モデル説明変数候補

Type	Candidate Variables	Category
Demographics	Gender	Male*, Female
	Age (years)	20-59years* 60-69years 70-79years 80-89years ≥ 90years
Clinical Factors	Hospital admission route	1 Emergency with ambulance 2 Emergency without ambulance 3 Scheduled*
	NYHA functional class	I or II*; III; IV
	Severe respiratory failure due to acute heart failure	0 Absent, 1 present
Comorbidities	Ischemic heart disease DCM Hypertension (including HHD) Other cardiomyopathy Atrial fibrillation/flutter Life-threatening arrhythmia Chronic renal failure (mild to moderate) COPD Previous stroke Anemia DM Dyslipidemia Cancer Shock (including cardiogenic shock)	0 Absent, 1 present

*Reference value. NYHA, New York Heart Association; DCM, dilated cardiomyopathy; HHD, hypertensive heart disease; COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus.

結果

Baseline characteristics　〜ATTENDレジストリーとの比較〜

	QIP*	ATTEND	P
No. of patients	9557	1110	
No. of hospitals	90	29	
Facility Level			
Hospital beds: median (range)	381 (95-979)	503 (42-1358)	
University hospitals　n (%)	0 (0)	13 (41)	<.0001
Teaching hospitals　n (%)	76 (84)	25 (78)	0.82
Patient Level			
Age, years　mean (SD)	78 (12)	73 (14)	<.0001
Male　%	50	59	<.0001
NYHA functional class n (%)		n=1100	<.0001
I	588 (6.2)	8 (0.7)	
II	2585 (27.0)	134 (12.1)	
III	3400 (35.6)	434 (39.1)	
IV	2984 (31.2)	524 (47.2)	

* DPC administrative data

アウトカムと入院時併存症　〜ATTENDレジストリーとの比較〜

	QIP* n=9557	ATTEND n=1110	P
Outcomes			
Length of stay (median,d)	17	21	
Length of stay (mean,d)	21	31	
In-hospital mortality (%)	7.0	7.7	0.43
Underlying disease (%)			
Ischemic heart disease (without AMI**)	33.8	33†	0.58
Atrial fibrillation/ flutter	29.0	40	<.0001
Hypertension	57.1	71	<.0001
Diabetes mellitus	27.9	34	<.0001
Previous stroke	6.8	12	<.0001
COPD***	6.5	9	.001

* DPC administrative data　　**AMI: acute myocardial infarction
†:without acute coronary syndromes (ACS)　***COPD: chronic obstructive pulmonary disease

Baseline characteristics ～Test / Validation dataset 比較 1～

	Test Dataset	Validation Dataset	P- value
Facility level characteristics			
Number of hospitals	45	45	
Teaching, n (%)	40 (88.9)	36 (80.0)	0.2447
Larger beds (>380), n (%)	22 (48.8)	23 (51.1)	0.6086
Patient level characteristics			
Number of patients	4861	4696	
Female, n (%)	2397 (49.3)	2349 (50.0)	0.487
Age (years, mean ± SD)	78.0 ± 12.4	78.7 ± 11.7	0.007
Admission route, n (%)			
Emergency with ambulance	1447 (29.8)	1467 (31.2)	0.118
Emergency without ambulance	2661 (54.7)	2185 (46.5)	<0.0001
Scheduled	753 (15.5)	1044 (22.2)	<0.0001
NYHA functional class, n (%)			
I or II	1658 (34.1)	1515 (32.3)	0.055
III	1746 (35.9)	1654 (35.2)	0.477
IV	1457 (30.0)	1527 (32.5)	0.007
Severe respiratory failure due to acute heart failure	306 (6.2)	397 (8.5)	<0.0001
In-hospital mortality, n (%)	326 (6.7)	344 (7.7)	0.236

Baseline characteristics ～Test / Validation dataset 比較 2～

	Test Dataset	Validation Dataset	P- value
Patient level characteristics			
Comorbidities, n (%)			
Ischemic heart disease	1593 (32.8)	1637 (34.9)	0.031
DCM	184 (3.8)	249 (5.3)	<0.0001
Hypertension (including HHD)	2798 (57.6)	2657 (56.6)	0.333
Other cardiomyopathy	89 (1.8)	97 (2.1)	0.406
Atrial fibrillation/flutter	1374 (28.3)	1400 (29.8)	0.096
Life threatening arrhythmia	103 (2.1)	110 (2.3)	0.459
Chronic renal failure (mild to moderate)	509 (10.5)	528 (11.2)	0.225
COPD	293 (6.0)	326 (6.9)	0.069
Previous stroke	337 (6.9)	309 (6.6)	0.492
Anemia	391 (8.0)	366 (7.8)	0.651
DM	1393 (28.7)	1274 (27.1)	0.096
Dyslipidemia	993 (20.4)	745 (15.9)	<0.0001
Cancer	247 (5.1)	226 (4.8)	0.545
Shock (including cardiogenic shock)	51 (1.0)	78 (1.7)	0.010

DCM, dilated cardiomyopathy; HHD, hypertensive heart disease; COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus.

院内死亡予測モデルに使用した最終説明変数

(Test dataset n=4861)

Variables	Standardized coefficient	Adjusted odds ratio (95% CI)	*P*-value
Female	0.137	1.15(0.89-1.48)	0.288
Age (reference; 20-59 years)			
60-69	0.290	1.34(0.61-2.94)	0.472
70-79	0.580	1.79(0.88-3.62)	0.107
80-89	1.330	3.78(1.93-7.39)	<0.001
≥ 90	2.051	7.78(3.90-15.51)	<0.001
*NYHA functional class at admission**			
III	0.659	1.93(1.30-2.87)	0.001
IV	1.659	5.25(3.66-7.54)	<0.001
Severe respiratory failure due to acute heart failure	1.251	3.49(2.47-4.93)	<0.001
Hypertension	-1.069	0.34(0.27-0.44)	<0.001
Life-threatening arrhythmia	0.961	2.61(1.48-4.62)	0.001
Chronic renal failure (mild to moderate)	0.566	1.76(1.27-2.44)	0.001
Shock	0.808	2.24(1.03-4.91)	0.043
Intercept	-4.584		

CI, confidence interval; NYHA, New York Heart Association. *Reference: NYHA I or II.

院内死亡予測モデルの予測力と妥当性検証

	n	C-statistics	Hosmer-Lemeshow 検定	P
Test dataset	4861	0.82	5.01	0.76
Validation dataset	4696	0.79	1.07	0.96

急性心不全院内粗死亡率および予測死亡率の病院間比較

・各病院の粗死亡率　　　　━━━ リスク調整予測死亡率の95%信頼区間
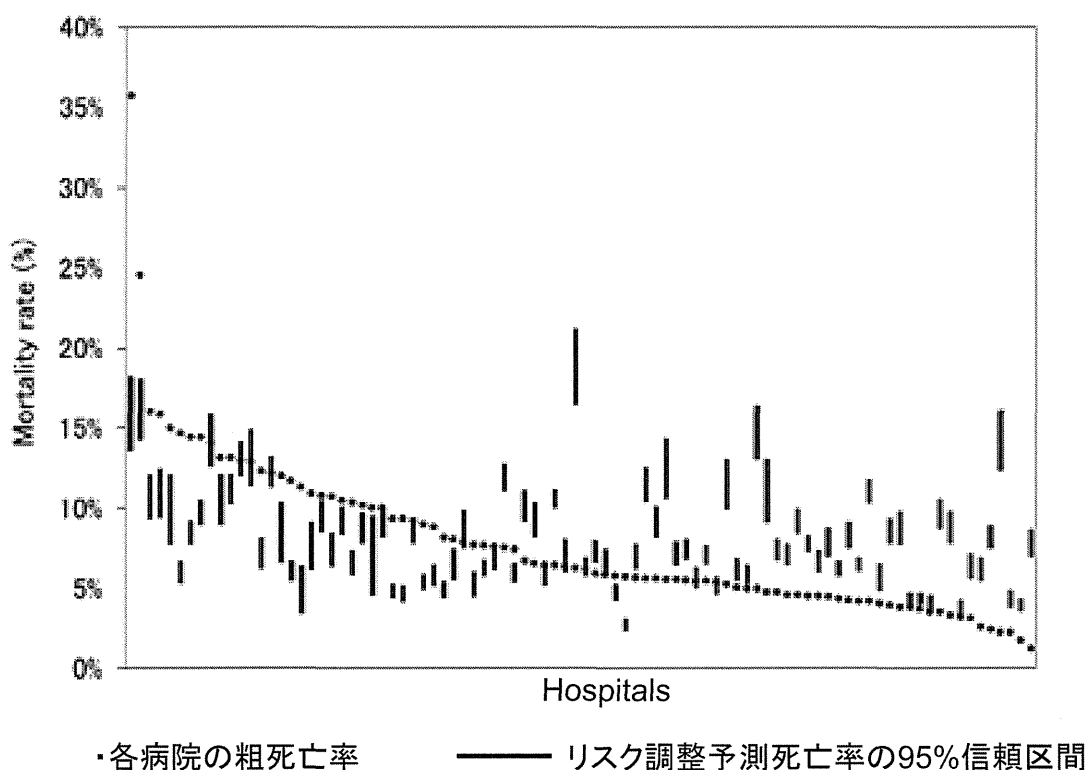
考察

■ 「急性」を示す病名付加コードにより、従来同定困難だった
　急性心不全を、臨床像とかけ離れない形で同定することが
　可能だといえる。

■ 本研究で開発した院内死亡予測モデルの予測力は
　高く、今後の応用が期待できる。

■ 開発したモデルを用いて、各病院の粗死亡率(観察死
　亡率)とリスク調整予測死亡率との違いを示すことがで
　きる。あまりにも観察死亡率が悪い場合は、提供医療
　の質を検討する契機とすることが可能である。

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限界

- DPCデータは記入枠に限界があり、病名のみで実際の病態を十分反映できるとは限らない。

- NYHA分類は 現場医師の判断によるが、医師が必ずしも専門医ではないため、判断が正しいとは限らない。

- 結果の解釈にあたり、QIP参加病院は医療の質改善に積極的な傾向があるなどの交絡については留意が必要である。

結論

本研究で開発した急性心不全患者の院内死亡予測モデルの予測力は高く、高額医療につながる急性心不全医療の提供内容について、病院間比較を行ったり、病院の診療を継時的にモニターする上で、今後も広く利用できると考えられる。

Variations in Healthcare Spending and Quality among Institutions

Tetsuya Otsubo, Yuichi Imanaka, Toshitaka Morishima, Noriko Sasaki, Sungchul Park, and Jason Lee

Contents

Variations in Healthcare Spending and Quality among Institutions

Abstract

Unwarranted institutional variations in healthcare spending and quality may indicate discrepancies in the quantity of services provided, management efficiency, and staff ability at the hospital level. However, because not all variations are unwarranted, analyses must take into account the differences in the needs and preferences of the various patient groups served. These variations can be influenced by factors such as payment systems, hospital ownership, management methods, resource availability, teaching status, and practice patterns. Although institutional variations may be intertwined with variations at the regional level, some measures of care are more meaningful when quantified at the hospital level, such as nosocomial infection rates or indicators of hospital management efficiency. Accurately identifying unwarranted variations as stemming from causes at the institutional level would also help to identify the appropriate stakeholders and decision makers who have the relevant authority and jurisdiction to address the problem. In this chapter, we address the empirical evidence of institutional variations in healthcare spending, medical practice patterns, and outcomes. We also investigate the factors that have been shown to influence these variations, and discuss the general methodologies used in analyzing institutional-level variations in healthcare spending and quality.

1. Introduction

Unwarranted institutional variations in healthcare spending and quality may indicate discrepancies in the quantity of services provided, management efficiency, and clinical staff ability among different hospitals. These variations can also point to the unequal distribution of resources, inefficient use of existing resources, or provision of sub-optimal healthcare in some hospitals. Growing recognition of the existence and impact of unwarranted variations among hospitals is seen in the advent of quality-incentivizing systems such as pay for performance (P4P) and public reporting systems. The rationale for reducing unwarranted variations among institutions is that, in theory, there is an optimal delivery of healthcare, in which the highest possible quality of care is provided at the lowest possible cost. Deviations from this optimum may simply reflect variations in patient populations, and therefore might not necessarily indicate poorer quality of healthcare. Research into healthcare variations at the institutional level must take into account the differences in the needs of the various patient groups served.

The dependability and usability of observed variations as indicators is limited by the quality of data and methodological approaches. Large databases comprising standardized data from numerous healthcare providers, coupled with appropriate adjustment methodologies, can increase the cogency of any variations observed. Variations that extend beyond the hospital level are covered in elsewhere in this handbook.

Unwarranted variations are those that are not a result of differential patient case mix or environmental factors, and can be reduced through improvements to payment systems, resource distribution, and clinical guidelines. These variations can be influenced by factors such as payment systems, hospital ownership, insurance systems, management methods, resource availability, teaching status, and practice patterns. The identification of "optimal" healthcare can be conducted using the various guidelines and standards promulgated by expert bodies within each field, while taking into account the unique characteristics of each country or region.

Uneven healthcare spending and quality at the institutional level are likely to be of most interest to hospital management staff, policymakers, payers, and health services researchers, who aim to elucidate the variations in order to bring about improvements or adjust payment systems and policies. In addition to these stakeholders, the general public is increasingly aware of these variations. The information asymmetry been patients and doctors has traditionally led to a general impression that the care provided by any medical professional has been correct and necessary. However, growing patient awareness amid reports of hospital variations in the quality of healthcare processes and outcomes (including hospital scorecards and the Centers for Medicaid and Medicare Services' [CMS] Hospital Compare program)

B-2 「Impact of hospital case volume on quality of end-of-life care among cancer patients: a cross-sectional study using claims data 」

京都大学大学院 医学研究科 医療経済学分野 ◎森島 敏隆

【背景】 Issues pertaining to end-of-life cancer care affect a large number of Japanese people. Quality of terminal care draws increasing attention. Nevertheless, the rates of hospice use and home-care service are still low in Japan. Most Japanese people die in acute-care hospitals currently. It is important to examine quality of terminal care in acute-care hospitals.

【目的】 To investigate relationship between quality of end-of-life care and hospital characteristics after adjusting for patient characteristics.

【方法】 A cross-sectional study was conducted. The data source was comprised of claims information electronically submitted to National Health Insurance and Long Life Medical Care System. Patients who died of cancer in acute-care hospitals in Kyoto Prefecture between March 2009 and May 2010, with available claims records for at least 2 months prior to death were included in this study. Patients who used hospice service during their last 2 month of life, and those who received terminal care at hospitals with less than 10 terminally ill cancer patients were excluded. Benchmark quality measures for terminal cancer care developed to identify good- and poor-quality procedures from administrative data were used to determine the following: use of opioids during the last 2 months of life (good-quality), receipt of life-sustaining treatments (cardiopulmonary resuscitation, intubation, or mechanical ventilation) or admission to intensive care units during the last month of life (poor-quality), and receipt of chemotherapy during the last 2 months of life (poor-quality). Patient characteristics data regarding age, sex, cancer types, and comorbidities were obtained. The treating hospital for each patient was defined as the last hospital admitted to or visited before death. Hospital characteristics included teaching status, ownership, palliative care team status, and proportion of board certified oncologists. To determine whether there was a volume effect that might explain the differences of procedures, hospitals were grouped into quartiles according to their case volume during the study period. Multilevel logistic regression models were used to handle data consisting of patients within a given hospital.

【結果】 We analyzed 3205 decedents from 55 hospitals. There were more men than women. The largest age-group was 75-79 years. The most common type of cancer was lung cancer, followed by gastric cancer. There were significant associations between quality of terminal care and the hospital case volume after adjusting for the patient characteristics and the hospital characteristics. The opioid use model revealed that hospitals in higher volume quartiles were more likely to provide opioids, compared to those in the lowest volume quartile. The life-sustaining treatment model revealed that hospitals in higher volume quartiles were less likely to provide life-sustaining treatment or intensive care, compared to those in the lowest volume quartile. The likelihood of chemotherapy was not significantly associated with the case volume in the chemotherapy model. We found no associations between other hospital characteristics and procedure indicators.

【考察】 The case volume of terminally ill cancer patients correlated positively with the likelihood of opioid use, and correlated negatively with that of life-sustaining treatments. Quality of terminal care should be improved in hospitals with smaller case volume.

Impact of hospital case volume on quality of end-of-life care among cancer patients: a cross-sectional study using claims data

Presented at the 7th annual meeting of JHEA
on July 21, 2012

京都大学大学院医学研究科
医療経済学分野
森島敏隆、Jason LEE、大坪徹也、
猪飼宏、今中雄一

1

背景1

- わが国の最多の死因はがん
- 諸外国に比べて遅れている[1]緩和ケアが普及するように政府が推進[2]
- ホスピス・在宅医療は十分に普及していないので、現状では大多数の患者が一般病院で死亡
- 一般病院の終末期医療の質はどうか？
- 緩和ケアチームの体制・実績に差がある[2]

1. Wright et al. J Pain Symptom Manage 2008.
2. がん対策推進基本計画（厚生労働省）2012

2

背景2

- 政府は全国どこでも緩和ケアを適切に提供することを目指している[1]
- がん治療の質の均てん化を目指す[2]のなら、症例数の多寡にかかわらず良質な終末期医療を提供する必要
- 症例数はstructureのような性質で、医療の質に関連[3]
- 症例数と終末期医療の質の関係は不明

1. がん対策推進基本計画（厚生労働省）2007
2. がん医療水準均てん化の推進に関する検討会報告書（厚生労働省）2005
3. Epstein et al. NEJM 2002.

3

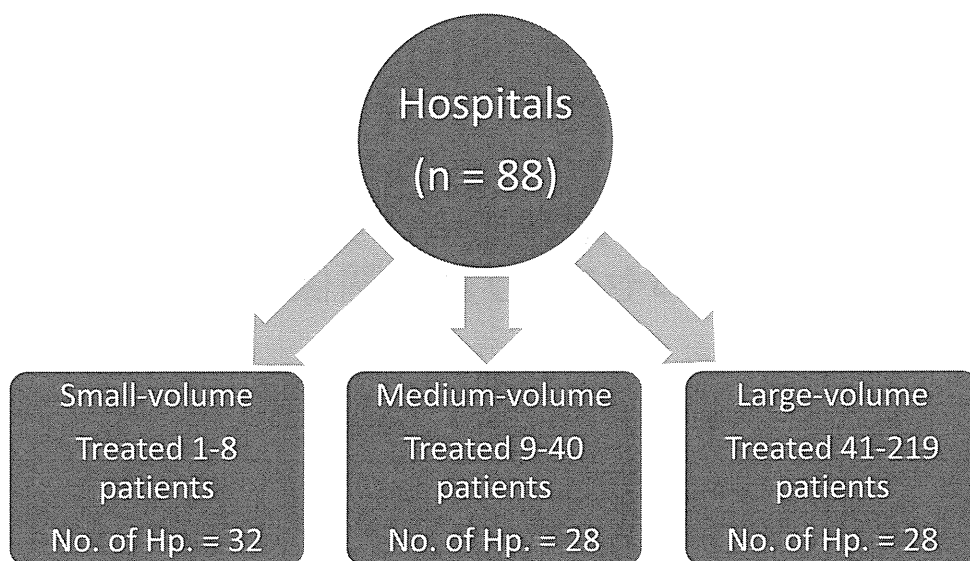# 目的

一般病院のがん末期患者の症例数と、がん終末期医療（プロセス）の質の関係を検証

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方法、デザイン、データ

- デザイン
  Cross-sectional
- データソース
  京都府の国民健康保険と後期高齢者医療制度の
  診療報酬明細書のデータベース
- 研究対象患者
  包含基準 (n=3535)
  - ✓ 2009年3月〜2010年5月にがん (ICD-10 codes: Cxx.x)で死亡
  - ✓ 死亡月を含む終末期2か月間の診療報酬明細書が利用可能

  除外基準 (n=241)
  - ✓ 終末期2か月間にホスピスを利用

病院のグループ分け

Hospitals
(n = 88)

Small-volume	Medium-volume	Large-volume
Treated 1-8 patients	Treated 9-40 patients	Treated 41-219 patients
No. of Hp. = 32	No. of Hp. = 28	No. of Hp. = 28

患者を治療した病院
= 患者を死亡診断した病院と定義

終末期医療の質の指標

| 麻薬 | Good-quality care[1,2] |

- 最期2か月間の使用の有無

| ICU or 延命治療 | Poor-quality care[1-4] |

- 最期1か月間のICU、心肺蘇生、気管内挿管、人工呼吸のいずれかの有無

| 化学療法 | Poor-quality care[1-4] |

- 最期2か月間の抗癌剤（細胞傷害性or分子標的薬）の使用の有無

1. Setoguchi et al. J Clin Oncol. 2008.
2. Grunfeld et al. Cancer. 2008.
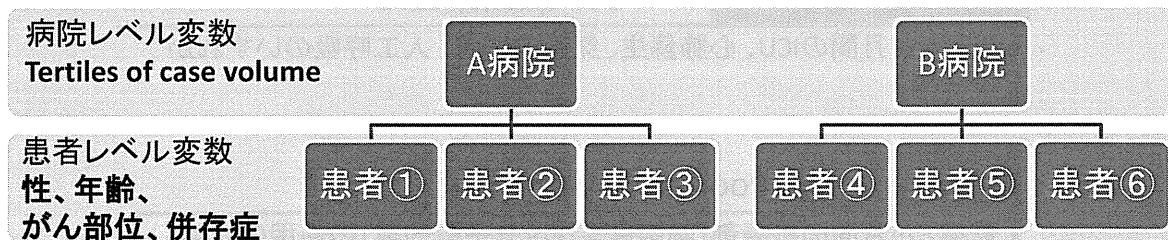3. Earle et al. J Clin Oncol. 2004.
4. Tang et al. Ann Oncol. 2009.

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患者特性

- 性別
- 年齢グループ（-64, 65-69, 70-74, 75-79, 80-84, 85-）
- がんの部位
    肺、胃、大腸、肝、胆、膵、血液（白血病とリンパ腫）
    前立腺、乳、その他
- 併存症
    がん以外の疾患をCharlson Indexに従って
    スコア化[1,2]したものをグループ化（0-1, 2, 3, 4-）

1. Charlson et al. J Chronic Dis 1987.
2. Quan et al. Med Care 2005.

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統計解析

- 各指標の実行の有無（2値変数）を目的変数
- マルチレベル・ロジスティック回帰モデル（ランダム切片）

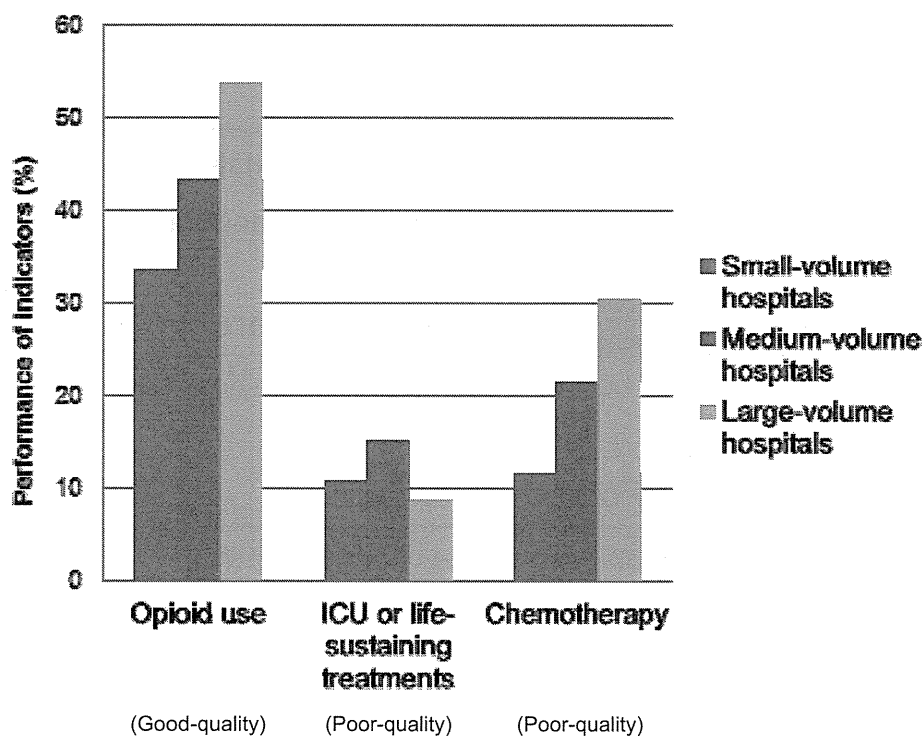| 病院レベル変数
Tertiles of case volume | | A病院 | | | | B病院 | |
| 患者レベル変数
**性、年齢、
がん部位、併存症** | 患者① | 患者② | 患者③ | 患者④ | 患者⑤ | 患者⑥ |

9

方法、その他

- P <0.05（両側検定）を統計学的有意

- 統計ソフトウェア
  IBM SPSS 19とSAS 9.2

- 倫理審査
  京都大学大学院医学研究科
  医の倫理委員会承認(E-1023)

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結果・患者特性

	Hospital case volume		
	Small	Medium	Large
No. of patients (n = 3294)	128	627	2539
Women	58 (45.3)	257 (41.0)	983 (38.7)
Age, y			
≤64	2 (1.6)	61 (9.7)	334 (13.2)
65–69	6 (4.7)	59 (9.4)	341 (13.4)
70–74	12 (9.4)	67 (10.7)	389 (15.3)
75–79	22 (17.2)	127 (20.3)	576 (22.7)
80–84	29 (22.7)	135 (21.5)	497 (19.6)
≥85	57 (44.5)	178 (28.4)	402 (15.8)
Cancer type			
Lung	26 (20.3)	143 (22.8)	475 (18.7)
Stomach	26 (20.3)	98 (15.6)	350 (13.8)
Colorectum	20 (15.6)	85 (13.6)	281 (11.1)
Liver	10 (7.8)	55 (8.8)	271 (10.7)
Pancreas	5 (3.9)	40 (6.4)	229 (9.0)
Biliary tract	7 (5.5)	33 (5.3)	122 (4.8)
Blood	1 (0.8)	23 (3.7)	181 (7.1)
Prostate	9 (7.0)	21 (3.3)	67 (2.6)
Breast	2 (1.6)	16 (2.6)	63 (2.5)
Other	22 (17.2)	113 (18.0)	500 (19.7)
Charlson Comorbidity Index			
0–1	30 (23.4)	157 (25.0)	925 (36.4)
2	20 (15.6)	132 (21.1)	514 (20.2)
3	24 (18.8)	98 (15.6)	339 (13.4)
≥4	54 (42.2)	240 (38.3)	761 (30.0)

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質指標の実行の割合（調整前）

Performance of indicators (%)

- Small-volume hospitals
- Medium-volume hospitals
- Large-volume hospitals

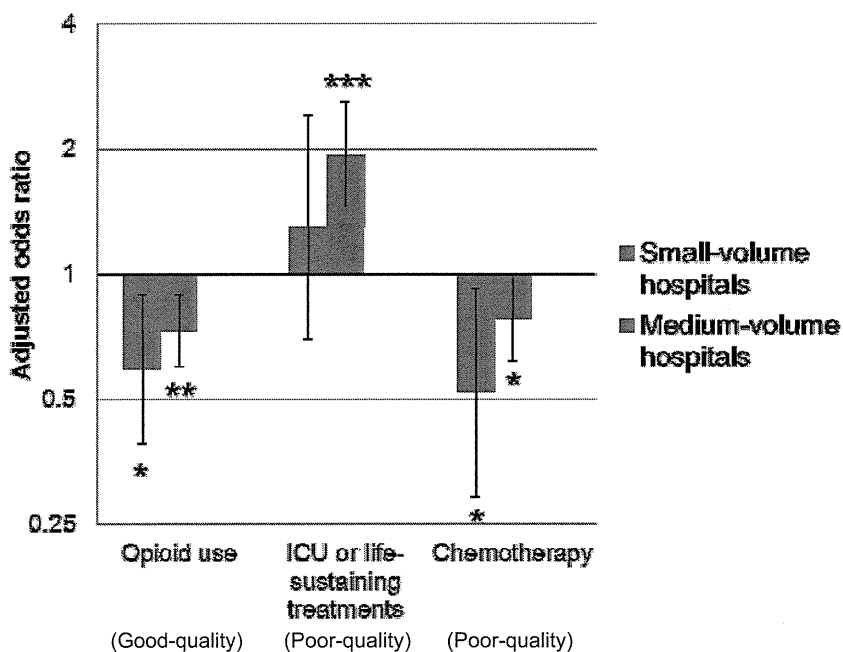| Opioid use	ICU or life-sustaining treatments	Chemotherapy
(Good-quality)	(Poor-quality)	(Poor-quality)

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患者特性を調整した後のオッズ比

Adjusted odds ratios are presented as ratio relative to large-volume hospitals.
Vertical lines indicate 95% confidence interval.
* P <0.05, ** P <0.01, *** P <0.001 when compared to large-volume hospitals.

結果のまとめ

麻薬 Good-quality care

- small-volume hospitals < large-volume hospitals
- medium-volume hospitals << large-volume hospitals

ICU or 延命治療 Poor-quality care

- medium-volume hospitals >>> large-volume hospitals

化学療法 Poor-quality care

- small-volume hospitals < large-volume hospitals
- medium-volume hospitals < large-volume hospitals

Inequality signs indicate larger/smaller in adjusted odds ratio.

考察

- がん終末期医療の3つのプロセス指標と、一般病院の症例数の関係を調べた。
- 3つの指標について、医療の質と症例数の一定の関係は得られなかった。

麻薬の使用に関する考察

麻薬 Good-quality care

- small-volume hospitals $<$ large-volume hospitals
- medium-volume hospitals $<<$ large-volume hospitals

- 症例数の少ない病院では、麻薬を処方する必要性の認識不足か、ためらいがあるのか。
- 一方、症例数の多い病院ではそのようなためらいがなくなるのかも。

麻薬の使用に関する含意

- 疼痛を十分にコントロールすることは終末期患者のQOLの向上に不可欠[1]
- 麻薬はがん緩和ケアに不可欠[2]

- 麻薬の処方に関する障壁を同定し、取り除く努力の必要性[3]
- あるいは、症例数の多い病院に患者を集約する必要性

1. Cleeland et al. NEJM 1994.
2. De Lima et al. J Pain Symptom Manage 2007.
3. Friedenberg et al. J Palliat Med. 2012.

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ICU, 延命治療の施行に関する考察

ICU or 延命治療	Poor-quality care

- medium-volume hospitals >>> large-volume hospitals
- small-volume hospitals ≒ large-volume hospitals

- medium-volume hospitalsでは、最期までできる限りの延命をしなくてはならないと考えているのかも。
- small-volume hospitalsでは、集中治療や延命治療をする必要性を感じても、リソースが不足していて実行できないのかも。

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ICU、延命治療に関する含意

終末期の集中治療・延命治療は、患者のQOLを
落とすことになることが多い[1-2]ことを知る必要性

1. Wennberg et al. Health Aff. 2009.
2. Teno et al. J Am Geriatr Soc. 2005.

化学療法の施行に関する考察

化学療法 Poor-quality care

- small-volume hospitals < large-volume hospitals
- medium-volume hospitals < large-volume hospitals

- 症例数の多い病院では、がん治療の専門医が
  多く在籍。専門医は自らの経験を積むために
  化学療法のoverindicationの傾向があるのか
  も。
- 症例数の多い病院には、治癒を目指した治療
  を希望する患者が集まるのかも。