**Table 2** Regression models showing association between patient characteristics, co-morbid conditions, surgery associated factors and hospital stratification on total hospital costs, antibiotic costs, and post-surgical length of stay

| Models | Total hospital costs 1 | | | Total hospital costs 2 | | | Antibiotic costs 1 | | | Antibiotic costs 2 | | | Post-surgical length of stay 1 | | | Post-surgical length of stay 2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.607 | | | 0.643 | | | 0.349 | | | 0.661 | | | 0.282 | | | 0.322 | | |
| $R^2$ | Beta | *B* | *P*-value | Beta | *B* | *P*-value | Beta | *B* | *P*-value | Beta | *B* | *P*-value | Beta | *B* | *P*-value | Beta | *B* | *P*-value |
| Patient characteristics | | | | | | | | | | | | | | | | | | |
| Age (≥70 years) | 0.061 | 0.032 | 0.002 | 0.064 | 0.034 | 0.001 | 0.009 | 0.023 | 0.713 | 0.008 | 0.020 | 0.662 | 0.083 | 0.078 | 0.002 | 0.072 | 0.068 | 0.007 |
| Gender | 0.006 | 0.003 | 0.779 | −0.002 | −0.001 | 0.929 | −0.015 | −0.039 | 0.546 | −0.004 | −0.010 | 0.835 | 0.053 | 0.053 | 0.049 | 0.045 | 0.046 | 0.084 |
| Post-surgical infection | 0.325 | 0.216 | <0.001 | 0.315 | 0.209 | <0.001 | 0.580 | 1.716 | <0.001 | 0.593 | 1.755 | <0.001 | 0.404 | 0.473 | <0.001 | 0.401 | 0.469 | <0.001 |
| Co-morbid conditions | | | | | | | | | | | | | | | | | | |
| Acute myocardial infarction | 0.022 | 0.050 | 0.252 | 0.010 | 0.022 | 0.597 | −0.050 | −0.502 | 0.047 | −0.023 | −0.232 | 0.208 | 0.025 | 0.099 | 0.343 | 0.013 | 0.051 | 0.619 |
| Congestive heart failure | 0.057 | 0.189 | 0.004 | 0.055 | 0.182 | 0.004 | −0.027 | −0.397 | 0.286 | 0.021 | 0.311 | 0.253 | 0.047 | 0.276 | 0.075 | 0.043 | 0.247 | 0.103 |
| Peripheral vascular disease | −0.008 | −0.035 | 0.679 | −0.007 | −0.029 | 0.720 | 0.013 | 0.256 | 0.596 | 0.014 | 0.280 | 0.425 | 0.009 | 0.072 | 0.719 | 0.013 | 0.099 | 0.614 |
| Cerebral vascular accident | 0.014 | 0.022 | 0.462 | 0.008 | 0.011 | 0.682 | 0.000 | 0.003 | 0.984 | 0.016 | 0.105 | 0.389 | −0.004 | −0.010 | 0.882 | −0.009 | −0.025 | 0.716 |
| Pulmonary disease | −0.023 | −0.032 | 0.246 | −0.014 | −0.020 | 0.447 | 0.013 | 0.081 | 0.606 | 0.000 | −0.002 | 0.986 | 0.005 | 0.013 | 0.842 | 0.009 | 0.022 | 0.724 |
| Peptic ulcer | −0.002 | −0.003 | 0.905 | 0.000 | 0.000 | 0.988 | −0.034 | −0.181 | 0.184 | −0.024 | −0.127 | 0.202 | −0.004 | −0.009 | 0.881 | −0.006 | −0.014 | 0.808 |
| Liver disease | 0.016 | 0.056 | 0.420 | 0.021 | 0.075 | 0.254 | 0.002 | 0.033 | 0.933 | −0.002 | −0.024 | 0.933 | 0.021 | 0.132 | 0.423 | 0.023 | 0.141 | 0.378 |
| Diabetes | 0.024 | 0.021 | 0.228 | 0.037 | 0.034 | 0.046 | 0.020 | 0.079 | 0.436 | 0.000 | −0.001 | 0.989 | 0.026 | 0.042 | 0.318 | 0.034 | 0.054 | 0.187 |
| Diabetes w/complications | 0.035 | 0.089 | 0.073 | 0.024 | 0.061 | 0.206 | −0.021 | −0.234 | 0.410 | 0.034 | 0.387 | 0.064 | 0.060 | 0.265 | 0.024 | 0.038 | 0.168 | 0.151 |
| Renal disease | 0.032 | 0.071 | 0.097 | 0.025 | 0.054 | 0.191 | −0.046 | −0.453 | 0.065 | −0.043 | −0.418 | 0.019 | 0.012 | 0.045 | 0.658 | 0.007 | 0.025 | 0.799 |
| Metastatic cancer | 0.007 | 0.006 | 0.723 | 0.036 | 0.033 | 0.064 | 0.036 | 0.145 | 0.164 | 0.051 | 0.209 | 0.007 | 0.010 | 0.016 | 0.718 | 0.031 | 0.050 | 0.243 |
| Surgery associated factors | | | | | | | | | | | | | | | | | | |
| Pre-surgical LOS | 0.333 | 0.019 | <0.001 | 0.325 | 0.019 | <0.001 | 0.069 | 0.018 | 0.006 | −0.026 | −0.007 | 0.175 | 0.090 | 0.009 | 0.001 | 0.065 | 0.006 | 0.018 |
| Gastrectomy type | 0.359 | 0.200 | <0.001 | 0.352 | 0.196 | <0.001 | 0.061 | 0.152 | 0.020 | 0.058 | 0.145 | 0.003 | 0.144 | 0.142 | <0.001 | 0.132 | 0.129 | <0.001 |
| No. of surgeries | 0.194 | 0.071 | <0.001 | 0.221 | 0.081 | <0.001 | −0.039 | −0.064 | 0.144 | 0.031 | 0.051 | 0.154 | 0.070 | 0.046 | 0.012 | 0.121 | 0.079 | <0.001 |
| Surgery duration | 0.148 | 0.000 | <0.001 | 0.136 | 0.000 | <0.001 | 0.010 | 0.000 | 0.707 | 0.043 | 0.001 | 0.040 | 0.091 | 0.000 | 0.001 | 0.070 | 0.000 | 0.018 |
| Hospitals | | | | | | | | | | | | | | | | | | |
| B | | | | 0.023 | 0.036 | 0.316 | | | | −0.255 | −1.801 | <0.001 | | | | 0.118 | 0.329 | <0.001 |
| C | | | | 0.030 | 0.029 | 0.309 | | | | 0.218 | 0.954 | <0.001 | | | | 0.058 | 0.100 | 0.153 |
| D | | | | −0.075 | −0.049 | 0.043 | | | | 0.256 | 0.749 | <0.001 | | | | −0.016 | −0.018 | 0.758 |
| E | | | | 0.067 | 0.067 | 0.019 | | | | −0.161 | −0.719 | <0.001 | | | | 0.119 | 0.211 | 0.002 |
| F | | | | −0.068 | −0.099 | 0.006 | | | | −0.212 | −1.372 | <0.001 | | | | −0.103 | −0.265 | 0.003 |
| G | | | | 0.137 | 0.129 | <0.001 | | | | 0.126 | 0.529 | <0.001 | | | | 0.069 | 0.115 | 0.082 |
| H | | | | −0.014 | −0.009 | 0.700 | | | | 0.238 | 0.698 | <0.001 | | | | 0.096 | 0.111 | 0.057 |
| I | | | | 0.050 | 0.038 | 0.139 | | | | 0.065 | 0.215 | 0.051 | | | | 0.123 | 0.162 | 0.009 |
| J | | | | 0.036 | 0.038 | 0.195 | | | | −0.105 | −0.493 | <0.001 | | | | 0.030 | 0.055 | 0.434 |

Beta refers to standardized coefficients and B refers to unstandardized coefficients.

**Table 3** Observed and risk-adjusted means of total hospital costs, antibiotic costs, post-surgical length of stay in total and by hospital

| | Total hospital costs (US$) | | | | Antibiotic costs (US$) | | | | Post-surgical length of stay (days) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Uninfected | | Infected | | Uninfected | | Infected | | Uninfected | | Infected | |
| | Observed | Adjusted | Observed | Adjusted | Observed | Adjusted | Observed | Adjusted | Observed | Adjusted | Observed | Adjusted |
| Total | 11 252.9 | 11 543.6 | 15 676.3 | 14 310.6 | 42.9 | 45.9 | 277.9 | 248.3 | 16.1 | 17.5 | 29.2 | 28.1 |
| A | 11 041.2 | 11 334.7 | 19 919.8 | 17 848.0 | 28.9 | 31.0 | 838.9 | 795.6 | 15.1 | 16.6 | 38.4 | 40.6 |
| B | 11 597.7 | 12 205.9 | 16 785.4 | 13 897.1 | 7.9 | 8.9 | 161.2 | 114.4 | 21.1 | 23.0 | 31.3 | 27.7 |
| C | 13 270.0 | 11 740.7 | 14 981.6 | 12 776.0 | 69.6 | 67.7 | 208.8 | 196.7 | 17.7 | 17.4 | 24.8 | 23.1 |
| D | 10 314.6 | 10 783.7 | 14 271.6 | 13 696.7 | 56.8 | 59.7 | 335.4 | 313.2 | 14.6 | 16.0 | 24.6 | 24.9 |
| E | 12 407.0 | 12 205.4 | 15 937.8 | 14 001.7 | 14.8 | 15.5 | 124.4 | 114.2 | 18.8 | 19.5 | 28.5 | 25.7 |
| F | 10 736.8 | 10 644.5 | 12 601.3 | 11 811.6 | 8.3 | 9.3 | 218.9 | 207.2 | 12.5 | 13.2 | 18.0 | 18.1 |
| G | 11 541.3 | 12 759.4 | 16 375.3 | 17 681.3 | 42.5 | 50.7 | 250.7 | 275.0 | 14.9 | 17.6 | 33.3 | 38.2 |
| H | 10 771.2 | 11 421.2 | 14 687.9 | 13 602.8 | 51.2 | 56.9 | 289.2 | 247.4 | 15.7 | 18.1 | 27.2 | 27.0 |
| I | 11 476.4 | 11 745.3 | 16 937.2 | 14 230.7 | 37.1 | 38.3 | 302.9 | 254.9 | 17.4 | 18.3 | 33.6 | 29.5 |
| J | 11 329.9 | 11 750.8 | 17 167.6 | 15 266.5 | 23.0 | 24.8 | 222.1 | 175.7 | 16.2 | 17.5 | 34.0 | 31.1 |

In the case of antibiotic costs, the regression model was able to account for 34.9% of variation observed, and 66.3% with hospital stratification included. Age and gender were not significant with antibiotic costs in both models. When hospitals were not included in analysis, pre-surgical LOS and gastrectomy type were significantly associated with antibiotic costs. When hospitals were included, only gastrectomy type remained significant, and surgery duration gained significance.

The regression models developed were able to account for 28.2% of variations in post-surgical LOS, and 32.2% after taking into account hospital stratification. Age showed significant association in both models, while gender showed association only when hospitals were not included in analysis. The only co-morbid condition significantly associated with post-surgical LOS was diabetes with complications in the first model. Furthermore, pre-surgical LOS, gastrectomy type and number of surgeries were significant factors associated with post-surgical LOS.

The risk-adjusted differences for all three medical resource utilization indicators between infected and uninfected patients at hospital level were shown in Table 3. Risk adjustment resulted in reducing the variation between infected and uninfected patients. Infected patients showed a risk-adjusted increase in US$2767, or approximately 24% for total hospital costs (and a pre-adjusted increase of US$4423.4). At the hospital level, there was a range of adjusted infection-based increases in total hospital costs from US$1035 (Hospital C) to US$6513 (Hospital A).

In general, infections were associated with an increase in US$202.4 in mean antibiotic costs. Prior to adjustment, the difference in antibiotic costs between infected and uninfected patients was US$235. Hospital E showed the least amount of increase at a risk-adjusted mean of US$98.8. The highest increase in antibiotic costs as a result of infections was seen in Hospital A, at US$764.6. In addition, Hospitals B, E and F presented very low antibiotic costs for their respective uninfected populations, at less than US$15.

Hospital stay was extended by an adjusted average of 10.6 days post surgery, as a result of infection. While most hospitals managed to control the extended LOS to approximately 10 days or less, Hospitals A and G had large increases of 24 days and 20.7 days, respectively. Hospital B showed the lowest increase in mean post-surgical LOS in infected patients at only 4.7 days.

## Discussion

In this study, we used a combination of ICD codes and antibiotic utilization patterns in order to identify HAIs in gastrectomy surgery patients admitted into 10 hospitals in Japan. Regression analysis was conducted to estimate the impact of medical resource utilization increases involved with infections, with resource utilization measured in three indicators – total hospital costs, antibiotic costs and post-surgical LOS. Finally, we conducted risk-adjusted performance comparisons within the 10 hospitals.

Previous studies have shown that the use of ICD codes to identify HAIs has poor sensitivity and positive predictive value [13,14]. Furthermore, using claims data alone to derive secondary diagnoses has been found to lack distinguishing ability between pre-existing conditions and conditions that occur post admission [21]. In response to these issues, we complemented ICD code identification with antibiotic utilization data and adjusted selection criteria to reduce misidentification of pre-existing conditions. The use of ICD codes alone would have resulted in an infection incidence of approximately 8%. ICD codes alone may have been limited to the more serious infections, while antibiotic utilization allowed us to include less severe infections in our calculations that were not reflected in ICD codes.

Evidence-based medicine supports that even with gastrectomy surgeries, a single dose of cefazolin before surgery is sufficient prophylaxis [22,23]. However, the Japanese Society for Chemotherapy produced guidelines that recommended 3–4 days of prophylaxis for clean-contaminated surgeries such as gastrectomy. Furthermore, a previous study [24] showed that the mean prophylaxis given to gastrectomy patients was approximately 3–4 days. Taking this into account, we adjusted for this over-utilization of antibiotics by allowing for a 3-day prophylactic period post surgery, and identifying cases with 4 or more days of antibiotic utilization as infections. The failure to do so may have resulted in mistakenly identifying antibiotic over-utilization as infections. However, there would be an uncertainty as to the validity of cases identified as infected by this criterion alone, as cases with 4 or more days of antibiotic utilization may simply represent antibiotic administration practice variation. Despite this, all cases that were identified by this criterion were further confirmed by at least one other identification criterion.

A previous study of a single hospital in Japan showed a 13.8% incidence of SSIs associated with gastrectomy [25], while the sample population here presented a 20.3% incidence proportion of infections that included other infections in addition to SSIs, such as bloodstream infections and pneumonia.

In all six regression models that we used, post-surgical HAIs were significantly associated with increases in total hospital costs, antibiotic costs and post-surgical LOS. Among the independent variables, comparisons of standardized coefficients (Table 2) showed that HAIs had the third highest magnitude of impact on total hospital costs (after type of gastrectomy and pre-surgical LOS), and the highest magnitude of impact on antibiotic costs and post-surgical LOS. Total hospital costs and post-surgical LOS were sensitive to all surgery-associated factors, but antibiotic costs were unsurprisingly less sensitive to this group of variables.

Post-surgical LOS showed significant associations with both age and gender, with elderly (≥70 years) male patients associated with longer hospital stays. This was consistent with previous studies that showed longer LOS periods associated with elderly [26] and male patients [27]. The problems of increases in post-surgical LOS associated with HAIs are further exacerbated by the already-lengthy hospital stay durations in Japan [28].

Pre-existing co-morbid conditions did not seem to show consistent or strong influences on increases in medical resource utilization based on our models, which may be due to the low volume of cases with co-morbidity scores. The two most common co-morbidities (that occurred in approximately 10% of the dataset population) were diabetes and metastatic cancer, which showed significant association with total hospital costs and antibiotic costs, respectively.

Even after risk adjustment, we observed large degrees of variation in HAI-associated increases in all three indicators. The difference between mean total hospital costs uninfected and infected patients ranged as much as from US$1035 in Hospital C to US$6513 in Hospital A. Hospital A had approximately 2.4 times the overall mean of increased total hospital costs associated with HAI, and had the largest observed difference between infected and uninfected patients with regards to post-surgical LOS. A more detailed inspection of the cases in Hospital A revealed that two of the five had methicillin-resistant *Staphylococcus aureus* (MRSA) infections, which may have accounted for the increased medical resource utilization reflected.

The overall risk-adjusted mean of increased antibiotic costs associated with HAIs was US$202. Table 2 showed that the $R^2$ value for the regression model using antibiotic costs as the dependent variable that had included hospital stratification was much higher than that of the model that did not. Furthermore, when hospital stratification was included in analysis, most of the hospitals showed significant association, implying high variation in antibiotic use at the hospital level. Hospital B showed the lowest adjusted antibiotic costs for uninfected patients at US$8.9, while Hospitals E and F also had very low values in this category. An analysis of the cases in these hospitals revealed that all uninfected cases were given the appropriate 1-day-only prophylaxis method as prescribed by evidence-based medicine. In addition to these laudable achievements, Hospitals B and E managed to control the increase in antibiotic costs in infected patients to US$99 and US$105, respectively. Increases in antibiotic costs in Hospital F were closer to the overall average at US$198. This could imply that there may be stringent antibiotic utilization guidelines in place at Hospitals B and E, and that they are strictly adhered to even in infected cases. The other seven hospitals had higher adjusted antibiotic costs in their uninfected cases, and an analysis of these hospitals showed that the majority of cases were given approximately 2–3 days of prophylaxis. This unfavourable utilization rates for uninfected cases reflected the results reported previously [25], and resulted in unnecessary cost as well as increase the risk of developing resistant bacteria.

With regards to limitations of this study, the sampled hospitals were part of a database known as the QIP. These hospitals had voluntarily entered this project in order to improve health care quality and management, and as such, may not represent the general situation of hospitals in Japan. Therefore, there may be a degree of selection bias and resulting generalizability issues.

We believe the method presented here can be similarly applied to analysing patients with other diseases and procedures. We have used this technique to quantify the increases in medical resource utilization associated with post-surgical HAIs, and also shown that even after adjusting for variations in patient characteristics and other variables, a large degree of variation still exists between hospitals in terms of resource utilization. In this study, we observed both good performers in terms of controlling infection incidence and the resulting resource utilization, as well as hospitals that did not perform as well. The results of this study were reported back to the participating hospitals in order to commend and encourage further good practice in good performers, as well as to bring attention to problem areas in the other hospitals. This information is highly useful for the hospitals involved as they represent not only information about their own hospitals, but provide a context of other hospitals in which to compare their own performance.

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# Healthcare Accreditation and Quality Issues in Japan

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1

## Healthcare Quality/Safety Trend in Japan

- Medical accidents began to be frequently reported by mass media (late 1990s, 1999)
- Hospital accreditation introduced a new focus on patient right and safety, and care process (2000)
- National grand policy for patient safety (2002)
- Patient safety management system is formally required for hospitals (2003)
- Regional centers to promote patient safety started over the nation (2003, & legalized 2006)
- National DB for medical accidents (2004)
- Reimbursement system introduced additional fee points for patient safety system (2006)

2

## Today's Outline

1. National Quality Initiatives and JCQHC (Japan Council for Quality Health Care)
2. Impact of Hospital Accreditation: A Study in Japan
3. National Data Infrastructures for Quality & their potentials

3

## JCQHC History

Japan Council for Quality Health Care: National healthcare accreditor

- In 1985, Ministry of Health and Wealfare and Japan Medical Association
  "Study group of Hospital Accreditation"
- In 1993, Ministry of Health, Labor and Wealfare [MHLW]
  "Study group on Hospital Accreditation"
- **Through the Collaboration between the Government and Medical Profession ,**

4

# JCQHC History

- In 1995, JCQHC was established. The major parts of the Set-Up Fund were from the MHLW and the Japan Medical Association, and also from hospital and professional associations
- In 1997, JCQHC started Hospital Accreditation. - Voluntary Basis -
- JCQHC has accredited about 2,500 hospitals (about half of the total hospital beds in Japan)

5

# JCQHC History

- Starting from Hospital Accreditation Services,
- JCQHC has been carrying out several nation-level services.
- All of them are

  *To Improve Quality and Safety in Health Care

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# JCQHC's Mission

(Japan Council for Quality Health Care)

- To improve the quality and safety of health care,
- and to contribute to improving the health and welfare of the people
- as a neutral, scientific, third-party organization

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# JCQHC Functions

- Hospital Accreditation
  to improve the quality of hospital care
- Patient Safety Promotion
  to promote patient safety through networking and professional learning among accredited hospitals
- No-Fault Compensation System on Obstetrical Adverse Events
  to compensate childbirth cerebral palsy, and to improve the quality of obstetric care through RCA on adverse events
- EBM medical information network/distribution services; "MINDS"
  to distribute Clinical Practice Guidelines & improve their Q
- National Database of Medical Adverse Events
  to prevent errors/accidents and improve patient safety
- Near miss Event in Pharmacy

8


9

# Quality Initiatives in Japan

- Initiated and Designed by the National-level collaboration & Government level
- Professional persons and organizations committed themselves at the initiation and for the development
- Steady steps; Great potentials for further strong movements and systems

10

# Professional Autonomy Works !

- Patient Safety Promotion

voluntary networking for mutual learning & QI

- No-Fault Compensation System on Obstetrical Adverse Events

lawsuits decreased

RCA for improvement at practice & system

- EBM medical information NW/Dist services

improved Quality of CPGuidelines

fostered professional networking for quality

- National Database of Medical Adverse Events information helped professionals to prevent errors and improve safety

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# Today's Outline

1. National Quality Initiatives and JCQHC (Japan Council for Quality Health Care)
2. Impact of Hospital Accreditation: A Study in Japan
3. National Data Infrastructures for Quality & their potentials

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# Impact of Accreditation

- About five years ago, we showed "Accreditation Improved Quality" in infection control practices.
- This time, we examined "How hospital professionals consider the impact of accreditation on daily practice."

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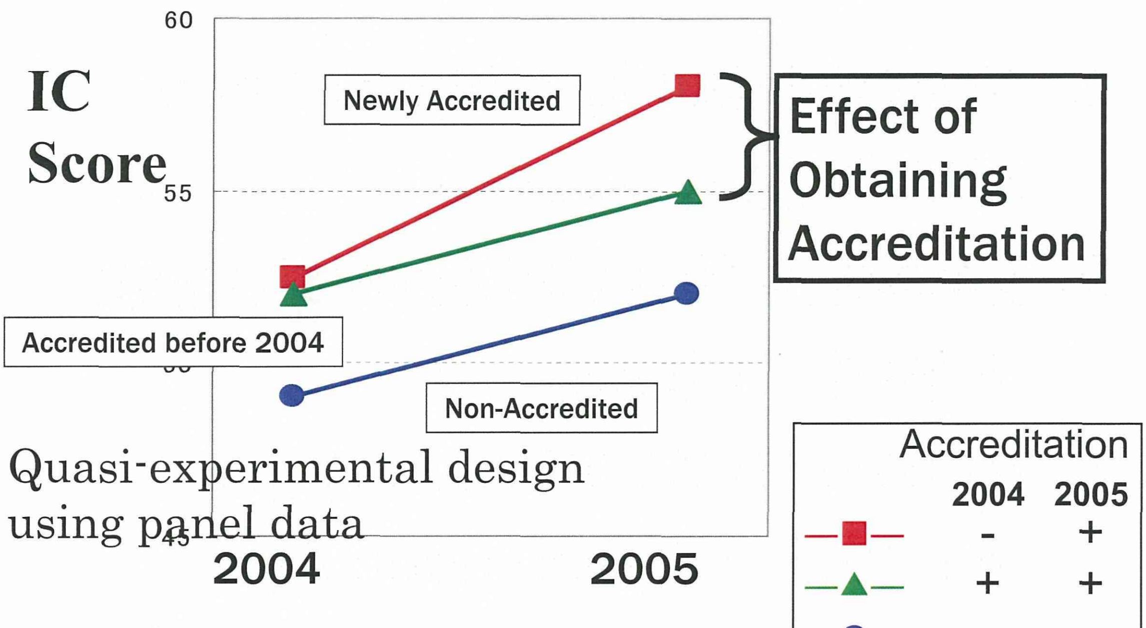
## Change in IC score* by accreditation status (*infection control practices following guidelines)




Quasi-experimental design using panel data

*Am J Infect Control* 2008;36(3):212-219

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## Impact of Hospital Accreditation
## A Survey in Japan

- The Study Objective:
  To understand the impact of hospital accreditation on hospital services
  (to review 15-year achievement since its birth)
- A Questionnaire Survey was conducted, asking hospital medical directors,
- Whether "hospital accreditation" impacted your hospital on each area

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## Impact of Hospital Accreditation:
## A Survey in Japan

- Method:
  Questionnaire survey of 55 items,
  (Developed after a feasibility test)
  > administered to 2944 hospitals
  2570 Accredited
  374 Non-surveyed-Non-accredited, stratified-randomly sampled
  > in January-February 2010
- Response rate : 59.8% (1761 / 2944)

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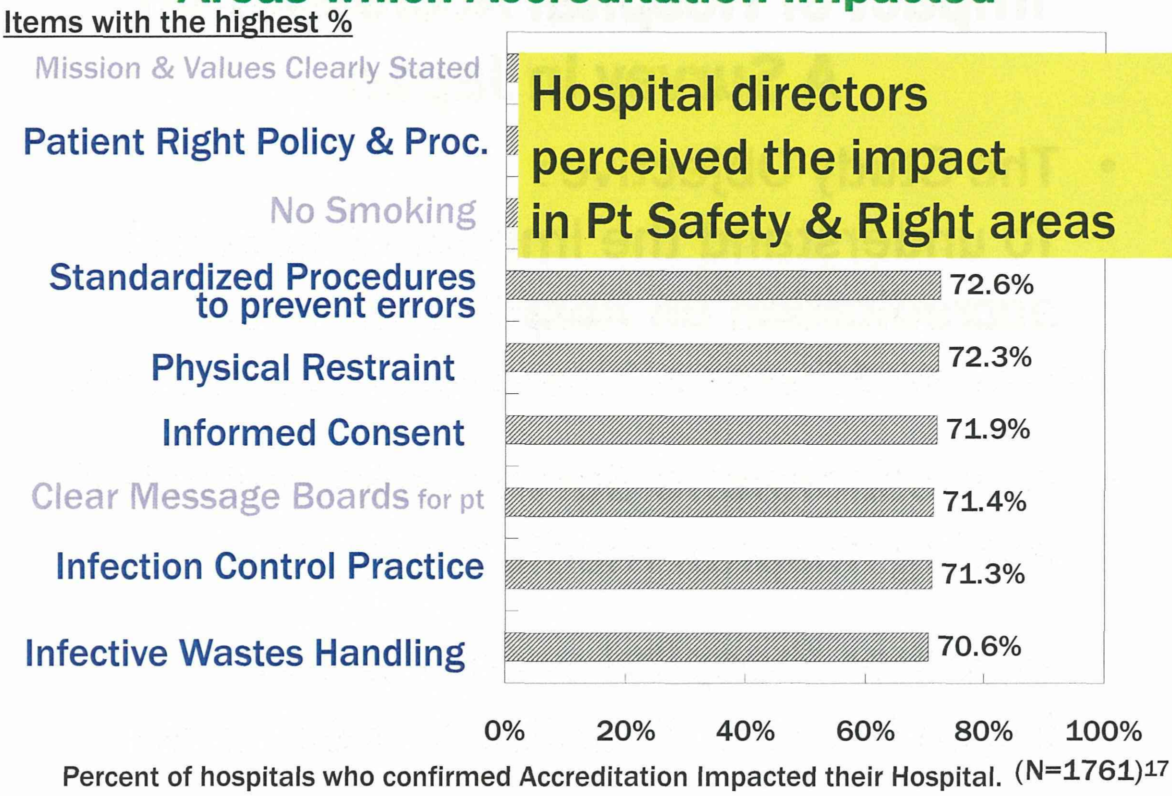
## Areas which Accreditation Impacted




Hospital directors perceived the impact in Pt Safety & Right areas

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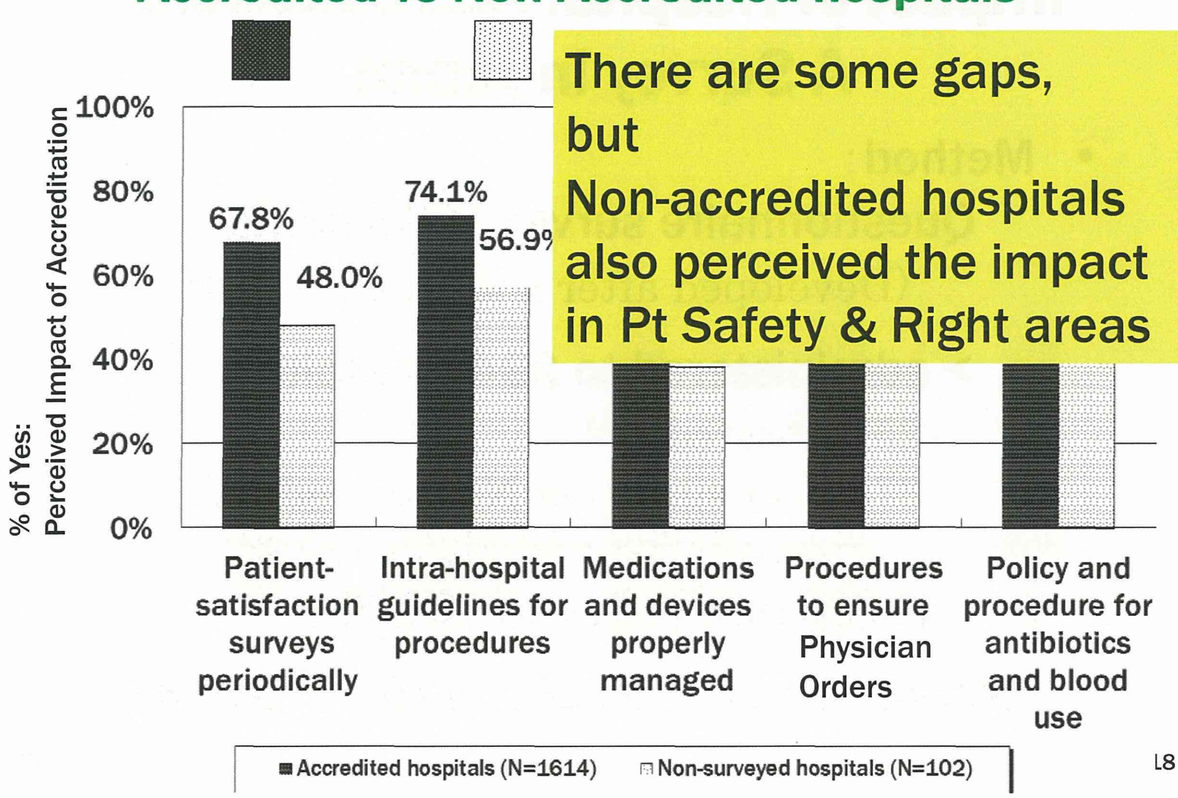
## Accredited vs Non-Accredited hospitals




There are some gaps, but Non-accredited hospitals also perceived the impact in Pt Safety & Right areas

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## Impact of Hospital Accreditation: Summary

The study suggested:

- Hospital accreditation impacted practices particularly in Patient Safety and Patient Right areas
- Hospital accreditation impacted also Non-accredited hospitals, probably through the hospital accreditation standard getting the de fact standard for the whole hospital/health care arena



## For Future Directions of Accreditation

- More Interactive, more Value-creating survey
- More direct values for Patients (participation, provider choice, etc.)
- More focus on the Hospital Service Region (not only a hospital)
- Revisit continuous/clinical(medical) quality improvement based on professional autonomy (w/ QI)
- To support more explicitly "Management" (quality/safety/resources/finance/ w/visionary leadership, etc.) for sustainability and growth

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# National Data Infrastructure for Quality & their potentials (Measures/Design/Policy)

## To Solve the issues of Quality vs. Cost/Resource


# Well-designed DB needed

Administrative Data are promising for the system analysis

- One can obtain comprehensive database with low cost.
- One can measure Regional and Institutional performance
- Lack of clinical details is the weakness.
- Therefore, one need well-designed datasets & analysis (eg. clinical severity info.)

# Emerging administrative database

- Diagnosis Procedure Combination Database
  - Casemix classification systems
  - Detailed data with some severity info.
  (eg. CHF: NYHA, Stroke: Coma scale, m-Rankin Scale)
  - Voluntary participants, scattered all over Japan
- National Database of claims (healthcare & long-term care insurance claims, and health screening)
  - The comprehensive/exhaustive national DB
  - Just starting (Involved in a new design)
  - Some example outputs

# On-going Analysis Examples based on emerging database at the national level

- Quality is affected by Competition or Concentration ?
- Higher Spending (or Cost) is necessary for Higher Quality ?

# Question 1

## "Quality" is affected by Competition or Concentration ?

In health care, effects (positive or negative) of competition and/or resource concentration are not clearly known yet.

It is even difficult to distinguish between competition and resource concentration.

# Objective

To assess the effect of
hospital competition and
resource concentration
on the quality of care for AMI patients

# Conceptual Framework 1/2

- **Competition at the hospital level** is likely to be more dominant than concentration/co-operation because hospitals have to compete for the limited patients for sustainability of their service.

On the other hand,

- **Concentration of cardiologists** within a hospital may result in more cooperative effects (besides capacity effects) than hospital concentration at the regional level.



# Conceptual Framework 2/2

| | **Hospitals in a region** | **Cardiologists in a hospital** |
|---|---|---|
| Competition | ◎ | ○ |
| Concentration | ○ | ◎ |

# Methodology

- **The definition of hospital service area:**
  - Secondary medical district (~300million pop.)( >300 in Japan)
  - This is often the unit of health care policies. (smaller than prefectures)
- **The definition of hospital competition**
  - We analyzed Diagnosis-Procedure Combination (DPC) hospitals with more than 10 AMI cases during the latter six months of 2008 (This covers eventually all hospitals which regularly treat AMI cases.)



# Methodology

- **The definition of cardiologist concentration**
  - Estimated from the number of cardiologists in a hospital
  - The cardiologist concentration of a hospital is a more valid index to measure than total physician concentration because treatments for AMI patients is primarily conducted by cardiologists