

Public Perception of the Concentration of Cardiac and Cerebrovascular Surgery to Metropolitan Hospitals

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Background: This study investigates the perception of the general public regarding the concentration to metropolitan, hospitals of cardiac and cerebrovascular surgeries, and the perceived public need for government policies to resolve this issue. **Methods:** A total of 800 participants were recruited for our telephone interview survey. Quota sampling was performed, adjusting for age and sex, to select by various geographic regions. Sampling with random digit dialing was performed; we called the randomly generated telephone numbers and made three attempts for non-responders before moving on to a different telephone number. **Results:** Our sample population was 818 participants, 401 men (49.0%) and 417 women (51.0%). Our data showed that 85.5% of participants thought that cardiac surgery and neurosurgery patients are concentrated in large hospitals in Seoul. The principle reason for regional patients to want to receive surgery at major hospitals in Seoul was because of poor medical standards associated with regional hospitals (87.7%). We found that a vast majority of participants (97.5%) felt that government policies are needed to even out the clustering of cardiac surgery and neurosurgery patients, and that this clustering may be alleviated if policies that can specifically enhance the quality and the capacity of regional hospitals to carry out surgeries are adopted (98.3%). **Conclusion:** Government policy making must reflect public desiderata, and we suggest that these public health needs may be partially resolved through government-designated cardiac and neurosurgery specialist hospitals in regional areas.

Key words: 1. Perception
2. Cardiovascular diseases
3. Surgical procedures, operative
4. Cerebrovascular disorders

Introduction

Health statistics for Korea show that the second and third leading causes of death were cardiac disease and neurovascular disease, respectively, in 2014 [1]. There has been an increasing trend in mortality from cardiac disease in the past decade. Deaths from

cardiac disease increased from 36.7 to 52.4 deaths per 100 000 population between 2004 and 2014; among them, deaths occurred mostly from ischemic heart disease (27.9 per 100 000 population) [1]. Although deaths from neurovascular disease significantly decreased from 70.1 to 48.2 deaths per 100 000 populations between 2004 and 2014, it still remains the

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third leading cause of death in Korea [1]. The high prevalence of cardio-cerebrovascular diseases has led to a concomitant increase in annual health expenditure for circulatory diseases, from 1.47 trillion to 7.1 trillion won (2004–2014) [2]. Thus, both the social and economic burdens of cardio-cerebrovascular disease have increased.

With the rapid increase in hospital volumes for cardiocerebrovascular diseases resulting from the mass clustering of patients to the metropolitan hospitals, there has been an imbalance between supply and demand in healthcare service among metropolitan and regional hospitals. The patient clustering effect has led to an investment infrastructure for healthcare centers that preferentially targets metropolitan areas, leading to metropolitan-regional difference in healthcare quality. To address this issue, regional cardiocerebrovascular centers were established in 2008 to enhance the quality of treatment for cardiocerebrovascular diseases and to reduce differences in regional treatment qualities; their effects are now starting to be reported in the literature [3]. Studies have shown that regional cardiocerebrovascular disease centers address the problem of regional disparities of supply and demand, enhance the quality of medical service, and reduce disease burden. However, it has not been effective to reduce regional disparities in hospital volumes and the volumes in metropolitan hospitals remain significant [4]. Additional government policies must be further adopted to address metropolitan-regional disparities in surgical volumes for cardiocerebrovascular diseases.

Development and enforcement of government healthcare policies require the active involvement of the public—the primary end-consumers of government regulation [5,6]—but they are often excluded in this process due to a lack of professional knowledge [7]. However, development or implementation of government policies can only be said to have been done for the benefit of the general population when the public voice has been heard [8].

We investigated the current public perception of the concentration of cardiac surgery and cerebrovascular surgery in metropolitan hospitals relative to regional hospitals, and the demand for government policies that can address disparities in regional-metropolitan healthcare. This study aimed to provide results for a more informed national policy and future

developments and strategies for cardiocerebrovascular disease management.

Methods

1) Subjects of study and survey period

We used quota sampling to recruit participants from 17 areas across the major geographic regions in Korea. We designated quota samples from each region, adjusting for age and sex, for a target total of 800 participants: 150 participants from the Seoul metropolitan area, 190 from Chungcheong, 200 from Gyeongsang, 180 from Jeolla, 80 from Kangwon, and 80 from Jeju. We conducted the telephone interview survey from April 20 to April 30, 2015.

2) Research methods

We adopted a random digit dialing (RDD) telephone sampling method to address concerns of selection bias associated with the low coverage of the national telephone registry. The RDD sampling process occurred in four stages: (1) retrieve all telephone numbers from the most recent update of the Korean telephone directory database; (2) generate telephone numbers from 0001 to 9999 for every area code; (3) exclude telephone numbers registered as a business or company; and (4) differentiate the telephone numbers by region (regional or metropolitan).

Telephone interviews were carried out by calling all telephone numbers randomly generated through RDD sampling, and excluding numbers that were no longer valid. We confirmed that the area code matched the self-reported address of the responders and obtained basic information such as name and gender. After we confirmed that the potential participants fit our selection criteria and received informed consent, we asked them answer the questions from our questionnaire.

Research began with preparations for carrying out due diligence, confirmation and appraisal of survey content, input of data, and computational processing. We made multiple call attempts to prevent bias introduced by non-responders. If, after 3 attempts, there still was no response or if the respondent did not consent to the survey, then we searched for another interviewable telephone number and repeated the telephone interview process.

3) Statistical analysis

All statistical analyses were performed using IBM SPSS for Windows ver. 22.0 (IBM Co., Armonk, NY, USA). We used frequency analysis to describe the number of occurrences for each response chosen by the respondents. A comparative analysis between regional and metropolitan responses was also performed. We tested the statistical significance of metropolitan-regional differences using χ^2 tests. The α level for statistical significance was 0.05.

Results

1) General characteristics of subjects

Survey participants were recruited through quota sampling by age and sex. We enrolled a final sample size of 818 respondents of which 401 were men (49.0%) and 417 were women (51.0%). Respondents were primarily in their 40s (20.7%) and were followed by, in decreasing order of proportion, respondents in their 30s (19.9%), their 60s (19.8%), and their 50s and 20s (19.7% each). We found that 63.8% of respondents were married; most respondents were university degree holders (63.4%). The distribution of respondents by range of national monthly income was as follows: 5 million South Korean won (KRW) or more (21.8%), 3–3.99 million KRW 19.4%, 4–4.99 million KRW (17.0%), 2–2.99 million KRW (13.2%), 1–1.99 million KRW (11.0%), and less than 1 million KRW (9.7%). By area of residence, 153 respondents resided in metropolitan areas (52 Seoul residents, 51 Gyeonggi residents, and 50 Incheon residents) (18.7%) and 665 respondents resided in regional areas (194 Chungcheong residents, 186 Jeolla residents, 204 Gyeongsang residents, 40 Kangwon residents, and 41 Jeju residents) (81.3%) (Table 1).

2) Clustering of cardiac surgery and neurosurgery patients to large metropolitan hospitals and the current status of healthcare standards in regional hospitals

We asked respondents how concentrated were cardiac surgery and neurosurgery patients in large hospitals in Seoul in relation to large regional hospitals, 85.5% of participants responded that they were concentrated ('very concentrated' [43.6%] and 'quite concentrated' [41.9%]), 3.7% of participants thought that patients were 'somewhat concentrated,' and only

Table 1. General characteristics

Characteristic	Value
Gender	
Male	401 (49.0)
Female	417 (51.0)
Age (yr)	
20s	161 (19.7)
30	163 (19.9)
40s	169 (20.7)
50s	162 (19.8)
≥60s	163 (19.9)
Marital status	
Married	522 (63.8)
Single	245 (30.0)
Separated/divorced/widowed	51 (6.2)
Education level	
No formal education	11 (1.3)
Primary education	55 (6.7)
Lower secondary education	29 (3.5)
Upper secondary education	194 (23.7)
Tertiary education	519 (63.4)
No response	10 (1.2)
Average monthly income (million Korean won)	
< 1	79 (9.7)
1–1.99	90 (11.0)
2–2.99	108 (13.2)
3–3.99	159 (19.4)
4–4.99	139 (17.0)
≥ 5	178 (21.8)
No response	65 (7.9)
Area of residence	
Metropolitan	153 (18.7)
Chungcheong	194 (23.7)
Jeolla	186 (22.7)
Gyeongsang	204 (24.9)
Kangwon	40 (4.9)
Jeju	41 (5.0)
Total	818 (100.0)

Values are presented as number (%).

1.1% participants thought that patients were 'not concentrated in metropolitan hospitals compared to regional hospitals' ('not concentrated' [1.15%] and 'not at all concentrated' [0%]). More respondents from regional areas than respondents from metropolitan areas thought that cardiac surgery and neurosurgery patients were concentrated in Seoul (45.1% vs. 37.3%). The difference in terms of the area of residence of the participants on responses had no statistical significance (p=0.588) (Table 2).

Table 2. Concentration of cardiac surgery and neurosurgery patients to large hospitals in Seoul and healthcare standards of large hospitals in regional areas

	Total	Metropolitan sub-total	Regional sub-total	Regional regions				
				Chungcheong	Jeolla	Gyeongsang	Kangwon	Jeju
How concentrated are cardiac surgery and neurosurgery patients in large hospitals in Seoul in relation to large regional hospitals?								
Very concentrated	43.6	37.3	45.1	43.3	46.2	51.0	27.5	36.6
Quite concentrated	41.9	42.5	41.8	41.8	37.1	39.7	62.5	53.7
Somewhat concentrated	3.7	3.3	3.8	3.1	4.3	3.9	7.5	0
A little bit concentrated	1.1	0.7	1.2	2.1	1.6	0.5	0	0
Not at all concentrated	0	0	0	0	0	0	0	0
No response/no opinion/uncertain	9.7	16.3	8.1	9.8	10.8	4.9	2.5	9.8
Please rate the standard of healthcare provided by large regional hospitals in relation to large metropolitan hospitals.								
Very high	0.1	0.7	0	0	0	0	0	0
High	0.2	0	0.3	0	0.5	0.5	0	0
Moderate	13.8	13.1	14.0	13.9	16.7	12.7	10.0	12.2
Low	57.2	57.5	57.1	54.1	51.1	60.3	80.0	61.0
Very low	13.0	9.8	13.7	17.5	11.3	14.2	7.5	9.8
No response/no opinion/uncertain	15.6	19.0	14.9	14.4	20.4	12.3	2.5	17.1

Values are presented as %.

When we asked respondents to rate the standard of healthcare of regional hospitals with respect to that provided by metropolitan hospitals, 70.2% of respondents thought that the standards were 'low' ('very low' [13.0%] and 'low' [57.2%]), and 13.8% of respondents said that the standards were moderate. Only a very small percentage of participants (0.3%) said healthcare standards of regional hospitals were higher than those of metropolitan hospitals ('high' [0.2%] and 'very high' [0.1%]). Interestingly, a greater proportion of regional residents had poorer perceived standards of regional healthcare than metropolitan residents (67.3% vs. 70.8%). However, the metropolitan-regional difference in perceptions of healthcare standards was not statistically significant ($p=0.353$) (Table 2).

3) Hospital preference for cardiac surgery and neurosurgery and the reasons for regional patients wanting to transfer to large metropolitan hospitals

When asked which area they would choose if the respondent or the family of the respondent was to

receive cardiac surgery or neurosurgery at a hospital, we found that 72.2% of respondents would go to a 'large metropolitan hospital,' 17.2% would choose 'a large regional hospital near where they live,' and 6.1% of respondents said that the hospital location did not determine their choice. Again, we found that regional difference in the stated preference of metropolitan hospitals over regional hospitals was not statistically significant (73.2% of metropolitan residents vs. 72.0% of regional residents) ($p=0.532$) (Table 3).

The principal reason why regional patients choose metropolitan hospitals over regional hospitals was because of 'poor quality of healthcare in regional hospitals' (87.7%), 'lack of hospitals in regional areas' (15.8%), 'patient autonomy in hospital selection' (10.8%), 'ease of travel' (8.7%), and 'other' (0.6%). Responses were similar between regional and metropolitan respondents; both answered that quality of healthcare was the major determining factor of hospital choice (84.3% of metropolitan residents vs. 88.4% of regional residents) (Table 3).

Table 3. Hospital preference for cardiac surgery and neurosurgery and reasons behind the preference for large metropolitan hospitals of regional patients

	Total	Metropolitan sub-total	Regional sub-total	Regional regions				
				Chungcheong	Jeolla	Gyeongsang	Kangwon	Chungcheong
Please indicate the hospital you would choose if you or your family needed to receive cardiac surgery or neurovascular surgery.								
A large metropolitan hospital	72.2	73.2	72.0	76.8	67.7	70.1	77.5	73.2
A large regional hospital near where you live	17.2	16.3	17.4	13.9	22.6	18.1	10.0	14.6
Any of the above	6.1	6.5	6.0	4.6	5.4	5.9	12.5	9.8
Others	1.3	0	1.7	2.6	1.1	2.0	0	0
No response/no opinion/uncertain	3.1	3.9	2.9	2.1	3.2	3.9	0	2.4
If a regional patient, please indicate why you would move to metropolitan hospitals? (Choose all that applies)								
Poor quality of healthcare in regional hospitals	87.7	84.3	88.4	85.1	85.5	92.6	95.0	90.2
Lack of hospitals in regional areas	15.8	20.9	14.6	14.9	15.6	11.3	25.0	14.6
Patient autonomy in hospital selection	10.8	16.3	9.5	6.2	9.7	7.4	27.5	17.1
Ease of travel	8.7	16.3	6.9	6.7	4.8	6.4	20.0	7.3
Other	0.6	0.7	0.6	0.5	1.6	0	0	0
No response/no opinion/uncertain	1.5	0.7	1.7	3.6	0.5	1.0	0	2.4

Values are presented as %.

4) Demand for national policies that promote a regional balanced development of healthcare service for cardiac surgery and neurosurgery

To address the phenomenon of clustering of patients to large metropolitan hospitals, the questionnaire also asked participants whether they agreed or disagreed with the need to develop government policies that would distribute patients more evenly across regions; 97.5% of respondents agreed (‘strongly agree’ [41.1%] and ‘agree’ [56.4%]). We found that there was a significantly higher demand for such policies among regional residents (42.7%) than among metropolitan residents (34.0%) (p=0.047) (Table 4).

We also asked whether participants agreed with the statement that government policies that help increase the surgery capacity of regional hospitals are needed for the balanced development of regional-metropolitan healthcare. We found that 98.3% of participants agreed (‘strongly agree’ [44.4%] and ‘agree’ [53.9%]). Again, we found that a significantly greater proportion of regional residents agreed with this statement than metropolitan residents (46.5% vs. 35.3%) (p=0.006) (Table 4).

Responses to the question that assessed the perceived needs of government-designated cardiac surgery and neurosurgery-specialist major hospitals specifically in regional areas, 97.9% of respondents agreed (‘very agree’ [40.2%] and ‘agree’ [57.7%]). The need for specialist hospitals perceived by regional residents and metropolitan residents did not show a significant difference (42.4% of regional residents vs. 30.7% of metropolitan residents) (p=0.053) (Table 4).

5) Intentions to use government-designated cardiac surgery and neurosurgery-specialist hospitals in regional regions and factors to consider when establishing them

Asked how likely respondents would use medical services provided by cardiac surgery and neurosurgery-specialist hospitals in regional areas, 84.2% of participants said they were likely to use it (‘very likely’ [31.8%] and ‘likely’ [52.4%]), 15.7% said they were unlikely to use it (‘unlikely’ [12.8%] and ‘very unlikely’ [2.9%]). There was a statistically significant difference in the anticipated usage of specialist hospitals between regional and metropolitan residents;

Table 4. Demand for national policies promoting regional balanced healthcare service relating to cardiac surgery and neurosurgery

	Total	Metropolitan sub-total	Regional sub-total	Regional regions				
				Chungcheong	Jeolla	Gyeongsang	Kangwon	Chungcheong
Please indicate whether you agree or disagree with the statement that government policies are needed to distribute patients concentrated in large metropolitan hospitals.								
Strongly agree	41.1	34.0	42.7	41.8	42.5	48.0	32.5	31.7
Agree	56.4	62.7	54.9	55.7	53.2	51.0	67.5	65.9
Disagree	2.6	3.3	2.4	2.6	4.3	1.0	0	2.4
Strongly disagree	0	0	0	0	0	0	0	0
Please indicate whether you agree or disagree with statement that government policies are needed to enhance the surgery capacity of regional hospitals								
Strongly agree	44.4	35.3	46.5	46.9	47.8	51.5	32.5	26.8
Agree	53.9	61.4	52.2	51.5	50.0	47.5	67.5	73.2
Disagree	1.7	3.3	1.4	1.5	2.2	1.0	0	0
Strongly disagree	0	0	0	0	0	0	0	0
Please indicate whether you agree or disagree with the statement that government-designated cardiac surgery and neurosurgery-specialist hospitals are needed in regional areas.								
Strongly agree	40.2	30.7	42.4	42.8	39.2	50.0	32.5	26.8
Agree	57.7	69.3	55.0	53.1	57.0	49.5	67.5	70.7
Disagree	2.1	0	2.6	4.1	3.8	0.5	0	2.4
Strongly disagree	0	0	0	0	0	0	0	0

Values are presented as %.

96.8% of regional residents said that they were likely to go to these hospitals and only 29.5% of metropolitan residents said the same ($p < 0.001$) (Table 5).

There was a clear demand by regional residents for cardiac surgery and neurovascular surgery specialist hospitals in regional areas, so we also assessed what factors were considered important for these potential consumers. We found the following proportions of factors were considered important determinants of a successful specialist hospital: 'professional competence of doctors' (74.3%), 'excellent healthcare facilities' (16.9%), 'affordable medical fees' (5.6%), 'reduction in waiting time and consultation time' (3.5%); and 'good customer service' (1.0%). A greater proportion of respondents from regional areas (75.6%) than from metropolitan areas (68.65%) thought that professional competence of doctors was important. Respondents, irrespective of region, considered pro-

fessional competence as the most important factor to consider during the establishment of cardiac surgery and neurosurgery-specialist hospitals in regional areas (Table 5).

Discussion

More patients, especially those receiving cardiac surgery and cerebrovascular surgery, are being concentrated to large metropolitan hospitals. Although it is in the interest of the government to provide a regionally balanced healthcare service to the public, preventative measures are lacking that actually deter patients from preferential use of large metropolitan hospitals. In order for the government to make informed policy decisions reflective of current perceptions of the general population, we investigated the public perception of the extent of clustering of car-

Table 5. Intentions to use government-designated cardiac surgery and neurosurgery specialist hospitals in regional areas and factors to consider when establishing them

	Total	Metropolitan sub-total	Regional sub-total	Regional regions				
				Chungcheong	Jeolla	Gyeongsang	Kangwon	Chungcheong
How likely is that you would use the medical services provided by government-designated cardiac surgery and neurosurgery specialist hospitals in regional areas?								
Very likely	31.8	2.0	38.6	41.2	40.9	41.7	15.0	24.4
Likely	52.4	27.5	58.2	56.2	55.4	54.4	85.0	73.2
Unlikely	12.8	55.6	3.0	2.6	3.2	3.9	0	2.4
Very unlikely	2.9	15.0	0.2	0	0.5	0	0	0
Which factor is particularly important for government-designated cardiac surgery and neurosurgery-specialist hospitals in regional areas to succeed? ^{a)}								
Professional competence of doctors	74.3	68.6	75.6	84.9	70.9	70.0	72.5	85.0
Excellent healthcare facilities	16.9	17.6	16.7	9.7	18.4	22.2	20.0	10.0
Affordable medical fees	5.6	9.8	4.6	2.2	6.7	5.4	5.0	2.5
Reduction of waiting time and consultation time	3.5	2.6	3.7	1.6	8.4	2.5	2.5	0
Good customer service	1.0	1.3	0.9	1.6	0.6	1.0	0	0
Others	0.2	0.7	0.2	0	0.6	0	0	0
No response/no opinion/uncertain	0.9	0.7	0.9	1.1	1.7	0	0	2.5

Values are presented as %.

^{a)}Answered by respondents who replied that government-designated cardiac surgery and neurosurgery-specialist hospitals are needed in regional areas (n=801).

diac surgery and neurosurgery patients in metropolitan hospitals and of the need to adopt national health policies in response to the clustering. We also evaluated the demand for cardiocerebrovascular management [9].

We found that a vast majority of the Korean population perceived that cardiac surgery and neurosurgery are concentrated in large metropolitan hospitals in relation to regional hospitals. This perception was more prominent among regional respondents than metropolitan respondents. In line with the findings of our study, surveys of members of the Korean Journal of Thoracic and Cardiovascular Surgery and of the Korean Journal of Vascular and Endovascular Surgery found that a very high percentage of physicians considered that surgery volumes tended to be disproportionately higher in large metropolitan hospitals than in regional hospitals (98.6% vs. 89.1%) [4]. We found that clinical physicians were more sensitive to surgery volumes and that their perceived concentration of

cardiac surgery was higher than that of cerebrovascular surgery.

Our population survey revealed that the general Korean population believes that the quality of medical service provided by regional hospitals is lower than that provided by metropolitan hospitals. The majority of participants responded that if they or their families had to receive cardiac surgery or neurosurgery, they would prefer to receive surgery from metropolitan hospitals. The most important factor associated with this preference for metropolitan hospitals was the perceived lower quality of medical service among regional hospitals. The lack of available hospitals, patient autonomy to choose whichever hospital they wanted to go to, and the ease of travel were other important factors. Regional residents replied that they would utilize metropolitan hospitals if the quality of service of the regional hospital in their area of residence was of concern. We inferred that these public perceptions directly contribute to the

clustering of patients to large metropolitan hospitals. However, when asked the same question, 48.0% of cardiac specialists and 27.8% of neurology specialists thought that the fundamental problem was in the quality of healthcare service in regional areas, showing a clear disparity in perceptions between specialists and the lay public [4]. Surgery specialists and the lay public also disagreed as to the principal reason for choosing metropolitan hospitals over regional hospital; specialists considered ease of travel and patient autonomy as the most vital factors [4]. While the general population considered lower standards of medical service of regional hospitals as their main reason for wanting to transfer to metropolitan hospitals, specialists considered ease of travel and increased patient autonomy as causes of clustering. We conclude that the dissatisfaction felt by the public in the quality of medical service may be specified through secondary analyses of supply factors of medical resources related to cardiac surgery and neurosurgery, of the current status of surgeries, of surgery channels, and of direct and indirect medical expenses across regions.

We found a clear demand for government policies that promote a more balanced development of healthcare services across Korea, especially with regards to the concentration of cardiac surgery and neurosurgery to major hospitals in Seoul. There was a significantly greater demand among regional residents than metropolitan residents. Respondents considered enhancing the surgery capacity and healthcare quality of regional hospitals were appropriate developments in policy. Our data revealed a real demand that necessitates the development of new government policies, but note that an approach is needed that takes into consideration the views of the public but and also those of physicians and experts of cardiocerebrovascular disease. A consensus approach will enable policy makers to make a comprehensive evaluation of other factors (such as performance level of cardiac surgery and neurosurgery by region, need for expansion, object of expansion, modes of expansion, and potential investment areas) related to this issue.

In this study, we investigated the perception of the Korean population through an interview survey. We recruited participants through quota sampling, arbitrarily collecting groups of around 200 participants by geographic region. Although our study is limited

in regional representation (sample sizes of Gangwon and of Jeju were relatively low), our study has merit in that it is the first population-wide study that investigated the public awareness of concentration of cardiac surgery and neurosurgery to metropolitan hospitals relative to regional hospitals. We anticipate that the results of this study can be used to inform future policy-making decisions.

In conclusion, for a balanced development in the healthcare services of metropolitan and regional areas, national health policy must be adopted that can distribute cardiac surgery and cerebrovascular surgery patients currently clustered preferentially in large hospitals in Seoul—a concern revealed through a public awareness survey. Policy decisions must be based on a comprehensive evaluation of the current status of the management of cardiocerebrovascular disease and of the needs assessment made by specialists.

Conflict of interest

No potential conflicts of interest relevant to this article are reported.

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