating nine Eagle Model estimates for death within the 6 months after discharge into GRACE Risk Score integers

(see pg. 2731 of 2004 JAMA article)

SAS code for obtaining risk score as in article

```
* 1. Age in years;
if  0 <=age < 35 then age_sc = 0;
else if 35 <=age < 45 then age_sc = 0  + (age-35)*((18-0)/10);
else if 45 <=age < 55 then age_sc = 18 + (age-45)*((36-18)/10);
else if 55 <=age < 65 then age_sc = 36 + (age-55)*((55-36)/10);
else if 65 <=age < 75 then age_sc = 55 + (age-65)*((73-55)/10);
else if 75 <=age < 85 then age_sc = 73 + (age-75)*((91-73)/10);
else if 85 <=age < 90 then age_sc = 91 + (age-85)*((100-91)/5);
else if age >=90 then age_sc = 100;

* 2. Pulse at presentation, in beats/minute;
if  0 <= pulse < 50 then pulse_sc = 0;
else if 50 <= pulse < 60 then pulse_sc= 0 + (pulse-50)*((3-0)/10);
else if 60 <= pulse < 80 then pulse_sc= 3 + (pulse-60)*((9-3)/20);
else if 80 <= pulse < 100 then pulse_sc= 9 + (pulse-80)*((14-9)/20);
else if 100 <= pulse < 130 then pulse_sc= 14 + (pulse-100)*((23-14)/30);
else if 130 <= pulse < 175 then pulse_sc= 23 + (pulse-130)*((35-23)/45);
else if 175 <= pulse < 200 then pulse_sc= 35 + (pulse-175)*((43-35)/25);
else if  pulse >=200 then pulse_sc= 43;

* 3. Systolic blood pressure at presentation, in mm Hg;
if  0 <=bpsys< 80 then sbp_sc =   24;
else if 80 <=bpsys< 90 then sbp_sc =   24 - (bpsys-80)*((24-22)/10);
else if 90 <=bpsys< 110 then sbp_sc =  22 - (bpsys-90)*((22-18)/20);
else if 110 <=bpsys< 130 then sbp_sc = 18 - (bpsys-110)*((18-14)/20);
else if 130 <=bpsys< 150 then sbp_sc = 14 - (bpsys-130)*((14-10)/20);
else if 150 <=bpsys< 180 then sbp_sc = 10 - (bpsys-150)*((10-4)/30);
else if 180 <=bpsys< 200 then sbp_sc =  4 - (bpsys-180)*((4-0)/20);
else if bpsys>=200 then sbp_sc =  0;

* 4. Initial creatinine in mg/dL;
 if   0 <= creat < 0.2 then creat_sc = 0 + (creat-0.0)*((1-0)/0.2);
else if 0.2 <= creat < 0.4 then creat_sc = 1 + (creat-0.2)*((2-1)/0.2);
else if 0.4 <= creat < 0.6 then creat_sc = 2 + (creat-0.4)*((3-2)/0.2);
else if 0.6 <= creat < 0.8 then creat_sc = 3 + (creat-0.6)*((4-3)/0.2);
else if 0.8 <= creat < 1.0 then creat_sc = 4 + (creat-0.8)*((5-4)/0.2);
else if 1.0 <= creat < 1.2 then creat_sc = 5 + (creat-1.0)*((6-5)/0.2);
else if 1.2 <= creat < 1.4 then creat_sc = 6 + (creat-1.2)*((7-6)/0.2);
else if 1.4 <= creat < 1.6 then creat_sc = 7 + (creat-1.4)*((8-7)/0.2);
else if 1.6 <= creat < 1.8 then creat_sc = 8 + (creat-1.6)*((9-8)/0.2);
else if 1.8 <= creat < 2.0 then creat_sc = 9 + (creat-1.8)*((10-9)/0.2);
else if 2.0 <= creat < 3.0 then creat_sc = 10+ (creat-2.0)*((15-10)/1.0);
else if 3.0 <= creat < 4.0 then creat_sc = 15+ (creat-3.0)*((20-15)/1.0);
else if creat >=4.0 then creat_sc = 20;

* for 5-8, code 0 if absent, 1 if present;
* 5. POSINIT is initial elevated serum cardiac biomarkers;
* 6. STDEPR is ST-segment depression on initial ECG;
* 7. MHMI   is history of MI (as of hospital admission);
```

* 8. MHCHF is history of CHF (as of hospital admission);
*** 9. NOPCI** is PCI performed in hospital **(code 1=no PCI, 0=PCI);**
* Risk score=sum of points for 9 factors;

*** equation;
escore = age_sc + pulse_sc + sbp_sc + creat_sc + **15***posinit
+ **11***stdepr + **12***mhmi + **24***mhchf + **14***nopci;

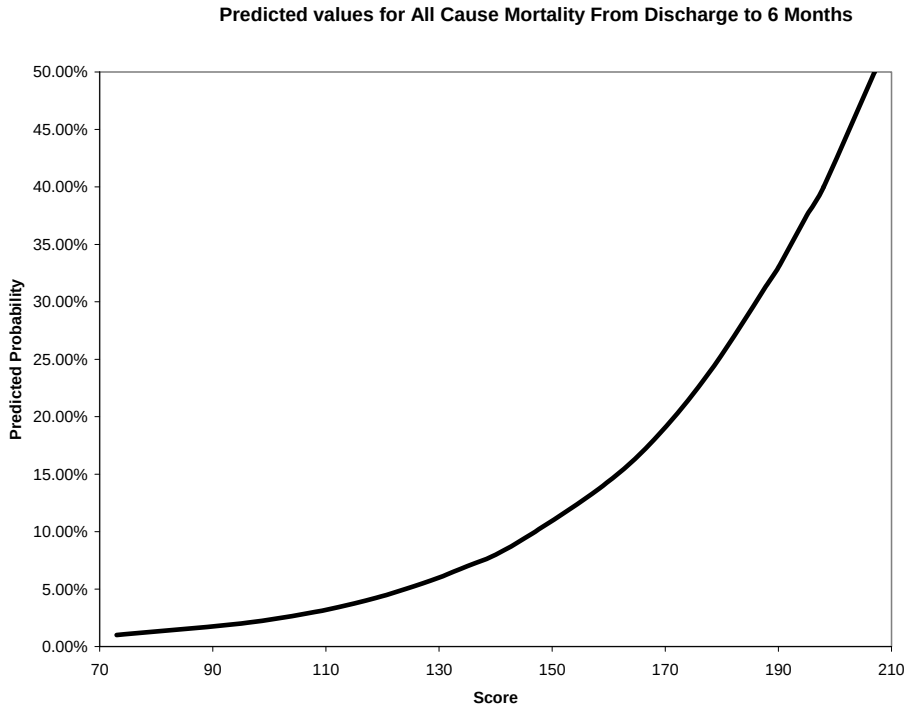

Table of selected individual scores by probability of 6 month death
(Note- probability computed directly from model estimates in section #5 should be slightly more accurate, as a single score cannot completely replace 8 distinct factors.)

Score	Probability	Score	Probability	Score	Probability
73	1.00%	135	7.00%	188	31.50%
95	2.00%	140	8.00%	190	33.00%
108	3.00%	147	10.00%	195	37.50%
117	4.00%	159	14.00%	198	40.00%
124	5.00%	168	18.00%	207	50.00%
130	6.00%	178	24.00%	216	60.00%
				225	70.00%

7. Nomogram translating five risk factors for post discharge death/MI into GRACE Risk Scores (as used in Palm Pilot program)

```
/*********************************************************************
   Risk score for 6 mo post discharge death or MI-  5 factors. This score ignores 5 death model factors:
pulse, sys BP, creatinine, PCI, and ST depression, and introduces in-hospital CABG.
*********************************************************************/

* 1. Age in years;
if  0 <=age < 35 then age_sc = 0;
else if 35 <=age < 45 then age_sc = 0  + (age-35)*((18-0)/10);
else if 45 <=age < 55 then age_sc = 18 + (age-45)*((36-18)/10);
else if 55 <=age < 65 then age_sc = 36 + (age-55)*((55-36)/10);
else if 65 <=age < 75 then age_sc = 55 + (age-65)*((73-55)/10);
else if 75 <=age < 85 then age_sc = 73 + (age-75)*((91-73)/10);
else if 85 <=age < 90 then age_sc = 91 + (age-85)*((100-91)/5);
else if age >=90 then age_sc = 100;

* 2-4 are coded 1=present, 0=absent;
* 2. POSINIT is initial elevated serum cardiac biomarkers;
* 3. MHMI    is history of MI (as of hospital admission);
* 4. CHF     is past CHF or CHF developed in the hospital;
* 5. NOCABG  is CABG performed in the hospital (1=no CABG 0=CABG);
if chfpe=1 or mhchf=1 then chf=1;
if chfpe=0 and mhchf=0 then chf=0;

if cabg=1 then nocabg=0;
if cabg=0 then nocabg=1;

dthmi_pt= age_sc + 22*posinit + 29*mhmi + 72*chf + 36*nocabg;
```

How risk score for 6-month death/MI relates to probability of 6-month death/MI (from Palm Pilot software)

Please NOTE:
Because the death/MI score ignores 5 factors in the death model, it's possible the death probability > death/MI prob based on solely on score. In such cases, the death/MI prob is made > death prob, since it's illogical to have the combined death/MI prob. be < death prob.

Score	Prob*	Score	Prob*	Score	Prob*
<6	0	148-153	10	194-196	22
6-19	0.6	154-157	11	197-199	23
20-30	0.8	158-162	12	200-201	24
31-64	1	163-166	13	202-204	25
65-85	2	167-170	14	205-206	26
86-99	3	171-174	15	207-209	27
100-111	4	175-177	16	210-211	28
112-120	5	178-181	17	212-214	29
121-128	6	182-184	18	215-235	30
129-135	7	185-187	19	236-255	40
136-142	8	188-190	20	>255	50
143-147	9	191-193	21		

* Must be > prob of death alone (see note above)

Fox Model for Death between Hospital Admission and 6 months later

8. Nomogram for risk score for death from admission to 6 months later
(as used in Palm Pilot software)

Although the published paper (BMJ 2006) mentions 9 reduced model factors, the palm pilot uses the 8 Granger factors

```
* 1. AGE in years;
if  0 <=age < 35 then age2 = 0;
else if 35 <=age < 45 then age2 = 0  + (age-35)*(1.8);
else if 45 <=age < 55 then age2 = 18 + (age-45)*(1.8);
else if 55 <=age < 65 then age2 = 36 + (age-55)*(1.8);
else if 65 <=age < 75 then age2 = 54 + (age-65)*(1.9);
else if 75 <=age < 85 then age2 = 73 + (age-75)*(1.8);
else if 85 <=age < 90 then age2 = 91 + (age-85)*(1.8);
else if age >=90 then age2 = 100;

* 2. PULSE in beats/minute;
if  0 <=pulse < 70 then pulse2 = 0;
else if 70 <=pulse < 80 then pulse2 = 0  + (pulse-70)*(.3);
else if 80 <=pulse < 90 then pulse2 = 3  + (pulse-80)*(.2);
else if 90 <=pulse < 100 then pulse2 = 5 + (pulse-90)*(.3);
else if 100<=pulse < 110 then pulse2 = 8 + (pulse-100)*(.2);
else if 110<=pulse < 150 then pulse2 = 10 + (pulse-110)*(.3);
else if 150<=pulse < 200 then pulse2 = 22 + (pulse-150)*(.3);
else if pulse >=200 then pulse2 = 34;

* 3. BPSYS is systolic blood pressure (mm Hg);
if  0 <=sbp <  80 then sysbp2 = 40;
else if 80 <=sbp < 100 then sysbp2 = 40 -(sbp-80)*(.3);
else if 100<=sbp < 110 then sysbp2 = 34 -(sbp-100)*(.3);
else if 110<=sbp < 120 then sysbp2 = 31 -(sbp-110)*(.4);
else if 120<=sbp < 130 then sysbp2 = 27 -(sbp-120)*(.3);
else if 130<=sbp < 140 then sysbp2 = 24 -(sbp-130)*(.3);
else if 140<=sbp < 150 then sysbp2 = 20 -(sbp-140)*(.4);
else if 150<=sbp < 160 then sysbp2 = 17 -(sbp-150)*(.3);
else if 160<=sbp < 180 then sysbp2 = 14 -(sbp-160)*(.3);
else if 180<=sbp < 200 then sysbp2 = 8 -(sbp-180)*(.4);
else if sbp >=200 then sysbp2 = 0;

* 4. Creatinine in mg/dl;
if 0.0 <=creat < 0.2 then crt2 = 0  + (creat-0)*(1/.2);
else if 0.2 <=creat < 0.4 then crt2 = 1  + (creat-0.2)*(2/.2);
else if 0.4 <=creat < 0.6 then crt2 = 3  + (creat-0.4)*(1/.2);
else if 0.6 <=creat < 0.8 then crt2 = 4  + (creat-0.6)*(2/.2);
else if 0.8 <=creat < 1.0 then crt2 = 6  + (creat-0.8)*(1/.2);
else if 1.0 <=creat < 1.2 then crt2 = 7  + (creat-1.0)*(1/.2);
else if 1.2 <=creat < 1.4 then crt2 = 8  + (creat-1.2)*(2/.2);
else if 1.4 <=creat < 1.6 then crt2 = 10 + (creat-1.4)*(1/.2);
else if 1.6 <=creat < 1.8 then crt2 = 11 + (creat-1.6)*(2/.2);
else if 1.8 <=creat < 2.0 then crt2 = 13 + (creat-1.8)*(1/.2);
else if 2.0 <=creat < 3.0 then crt2 = 14 + (creat-2.0)*(7/1);
else if 3.0 <=creat < 4.0 then crt2 = 21 + (creat-3.0)*(7/1);
else if creat >=4.0 then crt2 = 28;
```

```
* 5. Killip class I,II,III,IV;
 if killip=1 then killips = 0;
else if killip=2 then killips = 15;
else if killip=3 then killips = 29;
else if killip=4 then killips = 44;

* 6. CARRST is cardiac arrest on presentation (1 if present, 0 if absent);
* 7. POSINIT is positive initial cardiac enzymes (1 if present, 0 if absent);
* 8. STCHANGE is ST deviation, assigned a value of 1 if present, 0 if absent;

* Death risk score=sum of points for 8 factors;
deatha6_pt = killips + sysbp2 + pulse2 + age2 + crt2 + 17*stchange + 13*posinit + 30*carrst;
```

How score relates to probability of death between admission and 6 months later

Score	Prob	Score	Prob	Score	Prob
6	0.2	132	12	174	40
27	0.4	134	13	183	50
39	0.6	137	14	191	60
48	0.8	139	15	200	70
55	1.0	141	16	208	80
60	1.2	143	17	219	90
65	1.4	145	18	285	99
69	1.6	147	19		
73	1.8	149	20		
76	2	150	21		
88	3	152	22		
97	4	153	23		
104	5	155	24		
110	6	156	25		
115	7	158	26		
119	8	159	27		
123	9	160	28		
126	10	162	29		
129	11	163	30		

9. Nomogram for Risk Score for Death or MI from Admission to 6 Months later (as used in Palm Pilot software) (pulse is not used)

```
* 1. AGE in years;
if  0 <=age < 35 then age2 = 0;
else if 35 <=age < 45 then age2 = 0  + (age-35)*(1.8);
else if 45 <=age < 55 then age2 = 18 + (age-45)*(1.8);
else if 55 <=age < 65 then age2 = 36 + (age-55)*(1.8);
else if 65 <=age < 75 then age2 = 54 + (age-65)*(1.9);
else if 75 <=age < 85 then age2 = 73 + (age-75)*(1.8);
else if 85 <=age < 90 then age2 = 91 + (age-85)*(1.8);
else if age >=90 then age2 = 100;

* 3. BPSYS is systolic blood pressure (mm Hg);
if  0 <=sbp <  80 then sysbp3 = 54;
else if 80 <=sbp < 200 then sysbp3 = 54 -(sbp-80)*(.45);
else if sbp >=200 then sysbp3 = 0;

* 4. Creatinine in mg/dl;
if 0.0 <=creat < 3.0 then crt3 = 0  + (creat-0)*(10);
else if 3.0 <=creat < 4.0 then crt3 = 30 + (creat-3.0)*(11);
else if creat >=4.0 then crt3 = 41;

* 5. Killip class I,II,III,IV;
if killip=1 then killips3 = 0;
else if killip=2 then killips3 = 27;
else if killip=3 then killips3 = 55;
else if killip=4 then killips3 = 82;

* Death/MI risk score=sum of points for 7 factors (pulse not used);
deathmia6_pt = killips3 + sysbp3 + age2 + crt3 + 39*stchange + 41*posinit + 66*carrst;
```

How score relates to probability of death/MI between admission and 6 months later

Note- if probability of death/MI based on score is less than prob of death alone, score is ignored and prob of death/MI is made > prob of death

Score	Prob*	Score	Prob*	Score	Prob*
2	4	105	14	232	50
20	5	114	15	242	50
38	6	122	17	260	60
46	6	132	19	271	70
50	7	141	21	287	70
55	7	148	23	296	80
67	8	165	27	309	80
74	9	168	28	327	90
77	10	187	34		
86	11	196	38		
96	12	205	40		
104	13	223	40		

* Must be > probability of death alone (see note above)