

**Outpatient Imaging Efficiency Measures  
Minimum Case Count Requirements**

## Minimum Case Count Requirements

The outpatient imaging efficiency (OIE) measures will be used to compare the relative utilization of specific imaging services at each facility in comparison to other facilities. In order for this information to be meaningful and useful, it is important that the each OIE measure be representative of the true experience of the respective facility. In statistical terms, this means the measures need to have a high degree of precision (i.e. we would expect that, all other things being equal, the measure would show the same or similar results as the facility conducts many more similar imaging studies) and accuracy (i.e., the measure represents the actual or true value for the facility).

In order for the measure to be useful, there has to be an adequate number of cases in the denominator. Small case counts can be problematic for many facilities that do not perform a high volume of the relevant imaging studies. In the situation where a facility provides only a handful of imaging studies that are eligible for a measure, the results of the measure may be significantly impacted and / or skewed by one or two additional cases.

For example, let's suppose that a facility provides five MRIs for Lumbar Spine in a given year for patients with a primary diagnosis of low back pain. If that facility failed to provide prior conservative therapy for one of these patients, the facility rate for the MRI Lumbar Spine measure would be 0.20. One additional case with no antecedent therapy would increase the facility's rate significantly by 0.20, up to 0.40. With only five cases, we would not have much statistical confidence that we have an accurate or precise picture of what the "true" rate is for this facility.

Ideally, measures should reflect the actual or true rate (or ratio) of the facility. That is, we want the rate that reflects what each facility would be expected to have as if they provide a very large amount (i.e., infinite number) of relevant imaging studies. In the situation where a facility provides a very large number of relevant imaging studies, a handful of additional cases would not cause the facility's rate to be much different from their "true" rate. Thus, we will need to determine an appropriate case count to ensure that measures are not being influenced unduly by a few cases.

In order to determine what an appropriate case count is for a particular measure, we will first need to determine appropriate levels for accuracy and precision. Different measures and policy contexts may require different levels of accuracy and precision. In the context of the outpatient imaging efficiency measures, this issue becomes somewhat more complicated as each facility has its own measure, there is substantial variation in facility measures, and we do not have a clear defined target rate for all measures. Given this, designating a fixed precision (e.g. 90 percent confidence intervals of +/- 3 percentage points) across all facility measures may be too restrictive.

Consider a measure where lower rates are preferable. Let us suppose that a desired rate lies somewhere below 0.10. If the observed rate for a facility is 0.05, then we would clearly like to have a high-level of precision (e.g. 5 percentage point precision) in order to conclude the true rate for this measure is indeed within the desired range. If for example, the precision in this example was 20 percentage points (i.e., +/- 0.20), the confidence interval would span from 0.00 to 0.25, which does not give the hospital much confidence that the true rate for this facility is in

the desired range. However, if another facility had a rate of 0.40, then having a precision of 20 percentage points would suffice, since the lower end of the confidence interval would be 0.20, which is still above the desired range. Hence, we would feel confident that this second facility is not within that range.

The two examples described above exemplify how different levels of precision can be used to attain reasonable levels of statistical confidence in our measures. In the case of the lower rate, a precision of 5 percentage points made more sense than 20 percentage points; whereas, in the case of the higher rate, 20 percentage points would suffice. Thus, the approach will be to choose a desired level of accuracy and precision for each facility depending on its observed rates and the desired policy outcome (e.g. identifying low rates, rates different from the mean, etc.) which in turn will determine the required case count needed to make each facility's rate publically reportable.

The aim is to choose levels of precision that will meet both policy and statistical standards of reasonableness. In general, in order to satisfy the policy need of reporting measures in the public domain that can be used to compare outpatient facilities across the US; we want to be able to report measures on as many facilities as possible to make the comparisons as pertinent as possible. At the same time, we aim to meet statistical standards of precision and accuracy to ensure that each facility measure is reflective of its actual or true behavior.

A full list of minimum case count requirements for the OIE measures (OP-8, OP-9, OP-10, and OP-11) by rates is shown in **Table 1**. As shown in the table minimum case count requirements range between 31 and 67 and vary based on the observed facility rate. Minimum case count requirements were developed for each facility in order to assure a 90 percent confidence level for the observed facility rate.

As an illustration of how to interpret the table, if a facility had an observed rate on a particular measure that was below 0.05 then a minimum denominator case count of 45 would be needed for a particular measure. Alternatively, if a facility had a rate of 0.15 then a minimum case volume of 67 would be needed for the facility's data to be reported on the measure. A facility may, for example, have sufficient case count volume for some OIE measures and not for others.

**Table 1: Required Case Counts for 90 Percent Confidence and Specified Precisions**

| Observed Facility Rate | Required Precision | Case Count Needed to Attain Required Precision | Observed Facility Rate | Required Precision | Case Count Needed to Attain Required Precision |
|------------------------|--------------------|--|------------------------|--------------------|--|
| 0.00                   | 0.05               | 45   |                        |                    |  |
| 0.01                   | 0.05               | 45   | 0.51                   | 0.15               | 31   |
| 0.02                   | 0.05               | 45   | 0.52                   | 0.15               | 32   |
| 0.03                   | 0.05               | 45   | 0.53                   | 0.14               | 33   |
| 0.04                   | 0.05               | 45   | 0.54                   | 0.14               | 34   |
| 0.05                   | 0.05               | 52   | 0.55                   | 0.14               | 35   |
| 0.06                   | 0.05               | 56   | 0.56                   | 0.14               | 36   |
| 0.07                   | 0.05               | 60   | 0.57                   | 0.13               | 37   |
| 0.08                   | 0.06               | 63   | 0.58                   | 0.13               | 38   |
| 0.09                   | 0.06               | 64   | 0.59                   | 0.13               | 39   |
| 0.10                   | 0.06               | 66   | 0.60                   | 0.13               | 40   |
| 0.11                   | 0.06               | 67   | 0.61                   | 0.13               | 41   |
| 0.12                   | 0.07               | 67   | 0.62                   | 0.12               | 42   |
| 0.13                   | 0.07               | 67   | 0.63                   | 0.12               | 43   |
| 0.14                   | 0.07               | 67   | 0.64                   | 0.12               | 45   |
| 0.15                   | 0.07               | 67   | 0.65                   | 0.12               | 46   |
| 0.16                   | 0.07               | 66   | 0.66                   | 0.11               | 47   |
| 0.17                   | 0.08               | 65   | 0.67                   | 0.11               | 48   |
| 0.18                   | 0.08               | 65   | 0.68                   | 0.11               | 49   |
| 0.19                   | 0.08               | 64   | 0.69                   | 0.11               | 50   |
| 0.20                   | 0.08               | 63   | 0.70                   | 0.11               | 51   |
| 0.21                   | 0.09               | 62   | 0.71                   | 0.10               | 53   |
| 0.22                   | 0.09               | 61   | 0.72                   | 0.10               | 54   |
| 0.23                   | 0.09               | 60   | 0.73                   | 0.10               | 55   |
| 0.24                   | 0.09               | 59   | 0.74                   | 0.10               | 56   |
| 0.25                   | 0.09               | 57   | 0.75                   | 0.09               | 57   |
| 0.26                   | 0.10               | 56   | 0.76                   | 0.09               | 59   |
| 0.27                   | 0.10               | 55   | 0.77                   | 0.09               | 60   |
| 0.28                   | 0.10               | 54   | 0.78                   | 0.09               | 61   |
| 0.29                   | 0.10               | 53   | 0.79                   | 0.09               | 62   |
| 0.30                   | 0.11               | 51   | 0.80                   | 0.08               | 63   |
| 0.31                   | 0.11               | 50   | 0.81                   | 0.08               | 64   |
| 0.32                   | 0.11               | 49   | 0.82                   | 0.08               | 65   |
| 0.33                   | 0.11               | 48   | 0.83                   | 0.08               | 65   |
| 0.34                   | 0.11               | 47   | 0.84                   | 0.07               | 66   |
| 0.35                   | 0.12               | 46   | 0.85                   | 0.07               | 67   |
| 0.36                   | 0.12               | 45   | 0.86                   | 0.07               | 67   |
| 0.37                   | 0.12               | 43   | 0.87                   | 0.07               | 67   |
| 0.38                   | 0.12               | 42   | 0.88                   | 0.07               | 67   |
| 0.39                   | 0.13               | 41   | 0.89                   | 0.06               | 67   |
| 0.40                   | 0.13               | 40   | 0.90                   | 0.06               | 66   |
| 0.41                   | 0.13               | 39   | 0.91                   | 0.06               | 64   |
| 0.42                   | 0.13               | 38   | 0.92                   | 0.06               | 63   |

| <b>Observed Facility Rate</b> | <b>Required Precision</b> | <b>Case Count Needed to Attain Required Precision</b> | <b>Observed Facility Rate</b> | <b>Required Precision</b> | <b>Case Count Needed to Attain Required Precision</b> |
|-------------------------------|---------------------------|---|-------------------------------|---------------------------|---|
| 0.43                          | 0.13                      | 37  | 0.93                          | 0.05                      | 60  |
| 0.44                          | 0.14                      | 36  | 0.94                          | 0.05                      | 56  |
| 0.45                          | 0.14                      | 35  | 0.95                          | 0.05                      | 52  |
| 0.46                          | 0.14                      | 34  | 0.96                          | 0.05                      | 45  |
| 0.47                          | 0.14                      | 33  | 0.97                          | 0.05                      | 45  |
| 0.48                          | 0.15                      | 32  | 0.98                          | 0.05                      | 45  |
| 0.49                          | 0.15                      | 31  | 0.99                          | 0.05                      | 45  |
| 0.50                          | 0.15                      | 31  | 1.00                          | 0.05                      | 45  |