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Predictive value of Medicare claims data for identifying revision of index hip replacement was modest

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Abstract

Objective—To determine the positive predictive value of Medicare claims for identifying revision of total hip replacement (THR), a frequent marker of THR quality and outcome.

Study Design and Setting—We obtained Medicare Part A (Hospital) claims from seven states on patients that had primary THR from July 1995 through June 1996. We searched claims to determine whether these THR recipients had a subsequent revision THR through December 2006. We selected a sample of subjects with codes indicating both index primary and subsequent revision THR. We obtained medical records for both procedures to establish whether the revision occurred on the same side as index primary THR.

Results—Three hundred seventy-four subjects had codes indicating primary THR in 1995–96 and subsequent revision. Seventy-one percent (95% confidence interval: 66, 76) of the revisions were performed on the index joint and would be correctly attributed as revisions of the index THR, using Medicare Claims data.

Conclusion—Claims data on revision THR that do not contain information on the side that was operated on are ambiguous with respect to whether the revision was performed on the index or contralateral side. Claims-based analyses of revisions after an index THR should acknowledge and adjust for this source of potential misclassification.

Keywords

Total hip replacement; Revision; Administrative data; Medicare claims; Misclassification; Accuracy

1. Introduction

The definitive treatment of advanced lower extremity arthritis is total joint replacement. In 2007, 252,000 total hip replacements (THRs) and 550,200 total knee replacements were performed in the United States [1]. A key outcome of total joint replacement is the need for

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Supplementary material

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subsequent revision surgery. Revision is regarded as an objective measure of implant failure [2] and can be ascertained from administrative data, permitting studies of this endpoint in population-based large samples. Many studies have used administrative data, particularly Medicare Part A (hospital) claims, to identify subsequent revision THR as a complication of primary THR [3–10]. Administrative data such as Medicare claims are attractive for study of revision THR because virtually 100% of US residents aged 65 or greater are covered by Medicare; claims permit longitudinal follow-up even if patients change addresses, hospitals or surgeons; and Medicare hospital claims are relatively inexpensive to obtain and easy to work with. However, Medicare Part A data, and other sources that use ICD-9 coding, have the important disadvantage of not distinguishing the laterality of the procedure.

Few studies have validated the positive predictive value (PPV) of administrative data for identifying revision of a specific total knee or hip replacement [11–17]. Because the ICD-9 and CPT codes used to identify these procedures do not specify laterality, one potential source of inaccuracy is misattribution of revision to a given index total joint replacement, when the revision may have occurred on the contralateral joint. The goal of this study is to determine the PPV of Medicare claims data for identifying cases of revision surgery on the index hip after primary THR.

2. Methods

2.1 Study sample

This study was performed on a subsample of a national cohort of 58,521 Medicare recipients who underwent primary THR between July 1, 1995 and June 30, 1996. Details of the parent study have been reported elsewhere [3]. Medicare THR recipients were excluded if they were less than 65 years old; had codes indicating bilateral THR, hemiarthroplasty, conversion of hemiarthroplasty to THR; or had a diagnosis of hip fracture, cancer or infection. THR recipients were included in this analysis if they also underwent revision THR between the time of the primary THR and December 31, 2006; and, if at the time of the index primary THR, they resided in Illinois, Michigan, North Carolina, Ohio, Pennsylvania, Tennessee, or Texas. These states were chosen to provide geographic diversity. Revision THR was identified using Medicare A (hospital) data with the ICD-9 procedure code 81.53 up to October 1, 2005. After this date, the ICD-9 procedure codes for revision THR changed to 00.70 – 00.73. We used both the new and prior codes for 2005 –06 to ensure that we did not lose patients because of these coding changes. We censored subjects who had a contralateral primary THR after the index procedure because it would be unclear whether a subsequent revision THR pertained to the index or the second primary.

2.2 Data collection procedures and data elements

We obtained medical records for both the index THR and the putative revision. Trained abstractors documented whether the revision was performed on the side of the index THR or on the contralateral side. We also determined from the medical record whether the patient had a contralateral primary THR before index procedure

2.3 Analyses

We calculated the proportion of subjects with confirmed revision THR performed on the same hip that had the index THR. We stratified these analyses by whether the patient had undergone prior contralateral THR and by the 1995–96 THR procedure volume of the hospital where revision THR was performed. In a sensitivity analysis, we examined whether the diagnosis code V43.64 (hip joint replacement) identified patients with prior contralateral THR, who are at greater risk of contralateral revision than patients without this code.

The study was approved by the Partners Health Care Human Investigations Committee.

3. Results

3.1 Composition of the study cohort

The parent cohort included 58,521 Medicare recipients undergoing primary THR from July 1, 1995 to June 30, 1996. Of these, 4,460 had codes for revision THR through December 31, 2006, after censoring subjects with a second primary prior to the revision. One thousand three hundred nine of these patients had their initial primary THR in the seven states noted above and were eligible for the analyses presented in this article. We requested from hospitals the medical records for both the index primary and subsequent revision; the hospitals provided records for 374 of these patients (29%). The low response rate was primarily because of hospitals' concerns about patient confidentiality and Health Insurance Portability and Accountability Act (HIPAA) regulations. The patients whose medical records were abstracted did not differ in age, sex, Medicaid eligibility status, Charlson comorbidity score, hospital volume, or duration from the index primary to the revision from those whose medical records were requested but not obtained (see Table in electronic Appendix 1 on the journal's web site at www.elsevier,com). Those whose medical records were not obtained were more likely to be of non-white race (6.2%) than those whose records were obtained (3.8%).

The 374 subjects had a mean age of 73 years (standard deviation = 5, range = 65, 92), and 64% were female. Medical records revealed that 160 patients had undergone a contralateral THR before the index THR. Of these 160 patients, 154 (96%) had documentation of the year of the prior THR. Of these, 21 (14%) had prior primary THR performed before 1985, 51 (33%) had prior primary THR between 1985 and 1989, and 82 (53%) had prior primary THR between 1990 and 1995. By design, subjects in this analysis did not have subsequent primary THR after the index procedure.

3.2 Positive predictive value of codes for revision THR

Of the 374 subjects, 265 had revisions performed on the index joint, for a PPV of 71% (95% CI: 66, 76) (Table 1). Of the 214 subjects who did not have a history documented in the medical record of primary THR before their index THR, 97% had revisions of the index hip. However, of the 160 patients who did have prior primary THR, 36% (95% CI: 29, 43) of the revisions were on the index side. The proportion of revisions performed on the index side was especially low in those subjects who had a contralateral primary THR performed long before the index THR (Table 1). The proportion of revisions performed on the index side did not differ according to the THR procedure volume of the hospital, where the revision THR was performed.

Forty-seven (13%) of the primary THR cases were accompanied by the V43.64 codes. Forty-six of these 47 cases (98%) had contralateral THRs performed before the index. The likelihood that the revision was performed on the index side was much lower in the presence of the V43.64 code (26%) than in cases that did not have this code (77%). Thus, the PPV improved from 71% to 77% with the inclusion of this code.

4. Discussion

We performed medical record reviews of 374 Medicare beneficiaries from seven states who had primary THR in 1995–96 and a revision THR performed over the subsequent decade. We found that 71% of these revision surgeries were done on the index side. Thus, the assumption that a revision performed in the years after a particular primary THR represents a failure of that primary would be correct only 71% of the time. If we had not censored

subjects with second primaries (in whom we knew the subsequent revision would be ambiguous), the proportion of revisions on the index side might be even lower. Among the 160 patients that had a prior primary THR before the index primary THR, fully 64% had revision on the prior contralateral THR rather than the index THR. Thus, in these patients the assumption that revision THR was done on the index side would be correct only one-third of the time.

These findings should be considered by investigators and policy makers who use administrative data on revision THR as indicators of quality of THR care, outcomes in research studies, or components of a national total joint replacement registry [18]. A history of prior contralateral THR is difficult to document in Medicare claims because the history before joining Medicare at age 65 is censored. Even if information on prior contralateral THR were available, it would not determine whether the revision was on the index or contralateral hip. Laterality codes would clarify this issue but are not included in the ICD-9-CM coding currently used. They are included in the next version, ICD-10 CM, but these codes will not be implemented in Medicare until 2013. Laterality codes are also now included in CPT coding; thus administrative data that use CPT codes (such as Medicare Part B provider claims) may soon overcome some of the current limitations of Part A data. The presence of the V43.64 diagnosis code at admission, indicating prior THR, identified a group of patients in whom a subsequent revision was especially likely to be contralateral. This code is used infrequently, however; thus its role in identifying index revisions remains to be defined.

Lyman et al [12] also examined accuracy of administrative data for identifying revision of index total hip and total knee replacement in a hospital sample. These researchers used a clinical database to determine the laterality of the index primary and subsequent total hip and knee replacement procedures between January 1998 and October 2003. A major strength of these authors' single center study was the 100% ascertainment of eligible records (as compared with our 29%). They found that the side of index primary total joint replacements and subsequent revision procedures matched up for 69% of THA and 62% of TKA. These results in a hospital sample mirror those in our multi-state sample and further highlight the need to interpret administrative data on revision THR carefully. Lyman et al found that the probability that a revision was an index (vs. contralateral) procedure was higher if the procedure was litigated and if it occurred closer to the index primary. Our data did not permit us to examine the role of litigation in the accuracy of revision coding. As cases involving litigation may have been more difficult to obtain and more likely to be done on the index knee, our inability to identify litigated cases may have led to bias. In contrast to the findings of Lyman et al., we did not find that revisions performed sooner after the index primary were more likely to be done on the index side.

This study has several limitations. It is limited to subjects aged 65 or greater. Revision coding is likely to be more accurate in younger patients who have had less time to develop advanced arthritis of both hips. We obtained about one third of the medical records we requested. Although this could have caused bias with respect to our study question, we found no significant sex and age differences between the patients whose records were available and those whose records were not obtained. The study also has important strengths. It was performed in 213 hospitals across seven states using a single team of two experienced medical abstractors. Thus, the findings are not particular to coding practices in a single hospital or even state.

Finally, coding issues aside, we note that revision is not an ideal end point for studies of THR outcome. Patients with symptomatic and radiographic evidence of implant failure may

not seek care, prefer not to have the procedure, or may not be offered the procedure. Thus, while objective, revision may be an insensitive marker of poor outcome.

We conclude that a code for revision THR occurring in the years after primary THR does not always constitute a revision of the index primary procedure. Consequently, administrative claims data coded with ICD-9-CM should be used carefully for identifying revision as a measure of failure of THR. Efforts to use revision surgery as an indicator of quality or outcome will need to overcome these challenges by enforcing the use of codes specifying the operative side, adjusting for this source of misclassification, or complementing administrative data with primary data on revision THR.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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What's new?

- **Key finding:** Just 71% of Medicare Part A claims coded for revision total hip replacement (THR) after a primary procedure pertain to revision of the index joint.
- **What this adds to what was known?** Claims data using ICD-9 codes are used frequently to study the risk of revision after primary THR. However, such data do not distinguish the side that operated on, potentially creating ambiguity in ascribing a revision to a prior primary THR. Despite this potential limitation, the positive predictive value of administrative claims for revision THR has not been studied previously in a large national sample.
- **What is the implication; what should change now?** Efforts to use revision surgery as an indicator of quality or outcome will need to overcome these challenges by enforcing the use of codes that specify the operative side, adjusting for this source of misclassification, or complementing administrative data with primary data on revision THR.

Table 1

Among patients who had a primary THR in 1995–96 and a subsequent claim for a revision THR, the Table provides the number (percentage) in whom the revision was on the index vs. the contralateral hip.

	Year of Prior Primary				No Prior Primary	Total
Side of Revision	**< 1985**	**1985–89**	**1990–95**	**Missing Year**		
Index	3 (14%)	173 (33%)	383 (46%)	0 (0%)	207 (97%)	265 (71%)
Contralateral	18 (86%)	34 (67%)	44 (54%)	6 (100%)	7 (3%)	109 (29%)
Total	21	51	82	6	214	374