Surveillance for central line-associated bloodstream infections (CLABSIs): Accuracy of Different Sampling Strategies

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Background:

Active daily surveillance of central line days (CLDs) in the assessment of CLABSI rates is time consuming and burdensome for healthcare workers. Sampling of denominator data is a method that could reduce the time necessary to conduct active surveillance. Our ***objective*** was to evaluate the accuracy of various sampling strategies in the estimation of CLABSI rates, in neonatal and pediatric departments in Greece.

Methods:

Daily denominator data were collected in 22 units (4 PICUs, 12 NICUS and 6 ONCs) across Greece for 6 consecutive months. Thirty-two sampling strategies were evaluated using the original data as following:

- 1 fixed day/week *(7 samples)*,
- 2 fixed days/week *(21 samples)* and
- 1 fixed week/month *(4 samples).*

CLDs for each month were estimated as follows:

$$\frac{number\ of\ CLDs\ in\ the\ sample}{number\ of\ sampled\ days\ per\ month} * 30$$

The estimated CLDs were used to calculate CLABSI rates. The accuracy of the estimated CLABSI rates was assessed by calculating the percentage error for each month:

$$PE = (\frac{observed\ CLABSI\ rates - estimated\ CLABSI\ rates}{observed\ CLABSI\ rates})\%$$

The number (%) of months with PE ≤ 5% was calculated Intraclass Correlation Coefficient (ICC), Bland-Altman plots and percentage of months that are outside the limits of agreement were also calculated, in order to assess the agreement between estimated and actual CLABSI rates.

Results:

Sampling over 2 fixed days per week provided the most accurate estimates of CLABSI rates for all types of units compared to other strategies.

Percentage of estimated monthly CLABSI rates with PE ≤ 5% using this strategy ranged between 74.6%-88.7% in NICUs, 79.4%-94.1% in Ped.ONCs and 62.5%-91.7% in PICUs.

Table 1 presents the number of months (%) of the most accurate day-pair samples for each type of unit.

ICC values for all selected strategies were >0.9, indicating that estimated CLABSI rates strongly resemble the actual rates. Likewise, Bland-Altman percentage of months with estimated rates outside the limits of agreement were very low (<10% for almost all selected strategies). Figure 1 represents the Bland-Altman plot for a specific sampling strategy in NICUs. Bland-Altman plots for the rest of the selected sampling strategies were very similar to the one presented.

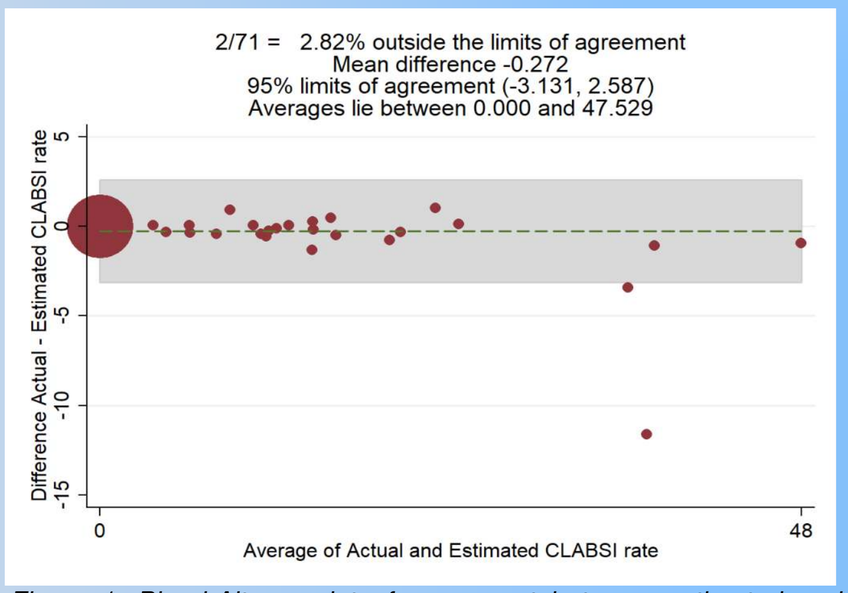

Figure 1: Bland-Altman plot of agreement between estimated and actual CLABSI rates for the day-pair strategy Wed-Sun in NICUs

Table 1: Number of months with CLABSI rate PE≤5%, Bland-Altman % outside the limits of agreement and ICCs between estimated and actual CLABSI rates by selected sampling strategies

Sample	N (%) of months with PE≤5%	BA % out of limits	ICC
NICUs (71 months)			
Mon-Fri	61(85.9%)	4.2%	>0.9
Tue-Wed	61(85.9%)	5.6%	>0.9
Wed-Sat	61(85.9%)	4.2%	>0.9
Wed-Sun	63(88.7%)	2.8%	>0.9
Thu-Sun	63(88.7%)	2.8%	>0.9
Ped.ONCs (34 months)			
Mon-Tue	32(94.1%)	2.9%	>0.9
Mon-Thu	31(92.2%)	11.8%	>0.9
Mon-Fri	33(97.1%)	5.9%	>0.9
Tue-Sat	31(92.2%)	8.8%	>0.9
Thu-Sat	31(92.2%)	5.9%	>0.9
Fri-Sat	31(92.2%)	8.8%	>0.9
Fri-Sun	31(92.2%)	8.8%	>0.9
PICUs (24 months)			
Thu-Fri	22(91.7%)	8.3%	>0.9
Fri-Sat	21(87.5%)	12.5%	>0.9

Conclusion:

Our findings further support existing evidence that sampling is a valid alternative to daily active surveillance and can provide reliable rates. More specifically, sampling over 2 fixed days per week seems to provide a more accurate alternative to the daily collection of CLABSI denominator data. Adoption of such monitoring methods in resource-limited healthcare systems, such as Greece, could be an important step towards better and less burdensome infection control and prevention. These findings should also be evaluated for the surveillance of other healthcare-associated infections.

36th Annual Meeting of the European Society for Paediatric Infectious Diseases, May 28 – June 2 2018, Malmo, Sweden
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ESP18-0748