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/SHRs 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 before 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 age, sex, 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, 2, 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 SMR/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 comorbid 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 ratios decreased 0.9%/0.6% for the FP group and 1%/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.

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

	For Profit			Non-Profit		
Condition	ME-Based, %	Claim-Based, %	Kappa Statistic (95% CI)	ME-Based, %	Claim-Based, %	Kappa Statistic (95% CI)
ASHD	29.0	56.2	0.24 (0.23, 0.24)	38.0	56.4	0.31 (0.29, 0.32)
CHF	42.0	64.0	0.39 (0.38, 0.39)	45.9	63.3	0.44 (0.42, 0.45)
CVA/ TIA	12.1	19.4	0.28 (0.27, 0.29)	12.9	17.5	0.29 (0.27, 0.31)
PVD	17.9	34.9	0.20 (0.20, 0.21)	20.5	35.8	0.23 (0.21, 0.24)
Other cardiac disease	23.1	62.8	0.14 (0.13, 0.14)	26.9	63.2	0.17 (0.16, 0.18)
COPD	13.2	33.3	0.35 (0.34, 0.35)	15.4	32.3	0.39 (0.37, 0.41)
Cancer	11.4	16.0	0.44 (0.43, 0.45)	13.3	16.1	0.49 (0.47, 0.51)
Diabetes	56.2	63.6	0.75 (0.74, 0.76)	55.2	61.4	0.77 (0.76, 0.78)
Alcohol dependence	0.7	1.5	0.29 (0.26, 0.33)	0.8	1.6	0.32 (0.25, 0.38)
Drug dependence	0.1	0.7	0.05 (0.03, 0.08)	0.2	0.7	0.06 (0.00, 0.12)
Tobacco use	3.6	7.2	0.18 (0.17, 0.19)	3.9	7.1	0.18 (0.15, 0.21)
Inability to ambulate	10.1	10.2	0.09 (0.08, 0.10)	10.7	8.4	0.11 (0.09, 0.13)
	Rural			Urban		
ASHD	34.0	54.5	0.28 (0.27, 0.30)	30.2	56.5	0.24 (0.24, 0.25)
CHF	43.3	62.3	0.41 (0.39, 0.42)	42.7	64.2	0.39 (0.39, 0.40)
CVA/ TIA	12.9	16.2	0.28 (0.26, 0.31)	12.2	19.5	0.28 (0.27, 0.29)
PVD	21.7	31.8	0.23 (0.21, 0.25)	17.9	35.6	0.21 (0.20, 0.21)
Other cardiac disease	26.6	60.9	0.17 (0.16, 0.19)	23.4	63.2	0.14 (0.14, 0.15)
COPD	16.8	34.3	0.40 (0.39, 0.42)	13.1	32.9	0.35 (0.34, 0.35)
Cancer	12.1	13.9	0.50 (0.47, 0.52)	11.7	16.4	0.45 (0.44, 0.46)
Diabetes	56.1	62.1	0.78 (0.76, 0.79)	55.9	63.3	0.75 (0.75, 0.76)
Alcohol dependence	1.0	1.4	0.32 (0.25, 0.40)	0.7	1.5	0.29 (0.26, 0.32)
Drug dependence	0.1	0.6	0.03 (-0.03, 0.08)	0.1	0.8	0.06 (0.03, 0.09)
Tobacco use	5.2	8.1	0.21 (0.18, 0.24)	3.4	7.0	0.17 (0.16, 0.19)
Inability to ambulate	10.6	9.0	0.08 (0.06, 0.11)	10.2	10.0	0.09 (0.08, 0.10)

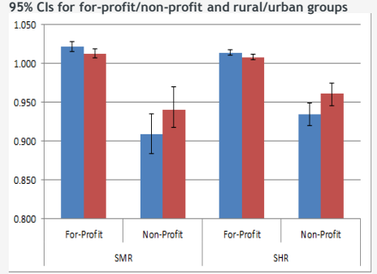
Table 2. Comparison of SMRs and SHRs adjusted for ME-based and claim-based Comorbid conditions

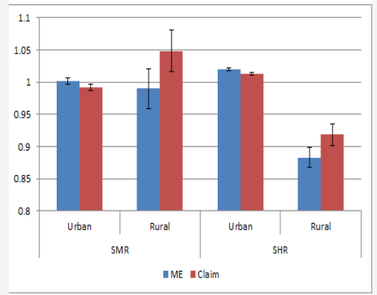
	SMR/SHR and Their 95% CIs		Difference and 95% CIs	
Provider	Claim-Based	ME-Based	(Claim-based – ME-based)	P value[2]
Type				
SMR				
For-profit	1.013 (1.007, 1.018)	1.022 (1.016, 1.027)	-0.009 (-0.011, -0.007)	< 0.0001
Non-profit	0.944 (0.920, 0.970)	0.909 (0.885, 0.933)	0.035 (0.028, 0.043)	< 0.0001
SHR				
For-profit	1.008 (1.005, 1.012)	1.014 (1.011, 1.018)	-0.006 (-0.007, -0.005)	< 0.0001
Non-profit	0.961 (0.946, 0.975)	0.935 (0.920, 0.949)	0.026 (0.023, 0.028)	< 0.0001
Rural/urban region				
SMR				
Rural	1.048(1.016, 1.081)	0.990 (0.959, 1.020)	0.058 (0.048,0.069)	< 0.0001
Urban	0.992(0.987, 0.997)	1.002 (0.997, 1.007)	-0.009 (-0.011, -0.008)	< 0.0001
SHR				
Rural	0.919 (0.902, 0.935)	0.883 (0.867, 0.898)	0.036 (0.033, 0.038)	< 0.0001
Urban	1.013 (1.010, 1.015)	1.020 (1.017, 1.022)	-0.007 (-0.007, -0.006)	< 0.0001

Conclusions

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

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





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