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/*************************************************************************
                  ApacheII  Macro
                              Predicted Death Rates based on APACHE II

Modified by Kendiss Olafson October 2005 to convert into the new codes

Last modified by Julie: April 17, 2007 with additional diagnostic codes

*************************************************************************/;

%macro apacheII;

data apa; set mod.apache(keep=study es);
run;

proc sort data=apa; by study;
run;

* ASSIGN NONOPERATIVE AND POSTOPERATIVE PATIENTS;
Data apadx; set mod.reg(keep=study from type adm1-adm6 apache cm1-cm6);
run;

proc sort data=apadx; by study;
run;

data apadx; merge apadx apa;
  by study;

  prevLOC = substr(FROM,2,1);
  IF prevLOC = 'P' OR (prevloc = 'R' AND type = 'S') then postop = 1;
  else postop = 0;
  IF Postop=1 AND ES = 'N' then EmergSurg = 1;
  else Emergsurg = 0;

  ** ASSIGN PRINCIPAL DIAGNOSTIC CATEGORIES;

  index1=0;index2=0;index3=0;index4=0;index5=0;index6=0;

        ARRAY ndex{6} index1 --index6;
        ARRAY prindx{6} adm1 -- adm6;

*       DEFINE ASPIR/POISON;
        aspir=0;poison=0;

            Do g = 1 to 6;
                IF 450 LE prindx{g} LE 499.9
                                THEN poison=1;
                  IF prindx{g} IN (36.59,37.59, 38.59, 39.59,2)
                                THEN aspir=1;
        End;
        asppoi= aspir + poison*2;

*           DEFINE Cancer and Cabg;
            ca = 0; cabg = 0;
            Do h = 1 to 6;
                  if  700 le prindx{h} le 749.9
                                        THEN ca = 1;
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                If prindx{h} in (750, 750.01, 750.02)
                                        THEN cabg = 1;
          END;
*

/*****          NONOPERATIVE PATIENTS           *****/;

iF postop=0 THEN DO;
      DO i = 1 to 6;
          *resp failure from ca;
          If prindx{i} in (23.06, 28.02,30.07,30.15)
              THEN ndex{i}=29;
          *dissecting thoracic/abdominal aneurysm;
          ELSE iF 127 <= prindx{i} AND prindx{i} <=127.9
              THEN ndex{i}=28;
          *SDH/epidural/intracerebral/SAH/brainstem bleed;
          ELSE iF prindx{i}in (500, 500.01, 501, 502, 502.01, 502.03, 502.04, 502.05,
502.9, 503,
                              503.01, 503.9, 504, 504.01, 504.02, 504.9)
              THEN ndex{i}=27;
          *hypovolemic/hemorrhagic shock;
          ELSE iF prindx{i} iN (136,136.01,136.02,136.03,136.04,136.05,136.06,
136.07,136.9)
              THEN ndex{i}=25;
          *cardiac arrest;
          ELSE iF prindx{i} iN (100,100.01,100.02, 130.01, 130.02, 131.04)
              THEN ndex{i}=23;
          *gi bleeding;
          ELSE iF 401 <= prindx{i} AND prindx{i} <= 402.9
                    THEN ndex{i}=22;
          *sepsis;
          ELSE iF (44 le prindx{i} le 46.91) OR (prindx{i} in (89, 90))
                    THEN ndex{i}=21;
          *respiratory infection;
          ELSE iF (36 le prindx{i} le 39.91) OR (prindx{i} in
(36.59,37.59,38.59,39.59)AND poison=0)
              THEN ndex{i}=20;
          *pulmonary embolism;
          ELSE iF 13 le prindx{i} le 13.9
              THEN ndex{i}=19;
          *aspiration/poisoning;
          ELSE iF asppoi=3
              THEN ndex{i}=18;
          *respiratory arrest;
        ELSE iF prindx{i}=100.03
              THEN ndex{i}=17;
          *coronary artery disease=Mi,ischemic cardio-m,unstable angina,acute coronary
              insufficiency,post-infarct angina;
        ELSE iF (102 le prindx{i}le 102.1) OR (prindx{i}iN (104.01, 151, 152, 155))
              THEN ndex{i}=16;
          *non-cardiogenic pulmonary edema;
        ELSE iF prindx{i}=2
              THEN ndex{i}=15;
          *cardiogenic shock;
        ELSE iF prindx{i} iN (101,101.01,101.02,101.03,101.04,101.05,101.06,101.08,
101.9)
              THEN ndex{i}=14;
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            *resp failure from COPD;
          ELSE iF prindx{i}iN (3, 8)
                THEN ndex{i}=13;
            *congestive heart failure;
          ELSE iF prindx{i} iN (103,103.01,103.02,103.03,103.04,103.05,103.06,103.07,
103.9)
                THEN ndex{i}=12;
            *head trauma=concussion,contusion,sub-dural,skull#,SAH,brainstem
bleed,epidural;
          ELSE iF prindx{i} iN (505.03, 508.04) OR (600 le prindx{i} le 600.1)
                               OR (602 le prindx{i} le 602.1)OR (647 le prindx{i} le
647.1)
                               OR (605 le prindx{i} le 605.1)OR (648 le prindx{i} le
648.1)
                               OR (654 le prindx{i} le 654.1)
                THEN ndex{i}=11;
      *seizure disorder;
          ELSE iF prindx{i} iN (509,509.02,509.03,509.04,509.05,509.07,508.08,509.09,
                509.1,509.11,509.12,509.13,509.9)
                THEN ndex{i}=10;
      *multiple trauma;
          ELSE iF 600  LE prindx{i} LE 699
                THEN ndex{i}=6;
      *rhythm disturbance;
          ELSE iF prindx{i} iN (130,130.03,130.04, 130.05,130.9,131,131.01,131.02,
                131.03,131.9,131.97)
                THEN ndex{i}=5;
      *dka;
          ELSE iF prindx{i}=301
                THEN ndex{i}=4;
      *hypertension;
          ELSE iF prindx{i}iN (199.19, 124, 124.9)
                THEN ndex{i}=3;
      *asthma;
          ELSE iF prindx{i} iN (6,6.9)
                THEN ndex{i}=2;
      *drug overdose;
          ELSE iF 450 LE prindx{i} LE 499.90
                THEN ndex{i}=1;
      *Gi NOS;
          ELSE iF 400 LE prindx{i} LE 449.9
                THEN ndex{i}=26;
      *cardiovascular NOS;
          ELSE iF (40 LE prindx{i} LE 43.91) OR (104 LE prindx{i} LE 126) OR
                        (132 LE prindx{i} LE 134.9) OR (140 le prindx{i} le 141)
                        OR (766 le prindx{i} le 766.01)
                THEN ndex{i}=24;
      *neuro NOS;
          ELSE iF (77 LE prindx{i} LE 80.91)OR (514 LE prindx{i} LE 599.04)
                OR (599.06 LE prindx{i} LE 599.94)OR prindx{i} iN (25, 25.01, 505,
505.01, 505.04,
                        505.06, 505.07. 505.08, 505.9, 506, 507, 507.9, 508, 508.01,
508.03, 508.05, 508.9)
                THEN ndex{i}=9;
      *metabolic/renal NOS;
          ELSE iF (51 le prindx{i} le 56.91) OR (302 le prindx{i} le 399.9)
                THEN ndex{i}=8;
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      *respiratory NOS;
         /* ELSE iF 1 LE prindx{i} LE 99.9 old*/
                  ELSE iF (9 LE prindx{i} LE 11.9) OR (14 le prindx{i} le 23.04) OR
                              (23.07 LE prindx{i} LE 23.9) OR (28.03 le prindx{i} le
30.06) OR
                              (30.08 LE prindx{i} LE 30.14) OR (30.16 le prindx{i} le
35.59) OR
                              prindx{i} in (4, 4.01, 5, 7, 26, 26.03, 27, 28)
               THEN ndex{i}=7;

      END;
END;

/***********    POST-OPERATIVE PATIENTS         ********/
ELSE IF postop=1 THEN DO;
      Do j = 1 to 6;
            *cardiac arrest;
            IF prindx{j} IN (100,100.01,100.02, 130.01, 130.02, 131.04)
                THEN ndex{j}=30;
            *sepsis;
            ELSE IF (44 le prindx{j} le 46.91) or prindx{j}in (89,90)
                        THEN ndex{j}=31;
            *GI perforation or obstruction;
                  Else if (69 le prindx{j} le 71.91) or  prindx{j} in (794.12, 418)
                        Then ndex{j} =32;
            *Resp Insufficiency post-op;
                  Else if (24 le prindx{j} le 24.9) OR (38 le prindx{j} le 38.91) OR
                        prindx{j} in  (26.01, 100.03)
                        Then ndex{j} = 33;
            *GI surgery for neoplasm;
                  Else if ca = 1 AND (prindx{j} in (784, 784.9, 785, 785.9, 786, 786.9,
787, 787.9, 788, 788.9,
                  789, 789.9, 790, 790.9, 791, 791.9, 792, 792.9, 793, 793.9, 794.03,
796, 796.9, 813, 813.9))
                        Then ndex{j} = 35;
            *gi bleeding;
            ELSE IF (401 le prindx{j} le 402.9) OR prindx{j} IN (794.15, 449.22)
                THEN ndex{j}=38;
            *hypovolemic/hemorrhagic shock;
            ELSE IF prindx{j} IN (136,136.01,136.02,136.03,136.04,136.05,136.06,
                136.07,136.9)
                THEN ndex{j}=39;
            *Laminectormy and other spinal surgery;
                  ELSE IF prindx{j} IN (830, 830.9, 831.02, 831.08)
                        THEN ndex{j} = 40;
            *Craniotomy for ICH/SDH/SAH;
                  ELSE if (601 le prindx{j} le 601.1) OR (603 le prindx{j} le 604.1) OR
                        (653 le prindx{j} le 653.1) OR
                  prindx{j} IN (828.03, 828.05, 828.06, 828.08, 828.12, 502.02, 503.02)
                        THEN ndex{j} = 41;
            *Thoracic surgery for neoplasm;
                  ELSE if ca = 1 AND ((769 le prindx{j}le 774) OR  prindx{j}IN (776,
777.01))
                        THEN ndex{j} = 43;
            *Head trauma;
                  ELSE if (prindx{j} ge 600 AND prindx{j} le 605.9)
                  OR (prindx{j} ge 648 AND prindx{j} le 648.9)
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                  OR (prindx{j} ge 653 AND prindx{j} le 654.9)
                        THEN ndex{j} = 44;
            *Renal transplant;
                  ELSE if prindx{j} in (805, 805.01, 805.02, 805.03)
                        then ndex{j} = 45;
            *Craniotomy for neoplasm;
                  ELSE if ca = 1 AND prindx{j} in (828.02, 828.13, 828.9)
                        then ndex{j} = 47;
            *Renal surgery for neoplasm;
                  ELSE if (ca = 1 and prindx{j} in (801.02, 801, 801.9)) OR prindx{j} =
801.02
                        then ndex{j} = 48;
            *Heart Valve Surgery;
                  ELSE if (751 le prindx{j} le 752.9)
                        OR prindx{j}in (754, 754.01, 754.02, 755, 758, 758,01, 758.02,
768)
                        THEN ndex{j} = 49;
            *Peripheral vascular surgery;
                  ELSE if (753 le prindx{j} le 753.9) OR (760 le prindx{j} le 760.9) OR
                        prindx{j} IN (156, 156.01, 756, 757, 763.04, 763.07, 763.09,
763.22)
                        THEN ndex{j} = 50;

            *Multiple Trauma;
                  Else if 600 le prindx{j} le 661.9
                        THEN ndex{j} = 52;
            *metabolic/renal NOS;
            ELSE IF (301 LE prindx{j} LE 399.9) OR (54 le prindx{j} le 56.91)
                THEN ndex{j}=34;
            *respiratory NOS;
                  ELSE IF (2 LE prindx{j} LE 23.9) OR (27 LE prindx{j} LE 37.97) OR
                        (prindx{j} IN (26, 26.01, 26.03, 781, 781.01, 781.02))
                THEN ndex{j}=36;
            *GI NOS;
            ELSE IF (57 LE prindx{j} LE 68.97) OR (72 LE prindx{j} LE 76.97)
                        OR (400 LE prindx{j} LE 449.97)
                THEN ndex{j}=37;
            *cardiovascular NOS;
            ELSE IF (101 LE prindx{j} LE 134.9) OR prindx{j} IN (140, 141, 151, 152, 155,
898, 24.12)
                THEN ndex{j}=42;
            *neuro NOS;
            ELSE IF (500 LE prindx{j} LE 599.9)
                OR prindx{j} IN (209,852, 25, 25.01)
                THEN ndex{j}=46;

      END;
END;

drop g h i j;

index = 0;
IF index1 > 0 then index = index1;
      else if index2 > 0 then index = index2;
      else if index3 > 0 then index = index3;
      else if index4 > 0 then index = index4;
      else if index5 > 0 then index = index5;
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      else if index6 > 0 then index = index6;
*Admission due to chronic CV - NEED TO STILL DEFINE;
IF postop =1 AND index = 0 THEN DO;
      ARRAY CM{6}  CM1 CM2 CM3 CM4 CM5 CM6;
      Do k = 1 to 6;
      IF CM{k} IN (151, 152, 158, 102, 103, 104, 130, 131, 128, 766) THEN index = 51;
      END;
END;
drop k;

run;

Data apadx;
      set apadx;

      array xs {52} w1-w52;
      do i=1 to 52;
          if index=i then xs{i}=1; else xs{i}=0;
    end;

      APA= -3.517 + (apache*0.146) + (0.603 * Emergsurg)
       - (w1*3.353)  - (w2*2.108)  - (w3*1.798)  - (w4*1.507)  - (w5*1.368)
         - (w6*1.228)  - (w7*0.890)  - (w8*0.885)  - (w9*0.759)  - (w10*0.584)
       - (w11*0.517) - (w12*0.424) - (w13*0.367) - (w14*0.259) - (w15*0.251)
       - (w16*0.191) - (w17*0.168) - (w18*0.142) - (w19*0.128) - (w20*0.0)
         + (w21*0.113) + (w22*0.334) + (w23*0.393) + (w24*0.470) + (w25*0.493)
       + (w26*0.501) + (w27*0.723) + (w28*0.731) + (w29*0.891) + (w30*0.393)
            + (w31*0.113) + (w32*0.060) - (w33*0.140) - (w34*0.196) - (w35*0.248)
            - (w36*0.610) - (w37*0.613) - (w38*0.248) - (w39*0.682) - (w40*0.699)
            - (w41*1.245) - (w42*0.797) - (w43*0.802) - (w44*0.955) - (w45*1.042)
            - (w46*1.150) - (w47*1.245) - (w48*1.204) - (w49*1.261) - (w50*1.315)
            - (w51*1.376) - (w52*1.684);

      expAPA=exp(APA);
      PredMort= expAPA / ( 1+ expAPA);

drop i;

      keep study index APA expAPA PredMort;
run;

proc sort data=apadx out=mod.apadx;
  by study;
run;


proc freq data=apadx order=freq;
  table index /list;
run;



%mend apacheII;

%apacheII;
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