UNIVERSITI TEKNOLOGI MARA

Fakulti Pengurusan dan Perniagaan

SOCIO ENVIRONMENT COMPENDIUM

2020

VOLUME 3(1), 2020

eISSN: 2636-9656

-SOCENTiUM-
keeping you informed

FACULTY OF BUSINESS AND MANAGEMENT
UNIVERSITI TEKNOLOGI MARA

EVALUATING VARIATIONS IN HEALTHCARE OUTCOME USING HEALTH INSURANCE BIG DATA: A MULTILEVEL ANALYSIS

Aziz Jamal*, Akira Babazono, Yunfei Li**, Shinichiro Yoshida** & Takako Fujita*****

*Health Administration Program, Faculty of Business and Management, Universiti Teknologi MARA, Puncak Alam Campus, 42300 Selangor, Malaysia.

E-mail: aziz2903@uitm.edu.my

**Graduate School of Medical Sciences, Faculty of Medicine, Kyushu University, Fukuoka Japan.

***Department of Health Sciences, Faculty of Medicine, Kyushu University, Fukuoka Japan.

Full article can be retrieved from here

1. INTRODUCTION

Hemodialysis-associated infection (HAI) has consistently been ranked as the main disease leading to death among dialysis patients (Jha et al., 2013). Using health insurance big data, this study attempts to examine the magnitude of the burden of HAI and quantify the extent to which patients, care facilities, and geographical characteristics influence variations in HAI risk. As understanding increases, information generated from the study would help in the development of policy and informed clinical practice on the prevention and control of infection..

ABSTRACT

The presence of comorbid conditions along with heterogeneity in terms of healthcare practices and service delivery could have a significant impact on a patient's outcomes. Therefore, the current study was conducted to quantify the extent to which such variations influence the risk of hemodialysis-associated infection (HAI). A total of 6,111 patients with end-stage renal disease (ESRD) who received hemodialysis treatment between 1 October 2015 and 31 March 2016 were identified from an insurance claim database. Patients were followed for one year from 1 April 2016 to 31 March 2017. A total of 200 HAI cases were observed during the follow-up and 12 patients died within 90 days of the onset of HAI. The results of the multilevel analyses indicated that HAI variations were only significant at the care facility level and were largely explained by the heterogeneity between care facilities. The results of this study highlight the need to look beyond the influence of patient-level characteristics when developing policies that aim at improving the quality of haemodialysis health care and service delivery.

Keywords: End-Stage Renal Disease, Hemodialysis, Infection, Insurance, Multilevel, Variations

2. METHOD

Data for analysis were obtained from the insurance claim records submitted to the Fukuoka Prefecture Association of Latter Stage Elderly Healthcare in Japan. A total of 6,111 patients with end-stage renal disease (ESRD) who received hemodialysis treatment between 1October 2015 and 31 March 2016 were identified from the insurance claim database. Patients were followed for one year from 1 April 2016 to 31 March 2017. The primary outcome was the development of hemodialysis-associated infection (HAI) after the index date (April 1, 2016). Quantification of area variations and contextual effects of care facility on both HAI risks were made by performing multilevel analyses, with patient data nesting in care facilities and within 13 secondary tiers of medical care areas (STMs). Data were fitted into multilevel Poisson regression with a random intercept. Units contributing to the likelihood of given intervals correspond to the “risk set” of Cox’s proportional hazards model (Rabe-Hesketch & Skondral, 2012). Four models were constructed. Model 0 was fitted without explanatory variables, and patient covariates were included in model 1 (sex, age, nephritis, diabetes mellitus, hypertension, malignancy & Charlson’s comorbidity Index), while health facility covariates (ownership & facility size) were added in model 2. Model 3 incorporate both patient and care facility covariates in the analysis. The magnitude of variations was assessed using model variance, Proportional Change in Variance (PCV), Inter-class Correlation Coefficient (ICC), and Median Hazard Ratio (MHR) (Rabe-Hesketch & Skrondal, 2012; Austin et al., 2016; Merlo et al., 2005)

3. RESULT

Variations were only statistically significant at health care-level. Variance was reduced following the inclusion of patient covariates (Model 1) and care facility covariates (Model 2). Controlling all covariates in our study, further reduction in model variance and MHR values were observed, as estimated by our random-effect model. Outcome variations at care facility-level were largely attributed to differences in healthcare covariates. Random-effect estimates are provided in Table 1.

Table 1:
Results of multilevel analysis examining the effect of health care and area variations on hemodialysis-associated infection.

	Model 0	Model 1	Model2	Model 3
Variance				
Area σ^2	<.001	<.001	<.001	<.001
HC σ^2	1.93	1.90	1.87	1.84
PCV (%)				
Area	Ref.	-	-	-
HC	Ref.	1.00	3.00	4.42
ICC				
Area	<.001	<.001	<.001	<.001
HC	0.98	0.98	0.98	0.98
MHR				
Area	1.00	1.00	1.00	1.00
HC	3.76	3.73	3.68	3.65

STM: Secondary Tier of Medical Care, HC: Health Care, PCV: Proportion Change in Variance, ICC: Inter-class Correlation Coefficient, MHR: Median Hazard Ratio.

4. DISCUSSION

To address significant variations in clinical outcomes at the care facility level, it is important to look beyond individual patient-level characteristics. While there were almost no variations at the area level, justifying spatial equity in the distribution and use of health care, significant variations exist at the care facility level. Therefore, the development of specific policies to reduce the incidence of hospital-induced infection and improve the survival of hemodialysis patients is urgently needed to address this issue. A task force that composes of various specialties must be set up and must work together to identify the best strategies for improving the current outcome and the quality of healthcare delivery.

REFERENCES

Austin, P. C., Wagner, P. & Merlo, J. (2016). The median hazard ratio: a useful measure of variance and general contextual effects in multilevel survival analysis. *Stat Med.* 2016 Mar 15; 36(6), 928-938. http://doi.org/: 10.1002/sim.7188

Jha, V., Garcia-Garcia, G., Iseki, K., Li, Z., Naicker, S., Plattner, B., Saran, R., Wang, A. Y. & Yang, C. W. (2013) Chronic kidney disease: global dimension and perspectives. *Lancet*, 382(9888), 260-72. https:// doi.org/: 10.1016/S0140-6736(13)60687-X.

Merlo, J., Yang, M., Chaix, B., Lynch, J. & Rastam, L. (2005). A brief conceptual tutorial on multilevel analysis in social epidemiology: investigating contextual phenomenon in different group of people. *J Epidemiol Community Health.* 2005 Jun; 59(6), 443-449. https//:doi.org/: 10.1136/jech.2004.023473

Rabe-Hesketh, S. & Skrondal, A. (2012). *Multilevel and Longitudinal Modeling Using Stata, Volume 2: Categorical Response, Counts, and Survival.* (3rd ed). Stata Press.