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Research paper

Pre-discharge rehabilitation after hip surgery reduces 30-day readmissions in older adults: National Health Insurance Service–Senior Cohort (2007–2012)

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ABSTRACT

Background: Rehabilitation programs before and after hip surgery can shorten the length of hospital stay, reduce the incidence of complications, and reduce the readmission rate after surgery in older adults aged 65 years or over. The present study aimed to investigate the status of readmissions within 30 days after discharge and related factors in elderly people through the big data analysis using the sample data from the National Health Insurance Service-Senior Cohort (NHIS-SC).
Method: The subjects of the present study were patients aged 65 years or older who underwent hip surgery between 2007 and 2012. The subjects undergoing hip surgery included those who underwent at least one surgery of the following during the period: replacement arthroplasty, revision arthroplasty, arthrodesis, internal fixation, reduction of fractured extremity and internal fixation. Each variable was selected for sociodemographic characteristics and clinical features of the subjects, and the characteristics of medical institutions according to 30-day readmission.
Results: Among 9008 study participants, 1628 (18.1%) were readmitted within 30 days. Lower readmission rate was associated with longer hospital stay, greater number of hospital beds, and rehabilitation before discharge; whereas a higher rate was associated with provincially located hospitals, getting of medical aid, accompanying fractures, ICU admission, and comorbidities.
Conclusions: Pre-discharge rehabilitation in patients aged ≥ 65 years who underwent hip surgery can reduce readmissions, and efforts to increase daily living functions such as muscle strength and walking ability are very important.

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1. Introduction

The population of older adults aged ≥ 65 years in South Korea is increasing steadily, and Korea will become a super-aged society by 2025, with older adults accounting for 20% of the total population. Such an aging population will be a factor for increasing medical expenses, and increase the burden on society [1]. The medical expenditure for people aged ≥ 65 years was KRW 19.9 trillion in 2014, accounting for 36.3% of the total medical expenditure; moreover, the rate of increase in medical expenditure for older adults aged ≥ 65 years was three times higher than for other age groups [2]. In terms of medical expenses, readmitted patients aged ≥ 65 years account for high-cost patients, as indicated in a report [3]. Therefore, this issue requires national level management.

Patients aged ≥ 65 years have lesser activities of daily living (ADL) after surgery than younger patients, which is associated with high readmission and mortality rates [4]. In particular, hip surgery is one of the most common procedures for aging population, and its biggest cause is femoral fracture due to a fall or pathological cause. Hip surgery causes many older people to lose their ability to walk after the surgery. Rehabilitation programs before and after hip surgery are effective in shortening the length of hospital stay, improving hip function in the long-term, and reducing the incidence of complications [5]. ADL function is known as a variable affecting readmission [6]. If hip function is improved through rehabilitation, the improvement of ADL function can be expected to reduce the readmission rate after hip surgery.

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The rate of readmission to hospital within 30 days after discharge is one of the best indicators of quality of care, hospital performance, and medical care utilization. This rate, within 28–30 days after discharge, is used as an indicator for hospital quality management in many countries including Australia and the United Kingdom [7]. The quality of care is important in terms of improving treatment outcomes and reducing costs, and if the quality of care is not managed during inpatient care, it may increase unplanned readmission. In addition, since readmission can be associated with inadequate inpatient care processes, early readmission can be used as an indicator of the quality of care [8].

The present study aimed to investigate the status of readmission to hospitals within 30 days after hospital discharge and related factors in patients aged ≥ 65 years undergoing hip surgery through data analysis of the anonymized NHIS-Senior Cohort data released for research purposes by the NHIS.

2. Methods

2.1. Data source

The dataset was provided by the Korean NHIS, founded in 2000 as a single-insurer system. Called the National Health Information Database (NHID), it contains personal information, demographics, and medical treatment data of Korean citizens who are categorized as insured employees, insured self-employed individuals, or medical aid beneficiaries. The NHIS-Senior Cohort (NHIS-SC) is a population-based cohort, built by randomly selecting a representative sample of 558,147 seniors, comprised of about 10% of the total eligible Korean (5,5000,000 persons) in 2002, and followed for 11 years until 2013 unless a participant's eligibility was disqualified due to death or emigration [9].

2.2. Study population

The participants included patients aged ≥ 65 years in the NHIS-Senior Cohort, who had undergone at least one of the following hip surgeries between 2007 and 2012: replacement arthroplasty (total, unicompartmental), revision arthroplasty (total, unicondylar), arthrodesis, internal fixation, reduction of fractured extremity or external fixation; in addition, at least one of the insurance claims codes was associated with the hip surgery.

Participants who were readmitted more than 2 times to hospitals within 30 days after discharge were evaluated as one readmission.

Patients were excluded from the study who were admitted to a hospital and then were transferred to another hospital to undergo surgery, were transferred to another hospital on the day of discharge, died without readmission within 1 month after discharge, had a length of hospital stay of 0 days, had data from medical institutions that opened or closed during the survey period or were changed to computerized-medium claiming institutions in the respective year, had unidentified patient data, had data without information on the medical institutions (Fig. 1).

2.3. Variables affecting readmission

Each variable was selected for the sociodemographic, institutions and clinical characteristics according to readmission within 30 days after discharge. The independent variables used in the present study were based on the literatures reported to date. However, because most of variables that were found to affect readmission in the existing literature contain physiological variables that are difficult to obtain from the claim data, variables comprised those that can be obtained. The disease codes were set based on the International Classification of Diseases, Tenth Revision (ICD 10), and hospitalization costs were calculated based on approved total amount of medical care expenses. The rehabilitation treatments included simple exercise therapy, combined exercise therapy, isokinetic exercise therapy, and gait therapy. The route of admission was also analyzed.

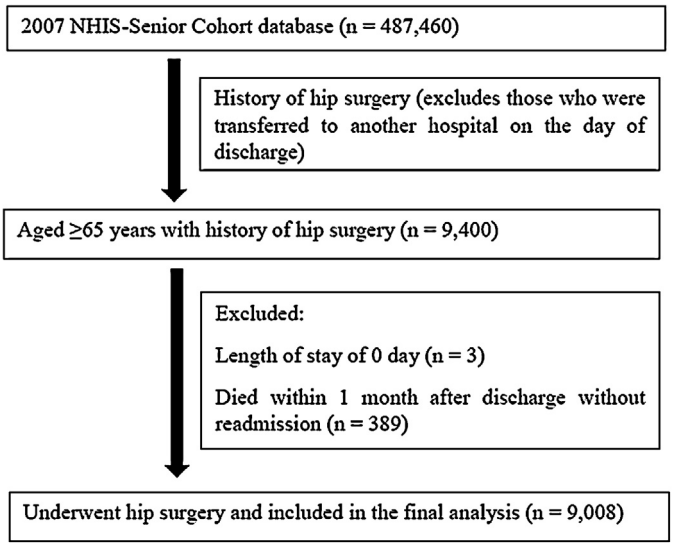

Fig. 1. Flowchart of pre-discharge rehabilitation after hip surgery cohort study.

2.4. Ethical approval

The present study protocol was reviewed and approved by the Institutional Review Board of Kyung Hee University Medical Center (KMC IRB 2016-02-106). Informed consent was submitted by all participants when they were enrolled.

2.5. Statistical analysis

The primary end point of the present study was to compare the characteristics of patients with a history of hip surgery according to 30-day readmission after discharge. Either the two-sample *t*-test or Wilcoxon two-sample test was performed to measure the statistical significance of basic demographic and clinical factors; the Fisher's Exact test was performed for categorical type. The age groups were divided by 5 year increments, and the income quantiles were categorized into 3 levels for analysis. The costs were calculated using a determined amount data with the sum of patient copayment and NHIS copayment. The area was divided into the city of Seoul, capital region (Incheon, Gyeonggi-do), and provinces. The readmission rate by the type of surgery refers to the number of readmitted participants by the type of surgery. Finally, we analyzed the characteristics and risk of 30-day readmission by controlling other factors using a multivariate logistic regression model. All statistical analyses were performed using R software, version 3.4.0 (R foundation for Statistical Computing, Vienna, Austria). Data were converted using SAS software, version 9.3 (SAS Institute Inc., Cary, NC, USA).

3. Results

Basic characteristics of the participants according to the presence or absence of readmission.

The present study involved 9008 participants, of whom, 1628 persons (18.1%) were readmitted within 30 days, and 7380 (81.9%) were not (Appendix S1).

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