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The outcomes of psychiatric inpatients by proportion of experienced psychiatrists and nurse staffing in hospital: New findings on improving the quality of mental health care in South Korea

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ABSTRACT

Readmission rates for mental health care are higher in South Korea than other Organization for Economic Development (OECD) countries. Therefore, it is worthwhile to continue investigating how to reduce readmissions. Taking a novel approach, we determined the relationship between psychiatrist experience and mental health care readmission rates. We used National Health Insurance claim data (N=21,315) from 81 hospitals to analyze readmissions within 30 days of discharge for "mood disorders" or "schizophrenia, schizotypal and delusional disorders" during 2010–2013. In this study, multilevel models that included both patient and hospital-level variables were analyzed to examine associations with readmission. Readmissions within 30 days of discharge accounted for 1079 (5.1%) claims. Multilevel analysis demonstrated that the proportion of experienced psychiatrists at a hospital was inversely associated with risk of readmission (OR: 0.79, 95% CI: 0.74–0.84 per 10% increase in experienced psychiatrists). Readmission rates for psychiatric disorders within 30 days of discharge were lower in hospitals with a higher number of nurses (OR: 0.95, 95% CI: 0.94–0.96 per 10 nurses). In conclusion, health policymakers and hospital managers should make an effort to reduce readmissions for psychiatric disorders and other diseases by considering the role that physician experience plays and nurse staffing.

1. Background

Readmission within 30 days of discharge is defined as when a patient who has been hospitalized for a specific disease is readmitted to the same hospital within 30 days of discharge. In mental health care, readmission could be occurred in various objectives. By the previous studies, readmission may act a prevention of inpatient's quality of life reduction due to longer length of stay and it is possible to providing mental health services more effectively (Lien, 2002). However, readmission primarily occurs as a part of maintaining high hospital occupancy. It adversely affects patients and increases the cost burden to National Health Insurance systems (NHIs) (Zhang et al., 2011). As a result, readmission is considered a quality indicator for inpatient services. Many health care professionals and researchers have studied how to reduce readmission in mental health care.

According to previous studies, readmission is influenced by: a history of previous readmission, length of stay, substance abuse, comorbidity, sex, marital status, and other factors (Yellowlees, 1994; Clarke et al., 1999; Bernardo and Forchuk, 2001; Figueroa et al., 2004; Bobier and Warwick, 2005; Valevski et al., 2007; Callaly et al., 2010; Callaly et al., 2011; Boaz et al., 2013; Moss et al., 2014). Readmission rates for mental health care are higher in South Korea than other Organization for Economic Development (OECD) countries (readmissions for schizophrenia in South Korea, 2011: 19.4%; OECD average: 12.3%) (OECD, 2013).

Therefore, it is worthwhile to further investigate how to reduce readmissions. We approach the factors influencing readmission from a new perspective. Some previous studies have demonstrated

Abbreviations: NHIs, National Health Insurance systems; OECD, Organization for Economic Development; ICD, International Classification of Diseases; ANOVA, analysis of variance; OR, odds ratio; 95% CI, 95% confidence interval; SD, standard deviation

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that health care outcomes are related to physician experience. In those studies, time in practice was inversely associated with good health outcomes, because experienced physicians were less receptive to adopting new treatment technologies (Stolley et al., 1972; Rhee, 1976; Sanazaro and Worth, 1985; Choudhry et al., 2005). As a result, health care outcomes for experienced physicians were not good. To date, however, there have been relatively few studies on physician experience. Also, existing studies have concentrated on medical disciplines such as clinical surgery rather than on mental health.

Although one study on depression and primary physician experience has been conducted, the results were insufficient to support a relationship between the two (Epstein et al., 2001). In addition, a study about experience of psychiatrist suggested new paradigm that unit's head psychiatrists more preference to longer length of stay in providing mental health services more effectively (Capdevielle et al., 2013). However, to the best of our knowledge, no studies on the effect of psychiatrist experience upon mental health outcomes, especially readmission have been conducted in South Korea. Therefore, our study aims to characterize the relationship between psychiatrist experience and mental health care readmissions in South Korea. In addition, we performed a subgroup analysis to investigate whether such associations depended on the disorder present (i.e., mood disorders vs. schizophrenia, schizotypal and delusional disorders).

2. Methods

2.1. Study population

There are about 1730 hospitals including 39 public hospitals during 2010–2013 in South Korea, however, the data we used in this study was only included 156 hospitals (117 private vs. 39 public) that extracted by using propensity score matching-methods (1:3) adjusting for hospital characteristics. Among 156 hospitals, we only analyzed hospitalizations at hospitals that treated both "schizophrenia, schizotypal and delusional disorders (F2.x)" and "mood disorders (F3.x)." In addition, we excluded cases with missing values for the variables of interest. Finally, 114 hospitals (public=31 vs. private=83, 19,638 hospitalization cases) were included for analysis. The unit of analysis was each hospitalization rather than patient.

2.2. Variables

The outcome variable in this study was readmission within 30 days of discharge for mood disorder or schizophrenia, schizotypal and delusional disorder. We treated the patient's first discharge in the calendar year as the index discharge. Readmissions within 30 calendar days of the index discharge were then assessed.

The primary variable of interest in relation to readmission within 30 days of discharge was the proportion of experienced psychiatrists. Experienced psychiatrists were defined as psychiatrists with more than 10 years of experience in mental health care.

We adjusted for both patient and hospital-level variables when analyzing the relationship between psychiatrist experience and readmission. Patient-level variables included in the analysis were: diagnosis, length of stay, sex, type of insurance coverage, age, and year. Diagnoses were determined according to International Classification of Diseases groupings (ICD-10: F2.x–F3.x), to reflect specific clinical mechanisms. Hospital-level variables encompassed both human resource variables and structural characteristics: total number of psychiatrists, number of nurses, number of beds, proportion of psychiatric beds, occupancy rate of psychiatric beds, ownership status, teaching status, and type of medical institution. The proportion of psychiatric beds was defined as the proportion of psychiatric beds over total beds. The occupancy rate of psychiatric beds was measured thus: total inpatient days of care for psychiatric disorders in a specific hospital/total psychiatric beds in a specific hospital*365. This equation for hospital occupancy rate considered readmissions. Types of medical institution included general hospital or hospital.

2.3. Statistical analysis

We examined the distribution of each categorical variable by examining frequencies and percentages, and then performed χ^2 tests to investigate associations with readmission within 30 days of discharge. These analyses were performed for both patient and hospital-level variables. To compare average values and standard deviations for continuous hospital-level variables, we performed analysis of variance (ANOVA). Multilevel models including both patient and hospital-level variables were analyzed to examine associations with readmission within 30 days of discharge. Additionally, subgroup analyses were performed according to diagnosis, teaching status, and ownership status, respectively. All statistical analyses were performed using SAS statistical software version 9.2. All *P*-values calculated were two-sided and considered significant at $P < 0.05$.

3. Results

The data used in this analysis consisted of 21,315 hospitalizations. Among them, 1079 (5.1%) were readmissions within 30 days of discharge. Table 1 shows univariate associations between various patient-level variables and readmission within 30 days. In terms of diagnosis, "schizophrenia, schizotypal and delusional disorders" were more frequent causes of readmission within 30 days than "mood disorders" (mood disorders: 2.2%, schizophrenia, schizotypal and delusional disorders: 10.3%). Cases hospitalized for more than 15 days had higher readmission rates than those with shorter hospitalizations (<15 days: 2.4%, ≥ 15 days: 6.8%). The readmission rate for males was higher than that for females (males: 8.1%, females: 3.5%). Readmission rates were similar for both types of insurance coverage studied (NHI: 5.1%, Medical Aid: 5.4%). Finally, readmission rates gradually increased over time.

Table 2 shows the distribution of hospital-level variables. The average proportion of experienced psychiatrists was 18.3% (mean: 18.3, SD: 31.2). The average number of psychiatrists and nurses were 1.9, SD: 1.9 and 159.6, SD: 152.1, respectively. The average number of total psychiatric beds was 5.4 (mean: 367.9, SD: 212.1), and the average occupancy rate of psychiatric beds was 14.0% (mean 14.0, SD: 36.0). There were fewer teaching hospitals in our sample ($n=36$) than non-teaching hospitals ($n=45$), and there were more private hospitals ($n=58$) than public hospitals ($n=23$). Finally, there were more general hospitals (79.0%) than hospitals (21.0%).

A multilevel analysis considering both patient and hospital-level variables revealed that patients with diagnoses of "schizophrenia, schizotypal and delusional disorders (ICD-10: F2.x)" had a higher risk of readmission within 30 days than those with "mood disorders (ICD-10: F3.x)" (OR: 3.81, 95% CI: 3.08–4.70; Table 3). Patients hospitalized for more than 15 days had a higher risk of readmission within 30 days than those hospitalized for shorter periods (OR: 2.26, 95% CI: 1.77–2.90). Females had a lower risk of readmission than males (OR: 0.68, 95% CI: 0.56–0.81). Finally, older patients were generally more likely to be readmitted than younger patients. In terms of hospital-level variables, a greater proportion of experienced psychiatrists was associated with a lower risk of readmission (OR: 0.79, 95% CI: 0.74–0.84 per 10%