

5.2.2 Method(s) of Reliability Testing

CBE ID 5598, Standardized Modality Switch Ratio for Incident Dialysis Patients (SMoSR)

Accountable entity level reliability

The reliability of the SMoSR was assessed using data from adult ESRD dialysis patients during 2021-2023. If the measure were a simple average across individuals in the facility, the usual approach for determining measure reliability would be a one-way analysis of variance (ANOVA), in which the between and within facility variation in the measure is determined. The inter-unit reliability (IUR) measures the proportion of the measure variability that is attributable to the between-facility variance. The SMoSR, however, is not a simple average and instead estimates the IUR using a bootstrap approach, which utilizes a resampling procedure to estimate the within facility variation that cannot be directly estimated by ANOVA. A small IUR (near 0) reveals that most of the variation of the measures between facilities is driven by random noise, indicating the measure would not be a good characterization of the differences among facilities, whereas a large IUR (near 1) indicates that most of the variation between facilities is due to the real difference between facilities.

Here we describe our approach to calculating IUR. Let T_1, \dots, T_N be the SMoSR for N facilities. For each facility, we randomly draw B bootstrap samples of subjects with replacement, each having the same number of subjects as the facility. Our numerical experiments reveal that $B=100$ is sufficient to reach estimation stability. That is, if the i^{th} facility has n_i subjects, randomly draw with replacement n_i subjects from those in the same facility, find the corresponding SMoSR _{i} and repeat the procedure B (say, 100) times. Thus, for the i^{th} facility, we have obtained 100 bootstrapped SMoSRs, $T_{i1}^*, \dots, T_{i100}^*$. Let S_i^* be the sample variance of this bootstrap sample for facility i , given by

$$s_{t,w}^2 = \frac{\sum_{i=1}^N [(n_i - 1) S_i^{*2}]}{\sum_{i=1}^N (n_i - 1)}$$

which is a bootstrap estimate of the within-facility variance in the SMoSR, namely, $\sigma_{(t,w)}^2$. Calling on formulas from the one-way analysis of variance, an estimate of the overall variance of T_i is

$$s_t^2 = \frac{1}{n'(N-1)} \sum_{i=1}^N n_i (T_i - \bar{T})^2$$

where

$$\bar{T} = \sum n_i T_i / \sum n_i$$

is the overall mean of the observed SMoSR and

$$n' = \frac{1}{N-1} (\sum n_i - \sum n_i^2 / \sum n_i)$$

is approximately the average facility size (number of patients per facility). Note that s_t^2 is the total variation of SMOsR and is an estimate of $\sigma_b^2 + \sigma_{t,w}^2$, where σ_b^2 is the between-facility variance, the true signal reflecting the differences across facilities. Thus, the estimated IUR, which is defined by

$$IUR = \frac{\sigma_b^2}{\sigma_b^2 + \sigma_{t,w}^2}$$

can be estimated with $(s_t^2 - s_{t,w}^2)/s_t^2$

The SMOsR calculation only included facilities with at least 1 expected modality switch to ensure stable estimates and comply with restrictions on reporting of potentially identifiable patient information related to small cell size.

Data element reliability

Data for this measure comes from the End Stage Renal Disease Quality Reporting System (EQRS), a CMS-owned data system that collects data directly from all Medicare-certified dialysis facilities. EQRS has processes in place [1] to ensure the reliability and validity of the patient level data used for a broad array of measure calculations, including this measure. Briefly, CMS performs a random selection of 300 eligible dialysis facilities each year. Ten patient records are randomly selected from a single quarter each year from each of the facilities selected to participate. The most recent reported review included EQRS entries from April 1, 2025 to June 30, 2025. Experienced nurse reviewers assessed the data obtained from the medical records on each of 60 data elements selected from EQRS, including the dialysis modality type for the reporting month.

References:

1. End Stage Renal Disease Facility Data Validation. CMS QualityNet.
https://qualitynet.cms.gov/files/68d58e4e9fb3148bd3307ea6?filename=2025_EQRS_ExecSummary.pdf (accessed 5/12/2026)

Table 2a. Accountable Entity Level Reliability Testing Results by Denominator, Target Population Size

	Overall	Min	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	Max
Reliability	0.702	0.272	0.454	0.550	0.604	0.640	0.670	0.698	0.724	0.751	0.780	0.831	0.955
Mean Performance Score	0.992	0.961	0.949	1.048	1.099	1.091	1.012	1.023	1.028	1.011	0.966	0.885	4.351
N of Entities	6,926	1	723	706	719	659	762	706	628	687	663	673	1
N of Persons / Encounters / Episodes	348,369	8	12,866	18,415	23,424	25,073	33,112	34,874	35,175	44,240	50,201	70,989	459

The IUR deciles were calculated based on the sample size within each facility and some facilities had the same values, so were grouped into the same decile. Due to this reason, deciles may not have a consistent distribution of facility counts.

Table 2a includes data for reporting period 2021-2023

Table 2b. Accountable Entity Level Reliability Testing Results by Reliability Score

	Overall	Min	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	Max
Reliability	0.702	0.272	0.451	0.549	0.603	0.640	0.670	0.698	0.723	0.750	0.779	0.827	0.955