Comorbidity Data Source May Impact SMR/SHR Calculation

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Introduction
- The standardized mortality ratio (SMR) and standardized hospitalization ratio (SHR) are used to measure dialysis facility performance.
- SMRs and SHRs were calculated with adjustment for patient demographics and comorbid conditions, which were derived from the end-stage renal disease (ESRD) Medical Evidence (ME) Report.
- However, information on comorbid conditions may be biased.
- Studies have shown low sensitivities for ME-based comorbid conditions, and the level of under-reporting may differ among facilities.
- The dialysis facility-level SMRs and SHRs are based on prevalent cohorts. ME-based comorbid conditions are even less reliable than they could be because comorbidity continues to develop and evolve after dialysis initiation.
- In this study, we sought to assess SMR and SHR bias from the first source of comorbidity bias above by comparing SMR/SHR adjusted for ME-based comorbid conditions with SMR/SHRs adjusted for comorbidity from medical claims (claim-based) for the following patient groups:
  - For-profit (FP) patients in all FP dialysis facilities and non-profit (NP; patients in all NP dialysis facilities)
  - Rural and urban.

Methods
- The United States Renal Data System ESRD database was used.
- US hemodialysis patients were included who initiated dialysis July 1-Dec 31, 2006-2010:
  - had Medicare as primary payer for 6 months after dialysis initiation
  - were aged ≥ 66 years, and
  - had no prior transplant.
- Patients enrolled in health maintenance organizations were excluded.
- FP/NP groups were defined by profit status of initiation dialysis facility and rural/urban groups by patient residential zip code and rural-urban commuting area code.
- Patients were followed from dialysis initiation to death, transplant, modality change, loss of Medicare coverage, or 1 year.
- Death was ascertained from the CMS ESRD Death Notification form and hospitalization from Medicare inpatient claims.
- Agreement between ME-based and claim-based comorbid conditions was measured by the kappa statistic.
- SMRs/SHRs were calculated as observed divided by expected number of events with adjustment for patient demographics, race, ethnicity, ESRD cause, incident year, and comorbid conditions.
- Expected numbers of events were calculated from a Cox regression model (death) and a piecewise Poisson regression model with time-intervals months 1, 3, 4, 5, 6, 7, 9, and 10-12 after dialysis initiation (hospitalization).
- Tests were performed by bootstrapping.

Results
- 73,950 incident hemodialysis patients were included.
- Claim-based comorbidity rates were higher than ME-based rates; see Table 1.
- Kappa statistics for comorbidity agreement were low, less than 0.5 for all, except for diabetes (0.77); see Table 1.
- Claim-based comorbidity rates were similar for FP and NP groups and slightly higher for the urban than for the rural group.
- ME-based comorbidity rates were lower for the FP and urban groups than for the NP and rural groups.
- Claim-based comorbid conditions generally had larger effects on outcomes than ME-based conditions (data not show here).
- Differences between ME-based and claim-based SMRs/SHRs were statistically significant (Table 2).
- For FP/NP groups, adjustment for claim-based comorbid conditions shrank the SMRs and SHRs to 1 compared with those adjusted for ME-based conditions (Figure 1).
- For urban/rural groups, switching the comorbidity condition data source changed the direction of SMRs, and adjustment for claim-based comorbid conditions shrank the SHRs to 1 (Figure 1).
- Compared with ME-based SMRs/SHRs, claim-based rates decreased 0.9%/0.8% for the FP group and 1.5%/0.7% for the urban group and increased 3.4%/2.8% for the NP group and 5.9%/4.1% for the rural group.

Conclusions
- The comorbidity data source may impact performance evaluation.
- The impact is larger for smaller groups, and may increase with prevalent patients included.

Table 1. ME-based and claim-based comorbid conditions by for-profit/non-profit and rural/urban groups

Table 2. Comparison of SMRs and SHRs adjusted for ME-based and claim-based Comorbid conditions rural/urban groups

Figure 1. ME-based and claim-based SMRs/SHRs and their 95% CIs for for-profit/non-profit and rural/urban groups.