# Sharing Experiences; How to Analysis Data from KORMI/KAMIR

## (SPSS를 활용한 방법론)

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**KSC 2015 춘계학회, 부산**

**April 17, 2015**

# Kamir/Kormi 연구 배경

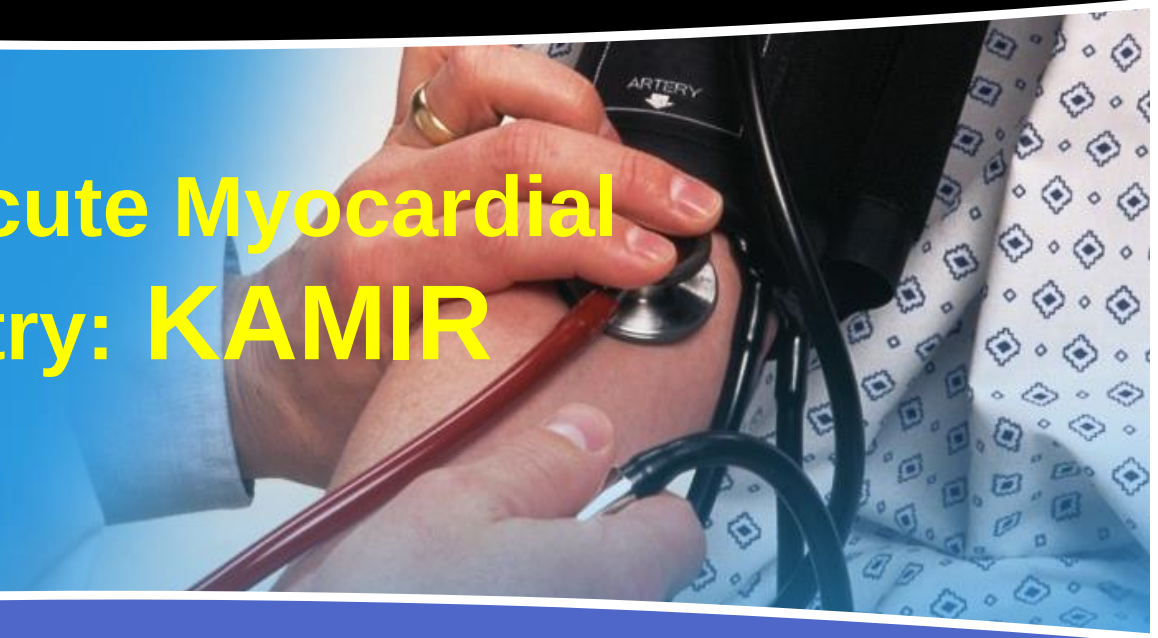
# Korea Acute Myocardial Infarction Registry (KAMIR) for the memorandum of 50th Anniversary of Korean Circulation Society



Sep 29-30th 2005

Kamir.or.kr

# On-line Korea Acute Myocardial Infarction Registry: KAMIR




http://www.kamir.or.kr

# KAMIR: Korea Acute Myocardial Infarction Registry

**Principal Investigator:** Jeong MH

**Sub-investigators:** Kim YJ, Kim CJ, Cho MC, Ahn YK

**Co-investigators:** 55 primary PCI centers

Ko YP, Koo BG, Gwon HC, Kim KS, Kim DI, Kim MH, Kim BO, Kim SW, Kim SJ, Kim YJ, Kim JK, Kim CJ, Kim TI, Rha SW, Rhew JY, Park GS, Park SW, Park SH, Bae JH, Seong IW, Seung KB, Ahn YK, Ahn TH, Yang JY, Oh SK, Yoon Jh, Lee HS, Lee MY, Lee SH, Lee SW, Rhim JY, Jeong KT, Jeong MH, Chung WS, Jeong HJ, Cho MC, Cho JH, Cho JM, Joo SJ, Jin DG, Jin SW, Chae SC, Chae IH, Chae JK, Choi DH, Tahk SJ, Han KR, Hur SH, Hwang JY

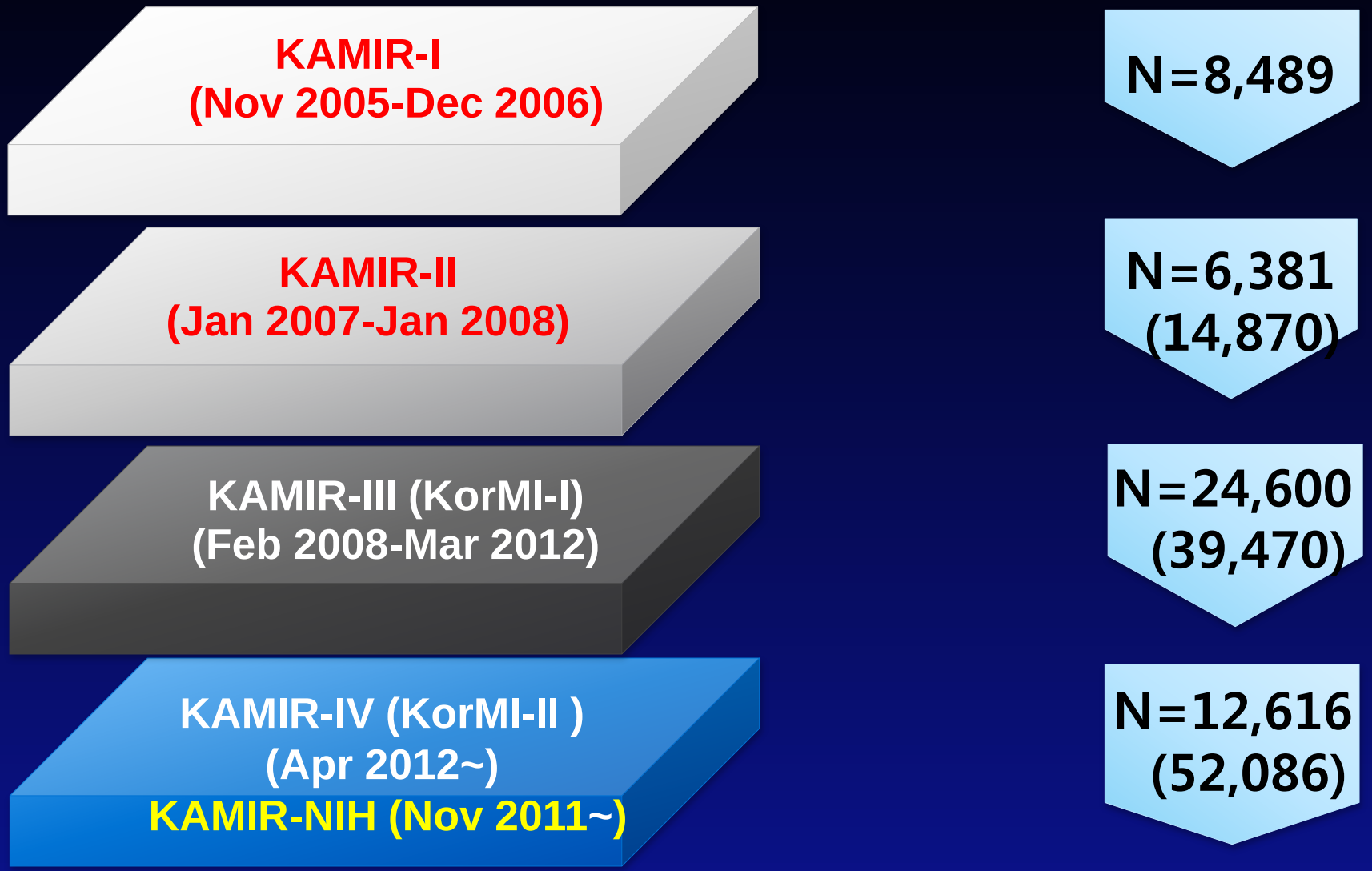
**Steering Committee:**

Park SJ, Jang YS, Seung KB, Chung WS, Cho JG, Kim YJ, Kim CJ, Cho MC, Yoon JH, Chae IH, Jeong MH

# Purpose of KAMIR Study

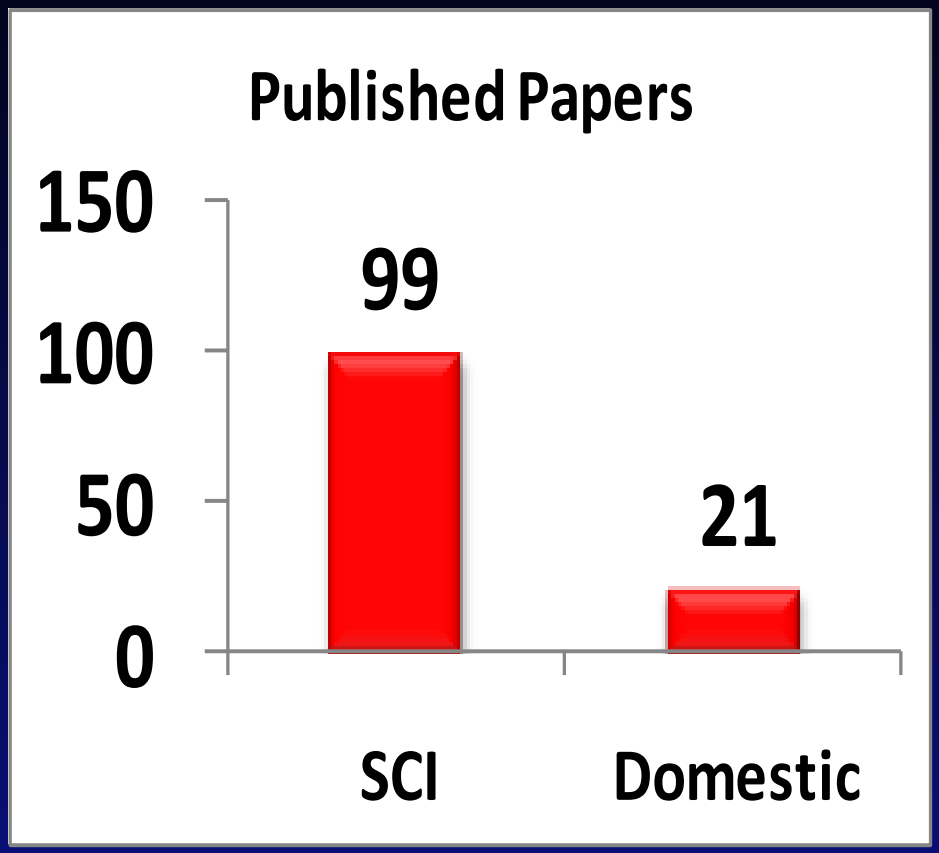
1. On-line registration of Korean AMI patients
2. Early detection of high risk patients
3. Risk factor documentation and analysis
4. New therapeutic strategy for AMI
5. Effective prevention strategy for AMI

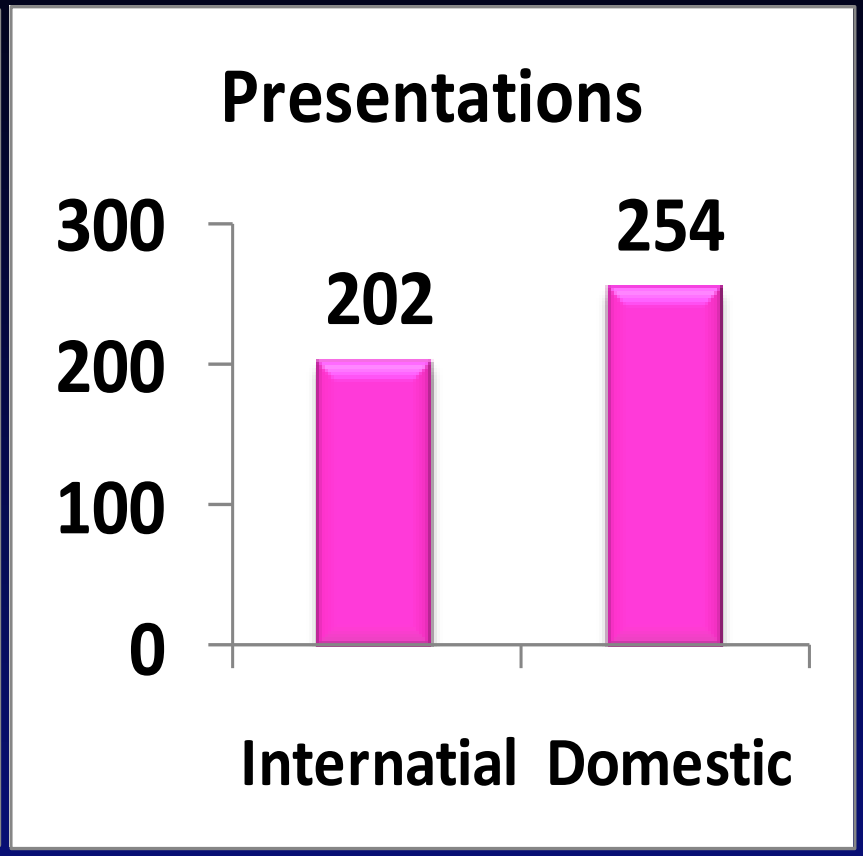
# Four Phases of KAMIR Study



# Research Committee

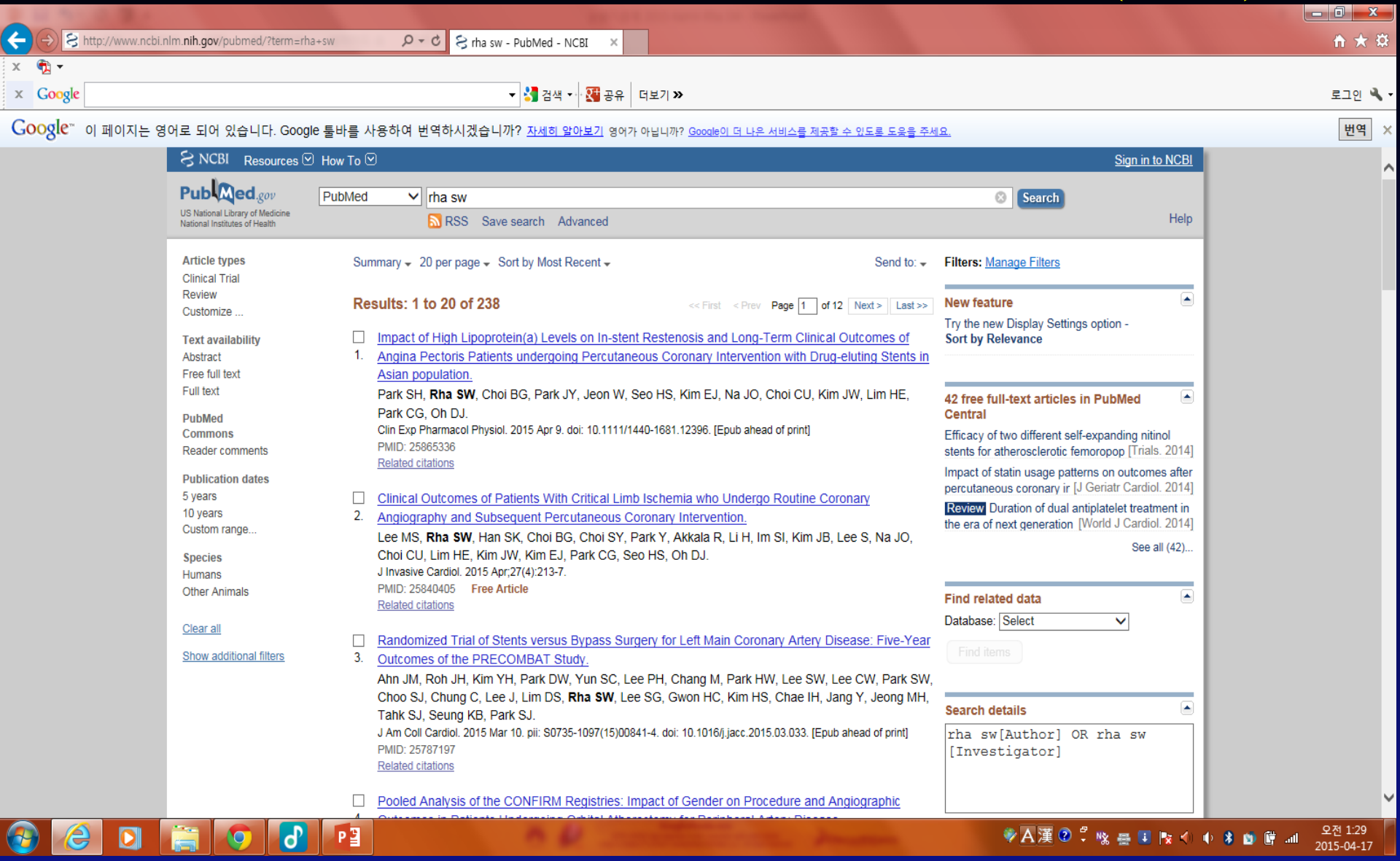
# KAMIR Publications and Presentations (2006~2014)




**Korea Acute Myocardial Infarction Research Group**
**Nov 19th 2007**

# Pubmed Outcomes; Rha SW (238)




2015.4.17 현재

# KUGH Published Kamir Papers (1)



Journal of Cardiology (2012) 59, 22–29

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*Clinical and Experimental Pharmacology and Physiology* (2012) **39**, 630–635
doi: 10.1111/j.1440-1681.2012.05721.x

## Long-Term Safety and Efficacy of *Pitavastatin* in Patients With Acute Myocardial Infarction (from the Livalo Acute Myocardial Infarction Study [LAMIS])

Soon Yong Suh, MD[a], Seung-Woon Rha, MD[b,*], Tae Hoon Ahn, MD[a], Eak Kyun Shin, MD[a], Cheol Ung Choi, MD[b], Dong Joo Oh, MD[b], Jang-Ho Bae, MD[c], Seung-Ho Hur, MD[d], Kyung Ho Yoon, MD[e], Seok-Kyu Oh, MD[e], Jong Hyun Kim, MD[f], Sang Wook Kim, MD[g], In Ho Chae, MD[h], Kee-Sik Kim, MD[i], Young Joon Hong, MD[j], and Myung Ho Jeong, MD[j], for the LAMIS Investigators

LDL cholesterol target attainment with good tolerance and was associated with favorable clinical outcomes up to 12 months.  (Am J Cardiol 2011;108:1530–1535)

# KUGH Published Kamir Papers (2)

Standard versus high loading doses of clopidogrel in
Low-molecular-weight heparin versus unfractionated

Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION

American Heart Association.

**Triple Versus Dual Antiplatelet Therapy in Patients With Acute ST-Segment Elevation Myocardial Infarction Undergoing Primary Percutaneous Coronary Intervention**

Kang-Yin Chen, Seung-Woon Rha, Yong-Jian Li, Kanhaiya L. Poddar, Zhe Jin, Yoshiyasu Minami, Lin Wang, Eung Ju Kim, Chang Gyu Park, Hong Seog Seo, Dong Joo Oh, Myung Ho Jeong, Young Keun Ahn, Taek Jong Hong, Young Jo Kim, Seung Ho Hur, In Whan Seong, Jei Keon Chae, Myeong Chan Cho, Jang Ho Bae, Dong Hoon Choi, Yang Soo Jang, In Ho Chae, Chong Jin Kim, Jung Han Yoon, Wook Sung Chung, Ki Bae Seung and Seung Jung Park

*Circulation.* 2009;119:3207-3214; originally published online June 15, 2009;
doi: 10.1161/CIRCULATIONAHA.108.822791
*Circulation* is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231

Print ISSN: 0009-7322. Online ISSN: 1524-4539

# Dr Rha's Kamir Published Papers (1)


1. Chen KY, **Rha SW,** Li YJ, Poddar KL, Jin Z, Minami Y, et al. Triple versus dual antiplatelet therapy in patients with acute ST-segment elevation myocardial infarction undergoing primary percutaneous coronary intervention. Circulation. 2009;119(25):3207-14.

2. Choi CU, **Rha SW**, Chen KY, Jin Z, Minami Y, Shin SY, et al. Mid-term angiographic benefit of sirolimus-eluting stents compared with paclitaxel-eluting stents in patients with acute myocardial infarction. Journal of cardiology. 2009;54(1):80-5.

3. Choi CU, **Rha SW,** Chen KY, Li YJ, Poddar KL, Jin Z, et al. Lack of clinical benefit of improved angiographic results with sirolimus-eluting stents compared with paclitaxel and zotarolimus-eluting stents in patients with acute myocardial infarction undergoing percutaneous coronary intervention. Circulation journal : official journal of the Japanese Circulation Society. 2009;73(12):2229-35.

4. Li YJ, **Rha SW,** Chen KY, Jin Z, Minami Y, Wang L, et al. Clinical characteristics and mid-term outcomes of acute myocardial infarction patients with prior cerebrovascular disease in an Asian population: Lessons from the Korea Acute Myocardial Infarction Registry. Clinical and experimental pharmacology & physiology. 2010;37(5-6):581-6.

5. Li YJ, **Rha SW,** Chen KY, Poddar KL, Jin Z, Minami Y, et al. Low-molecular-weight heparin versus unfractionated heparin in acute ST-segment elevation myocardial infarction patients undergoing primary percutaneous coronary intervention with drug-eluting stents. American heart journal. 2010;159(4):684-90 e1.

6. Choi CU, **Rha SW,** Oh DJ, Poddar KL, Na JO, Kim JW, et al. Standard versus high loading doses of clopidogrel in Asian ST-segment elevation myocardial infarction patients undergoing percutaneous coronary intervention: insights from the Korea Acute Myocardial Infarction Registry. American heart journal. 2011;161(2):373-82 e1-3.

# Dr Rha's Kamir Published Papers (2)


7. Suh SY, **Rha SW,** Ahn TH, Shin EK, Choi CU, Oh DJ, et al. Long-term safety and efficacy of Pitavastatin in patients with acute myocardial infarction (from the Livalo Acute Myocardial Infarction Study [LAMIS]). The American journal of cardiology. 2011;108(11):1530-5.

8. Chen KY, **Rha SW,** Li YJ, Jin Z, Minami Y, Park JY, et al. 'Smoker's paradox'in young patients with acute myocardial infarction. Clinical and Experimental Pharmacology and Physiology. 2012;39(7):630-5.

9. Chen KY, **Rha SW,** Wang L, Li YJ, Li GP, Poddar KL, et al. Unrestricted use of 2 new-generation drug-eluting stents in patients with acute myocardial infarction: a propensity score-matched analysis. JACC Cardiovascular interventions. 2012;5(9):936-45.

10. Li YJ, **Rha SW,** Chen KY, Jin Z, Wang L, Ramasamy S, et al. Low molecular weight heparin versus unfractionated heparin in patients with acute non-ST-segment elevation myocardial infarction undergoing percutaneous coronary intervention with drug-eluting stents. Journal of cardiology. 2012;59(1):22-9.

11. Chen KY, **Rha SW,** Wang L, Li YJ, Li GP, Choi CU, et al. One-year clinical outcomes of everolimus- versus sirolimus-eluting stents in patients with acute myocardial infarction. International journal of cardiology. 2014;176(3):583-8.

12. Chen KY, **Rha SW,** Li YJ, Li GP, Oh DJ, Jeong MH, et al. Comparisons of Everolimus- and Paclitaxel-Eluting Stents in Patients with Acute Myocardial Infarction. Journal of Interventional Cardiology. 2015.

# KAMIR & KORMI Data

**AMI 등록 시점 (Registrations)

1. **KAMIR1:** 2005.11 – 2006.12 (Total;41 center; 8,489 명)
2. **KAMIR2:** **200**7.1 – 2008.1 (Total;48 center; 6,381명)
3. **KORMI3:** 2008.2 – 2012.3 (Total;59 center; 25,980 명)

**2005.1 – 2012.3 (Total; 73 center; 40,850 명)**

# Variables in Kamir/Kormi CRF

**** Additional Variables for the updated Kamir/Kormi CRF**

1. **KAMIR 1:** 140개 변수

2. **KAMIR 2:** 149개 변수
   추가변수:
   - Premedication before PCI (Q37-5)
   - GP IIbIIIa inhibitor during PCI (Q37-6)
   - Distal protection device (Q37-7)
   - Stent thrombosis was developed (Q68)

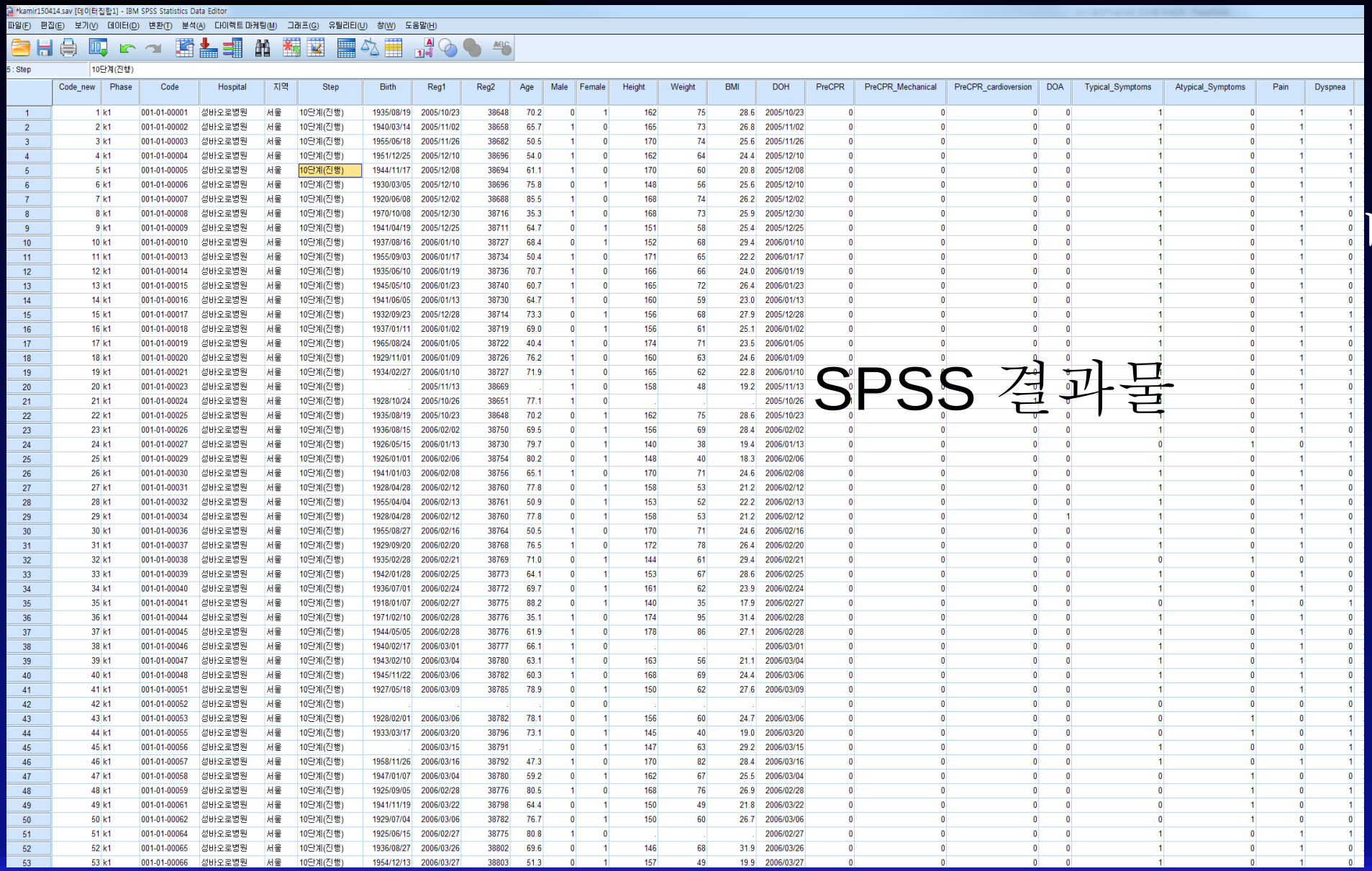
3. **KORMI:** 235개 변수
   추가변수:
   - Premedication before PCI (Q37-5-1,2,3)
   - Approach method; Radial, Femoral.. (Q37-8)
   - Use IVUS (Q38-6), - QCA information (Q38-12)
   - Echocardiography (Q42), - Cardiac CT (Q46), - HbA1c (Q61)
   - Medical therapy 세분화; (In-hospital, Q62~Q86; Discharge; Q88-7)
   - F/U Echocardiogram, MR grade (Q90- 4~8)
   - F/U Lab (Q95), - 24 months clinical F/U (Q96)

# Excel Data 통합

| | A | B | C | D | E | F | G | H | J | O | P | U | V | W | X | Y | Z | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Code_new | Phase | Code | Hospital | 지역 | Step | Birth | Reg1 | Age | Male | Female | BMI | Height | Weight | AbdominalC | HipC | DOH | Pre |
| 281 | 280 | k1 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1922-02-02 | 2006-04-14 | 84.3 | 0 | 1 | 20.0 | 155 | 48 | 75 | 77 | 2006-04-14 | 0 |
| 282 | 281 | k1 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1953-05-23 | 2006-04-15 | 52.9 | 1 | 0 | 27.7 | 169 | 79 | 88 | 91 | 2006-04-15 | 0 |
| 283 | 282 | k1 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1958-02-27 | 2006-04-16 | 48.2 | 1 | 0 | 27.0 | 170 | 78 | 90 | 89 | 2006-04-16 | 0 |
| 284 | 283 | k1 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1953-08-22 | 2006-04-16 | 52.7 | 1 | 0 | 26.8 | 175 | 82 | 90 | 94 | 2006-04-16 | 0 |
| 285 | 284 | k1 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1928-01-28 | 2006-04-17 | 78.3 | 0 | 1 | 21.5 | 157 | 53 | 82 | 80 | 2006-04-17 | 0 |
| 286 | 285 | k1 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1973-05-09 | 2006-04-17 | 33.0 | 1 | 0 | 29.8 | 185 | 102 | 100 | 98 | 2006-04-17 | 0 |
| 287 | 286 | k1 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1951-11-13 | 2006-04-18 | 54.5 | 0 | 1 | 26.1 | 154 | 62 | 96 | 100 | 2006-04-18 | 0 |
| 288 | 287 | k1 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1942-09-29 | 2006-04-20 | 63.6 | 1 | 0 | 25.8 | 174 | 78 | 90 | 95 | 2006-04-20 | 0 |
| 289 | 288 | k1 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1954-12-10 | 2006-04-22 | 51.4 | 1 | 0 | 25.9 | 162 | 68 | 88 | 87 | 2006-04-22 | 0 |
| 290 | 289 | k1 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1936-03-24 | 2006-04-24 | 70.1 | 1 | 0 | 23.2 | 158 | 58 | 80 | 78 | 2006-04-24 | 0 |
| 291 | 290 | k1 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1942-06-21 | 2006-04-29 | 63.9 | 0 | 1 | 26.2 | 160 | 67 | 86 | 91 | 2006-04-29 | 0 |
| 8713 | 8712 | k2 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1945-05-13 | 2007-04-01 | 61.9 | 1 | 0 | 23.9 | 165 | 65 | 89 | 88 | 2007-04-01 | 0 |
| 8714 | 8713 | k2 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1953-08-20 | 2007-04-02 | 53.7 | 1 | 0 | 22.8 | 169 | 65 | 85 | 87 | 2007-04-02 | 0 |
| 8715 | 8714 | k2 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1954-12-17 | 2007-04-13 | 52.4 | 1 | 0 | 29.4 | 168 | 83 | 91 | 100 | 2007-04-13 | 0 |
| 8716 | 8715 | k2 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1940-07-25 | 2007-04-14 | 66.8 | 1 | 0 | 24.6 | 160 | 63 | 92 | 95 | 2007-04-14 | 0 |
| 8717 | 8716 | k2 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1941-05-16 | 2007-04-19 | 66.0 | 1 | 0 | 19.5 | 168 | 55 | 92 | 97 | 2007-04-19 | 0 |
| 8718 | 8717 | k2 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1940-08-10 | 2007-05-01 | 66.8 | 0 | 1 | 26.0 | 158 | 65 | 105 | 100 | 2007-05-01 | 0 |
| 8719 | 8718 | k2 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1941-05-12 | 2007-05-05 | 66.0 | 0 | 1 | 23.7 | 159 | 60 | 85 | 86 | 2007-05-05 | 0 |
| 8720 | 8719 | k2 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1946-01-18 | 2007-05-07 | 61.3 | 0 | 1 | 22.9 | 152 | 53 | 90 | 92 | 2007-05-07 | 0 |
| 8721 | 8720 | k2 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1934-10-15 | 2007-05-07 | 72.6 | 1 | 0 | 18.1 | 165 | 52 | 84 | 81 | 2007-05-07 | 0 |
| 8722 | 8721 | k2 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1941-11-20 | 2007-05-07 | 64.5 | 1 | 0 | 24.5 | 163 | 65 | 80 | 79 | 2007-05-07 | 0 |
| 8723 | 8722 | k2 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1961-01-20 | 2007-05-07 | 45.9 | 1 | 0 | 23.5 | 182 | 78 | 93 | 96 | 2007-05-07 | 0 |
| 8724 | 8723 | k2 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1960-01-20 | 2007-05-08 | 47.3 | 0 | 1 | 28.3 | 166 | 78 | 98 | 96 | 2007-05-08 | 0 |
| 8726 | 8725 | k2 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1939-10-0 | 2007-04-19 | 67.4 | 1 | 0 | 22.8 | 169 | 65 | 88 | 91 | 2007-04-19 | 0 |
| 8729 | 8728 | k2 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1953-0 | 2007-05-31 | 53.7 | 1 | 0 | 23.3 | 171 | 68 | 82 | 86 | 2007-05-31 | 0 |
| 8730 | 8729 | k2 | 003-01-000 | 고대 구로병원 | 서울 | 10단계(진행) | 1955-12-12 | 2007-05-30 | 51.5 | 1 | 0 | 18.4 | 176 | 57 | 83 | 85 | 2007-05-30 | 0 |
| 20777 | 20776 | K3 | 023-00-005 | 고려의대 구로병원 | 서울 | 10단계(진행) | 1940-11-08 | 2011-04-04 | 70.4 | 1 | 0 | 20.2 | 162 | 53 | 70 | 90 | 2011-04-04 | 0 |
| 20778 | 20777 | K3 | 023-00-005 | 고려의대 구로병원 | 서울 | 10단계(진행) | 1966-07-22 | 2011-04-06 | 44.7 | 1 | 0 | 26.2 | 179 | 84 | 75 | 77 | 2011-04-06 | 0 |
| 20779 | 20778 | K3 | 023-00-005 | 고려의대 구로병원 | 서울 | 10단계(진행) | 1955-03-17 | 2011-04-12 | 56.1 | 1 | 0 | 20.2 | 168 | 57 | 88 | 91 | 2011-04-12 | 0 |
| 20780 | 20779 | K3 | 023-00-006 | 고려의대 구로병원 | 서울 | 10단계(진행) | 1950-08-28 | 2011-04-16 | 60.7 | 1 | 0 | 25.7 | 172 | 76 | 90 | 89 | 2011-04-16 | 0 |
| 20781 | 20780 | K3 | 023-00-006 | 고려의대 구로병원 | 서울 | 10단계(진행) | 1947-03-10 | 2011-04-08 | 64.1 | 1 | 0 | 23.7 | 173 | 71 | 90 | 94 | 2011-04-08 | 0 |
| 20782 | 20781 | K3 | 023-00-006 | 고려의대 구로병원 | 서울 | 10단계(진행) | 1962-02-20 | 2011-04-17 | 49.2 | 0 | 1 | 21.5 | 157 | 53 | 82 | 80 | 2011-04-17 | 0 |
| 20783 | 20782 | K3 | 023-00-006 | 고려의대 구로병원 | 서울 | 10단계(진행) | 1964-02-11 | 2011-04-15 | 47.2 | 1 | 0 | 22.8 | 165 | 62 | 100 | 98 | 2011-04-15 | 0 |
| 20784 | 20783 | K3 | 023-00-006 | 고려의대 구로병원 | 서울 | 10단계(진행) | 1936-05-18 | 2011-04-15 | 75.0 | 0 | 1 | 22.4 | 161 | 58 | 96 | 100 | 2011-04-15 | 0 |
| 20785 | 20784 | K3 | 023-00-006 | 고려의대 구로병원 | 서울 | 10단계(진행) | 1967-03-10 | 2011-04-30 | 44.2 | 1 | 0 | 23.9 | 165 | 65 | 90 | 95 | 2011-04-30 | 0 |
| 20786 | 20785 | K3 | 023-00-006 | 고려의대 구로병원 | 서울 | 10단계(진행) | 1970-06-04 | 2011-04-27 | 40.9 | 1 | 0 | 25.0 | 181 | 82 | 88 | 87 | 2011-04-27 | 0 |
| 20787 | 20786 | K3 | 023-00-006 | 고려의대 구로병원 | 서울 | 10단계(진행) | 1961-04-06 | 2011-04-29 | 50.1 | 1 | 0 | 23.7 | 172 | 70 | 80 | 78 | 2011-04-29 | 0 |
| 20788 | 20787 | K3 | 023-00-006 | 고려의대 구로병원 | 서울 | 10단계(진행) | 1926-09-21 | 2011-04-29 | 84.7 | 1 | 0 | 24.7 | 167 | 69 | 86 | 91 | 2011-04-29 | 0 |
| 20899 | 20910 | K3 | 023-00-00 | 고대 구로병원 | | 10단계(진행) | 1971-10-25 | Male | 183cm | 80kg | 72 | 83 | 2012-08-01 | 18:15 | 2012-08-01 18:15 | this hospit | 0:00 | |
| 20900 | 20909 | K3 | 023-00-00 | 고대 구로병원 | | 10단계(진행) | 1968-11-04 | Male | 173cm | 78kg | 89 | 95 | 2012-08-17 | 18:23 | 2012-08-17 18:23 | this hospit | 0:00 | |

KAMIR & KORMI 통합 후
SPSS 변환용 자료로 정리

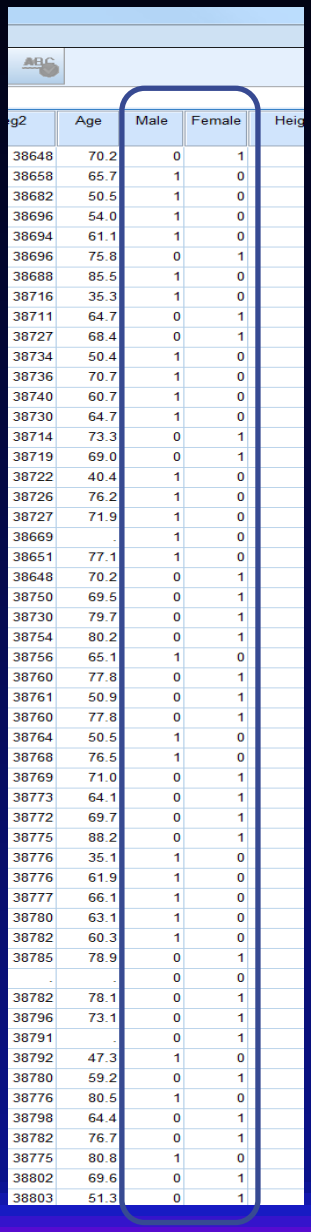
# SPSS변환




| | Code_new | Phase | Code | Hospital | 지역 | Step | Birth | Reg1 | Reg2 | Age | Male | Female | Height | Weight | BMI | DOH | PreCPR | PreCPR_Mechanical | PreCPR_cardioversion | DOA | Typical_Symptoms | Atypical_Symptoms | Pain | Dyspnea |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | k1 | 001-01-00001 | 성바오로병원 | 서울 | 10단계(진행) | 1935/08/19 | 2005/10/23 | 38648 | 70.2 | 0 | 1 | 162 | 75 | 28.6 | 2005/10/23 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 2 | 2 | k1 | 001-01-00002 | 성바오로병원 | 서울 | 10단계(진행) | 1940/03/14 | 2005/11/02 | 38658 | 65.7 | 1 | 0 | 165 | 73 | 26.8 | 2005/11/02 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 3 | 3 | k1 | 001-01-00003 | 성바오로병원 | 서울 | 10단계(진행) | 1955/06/18 | 2005/11/26 | 38682 | 50.5 | 1 | 0 | 170 | 74 | 25.6 | 2005/11/26 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 4 | 4 | k1 | 001-01-00004 | 성바오로병원 | 서울 | 10단계(진행) | 1951/12/25 | 2005/12/10 | 38696 | 54.0 | 1 | 0 | 162 | 64 | 24.4 | 2005/12/10 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 5 | 5 | k1 | 001-01-00005 | 성바오로병원 | 서울 | 10단계(진행) | 1944/11/17 | 2005/12/08 | 38694 | 61.1 | 1 | 0 | 170 | 60 | 20.8 | 2005/12/08 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 6 | 6 | k1 | 001-01-00006 | 성바오로병원 | 서울 | 10단계(진행) | 1930/03/05 | 2005/12/10 | 38696 | 75.8 | 0 | 1 | 148 | 56 | 25.6 | 2005/12/10 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 7 | 7 | k1 | 001-01-00007 | 성바오로병원 | 서울 | 10단계(진행) | 1920/06/08 | 2005/12/02 | 38688 | 85.5 | 1 | 0 | 168 | 74 | 26.2 | 2005/12/02 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 8 | 8 | k1 | 001-01-00008 | 성바오로병원 | 서울 | 10단계(진행) | 1970/10/08 | 2005/12/30 | 38716 | 35.3 | 1 | 0 | 168 | 73 | 25.9 | 2005/12/30 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 9 | 9 | k1 | 001-01-00009 | 성바오로병원 | 서울 | 10단계(진행) | 1941/04/19 | 2005/12/25 | 38711 | 64.7 | 0 | 1 | 151 | 58 | 25.4 | 2005/12/25 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 10 | 10 | k1 | 001-01-00010 | 성바오로병원 | 서울 | 10단계(진행) | 1937/08/16 | 2006/01/10 | 38727 | 68.4 | 0 | 1 | 152 | 68 | 29.4 | 2006/01/10 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 11 | 11 | k1 | 001-01-00013 | 성바오로병원 | 서울 | 10단계(진행) | 1955/09/03 | 2006/01/17 | 38734 | 50.4 | 1 | 0 | 171 | 65 | 22.2 | 2006/01/17 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 12 | 12 | k1 | 001-01-00014 | 성바오로병원 | 서울 | 10단계(진행) | 1935/06/10 | 2006/01/19 | 38736 | 70.7 | 1 | 0 | 166 | 66 | 24.0 | 2006/01/19 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 13 | 13 | k1 | 001-01-00015 | 성바오로병원 | 서울 | 10단계(진행) | 1945/05/10 | 2006/01/23 | 38740 | 60.7 | 1 | 0 | 165 | 72 | 26.4 | 2006/01/23 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 14 | 14 | k1 | 001-01-00016 | 성바오로병원 | 서울 | 10단계(진행) | 1941/06/05 | 2006/01/13 | 38730 | 64.7 | 1 | 0 | 160 | 59 | 23.0 | 2006/01/13 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 15 | 15 | k1 | 001-01-00017 | 성바오로병원 | 서울 | 10단계(진행) | 1932/09/23 | 2005/12/28 | 38714 | 73.3 | 0 | 1 | 156 | 68 | 27.9 | 2005/12/28 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 16 | 16 | k1 | 001-01-00018 | 성바오로병원 | 서울 | 10단계(진행) | 1937/01/11 | 2006/01/02 | 38719 | 69.0 | 0 | 1 | 156 | 61 | 25.1 | 2006/01/02 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 17 | 17 | k1 | 001-01-00019 | 성바오로병원 | 서울 | 10단계(진행) | 1965/08/24 | 2006/01/05 | 38722 | 40.4 | 1 | 0 | 174 | 71 | 23.5 | 2006/01/05 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 18 | 18 | k1 | 001-01-00020 | 성바오로병원 | 서울 | 10단계(진행) | 1929/11/01 | 2006/01/09 | 38726 | 76.2 | 1 | 0 | 160 | 63 | 24.6 | 2006/01/09 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 19 | 19 | k1 | 001-01-00021 | 성바오로병원 | 서울 | 10단계(진행) | 1934/02/27 | 2006/01/10 | 38727 | 71.9 | 1 | 0 | 165 | 62 | 22.8 | 2006/01/10 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 20 | 20 | k1 | 001-01-00023 | 성바오로병원 | 서울 | 10단계(진행) | . | 2005/11/13 | 38669 | . | 1 | 0 | 158 | 48 | 19.2 | 2005/11/13 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 21 | 21 | k1 | 001-01-00024 | 성바오로병원 | 서울 | 10단계(진행) | 1928/10/24 | 2005/10/26 | 38651 | 77.1 | 1 | 0 | . | . | . | 2005/10/26 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 22 | 22 | k1 | 001-01-00025 | 성바오로병원 | 서울 | 10단계(진행) | 1935/08/19 | 2005/10/23 | 38648 | 70.2 | 0 | 1 | 162 | 75 | 28.6 | 2005/10/23 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 23 | 23 | k1 | 001-01-00026 | 성바오로병원 | 서울 | 10단계(진행) | 1936/08/15 | 2006/02/02 | 38750 | 69.5 | 0 | 1 | 156 | 69 | 28.4 | 2006/02/02 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 24 | 24 | k1 | 001-01-00027 | 성바오로병원 | 서울 | 10단계(진행) | 1926/05/15 | 2006/01/13 | 38730 | 79.7 | 0 | 1 | 140 | 38 | 19.4 | 2006/01/13 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 25 | 25 | k1 | 001-01-00029 | 성바오로병원 | 서울 | 10단계(진행) | 1926/01/01 | 2006/02/06 | 38754 | 80.2 | 0 | 1 | 148 | 40 | 18.3 | 2006/02/06 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 26 | 26 | k1 | 001-01-00030 | 성바오로병원 | 서울 | 10단계(진행) | 1941/01/03 | 2006/02/08 | 38756 | 65.1 | 1 | 0 | 170 | 71 | 24.6 | 2006/02/08 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 27 | 27 | k1 | 001-01-00031 | 성바오로병원 | 서울 | 10단계(진행) | 1928/04/28 | 2006/02/12 | 38760 | 77.8 | 0 | 1 | 158 | 53 | 21.2 | 2006/02/12 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 28 | 28 | k1 | 001-01-00032 | 성바오로병원 | 서울 | 10단계(진행) | 1955/04/04 | 2006/02/13 | 38761 | 50.9 | 0 | 1 | 153 | 52 | 22.2 | 2006/02/13 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 29 | 29 | k1 | 001-01-00034 | 성바오로병원 | 서울 | 10단계(진행) | 1928/04/28 | 2006/02/12 | 38760 | 77.8 | 0 | 1 | 158 | 53 | 21.2 | 2006/02/12 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| 30 | 30 | k1 | 001-01-00036 | 성바오로병원 | 서울 | 10단계(진행) | 1955/08/27 | 2006/02/16 | 38764 | 50.5 | 1 | 0 | 170 | 71 | 24.6 | 2006/02/16 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 31 | 31 | k1 | 001-01-00037 | 성바오로병원 | 서울 | 10단계(진행) | 1929/09/20 | 2006/02/20 | 38768 | 76.5 | 1 | 0 | 172 | 78 | 26.4 | 2006/02/20 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 32 | 32 | k1 | 001-01-00038 | 성바오로병원 | 서울 | 10단계(진행) | 1935/02/28 | 2006/02/21 | 38769 | 71.0 | 0 | 1 | 144 | 61 | 29.4 | 2006/02/21 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 33 | 33 | k1 | 001-01-00039 | 성바오로병원 | 서울 | 10단계(진행) | 1942/01/28 | 2006/02/25 | 38773 | 64.1 | 0 | 1 | 153 | 67 | 28.6 | 2006/02/25 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 34 | 34 | k1 | 001-01-00040 | 성바오로병원 | 서울 | 10단계(진행) | 1936/07/01 | 2006/02/24 | 38772 | 69.7 | 0 | 1 | 161 | 62 | 23.9 | 2006/02/24 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 35 | 35 | k1 | 001-01-00041 | 성바오로병원 | 서울 | 10단계(진행) | 1918/01/07 | 2006/02/27 | 38775 | 88.2 | 0 | 1 | 140 | 35 | 17.9 | 2006/02/27 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 36 | 36 | k1 | 001-01-00044 | 성바오로병원 | 서울 | 10단계(진행) | 1971/02/10 | 2006/02/28 | 38776 | 35.1 | 1 | 0 | 174 | 95 | 31.4 | 2006/02/28 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 37 | 37 | k1 | 001-01-00045 | 성바오로병원 | 서울 | 10단계(진행) | 1944/05/05 | 2006/02/28 | 38776 | 61.9 | 1 | 0 | 178 | 86 | 27.1 | 2006/02/28 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 38 | 38 | k1 | 001-01-00046 | 성바오로병원 | 서울 | 10단계(진행) | 1940/02/17 | 2006/03/01 | 38777 | 66.1 | 1 | 0 | . | . | . | 2006/03/01 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 39 | 39 | k1 | 001-01-00047 | 성바오로병원 | 서울 | 10단계(진행) | 1943/02/10 | 2006/03/04 | 38780 | 63.1 | 1 | 0 | 163 | 56 | 21.1 | 2006/03/04 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 40 | 40 | k1 | 001-01-00048 | 성바오로병원 | 서울 | 10단계(진행) | 1945/11/22 | 2006/03/06 | 38782 | 60.3 | 1 | 0 | 168 | 69 | 24.4 | 2006/03/06 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 41 | 41 | k1 | 001-01-00051 | 성바오로병원 | 서울 | 10단계(진행) | 1927/05/18 | 2006/03/09 | 38785 | 78.9 | 0 | 1 | 150 | 62 | 27.6 | 2006/03/09 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 42 | 42 | k1 | 001-01-00052 | 성바오로병원 | 서울 | 10단계(진행) | . | . | . | . | 0 | 0 | . | . | . | . | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 43 | 43 | k1 | 001-01-00053 | 성바오로병원 | 서울 | 10단계(진행) | 1928/02/01 | 2006/03/06 | 38782 | 78.1 | 0 | 1 | 156 | 60 | 24.7 | 2006/03/06 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 44 | 44 | k1 | 001-01-00055 | 성바오로병원 | 서울 | 10단계(진행) | 1933/03/17 | 2006/03/20 | 38796 | 73.1 | 0 | 1 | 145 | 40 | 19.0 | 2006/03/20 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 45 | 45 | k1 | 001-01-00056 | 성바오로병원 | 서울 | 10단계(진행) | . | 2006/03/15 | 38791 | . | 0 | 1 | 147 | 63 | 29.2 | 2006/03/15 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 46 | 46 | k1 | 001-01-00057 | 성바오로병원 | 서울 | 10단계(진행) | 1958/11/26 | 2006/03/16 | 38792 | 47.3 | 1 | 0 | 170 | 82 | 28.4 | 2006/03/16 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 47 | 47 | k1 | 001-01-00058 | 성바오로병원 | 서울 | 10단계(진행) | 1947/01/07 | 2006/03/04 | 38780 | 59.2 | 0 | 1 | 162 | 67 | 25.5 | 2006/03/04 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 48 | 48 | k1 | 001-01-00059 | 성바오로병원 | 서울 | 10단계(진행) | 1925/09/05 | 2006/02/28 | 38776 | 80.5 | 1 | 0 | 168 | 76 | 26.9 | 2006/02/28 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 49 | 49 | k1 | 001-01-00061 | 성바오로병원 | 서울 | 10단계(진행) | 1941/11/19 | 2006/03/22 | 38798 | 64.4 | 0 | 1 | 150 | 49 | 21.8 | 2006/03/22 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 50 | 50 | k1 | 001-01-00062 | 성바오로병원 | 서울 | 10단계(진행) | 1929/07/04 | 2006/03/06 | 38782 | 76.7 | 0 | 1 | 150 | 60 | 26.7 | 2006/03/06 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 51 | 51 | k1 | 001-01-00064 | 성바오로병원 | 서울 | 10단계(진행) | 1925/06/15 | 2006/02/27 | 38775 | 80.8 | 1 | 0 | . | . | . | 2006/02/27 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 52 | 52 | k1 | 001-01-00065 | 성바오로병원 | 서울 | 10단계(진행) | 1936/08/27 | 2006/03/26 | 38802 | 69.6 | 0 | 1 | 146 | 68 | 31.9 | 2006/03/26 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 53 | 53 | k1 | 001-01-00066 | 성바오로병원 | 서울 | 10단계(진행) | 1954/12/13 | 2006/03/27 | 38803 | 51.3 | 0 | 1 | 157 | 49 | 19.9 | 2006/03/27 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |

SPSS 결과물

# Tip & Tricks for Raw Data Clean Up (1)



| g2 | Age | Male | Female | Heig |
|---|---|---|---|---|
| 38648 | 70.2 | 0 | 1 | |
| 38658 | 65.7 | 1 | 0 | |
| 38682 | 50.5 | 1 | 0 | |
| 38696 | 54.0 | 1 | 0 | |
| 38694 | 61.1 | 1 | 0 | |
| 38696 | 75.8 | 0 | 1 | |
| 38688 | 85.5 | 1 | 0 | |
| 38716 | 35.3 | 1 | 0 | |
| 38711 | 64.7 | 0 | 1 | |
| 38727 | 68.4 | 0 | 1 | |
| 38734 | 50.4 | 1 | 0 | |
| 38736 | 70.7 | 1 | 0 | |
| 38740 | 60.7 | 1 | 0 | |
| 38730 | 64.7 | 1 | 0 | |
| 38714 | 73.3 | 0 | 1 | |
| 38719 | 69.0 | 0 | 1 | |
| 38722 | 40.4 | 1 | 0 | |
| 38726 | 76.2 | 1 | 0 | |
| 38727 | 71.9 | 1 | 0 | |
| 38669 | | 1 | 0 | |
| 38651 | 77.1 | 1 | 0 | |
| 38648 | 70.2 | 0 | 1 | |
| 38750 | 69.5 | 0 | 1 | |
| 38730 | 79.7 | 0 | 1 | |
| 38754 | 80.2 | 0 | 1 | |
| 38756 | 65.1 | 1 | 0 | |
| 38760 | 77.8 | 0 | 1 | |
| 38761 | 50.9 | 0 | 1 | |
| 38760 | 77.8 | 0 | 1 | |
| 38764 | 50.5 | 1 | 0 | |
| 38768 | 76.5 | 1 | 0 | |
| 38769 | 71.0 | 0 | 1 | |
| 38773 | 64.1 | 0 | 1 | |
| 38772 | 69.7 | 0 | 1 | |
| 38775 | 88.2 | 0 | 1 | |
| 38776 | 35.1 | 1 | 0 | |
| 38776 | 61.9 | 1 | 0 | |
| 38777 | 66.1 | 1 | 0 | |
| 38780 | 63.1 | 1 | 0 | |
| 38782 | 60.3 | 1 | 0 | |
| 38785 | 78.9 | 0 | 1 | |
| . | . | 0 | 0 | |
| 38782 | 78.1 | 0 | 1 | |
| 38796 | 73.1 | 0 | 1 | |
| 38791 | . | 0 | 1 | |
| 38792 | 47.3 | 1 | 0 | |
| 38780 | 59.2 | 0 | 1 | |
| 38776 | 80.5 | 1 | 0 | |
| 38798 | 64.4 | 0 | 1 | |
| 38782 | 76.7 | 0 | 1 | |
| 38775 | 80.8 | 1 | 0 | |
| 38802 | 69.6 | 0 | 1 | |
| 38803 | 51.3 | 0 | 1 | |

## Missing data의 처리

- 범주형 변수는 가능한 이분형 (Binary; 0 or 1) 형태로 변환
- '변수' 속성에 맞추어 각각 새로운 변수로 만들어 준다

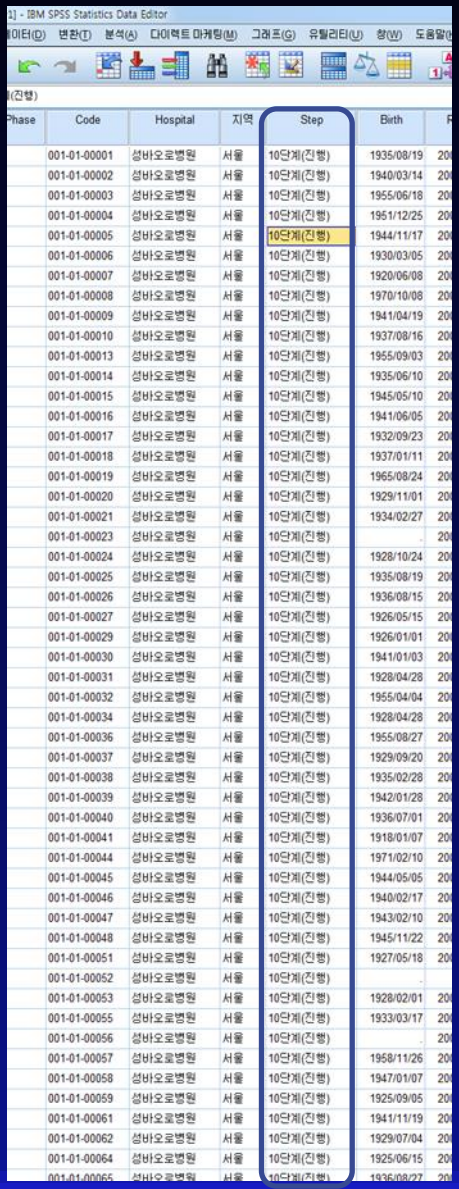
Examples) Missing data도 '0'으로 표시

Gender는 '남자: 1'와 '여자: 0'로 나뉘어 지지만 KAMIR에서는 7.3%의 missing data가 존재한다. 따라서
Male: '1' others: '0' / Female: '1' others: '0'

- 논문 작성시 현재 알고 있는 명확한 자료만 제시한다
  Gender (male): 16,875 (65.8%)

- 알고 있는 자료만 나누어 정리하면 회귀분석이나 Propensity score 분석 시 missing data의 loss없이 분석 가능

# Tip & Tricks for Raw Data Clean Up (2)




- KAMIR Data set은 등록된 자료의 진행사항을 확인 가능.
통계 진행 시 적절한 필터를 사용하면
Missing data를 걸러낼 수 있다.

Examples)

- AMI의 연도별 발생건수 분석
  : step 선택 해당 없음

- 가설의 Endpoint가
  In hospital complication 이면..
  => step 6~10단계

1단계 Patient at Admission
2단계 Condition at Admission
3단계 Past History
4단계 Initial Therapy
5단계 Coronary angiographics findings
**6단계 Hospitalization**
7단계 Lab findings
8단계 Medical therapy in hospital
9단계 Discharge
10단계 Follow-up

- 가설의 Endpoint가 Follow-up Clinical Outcomes이면..
  => step 10단계

# Statistical Analysis

기본통계방법

1. 연속형 변수 (Continuous variables)
   **Student t-test (Independent, Un-paired)**
   **Anova/Ancova**

2. 범주형 변수 (Categorical variables)
   **Chi-square test** or **Fischer's exact test**

3. 상대 위험과 오즈비 (Relative Risk & Odds Ratio)

"모두 합쳐도 10개 이내"

4. 로지스틱 회귀분석 (Logistic Regression Analysis)
   단순회귀모형 (Simple logistic)
   다중회귀모형 (Multiple logistic); Independent predictors./no time dependence

5. 생존율 곡선 (Survival Curve Analysis)
   **Kaplan-Meier**: Log-rank test
   **Cox-regression**: Cox proportional hazard model (time dependent)

6. Propensity-Score Analysis
   Adjusted analysis / Matched analysis

# Dr. Rha 의 Kamir 통계 Step

Ex) 두 군의 비교연구 (KAMIR/KORMI data에서만…)

1. 가설 설정 및 데이터 탐색

2. Propensity Score Matching: PS Matching
   - ⇒ 다중회귀분석 보다 PSM이 '혼란변수보정'에 있어 여러모로 편리하고 직관적임.
   - ⇒ Clinical Risk평가에 있어서, "상대위험도" 평가와 "Cox-proportional hazard model" 사용.
   - ⇒ PS Matching으로 인한 data loss를 피하고 싶다면
     Cox-proportional hazard model의 공변량 (co-variates) 에 PS를 넣어 보정.

3. 기본 통계 (Chi-검정, 독립T검정, 상대위험검정)

4. 회귀분석 & 생존율 분석
   - ⇒ Follow-up data의 Risk평가는 "회귀분석"이 아닌 "Cox-proportional hazard model"로 평가.

5. Subgroup Analysis
   ; cox regression between two subgroups

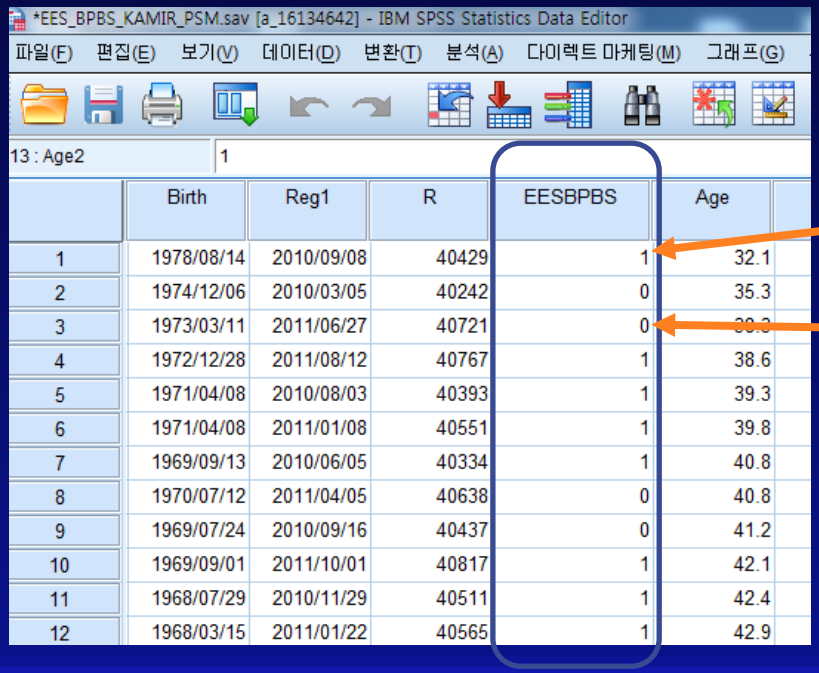
# Step 1 - Grouping

Everolimus-eluting (EES ) Vs. Biodegradable Polymer Biolimus Stent (BPBS; BES)의 2 Years Outcomes 비교연구

“EESBPBS”변수 생성

- 대상군: BPBSs (NOBORI, Biomatrix) => “1” 로 코딩

- 비교군: EESs (Promus, Xience V) => “0”으로 코딩



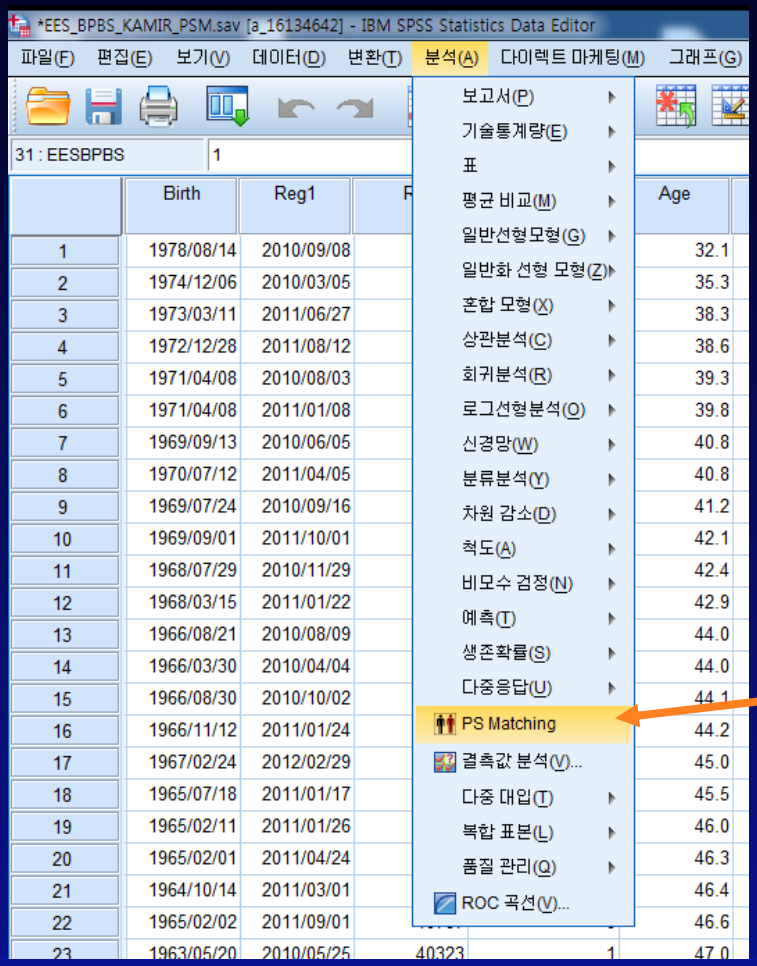

| | Birth | Reg1 | R | EESBPBS | Age |
|---|---|---|---|---|---|
| 1 | 1978/08/14 | 2010/09/08 | 40429 | 1 | 32.1 |
| 2 | 1974/12/06 | 2010/03/05 | 40242 | 0 | 35.3 |
| 3 | 1973/03/11 | 2011/06/27 | 40721 | 0 | 38.3 |
| 4 | 1972/12/28 | 2011/08/12 | 40767 | 1 | 38.6 |
| 5 | 1971/04/08 | 2010/08/03 | 40393 | 1 | 39.3 |
| 6 | 1971/04/08 | 2011/01/08 | 40551 | 1 | 39.8 |
| 7 | 1969/09/13 | 2010/06/05 | 40334 | 1 | 40.8 |
| 8 | 1970/07/12 | 2011/04/05 | 40638 | 0 | 40.8 |
| 9 | 1969/07/24 | 2010/09/16 | 40437 | 0 | 41.2 |
| 10 | 1969/09/01 | 2011/10/01 | 40817 | 1 | 42.1 |
| 11 | 1968/07/29 | 2010/11/29 | 40511 | 1 | 42.4 |
| 12 | 1968/03/15 | 2011/01/22 | 40565 | 1 | 42.9 |

(NOBORI, Biomatrix)

(Promus, Xience V)

# Step 2 – PS Matching (1)

- SPSS용 PSM Tool설치 (version 18-20, window 7)
  참고 사이트: http://www.ibm.com/developerworks/spssdevcentral

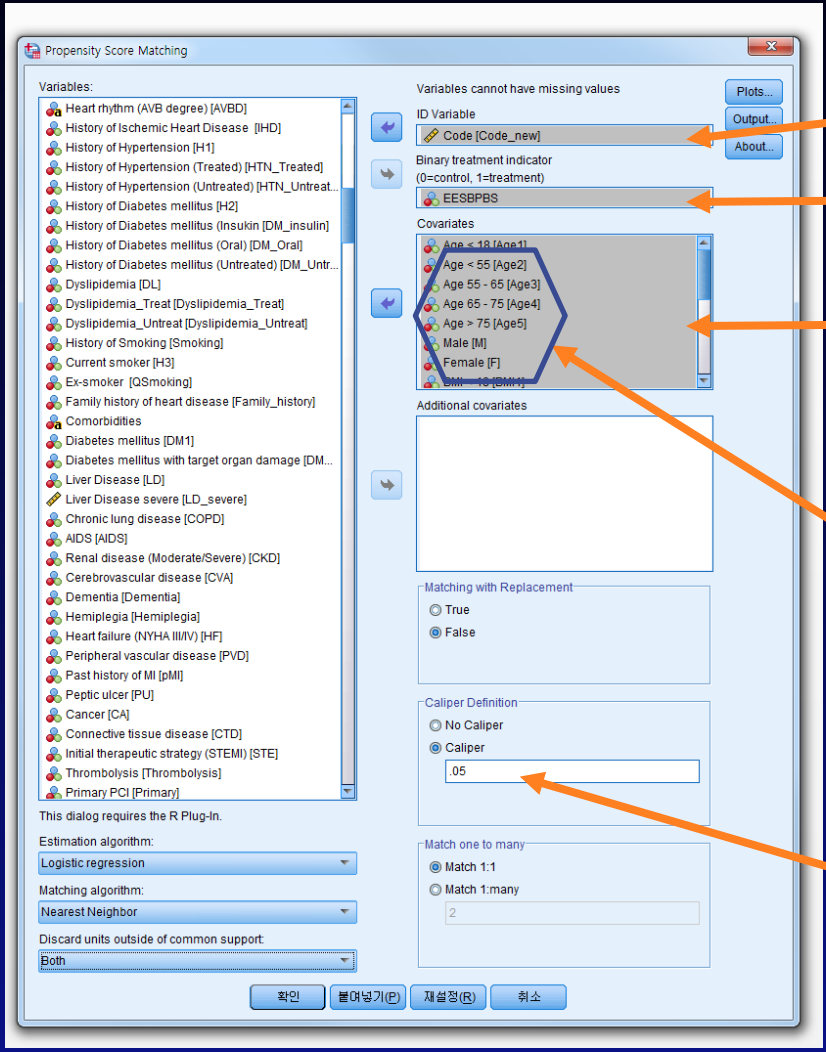




설치파일 목록

PS Matching in SPSS Dialog

# Step 2 – PS Matching (2)




환자 고유의 ID을 만들어 넣어준다.

검정변수: (EES vs. BPBS)

보정할 '공변량' 넣어준다.
- 다중공선성 test 상관없이 넣을 수 있다.
- 주의)
  공변량에는 'null'값이 있어서는 안된다.

Tip) 변수를 '세분화' 하고, 연속형 변수를 '그룹화' 하면 Missing data를 random 시키는 효과가 있어 Case lose를 줄일 수 있다.

비교, 대상군의 PS 간격 설정
- 숫자가 작을수로 잘 매칭되지만
-Data Loss가 많아짐

# PS Matching Result

PSM실행 후 아래와 같은 Information Pop-up창이 뜬다.

**Warning**

| |
|---|
| |
| |
| No warnings in estimation or matching procedure |

**Sample Sizes**

| | Control | Treated |
|---|---|---|
| All | 5203 | 950 |
| Matched | 917 | 917 |
| Unmatched | 3883 | 32 |
| Discarded | 403 | 1 |

PSM 결과
917 Pair, N=1,837

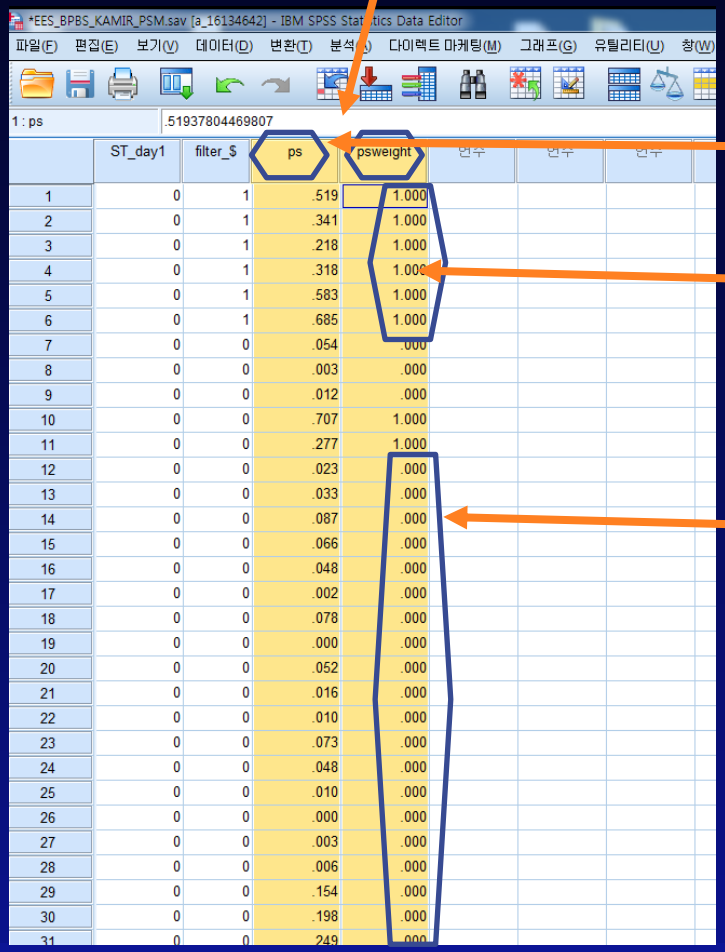
**Overall balance test (Hansen & Bowers, 2010)**

| | chisquare | df | p.value |
|---|---|---|---|
| Overall | 27.638 | 58.000 | 1.000 |

**Relative multivariate imbalance L1 (Iacus, King, & Porro, 2010)**

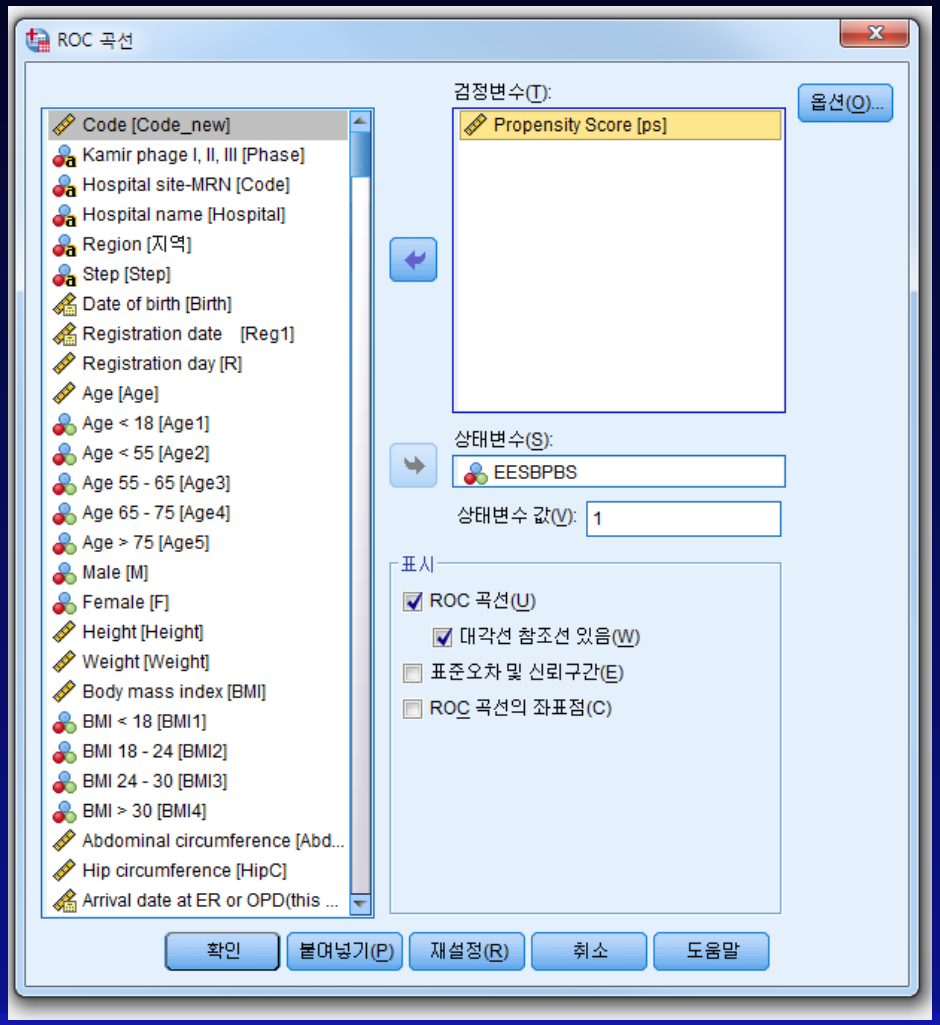
| | Before matching | After matching |
|---|---|---|
| Multivariate imbalance measure L1 | 1.000 | 1.000 |

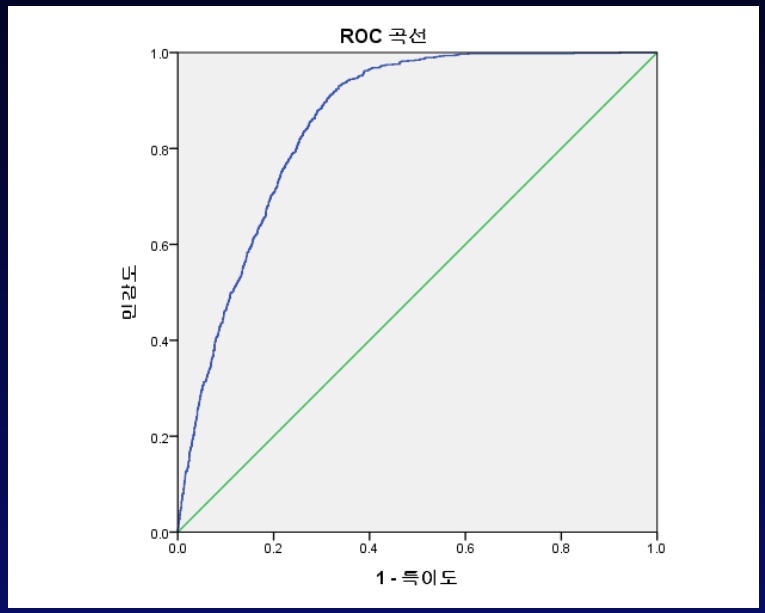
Data field 맨 뒤에 자동 생성



# Step 2 – PS 검정 타당도

상단 메뉴: 분석 => ROC 곡선




곡선 아래 영역
검정 결과 변수: Propensity Score

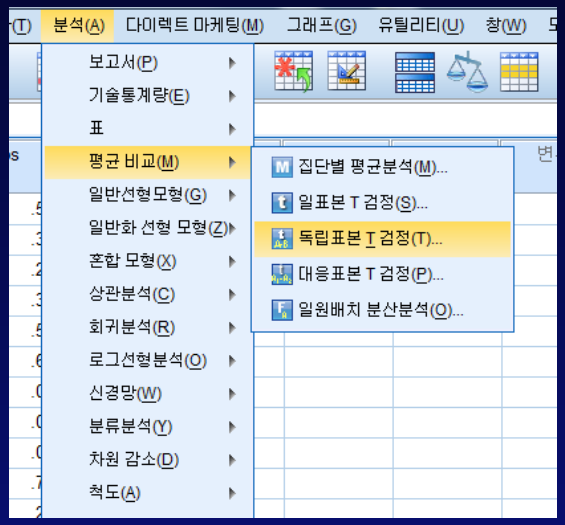
AUC (C-Statics): 0.856
* 통상 > 0.650…/ 0.800

# Step 3 – 기본 통계 (1)

## 1. 연속형 변수 (Continuous variables)

**Student t-test**

- 메뉴 상단: 분석 => 평균비교 => 독립표본T검정




T-검정

집단통계량

| | EESBPBS | N | 평균 | 표준편차 | 평균의 표준오차 |
|---|---|---|---|---|---|
| Age | 1 | 9[illegible] | 62.625 | 12.6528 | .4116 |
| | 0 | 5159 | 63.106 | 12.3183 | .1715 |

독립표본 검정

| | | Levene의 등분산 검정 | | 평균의 동일성에 대한 t-검정 | | |
|---|---|---|---|---|---|---|
| | | F | 유의확률 | t | 자유도 | 유의확률 (양측) |
| Age | 등분산이 가정됨 | 1.682 | .195 | -1.101 | 6102 | .271 |
| | 등분산이 가정되지 않음 | | | -1.080 | 1293.112 | .280 |

독립표본 검정

| | | 평균의 동일성에 대한 t-검정 | | | |
|---|---|---|---|---|---|
| | | 평균차 | 차이의 표준오차 | 차이의 95% 신뢰구간 하한 | 상한 |
| Age | 등분산이 가정됨 | -.4818 | .4377 | -1.3399 | .3763 |
| | 등분산이 가정되지 않음 | -.4818 | .4459 | -1.3565 | .3930 |

Levene의 등분산 검정

- 유의확율 ≥ 0.05: 등분산 가정
- 유의확율 < 0.05: 등분산 가정X

EES vs. BPBS

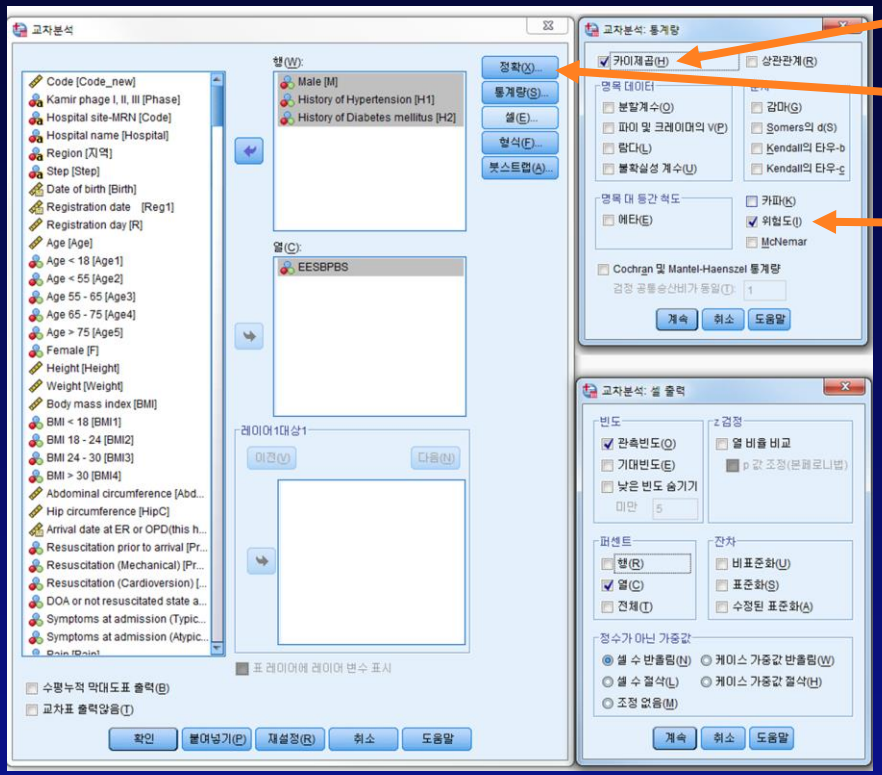
63.1±12.3, 62.6±12.6, P=0.271

# Step 3 – 기본 통계 (2)

## 2. 범주형 변수 (Categorical variables) & 상대위험도 분석

**Chi-square test** or **Fischer's exact test**

메뉴 상단: 분석 => 기술통계 => 교차분석




Chi-square test

Fischer's exact test: 정확한 검정

상대 위험과 오즈비
(Relative Risk & Odds Ratio)

# Step 3 – 기본 통계 (3)

## 2. 범주형 변수 (Categorical variables) & 상대위험도 분석

**Chi-square test or Fischer's exact test or Relative Risk**

교차표

| | | | EESBA9 | | |
|---|---|---|---|---|---|
| | | | 0 | 1 | 전체 |
| Total MACEs | 0 | 빈도 | 855 | 847 | 1702 |
| | | EESBA9 중 % | 93.2% | 92.4% | 92.8% |
| | 1 | 빈도 | 62 | 70 | 132 |
| | | EESBA9 중 % | 6.8% | 7.6% | 7.2% |
| 전체 | | 빈도 | 917 | 917 | 1834 |
| | | EESBA9 중 % | 100.0% | 100.0% | 100.0% |

카이제곱 검정

| | 값 | 자유도 | 점근 유의확률 (양측검정) | 정확한 유의확률 (양측검정) | 정확한 유의확률 (단측검정) | 점 확률 |
|---|---|---|---|---|---|---|
| Pearson 카이제곱 | .522[a] | 1 | .470 | .527 | .264 | |
| 연속수정[b] | .400 | 1 | .527 | | | |
| 우도비 | .523 | 1 | .470 | .527 | .264 | |
| Fisher의 정확한 검정 | | | | .527 | .264 | |
| 선형 대 선형결합 | .522[c] | 1 | .470 | .527 | .264 | .056 |
| 유효 케이스 수 | 1834 | | | | | |

a. 0 셀 (.0%)은(는) 5보다 작은 기대 빈도를 가지는 셀입니다. 최소 기대빈도는 66.00입니다.

b. 2x2 표에 대해서만 계산됨

c. 표준화 통계량은 .723입니다.

위험도 추정값

| | 값 | 95% 신뢰구간 | |
|---|---|---|---|
| | | 하한 | 상한 |
| Total MACEs (0 / 1)에 대한 승산비 | 1.140 | .799 | 1.625 |
| 코호트 EESBA9 = 0 | 1.070 | .887 | 1.290 |
| 코호트 EESBA9 = 1 | .938 | .794 | 1.110 |
| 유효 케이스 수 | 1834 | | |

Chi-square test

Fischer's exact test: 정확한 검정

5보다 작은 기대빈도의 셀이 20% 이상이면 Fischer's exact test를 사용한다

상대 위험도와 오즈비 (Relative Risk & Odds Ratio)

RR: 1.140, CI: 0.799 – 1.625

*Cox regression; HR

# Baseline & Angiographic Clinical Characteristics

| Variables | Entire Patients | | | Matched Patients | | |
|---|---|---|---|---|---|---|
| | EES (n=5203) | BPBS (n=950) | p Value | EES (n=917) | BPBS (n=917) | p Value |
| Male | 3850 (73.9) | 713 (75) | 0.494 | 701 (76.4) | 684 (74.5) | 0.356 |
| Age | 63.1 ± 12.3 | 62.6 ± 12.6 | 0.271 | 62.6 ± 12.5 | 62.6 ± 12.6 | 0.983 |
| Body mass index | 24.0 ± 3.1 | 24.1 ± 3.2 | 0.285 | 24.0 ± 3.0 | 24.1 ± 3.1 | 0.772 |
| LV ejection fraction, % | 52.1 ± 11.5 | 53.8 ± 10.6 | < 0.001 | 53.3 ± 10.6 | 53.8 ± 10.5 | 0.370 |
| History | | | | | | |
| Hypertension | 2550 (49.0) | 449 (47.2) | 0.322 | 448 (48.8) | 434 (47.3) | 0.513 |
| Diabetes mellitus | 1478 (28.4) | 256 (26.9) | 0.358 | 244 (26.6) | 245 (26.7) | 0.958 |
| Dyslipidemia | 619 (11.8) | 97 (10.2) | 0.136 | 99 (10.7) | 92 (10) | 0.593 |
| Prior heart failure (NYHA III/IV) | 70 (1.3) | 7 (0.7) | 0.121 | 6 (0.6) | 7 (0.7) | 0.781 |
| Renal disease | 72 (1.3) | 18 (1.8) | 0.228 | 18 (1.9) | 18 (1.9) | ns |
| Cerebrovascular disease | 299 (5.7) | 66 (6.9) | 0.150 | 59 (6.4) | 62 (6.7) | 0.778 |
| Peripheral vascular disease | 19 (0.3) | 5 (0.5) | 0.404 | 2 (0.2) | 4 (0.4) | 0.687 |
| Chronic lung disease | 68 (1.3) | 13 (1.3) | 0.878 | 16 (1.7) | 12 (1.3) | 0.446 |
| Liver disease | 38 (0.7) | 11 (1.1) | 0.173 | 4 (0.4) | 9 (0.9) | 0.164 |
| Peptic ulcer | 38 (0.7) | 9 (0.9) | 0.480 | 10 (1.0) | 8 (0.8) | 0.636 |
| Current smoking | 2230 (42.8) | 418 (44.0) | 0.514 | 391 (42.6) | 400 (43.6) | 0.671 |
| Family history of CAD | 388 (7.4) | 80 (8.4) | 0.303 | 75 (8.1) | 80 (8.7) | 0.675 |
| Diagnosis | | | | | | |
| ST-segment elevation MI | 3002 (57.6) | 492 (51.7) | 0.001 | 472 (51.4) | 475 (51.7) | 0.889 |
| Primary PCI | 2803 (53.8) | 461 (48.5) | 0.002 | 451 (49.1) | 445 (48.5) | 0.779 |
| Non-ST-segment elevation MI | 2167 (41.6) | 449 (47.2) | 0.001 | 440 (47.9) | 433 (47.2) | 0.743 |
| Early invasive treatment | 1840 (35.3) | 415 (43.6) | < 0.001 | 410 (44.7) | 400 (43.6) | 0.638 |
| Killip class | | | | | | |
| I | 3634 (69.8) | 692 (72.8) | 0.063 | 686 (74.8) | 669 (72.9) | 0.366 |
| II | 636 (12.2) | 99 (10.4) | 0.115 | 93 (10.1) | 95 (10.3) | 0.878 |
| III | 324 (6.2) | 54 (5.6) | 0.522 | 54 (5.8) | 53 (5.7) | 0.921 |
| IV | 264 (5.0) | 29 (3.0) | 0.007 | 27 (2.9) | 28 (3.0) | 0.891 |
| Laboratory findings | | | | | | |
| CK-MB | 129 ± 196 | 107 ± 261 | 0.016 | 116 ± 222 | 107 ± 263 | 0.443 |
| Troponin I | 41 ± 115 | 38 ± 118 | 0.451 | 33 ± 59 | 38 ± 11 | 0.231 |
| Total cholesterol | 184 ± 46 | 182 ± 43 | 0.460 | 183 ± 46 | 182 ± 42 | 0.777 |
| LDL-cholesterol | 115 ± 38 | 116 ± 38 | 0.412 | 114 ± 38 | 116 ± 38 | 0.311 |
| hsCRP | 13.0 ± 60.8 | 10.8 ± 38.9 | 0.335 | 15.0 ± 64.0 | 11.1 ± 39.5 | 0.163 |
| A1C, % | 6.7 ± 2.7 | 6.6 ± 2.6 | 0.799 | 6.5 ± 1.5 | 6.6 ± 2.6 | 0.370 |
| Blood glucose | 171 ± 81 | 167 ± 78 | 0.173 | 166 ± 76 | 167 ± 78 | 0.962 |

| Variables | Entire Patients | | | Matched Patients | | |
|---|---|---|---|---|---|---|
| | EES (n=5203) | BPBS (n=950) | p Value | EES (n=917) | BPBS (n=917) | p Value |
| Aggiographic and procedural characteristics | | | | | | |
| Infact related artery | | | | | | |
| LAD | 2545 (48.9) | 469 (49.3) | 0.797 | 433 (47.2) | 456 (49.7) | 0.283 |
| LCx | 840 (16.1) | 171 (18.0) | 0.156 | 165 (17.9) | 167 (18.2) | 0.903 |
| RCA | 1691 (32.5) | 295 (31) | 0.380 | 302 (32.9) | 280 (30.5) | 0.270 |
| Left main | 101 (1.9) | 14 (1.4) | 0.328 | 16 (1.7) | 13 (1.4) | 0.574 |
| Lesion type (B2/C) | 3548 (68.1) | 717 (75.4) | < 0.001 | 674 (73.5) | 686 (74.8) | 0.522 |
| B2 | 1385 (26.6) | 350 (36.8) | < 0.001 | 309 (33.6) | 327 (35.6) | 0.377 |
| C | 2163 (41.5) | 367 (38.6) | 0.090 | 365 (39.8) | 359 (39.1) | 0.774 |
| Multivessel disease | | | | | | |
| Double | 1638 (31.4) | 292 (30.7) | 0.649 | 313 (34.1) | 283 (30.8) | 0.135 |
| Triple | 1273 (24.4) | 184 (19.3) | 0.001 | 201 (21.9) | 178 (19.4) | 0.185 |
| Left main disease | 187 (3.5) | 29 (3.0) | 0.404 | 21 (2.2) | 27 (2.9) | 0.380 |
| Treated lesion | | | | | | |
| LAD | 2957 (56.8) | 537 (56.5) | 0.861 | 513 (55.9) | 521 (56.8) | 0.706 |
| LCx | 1263 (24.2) | 247 (26.0) | 0.256 | 244 (26.6) | 241 (26.2) | 0.874 |
| RCA | 1951 (37.4) | 354 (37.2) | 0.891 | 349 (38) | 338 (36.8) | 0.596 |
| Left main | 159 (3.0) | 22 (2.3) | 0.214 | 19 (2.0) | 21 (2.2) | 0.749 |
| Pre-procedural TIMI flow grade | | | | | | |
| 0 | 2303 (44.2) | 398 (41.8) | 0.176 | 397 (43.2) | 389 (42.4) | 0.706 |
| I | 659 (12.6) | 126 (13.2) | 0.612 | 119 (12.9) | 119 (12.9) | ns |
| II | 612 (11.7) | 134 (14.1) | 0.042 | 114 (12.4) | 127 (13.8) | 0.369 |
| III | 1176 (22.6) | 221 (23.2) | 0.655 | 233 (25.4) | 211 (23) | 0.230 |
| Stent diameter, mm | 3.1 ± 0.4 | 3.16 ± 0.4 | 0.949 | 3.1 ± 0.4 | 3.1 ± 0.3 | 0.237 |
| Stent length, mm | 23.9 ± 6.3 | 21.7 ± 4.8 | < 0.001 | 21.6 ± 4.7 | 21.8 ± 4.8 | 0.335 |
| Pre-PCI diameter stenosis, % | 87.0 ± 15.8 | 89.5 ± 13.3 | < 0.001 | 87.9 ± 14.1 | 89.6 ± 13.3 | 0.075 |
| Post-PCI diameter stenosis, % | 22.9 ± 11.7 | 21.7 ± 8.4 | 0.016 | 21.6 ± 9.7 | 21.7 ± 8.4 | 0.783 |
| Total stents/Patients, n | 1.4 ± 0.7 | 1.4 ± 0.7 | 0.020 | 1.41 ± 0.7 | 1.40 ± 0.7 | 0.769 |
| Pre-procedural TIMI flow grade | | | | | | |
| 0 | 42 (0.8) | 4 (0.4) | 0.204 | 8 (0.8) | 4 (0.4) | 0.247 |
| I | 43 (0.8) | 3 (0.3) | 0.093 | 6 (0.6) | 3 (0.3) | 0.507 |
| II | 177 (3.4) | 15 (1.5) | 0.003 | 28 (3.0) | 15 (1.6) | 0.045 |
| III | 4485 (86.2) | 856 (90.1) | 0.001 | 814 (88.7) | 823 (89.7) | 0.497 |

# Clinical Outcomes up to 2 Years

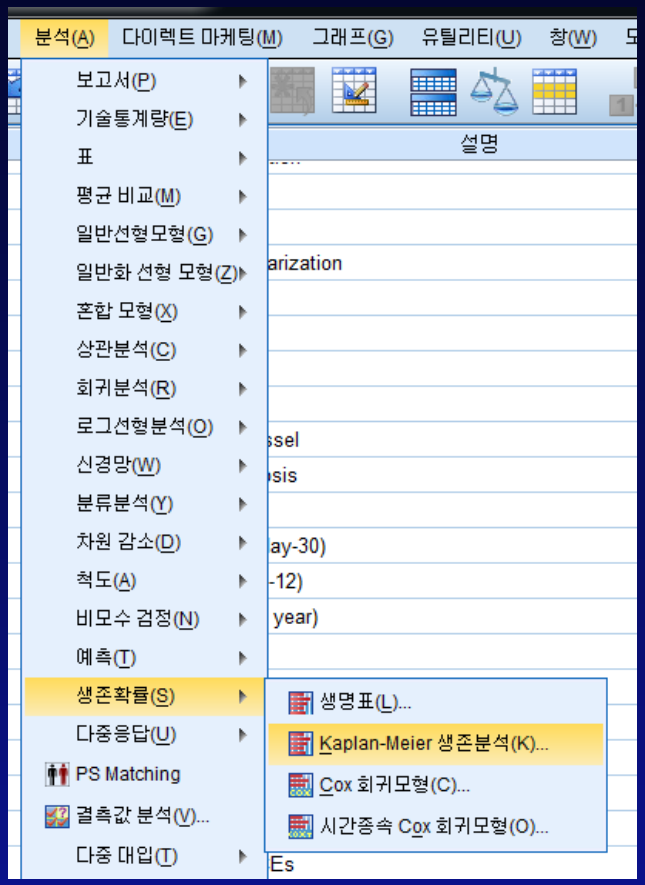
| Variables | Entire Patients | | | | Matched Patients | | | |
|---|---|---|---|---|---|---|---|---|
| | EES (n=5203) | BPBS (n=950) | Relative Risk (Odd ratio) | p Value | EES (n=917) | BPBS (n=917) | Relative Risk (Odd ratio) | p Value |
| Outcomes at 30 days | | | | | | | | |
| Total death | 167 (3.2) | 23 (2.4) | 0.74 (0.48 - 1.16) | 0.196 | 28 (3.0) | 23 (2.5) | 0.81 (0.46 - 1.42) | 0.478 |
| Cardiac Death | 162 (3.1) | 22 (2.3) | 0.73 (0.46 - 1.15) | 0.184 | 27 (2.9) | 22 (2.3) | 0.81 (0.45 - 1.43) | 0.469 |
| Re-MI | 13 (0.2) | 5 (0.5) | 2.11 (0.75 - 5.93) | 0.181 | 3 (0.3) | 5 (0.5) | 1.67 (0.39 - 7.00) | 0.726 |
| STEMI | 11 (0.2) | 2 (0.2) | 0.99 (0.22 - 4.49) | ns | 2 (0.2) | 2 (0.2) | 1.00 (0.14 - 7.11) | ns |
| Outcomes at 2 years | | | | | | | | |
| Total death | 233 (4.4) | 37 (3.8) | 0.86 (0.60 - 1.23) | 0.419 | 37 (4.0) | 37 (4.0) | 1.00 (0.62 - 1.59) | ns |
| Cardiac Death | 200 (3.8) | 27 (2.8) | 0.73 (0.48 - 1.10) | 0.132 | 33 (3.5) | 27 (2.9) | 0.81 (0.48 - 1.36) | 0.431 |
| Re-MI | 58 (1.1) | 15 (1.5) | 1.42 (0.80 - 2.52) | 0.224 | 11 (1.1) | 15 (1.6) | 1.36 (0.62 - 2.99) | 0.429 |
| STEMI | 30 (0.5) | 6 (0.6) | 1.09 (0.45 - 2.64) | 0.838 | 6 (0.6) | 6 (0.6) | 1.00 (0.32 - 3.11) | ns |
| Revascularization | 132 (2.5) | 20 (2.1) | 0.82 (0.51 - 1.32) | 0.430 | 15 (1.6) | 19 (2.0) | 1.27 (0.64 - 2.51) | 0.489 |
| CABG | 6 (0.1) | 1 (0.1) | 0.91 (0.10 - 7.58) | ns | 0 (0.0) | 1 (0.1) | 0.49 (0.47 - 0.52) | ns |
| Re-PCI | 126 (2.4) | 19 (2.0) | 0.82 (0.50 - 1.33) | 0.431 | 15 (1.6) | 18 (1.9) | 1.20 (0.60 - 2.40) | 0.598 |
| TLR | 37 (0.7) | 9 (0.9) | 1.33 (0.64 - 2.77) | 0.437 | 4 (0.4) | 9 (0.9) | 2.26 (0.69 - 7.37) | 0.164 |
| TVR | 59 (1.1) | 10 (1.0) | 0.92 (0.47 - 1.81) | 0.827 | 8 (0.8) | 10 (1.0) | 1.25 (0.49 - 3.18) | 0.636 |
| Non-TVR | 67 (1.2) | 10 (1.0) | 0.81 (0.41 - 1.59) | 0.549 | 5 (0.5) | 9 (0.9) | 1.80 (0.60 - 5.41) | 0.283 |
| Total MACE | 410 (7.8) | 71 (7.4) | 0.94 (0.72 - 1.22) | 0.668 | 62 (6.7) | 70 (7.6) | 1.13 (0.79 - 1.62) | 0.470 |
| TLF | 285 (5.4) | 50 (5.2) | 0.95 (0.70 - 1.30) | 0.789 | 47 (5.1) | 50 (5.4) | 1.06 (0.70 - 1.60) | 0.754 |
| TLR MACE | 262 (5.0) | 42 (4.4) | 0.87 (0.62 - 1.21) | 0.422 | 43 (4.6) | 42 (4.5) | 0.97 (0.63 - 1.50) | 0.912 |
| TVR MACE | 338 (6.4) | 61 (6.4) | 0.98 (0.74 - 1.30) | 0.931 | 55 (5.9) | 61 (6.6) | 1.11 (0.76 - 1.62) | 0.565 |
| Probable or definite stent thrombosis | 29 (0.5) | 10 (1.0) | 1.89 (0.92 - 3.90) | 0.077 | 4 (0.4) | 10 (1.0) | 2.51 (0.78 - 8.05) | 0.107 |
| Acute | 6 (0.1) | 1 (0.1) | 0.91 (0.10 - 7.58) | ns | 1 (0.1) | 1 (0.1) | 1.00 (0.06 - 16.0) | ns |
| Subacute | 3 (0.0) | 3 (0.3) | 5.49 (1.10 - 27.2) | 0.051 | 0 (0.0) | 3 (0.3) | 0.49 (0.47 - 0.52) | 0.250 |
| Late (1-12 months) | 17 (0.3) | 5 (0.5) | 1.61 (0.59 - 4.38) | 0.370 | 2 (0.2) | 5 (0.5) | 2.50 (0.48 - 12.9) | 0.452 |
| Very late (1-2 years) | 3 (0.0) | 1 (0.1) | 1.82 (0.18 - 17.5) | 0.489 | 1 (0.1) | 1 (0.1) | 1.00 (0.06 - 16.0) | ns |

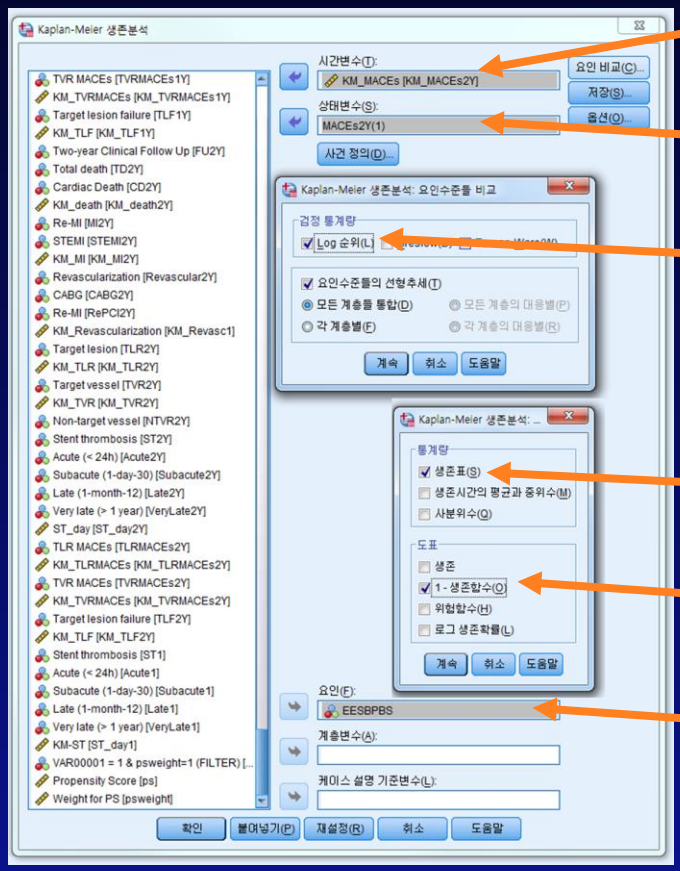
*동일한 결과값; p=1.0 or p<0.001 or ns

# Step 4 – 생존율 곡선 (1)

## 1. Kaplan-Meier Survival Curve

- 메뉴 상단: 분석 => 생존확율 => K-M curve분석




생존 시간

Event

Log Rank test

생존표

그래프

비교 변수

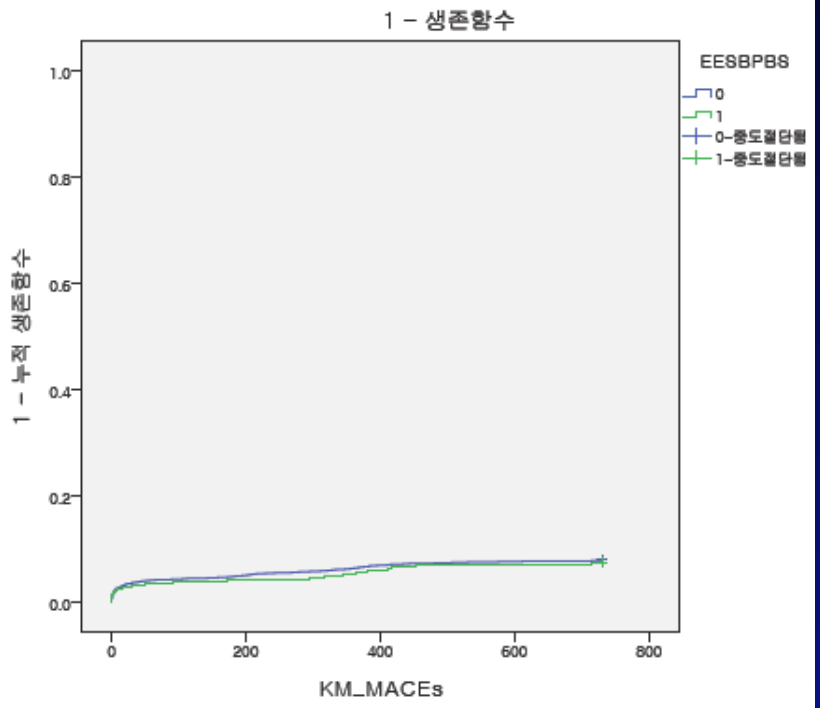
# Step 4 – 생존율 곡선 (2)

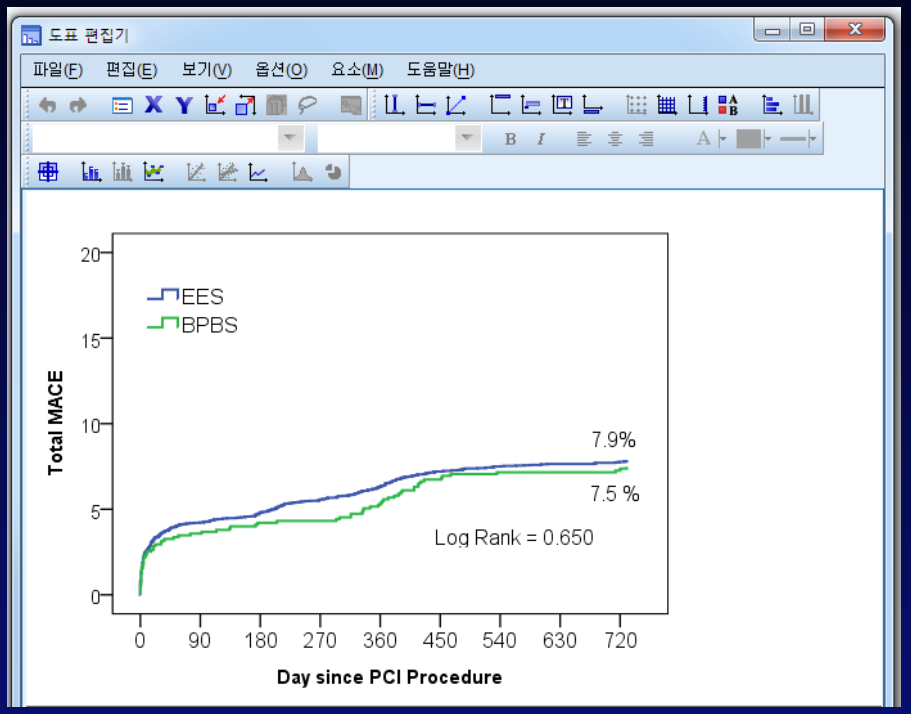
Log Rank test

전체 비교

| | 카이제곱검정 | 자유도 | 유의확률 |
|---|---|---|---|
| Log Rank (Mantel-Cox) | .206 | 1 | .650 |

추세 가중값의 벡터는 −1, 1.입니다. 디폴트입니다.

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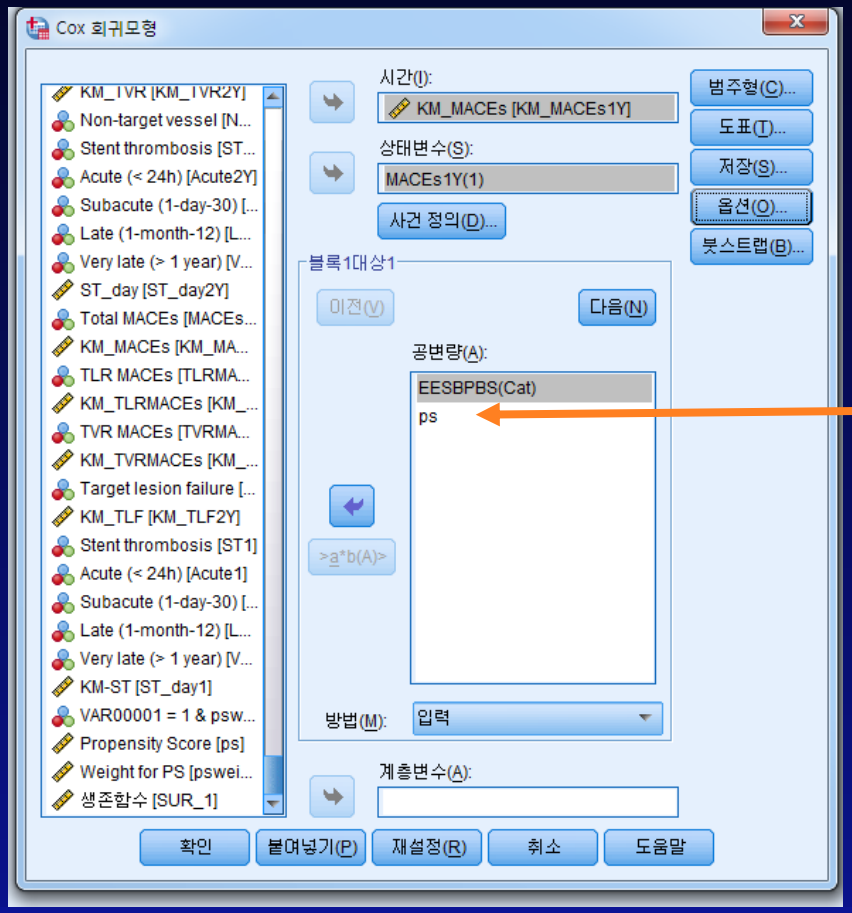
# Step 4 – 생존율 곡선 (3)

## 2. Cox-regression: Cox proportional hazard model

- 메뉴 상단: 분석 => 생존확율 => Cox 회귀모형




K-M curve분석과 거의 동일 함

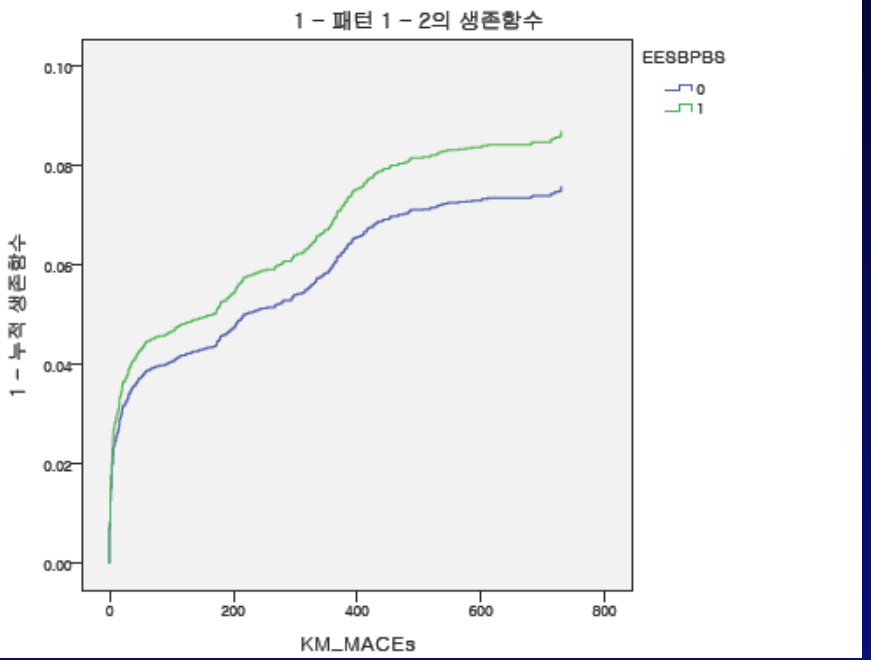
Propensity Score

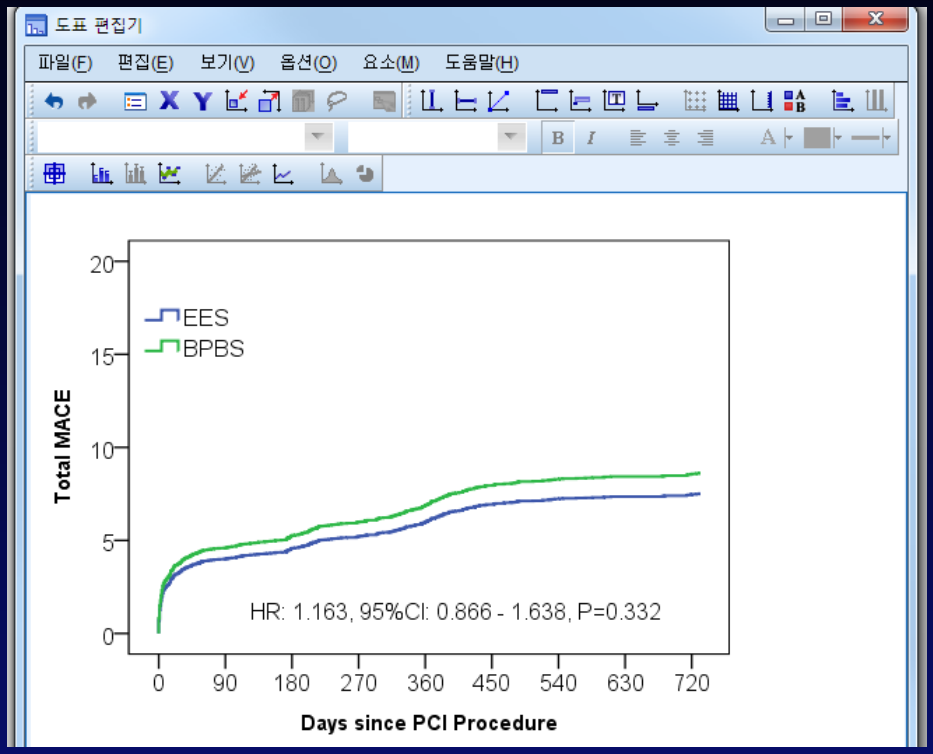
- **Cox proportional hazard ratio adjusted PS**

# Step 4 – 생존율 곡선 (4)

방정식의 변수

| | B | 표준오차 | Wald | 자유도 | 유의확률 | Exp(B) | Exp(B)에 대한 95.0% CI | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | 하한 | 상한 |
| EESBPBS | .142 | .147 | .941 | 1 | .332 | 1.163 | .865 | 1.538 |
| ps | −.879 | .319 | 7.620 | 1 | .006 | .415 | .222 | .775 |

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# Dr. Rha 의 Kamir/Kormi 통계분석 Summary

Ex) 두 군의 비교연구 (KAMIR/KORMI data에서만…)

1. 가설 설정 및 데이터 탐색
2. Propensity Score Matching: PS Matching
3. 기본 통계 (chi-검정, 독립T검정, 상대위험검정)
4. 회귀분석 & 생존율 분석
5. Subgroup Analysis

1. 의학통계학과의 정식 자문
2. 연구인력의 전문화; Data Coordinator/Statistics (최병걸, 최세연, 변재경 연구원)

# Thank you for your attention