Establishment of nation-wide transport system for acute cardiovascular disease

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Contents

- General facts about AMI in Korea
- Problems in pre-hospital care of AMI in Korea
- Building the nation-wide transport system for AMI in Korea

Contents

- **General facts about AMI in Korea**
- Problems in pre-hospital care of AMI in Korea
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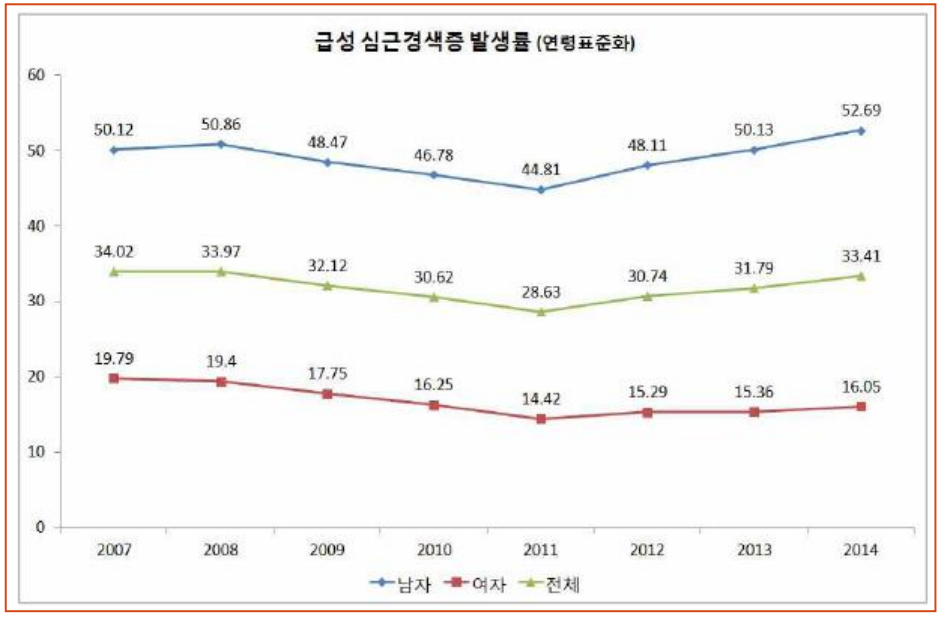
Facts about AMI in Korea

- **Incidence of AMI (crude, age-adjusted incidence)**
  - *No dedicated statistics for AMI incidence in Korea*
  - Statistical correction with National Insurance Reimbursement data
  - Increased incidence of AMI since 2011
  - Age-adjusted AMI incidence in general population: 52.7/100,000



Song Vogue Ahn. AMI burden in Korea using the National Insurance Reimburse System Big Data

Facts about AMI in Korea

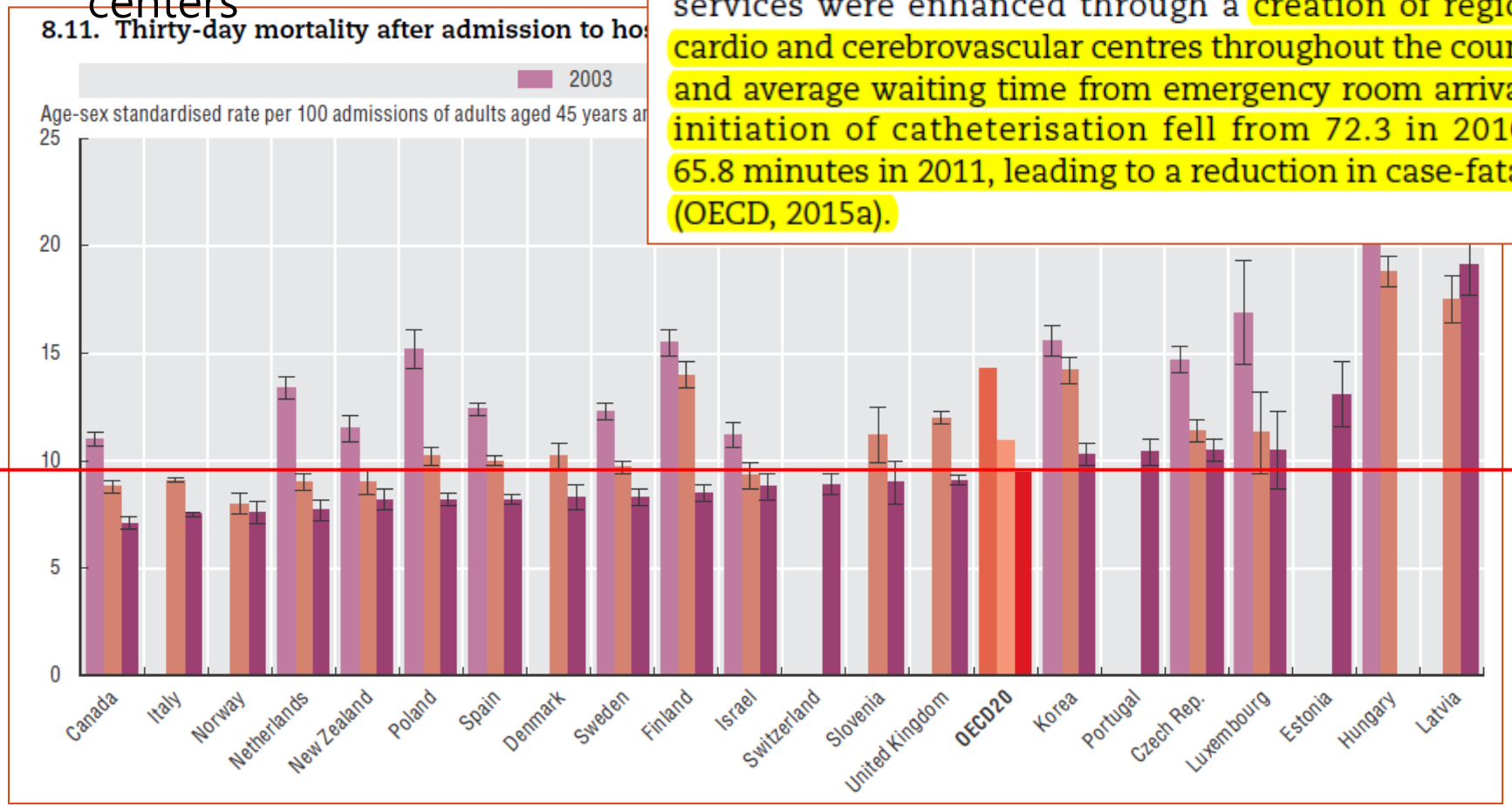
- **Can we reduce AMI mortality more?**
  - Age-adjusted mortality of ischemic heart disease (2005~2015, /100,000)

Statistics Korea

Facts about AMI

- **Can we reduce AMI mort**
  - Remarkable advancement
    centers

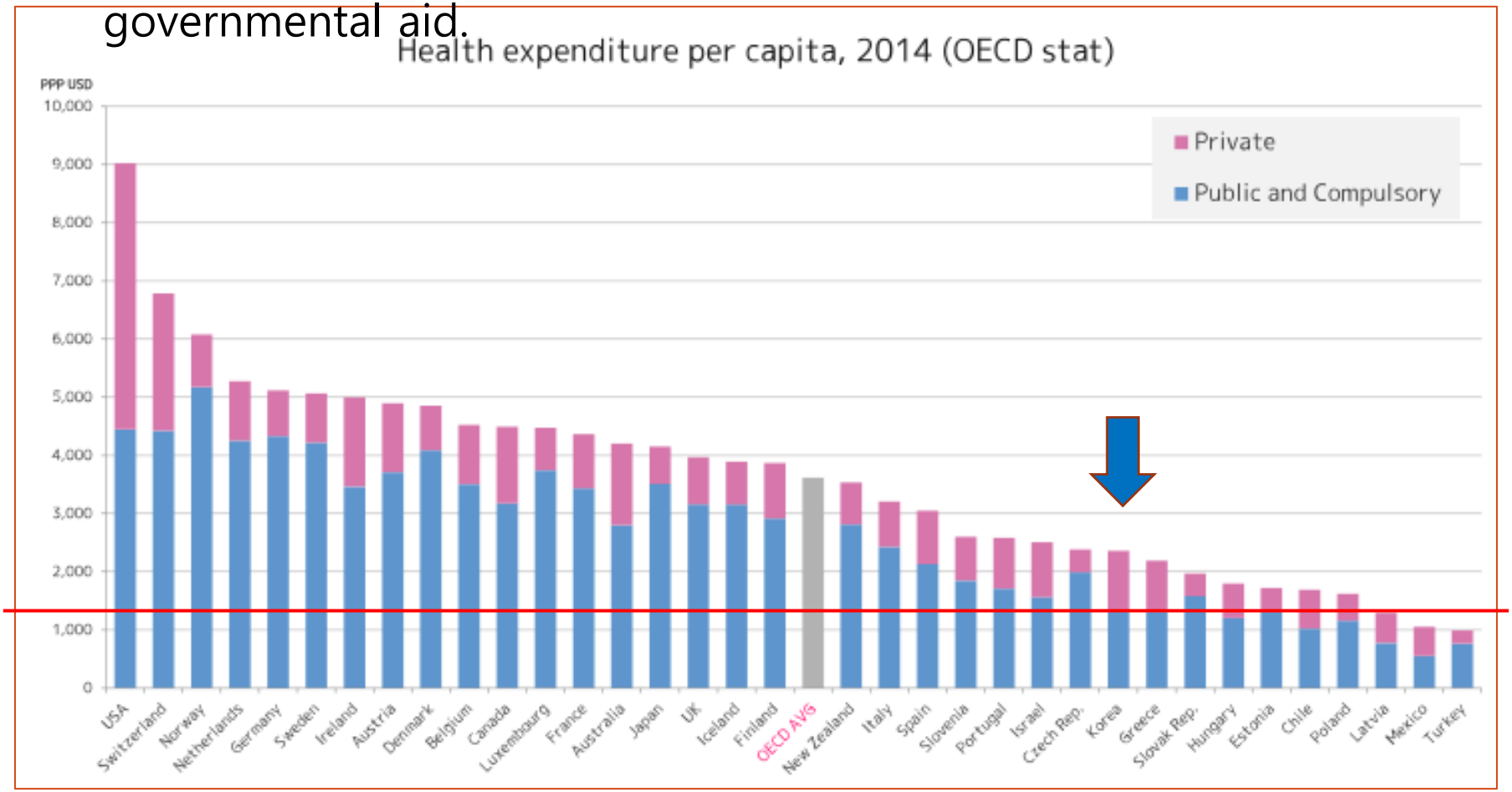
ventions and high-quality specialised health facilities such as percutaneous catheter intervention-capable centres have helped to reduce 30-day case-fatality rates (OECD, 2015a). For example, Korea had higher case-fatality rates for AMI but in 2006 it has implemented a Comprehensive Plan for CVD, encompassing prevention, primary care and acute CVD care (OECD, 2012). Under the Plan, specialised services were enhanced through a creation of regional cardio and cerebrovascular centres throughout the country, and average waiting time from emergency room arrival to initiation of catheterisation fell from 72.3 in 2010 to 65.8 minutes in 2011, leading to a reduction in case-fatality (OECD, 2015a).



OECD Health Statistics (Unit: age adjusted mortality /100,000)
http://www.oecd-ilibrary.org/social-issues-migration-health/health-at-a-glance-2015/mortality-following-acute-myocardial-infarction-ami_health_glance-2015-47-en

Facts about AMI in Korea

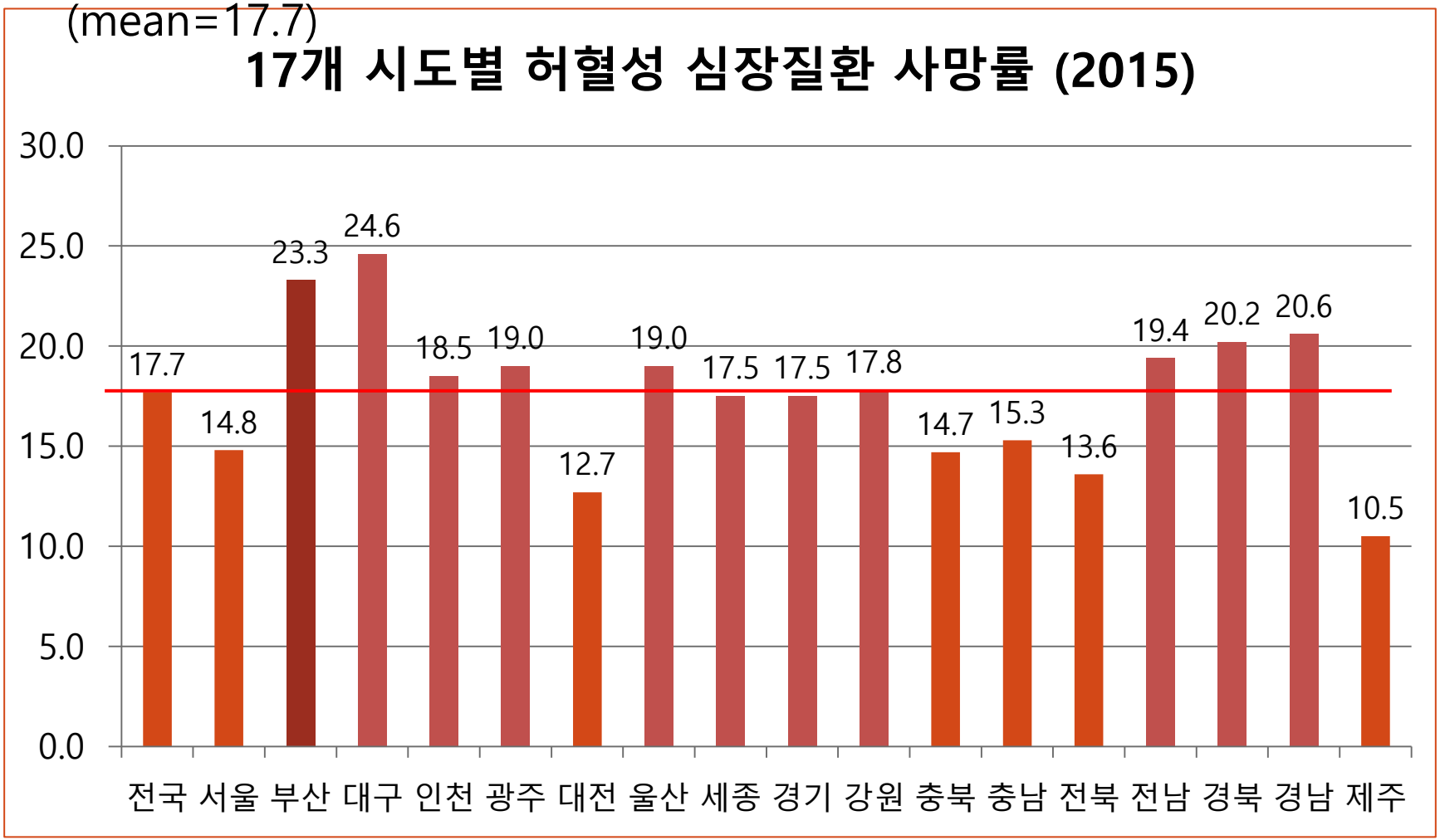
- **Can we reduce AMI mortality more?**
  - Healthcare expenditure per capita in OECD
  - It is not time to assess, punish or de-centive, but it is time to more governmental aid.



OECD Health Statistics

Facts about AMI in Korea

- **Can we reduce AMI mortality more?**
  - Is there vulnerable or high risk area for AMI death in Korea? (mean=17.7)



Statistics Korea, mortality statistics

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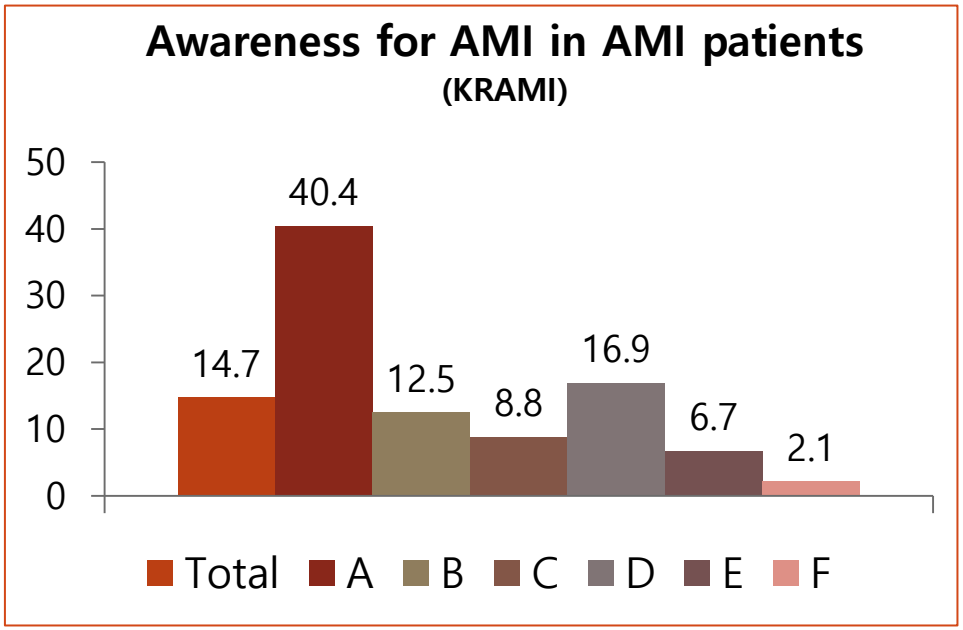
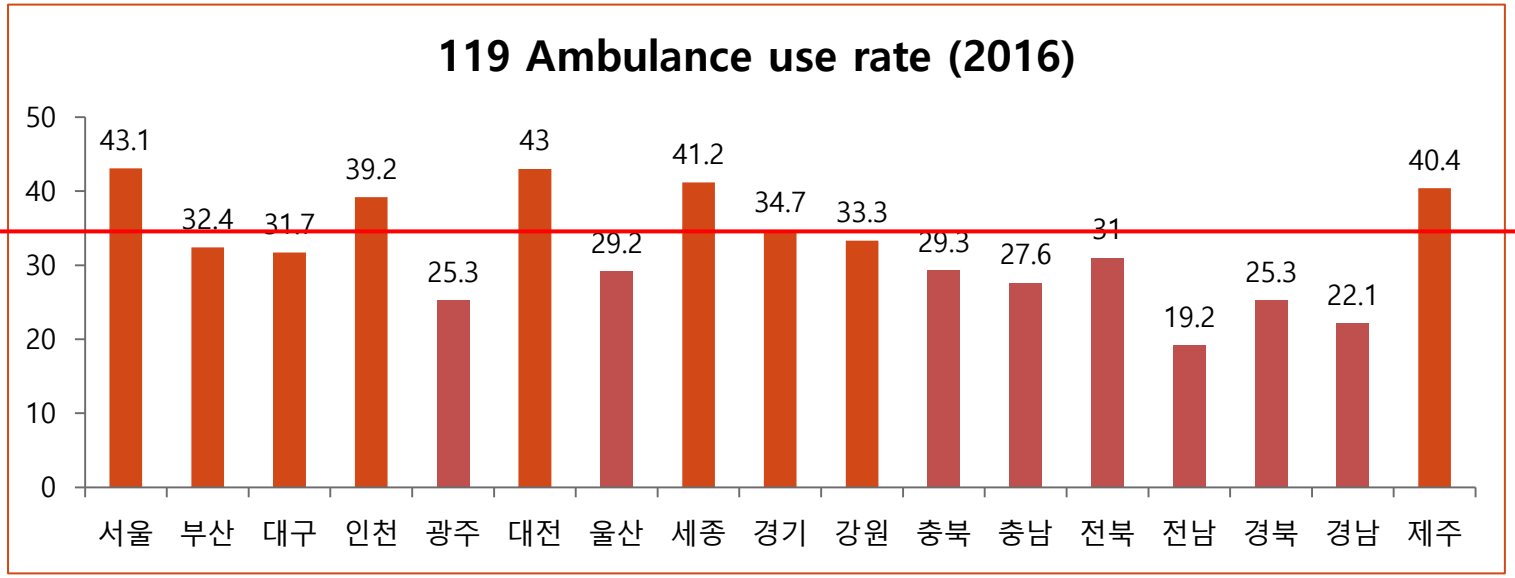
Realities in AMI treatment: Pre-Hospital





Data from KRAMI (Regional CV Centers) and NEDIS

Realities in AMI treatment: Pre-Hospital

1. Low awareness for AMI
   - Very low, and big regional differences (2~40%, mean 14.7%)
2. Long, long symptom onset to hospital arrival
   - More than 3 hours in STEMI, We lose the "golden time" to treat.
3. High re-transfer rate: delay of treatment initiation, higher mortality
   - regional/local/community EMC: 0.2/5.0/41.9%
   - High rate especially in mismatch area between governmental administration and EM care zone
   - High rate at: night and holidays, lower SES, *non-metropolitan area*
   - 119 EMS delivers chest pain patients to near hospital, not appropriate treating hospital
   - Increment re-transfer rate of X3-4 times in recent 5 years
   - same re-transfer rate on patients using between 119 service and other kinds of vehicles

KRAMI [권역심뇌혈관센터], NEDIS

Realities in AMI treatment: Pre-Hospital

4. 119 EMS: impossible to initial diagnosis, assess severity
   - Deficient of 12 leads ECG, rare wireless transmission of ECS
   - Deficient fine net-working among EMS-Center-Hospitals
   - Deficient of EMS personnel and high workload
5. Not exist the control center for acute CV disease patient distribution and transfer
   - Communication structure 119 EMS-severity assess-appropriate or optimal hospital
6. Low rate of using 119 EMS, selection of inappropriate hospital
7. Impossible to use 119 EMS between hospital transfer of severe patients
8. 15% of AMI patients have gone to primary care

Realities in AMI treatment: Pre-Hospital

9. Mismatch between healthcare zone and administration zone
   - Difficulties in awareness education, patients transfer, outcome feedback and reaction
   - Difficulties in systemic and permanent reaction strategies building-vicious cycle

환자 거주지 / 의료기관 소재지	서울	부산	대구	인천	광주	대전	울산	세종	경기	강원	충북	충남	전북	전남	경북	경남	제주
서울서북	19.9	0.2	0.1	1.1	0.1	0.8	0.0	0.0	2.3	0.7	0.9	1.2	0.6	0.4	0.6	0.2	0.9
서울동북	22.5	0.2	0.1	0.7	0.1	0.2	0.2	0.0	3.3	1.3	0.1	0.3	0.2	0.3	0.2	0.2	0.0
서울서남	25.0	0.1	0.1	1.5	0.1	0.1	0.5	0.8	3.8	0.5	0.4	1.0	0.4	0.1	0.2	0.1	0.0
서울동남	22.2	0.3	0.5	0.9	0.3	0.6	0.7	1.7	9.8	1.4	3.0	2.1	1.4	0.6	1.1	0.6	0.7
부산	0.3	95.6	0.3	0.1	0.0	0.1	6.7	0.8	0.2	0.3	0.1	0.3	0.3	0.6	1.0	30.2	0.4
대구	0.1	0.6	95.0	0.1	0.1	0.7	1.0	0.0	0.2	0.1	0.1	0.1	0.2	0.1	32.9	6.6	0.0
인천	2.5	0.1	0.1	87.1	0.1	0.2	0.5	0.0	10.7	0.7	0.7	2.6	0.5	0.7	0.3	0.2	0.2
광주	0.3	0.2	0.1	0.4	97.9	0.5	0.3	0.0	0.4	0.1	0.2	0.2	8.2	53.8	0.1	0.1	0.7
대전	0.3	0.1	0.1	0.4	0.0	93.0	0.0	42.9	0.3	0.2	6.4	22.5	2.1	0.1	0.3	0.2	0.2
울산	0.1	0.4	0.3	0.0	0.0	0.0	87.7	0.0	0.1	0.1	0.0	0.0	0.0	0.1	1.2	0.7	0.0
경기서북	1.9	0.1	1.1	4.6	0.1	0.2	0.2	0.0	13.1	0.3	0.1	0.3	0.1	0.0	0.1	0.1	0.0
경기동북	0.4	0.0	0.1	0.4	0.0	0.1	0.0	0.0	8.3	6.7	0.1	0.1	0.1	0.0	0.0	0.0	0.0
경기서남	1.3	0.1	0.2	0.9	0.1	0.1	0.0	0.0	26.9	0.7	0.8	1.6	0.4	0.4	0.3	0.1	0.2
경기동남	1.1	0.1	0.1	0.5	0.1	0.3	0.0	0.0	14.0	0.8	0.6	0.6	0.4	0.2	0.3	0.3	0.2
강원영동	0.3	0.1	0.1	0.2	0.0	0.2	0.3	0.0	0.2	32.4	0.1	0.0	0.0	0.2	0.3	0.2	0.0
강원춘천	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.5	15.3	0.2	0.1	0.0	0.0	0.0	0.1	0.0
원주충주	0.3	0.0	0.3	0.2	0.0	0.2	0.2	0.0	1.8	37.4	26.8	0.1	0.1	0.1	0.4	0.1	0.0
충남천안	0.4	0.1	0.1	0.4	0.1	0.5	0.2	9.2	3.4	0.3	0.4	57.7	0.2	0.2	0.2	0.1	0.0
충북청주	0.1	0.0	0.1	0.4	0.0	0.3	0.0	40.3	0.2	0.1	58.4	0.4	0.2	0.1	0.4	0.0	0.2
전북익산	0.1	0.0	0.1	0.2	0.0	0.6	0.0	1.7	0.0	0.1	0.1	8.3	35.6	0.2	0.1	0.2	0.0
전북전주	0.1	0.0	0.0	0.0	0.1	0.3	0.0	0.8	0.1	0.0	0.0	0.1	48.5	0.4	0.0	0.0	0.2
전남목포	0.0	0.1	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	20.2	0.1	0.0	0.2
전남순천	0.1	0.1	0.2	0.1	0.4	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.1	21.0	0.0	0.2	0.0
경북안동	0.1	0.1	0.5	0.1	0.0	0.1	0.0	0.0	0.0	0.3	0.1	0.1	0.2	0.0	22.3	0.1	0.0
경북구미	0.1	0.1	0.5	0.0	0.0	0.1	0.0	0.8	0.1	0.0	0.4	0.0	0.1	0.0	18.4	0.1	0.0
경북포항	0.1	0.3	0.5	0.0	0.0	0.1	1.1	0.0	0.0	0.1	0.0	0.1	0.1	0.0	18.7	0.1	0.0
경남창원	0.0	0.5	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	19.2	0.2
경남진주	0.0	0.3	0.1	0.0	0.1	0.1	0.3	0.0	0.1	0.1	0.0	0.1	0.2	0.1	0.1	39.8	0.0
제주	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.8	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	95.5

NEDIS, mapping table for patients residence and care hospital of AMI

Realities in AMI treatment: Pre-Hospital

9. Mismatch between healthcare zone and administration zone
   - Induction of high rate of re-transfer

환자 거주지 / 환자거주지	서울	부산	대구	인천	광주	대전	울산	세종	경기	강원	충북	충남	전북	전남	경북	경남	제주
서울서북	6.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
서울동북	3.0	-	-	-	-	-	-	-	3.2	-	-	-	-	-	-	-	-
서울서남	2.5	-	-	-	-	-	-	-	9.6	-	-	-	-	-	-	-	-
서울동남	2.9	-	-	-	-	-	-	-	2.4	-	-	-	-	-	-	-	-
부산	-	7.2	-	-	-	-	-	-	-	-	-	-	-	-	-	11.0	-
대구	-	-	6.5	-	-	-	-	-	-	-	-	-	-	-	10.4	17.9	-
인천	-	-	-	8.0	-	-	-	-	9.4	-	-	-	-	-	-	-	-
광주	-	-	-	-	13.7	-	-	-	-	-	-	-	28.0	18.6	-	-	-
대전	-	-	-	-	-	4.7	-	8.4	-	-	15.7	15.2	18.2	-	-	-	-
울산	-	-	-	-	-	-	8.7	-	-	-	-	-	-	-	-	-	-
경기서북	-	-	-	19.0	-	-	-	-	4.9	-	-	-	-	-	-	-	-
경기동북	-	-	-	-	-	-	-	-	12.4	43.7	-	-	-	-	-	-	-
경기서남	-	-	-	-	-	-	-	-	6.6	-	-	-	-	-	-	-	-
경기동남	-	-	-	-	-	-	-	-	7.4	-	-	-	-	-	-	-	-
강원영동	-	-	-	-	-	-	-	-	-	18.8	-	-	-	-	-	-	-
강원춘천	-	-	-	-	-	-	-	-	1.9	7.3	-	-	-	-	-	-	-
원주충주	-	-	-	-	-	-	-	-	18.2	13.9	13.8	-	-	-	-	-	-
충남천안	-	-	-	-	-	-	-	-	8.8	-	-	16.7	-	-	-	-	-
충북청주	-	-	-	-	-	-	-	-	-	-	5.4	-	-	-	-	-	-
전북익산	-	-	-	-	-	-	-	-	-	-	-	21.6	16.8	-	-	-	-
전북전주	-	-	-	-	-	-	-	-	-	-	-	-	18.0	-	-	-	-
전남목포	-	-	-	-	-	-	-	-	-	-	-	-	-	12.4	-	-	-
전남순천	-	-	-	-	-	-	-	-	-	-	-	-	-	14.8	-	-	-
경북안동	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.8	-	-
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경남창원	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.0	-
경남진주	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.4	-
제주	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.7

NEDIS, re-transfer rate of AMI according to residence area

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Improvement of public awareness

- **Awareness for initial symptoms of AMI**
- **Promotion of early seeking of 119 assistance**
  - Domestic mass media for general population
  - Local mass media for specific region and subset population
  - Repeated education programs for high risk populations with healthcare experts
  - Region specific education program according to AMI statistics in region

- ('15) Chungbuk Regional CV Center in Boeun county


3월5일 노인대학 발대식


3월26일 제일교회 노인대학


4월2일 산외면 노인대학


4월6일 속리산면 노인대학


4월8일 삼승면 노인대학


4월21일장안면 노인대학


5월1일 탄부면 노인대학

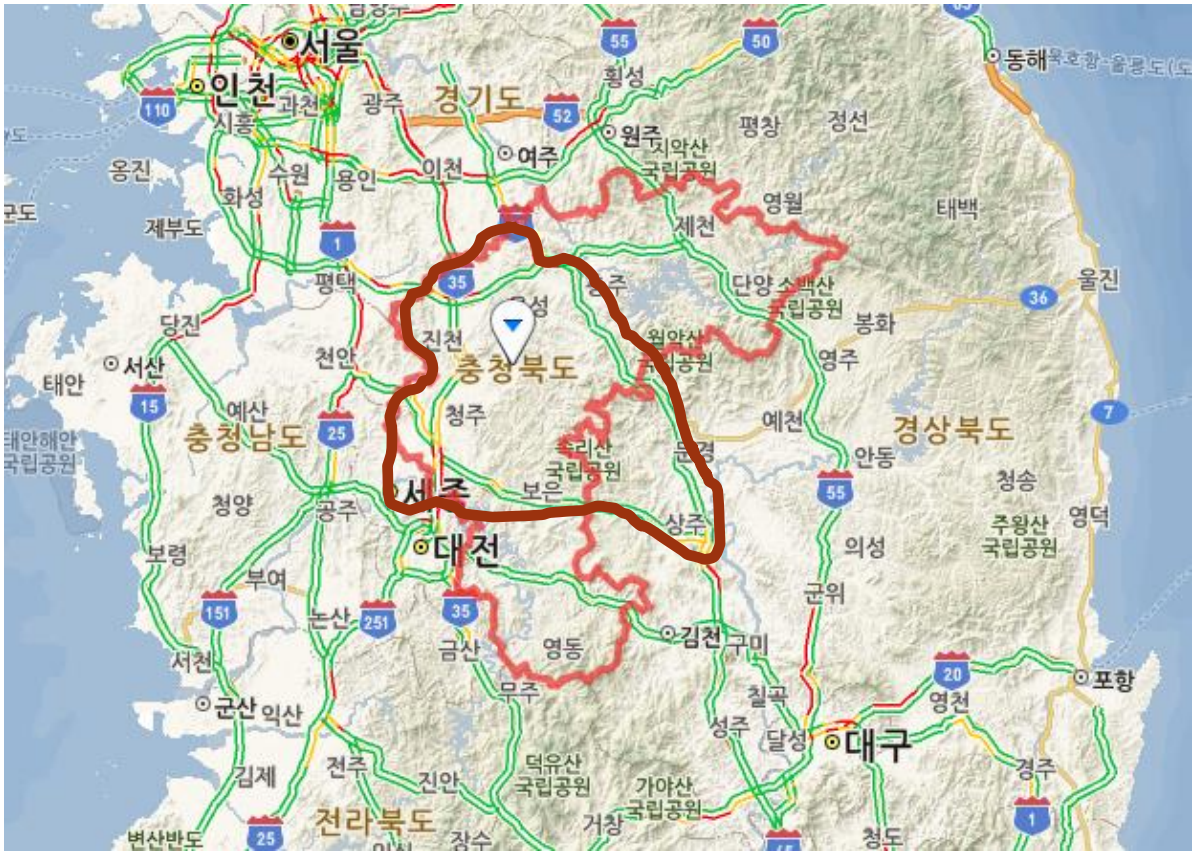

5월14일 회인면 노인대학


7월23일 내북면 노인대학


9월23일 삼승면 노인대학

Overcome mismatch of administration and healthcare zone

- **Chungbuk Province: 1.579 M (‘14), 3 cities, 8 counties**
  - **-0.465 M, + 0.395M**



- 원주권
  - 제천, 단양, 충주
- 대전권
  - 옥천, 영동
- 청주권
  - 문경, 상주
  - 조치원, 세종?

Overcome mismatch of administration and healthcare zone

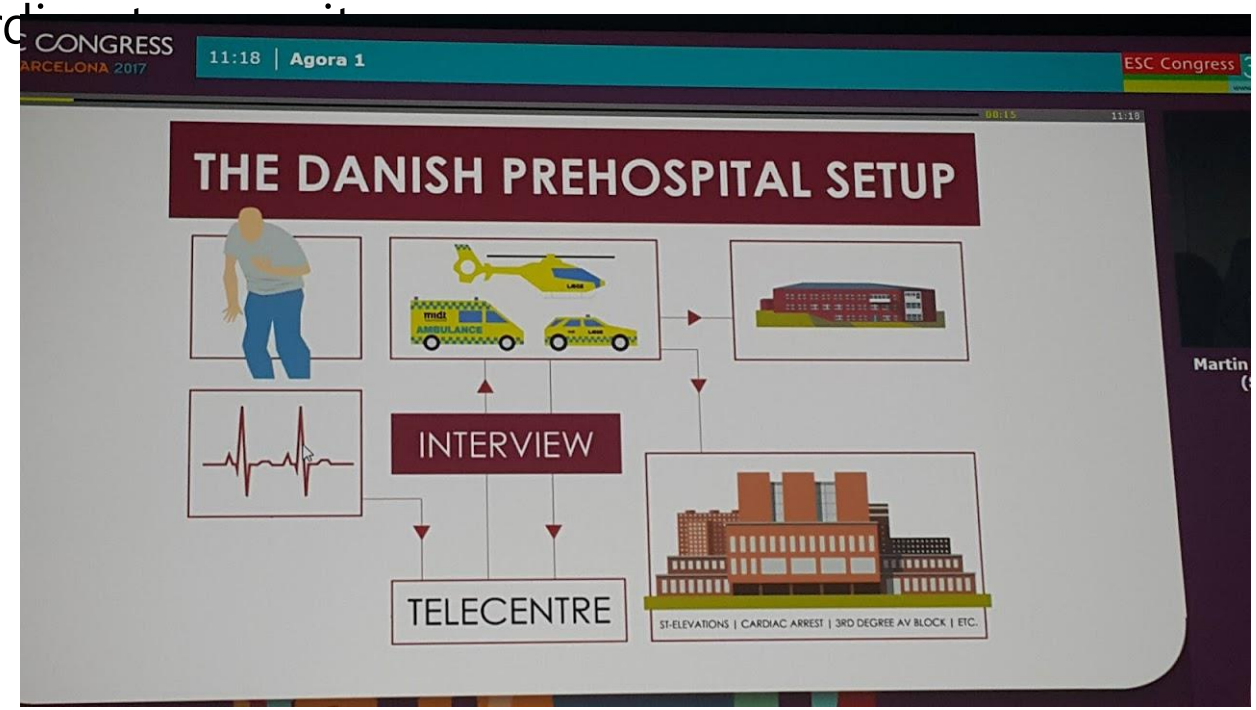
- **Fine analysis with healthcare zone beyond administration zone**
- **Build route map for emergent patients evacuation route**
  - Alliance with regional EMC and regional critical trauma center
- **AMI pre-hospital outcome measures**
  - should be the performance parameters for local government activity for healthcare
  - Because these are not just healthcare tasks for hospital, these are government responsibility.

1 hour transportation from anywhere of nation

- **AMI mortality difference**
  - between metropolitan cities and rural area
  - Among SES
- **Based on healthcare and evacuation route analysis**
  - Active use of 119 EMS, mobile ICU and *medical helicopters*
  - Direct transfer of AMI patients to appropriate hospital
  - Minimize re-transfer of patients and door-in-door out time
  - STEMI diagnosis
    - Should be started in 119 EMS
    - Diagnosis ambiguity case: never leave patient in local hospital, 119 should wait for diagnosis of STETMI and re-transfer to appropriate hospital
  - Central system for patients distribution to appropriate hospital
    - System merge 119 central center and regional CV center
  - Korean 119 EMS is still “transportation” system for AMI patients.
    - We need more compulsory budget and legal assistance to strengthen the Korean EMS.

Central information and distribution system

- **119 EMS – Center – Hospital in region**
  - Building of strong EMS with sufficient trained EMT and POC system
  - Wireless communication among 3 sectors
- **Danish AMI transfer system in EMS**
  - Wireless 12 leads ECG, cardiac enzyme POC device
  - Patient transportation to appropriate hospital (not near hospital) accord



Martin Rasmussen in Aarhus University Hospital, Denmark Presented in ESC 2017.

Central information and distribution system

- **We need more regional net-working**
  - 119 EMS – Center – Hospitals
- **We need more practical IT system.**
  - Google glasses in EMS

Martin Rasmussen in Aarhus University Hospital, Denmark Presented in ESC 2017.

24/7 reperfusion in regions

- **Clear standard to define cardiovascular centers for AMI treatment**
  - Regional CV center (? 11 to 20)
    - At least 5-6 certified PCI doctors, emergent CV surgery , Comprehensive rehab.
    - ECMO
    - Preventive medicine: regional strategy building, center for regional AMI registration
    - Education center for CV expert and EMS in region
  - Local CV center (? 70)
    - At least 3 certified PCI doctors, 24/7 based PPCI , cardiac rehab.
  - Community CV center (? 70)
    - Day time PPCI only ?
  - Co-work among central/local government and academic society (KSC, KSIC)
  - We need more governmental funding.
  - Enough medical cost and enough number of PCI doctors to maintain sustainability

Madhi Rasmussen Aarhus University Hospital, Denmark Presented in ESC 2017.

We need the national CV center.

- **CV disease is second killer for Korean population.**
  - But, we do not have the National CV Center.
    - The National Cancer Center already works well more than 10 years.

- **Tasks of the National CV Center.**
  - Center for proper registration and Statistics for AMI in nation-wide.
  - Governing center for the Regional CV Center.
  - Making healthcare strategy for treating AMI.
  - Making and maintenance the clear standard to define CV centers.
  - Center for advanced studies for CV disease
  - Center for international co-working to defeat CV disease

Conclusion

- **What are ideal system for acute CV disease in Korea.**

Pre-hospital	Hospital	Post-hospital
Awareness initial symptoms rapid call to 119 EMS	**Enforcement of CV hospitals** Systemic hierarchy Enough number of CV doctors Enough human resource and facilities	**Sustaining treatment** Patient-centered treat Preventing recurrence Compliance, recurrence rate
Systemic transportation diagnosis and assess in EMS regional distribution center pre-hosp. communication regional net-working of hosp.	**Systematization of CV centers** National CV center (1) Regional/local CV center (? 20/70) Community CV center (? 60)	**Regionalization** community based rehab.
Within 1 hr transportation Dr. Helicopter in remote area severe patients: mobile ICU and bypass to higher hospital	**Reduction of in-hosp. mortality** rapid reperfusion CCU and semi-CCU	**CV expert develop and Edu.** CV expert develop in Region CME in regional experts
Enforcement of EMS at least 3 EMTs in EMS wireless 12 leads ECG SpO2 sensor POC device for cardiac enzyme	**Regionalization** Regional CV center: severe and surgery patient, cardiac rehab. Education: Reg./Loc../Comm. CV center	**Sustainable treat. Environ.** appropriate medical cost Central-regional govern.-RCVC sustaining aid and good reason-based analysis and feedback