A STATISTICAL ANALYSIS PLAN TO UNDERSTAND OSTEOARTHRITIS PATIENT JOURNEY BY LINKING MEDICARE CLAIMS ACROSS CARE DELIVERY SETTINGS

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OBJECTIVES

To design a statistical approach to understand the journey of knee osteoarthritis (OA) patients through different care delivery settings, how resource use patterns shift over time, and key drivers of disease burden in the United States.

METHODS

We conducted extensive literature research on health economics and burden of illness studies on knee OA and found no study that directly compared the healthcare resource utilization between knee OA and non-OA patients across all care delivery settings in the US Medicare population. As a result, the resource use landscape for knee OA Medicare patients receiving care across sites of care—such as primary care, inpatient, outpatient, and ancillary services—remains unclear.

Medicare Limited Data Sets (LDS) included deidentified patient-level demographics and claims data on inpatient stays, outpatient visits, physician office visits, stays at skilled nursing facilities, home health, hospice care, and durable medical equipment. Each LDS file contains a unique patient identifier and information on diagnosis, date, type of service, length of stay, payment amount from different sources, and other information.

RESULTS

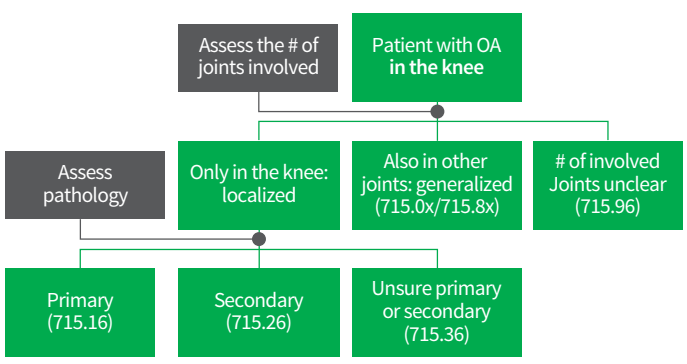
Determine datasets

We identified five relevant care settings that constitute the majority of resource use for knee OA patients: inpatient stays, outpatient visits, physician office visits, stays at skilled nursing facilities, and home health. Except for the physician office visits dataset, for which only a random 5% sample is available for any given year, complete claims data records are available for other settings. To properly account for any cohort effect caused by shifts in population demographics, care delivery patterns, and Medicare coverage policy, two years of claims data from 2009 and 2014 were analyzed.

Identify patient population

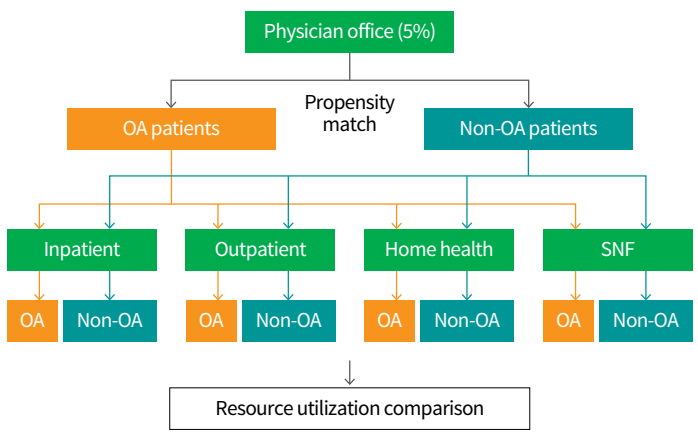
Following the classification of OA cases in clinical practice (Exhibit 1), knee OA patients were identified using the International Classification of Diseases, 9th revision, Clinical Modification (ICD-9-CM) principle diagnostic code of 715.16 (OA, localized, primary lower leg), 715.36 (OA, localized, not specified whether primary or secondary, lower leg), or 715.96 (OA, unspecified whether generalized or localized, lower leg). Individuals with correlated medical conditions that could potentially confound the analysis, such as rheumatoid arthritis (ICD-9-CM code 714.xx), psoriatic arthritis (ICD-9-CM code 696.xx), and ankylosing spondylitis (ICD-9-CM code 720.0x) were excluded from the study population.

Exhibit 1: Classification of OA



The unique patient ID can be used as the common key to link and pool claims records from different settings. To make sure each patient has a complete treatment history in the study population, knee OA patients were first identified from the 5% physician office visits file, and then utilization data for the same patients were extracted from the other four datasets with complete records. In the control group, the same number of non-OA patients were selected from patients who did not have the ICD-9 codes for OA listed and 1-to-1 matched to each knee OA patient based on age, gender, sex, race/ethnicity, location, and Medicare status (aged, disabled, with/without ESRD). (Exhibit 2)

Exhibit 2: The process of generating study OA and non-OA population



Analysis plan

Medicare claims payments and total submitted charges by service provider were directly extracted from claim data sets. Total expense is calculated as the sum of Medicare claims payments, various out-of-pocket payments from the patient (e.g., deductible and co-insurance), and other pass-through costs. (Exhibit 3) The number of claims is determined by type of service, with utilization days estimated for inpatient or SNF service providers. Resource use outcomes for each patient group at different times were compared longitudinally and cross-sectionally. (Exhibit 4)

All financial costs and resource utilization outcomes were examined as continuous variables, and the comparisons between knee OA and non-OA control cohorts were performed using the Student's t-test.

To identify influential cost drivers, log-transformed total treatment expenses per person were analyzed by multivariate linear regression to evaluate primary risk factors and cost drivers of knee OA under each type of service. Independent variables include age group, race/ethnicity, sex, Medicare status, and 19 different types of comorbid conditions. All costs were converted to 2014 dollars using the consumer price index (medical care).

Exhibit 3: Cost data structure in Medicare claims

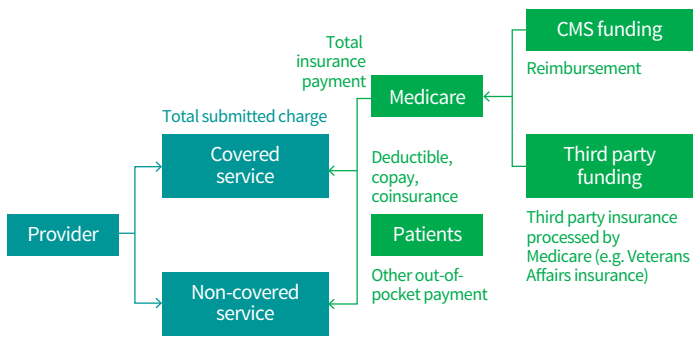
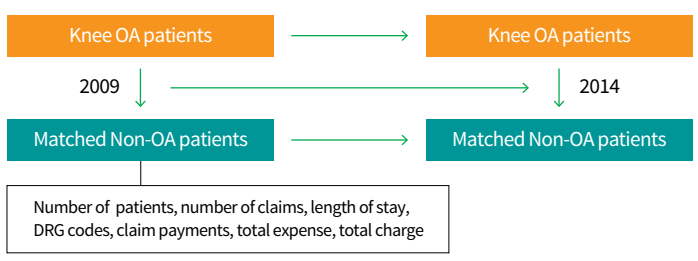


Exhibit 4: Illustration of longitudinal and cross-sectional analyses



CONCLUSIONS

A comprehensive burden of disease analysis on knee OA Medicare patients across care delivery settings is currently lacking. Assessing linked Medicare claims across different types of services can produce quantitative evidence to better manage the resource use of knee OA patients and understand the shift in care delivery patterns over time.

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