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Fatal Flaw in the Direct Standardization Technique used by the Joint Commission in measure #0471: PC-02 Cesarean Birth

This measure is based on the following original study:

Main E, Moore D, Farrel B, Schimmel L, Altman R, Abrahams C, et al. Is there a useful cesarean birth measure? Assessment of the nulliparous term singleton vertex cesarean birth rate as a tool for obstetric quality improvement. Am J Obstet Gynecol 2006;194:1644-52

The measure uses a target population of Nulliparous Term Singleton Vertex (NTSV) births. The original study revealed that patient age significantly affects the rate of cesarean birth in women with NTSV pregnancies. In order to adjust the measure for age the authors chose direct standardization which is a technique that requires each hospital to report a cesarean birth rate for each age group. The cesarean birth rate for each age group is then multiplied by a weight which is determined by the national percentage of total nulliparous births for that age group. The weight times the cesarean birth rate for each group is then calculated and is represented in the column on the right in the table below. The sum of the column on the right provides the hospital with their risk adjusted cesarean birth measure.

This is the table from the original study and represents 18,000 total births over three years:

Age group (y)	US weight (2002 data)*	Hospital Total NTSV births (for this age group)	Hospital NTSV CB (for this age group)	Hospital NTSV CB rate (for this age group)	US wt x hospital rate
under 15	0.004	1	1	1	0.004
15-19	0.211	68	7	0.1	0.022
20-24	0.297	433	51	0.12	0.035
25-29	0.237	1015	147	0.14	0.034
30-34	0.173	3376	645	0.19	0.033
35-39	0.064	1769	446	0.25	0.016
40-44	0.013	371	118	0.32	0.004
45-49	0.001	31	16	0.52	0.001
50+	0	4	2	0.5	0.000
		7,068	1,433	Summation =	0.149
Unadj. NTSV CB rate = 20.3% (1,433/7,068)				Adj. NTSV CB rate = 14.9%	

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The national percentage of total nulliparous births for each age group represents a national average and therefore may not be representative of the NTSV patient age distribution at any one given hospital. The fatal flaw in the direct standardization is the significant leveraging error that occurs if a hospital does not have the same NTSV patient age distribution as the national average. This is evident in the table from the sample hospital provided in the original study. Even though the table represents a hospital with 18,000 births over three years there are only 68 NTSV patients in the 15-19 year old age group. Since the US weight for this group is 0.211 (21.1%), the sample hospital's cesarean birth rate for this age group will provide 21.1% of the hospital's adjusted cesarean birth measure even though this age group only represents 0.96% of the NTSV births. If the 68 women in this age group are distributed equally over the three years then there are only two women each month whose outcome will determine 21.1% of the sample hospital's adjusted cesarean birth measure.

If in the first month both of the women in the 15-19 year old age group deliver vaginally and if in the second month one of the two women in this age group has a cesarean birth for any reason then the cesarean birth rate for this age group will increase from 0% to 50%. When the cesarean birth rate for this age group is multiplied by the US weight the result is that the second month will have an adjusted cesarean birth measure that is 10.55 percentage points higher than the first month. This is the tremendous leveraging error that can occur even in a hospital that has 500 total births per month.

Unfortunately, this tremendous leveraging error will render the results of this cesarean birth measure useless not only for hospitals with the same age distribution as the sample hospital but also for any hospital that does not have an age distribution that is similar to the national average. For example, a hospital that has mostly very young NTSV patients giving birth will find out that 25% of their adjusted cesarean birth measure is determined only by their NTSV patients that are 30 years old or older. This will provide an even larger leveraging error than the one seen in the sample hospital above.

The significant impact made by one cesarean birth regardless of the reason for that cesarean birth illustrates why measure #0471 will yield meaningless results for many hospitals. Unfortunately, as hospitals try to analyze their annual, semi-annual or quarterly results they will discover that the effect of the leveraging error creates even a bigger impact when the total number of births is less than 500 total births per reporting period. The effect of the leveraging error in the direct standardization age risk adjustment in measure #0471: PC-02 Cesarean Birth will only get worse with the recent requirement that hospitals with 300 total annual births begin reporting on this measure.

Unfortunately, there is no solution for the fatal flaw in measure #0471: PC-02 Cesarean Birth

– Gustavo San Román, MD