Variance

In probability theory and statistics, variance is the expectation of the squared deviation of a random variable from its mean. Informally, it measures how far a set of (random) numbers are spread out from their average value. Variance has a central role in statistics, where some ideas that use it include descriptive statistics, statistical inference, hypothesis testing, goodness of fit, and Monte Carlo sampling. Variance is an important tool in the sciences, where statistical analysis of data is common. The variance is the square of the standard deviation, the second central moment of a distribution, and the covariance of the random variable with itself.

Variance between providers in the neurosurgical field leads to inefficiencies and poor patient outcomes. Evidence based guidelines (EBGs) have been developed as a means of pooling the body of evidence in the literature to provide clinicians with the most comprehensive data-driven recommendations. However, these EBGs are not being implemented well into the clinician workflow, and therefore clinicians are left to make decisions with incomplete information. Equally underutilized are electronic health records (EHRs), which house enormous health data, but which have failed to capitalize on the power of that 'big data.' Early attempts at EBGs were rigid and not adaptive, but with the current advances in data informatics and machine learning algorithms, it is now possible to integrate 'big data' and rapid data processing into clinical decision support tools. As we strive towards variance reduction in healthcare, the integration of 'big data' and EBGs for decision-making are key.

Stopa et al., proposed that EHRs are an ideal platform for integrating EBGs into the clinician workflow. With this model, it will be possible to build EBGs into the EHR software, to continuously update and optimize EBGs based on the flow of patient data into the EHR, and to present data-driven clinical decision support at the point of care. Variance reduction in neurosurgery through the integration of evidence-based decision support in electronic health records will lead to improved patient safety, reduction of medical errors, maximization of available data, and enhanced decision-making power for clinicians [1].

1)
Stopa BM, Yan SC, Dasenbrock HH, Kim DH, Gormley WB. Variance reduction in neurosurgical practice: The case for analytics driven decision support in the era of Big Data. World Neurosurg. 2019 Feb 21. pii: S1878-8750(19)30414-0. doi: 10.1016/j.wneu.2019.01.292. [Epub ahead of print] PubMed PMID: 30797905.