

ABSTRACT

The cumulative sum charting procedure has been traditionally used in the manufacturing industry for testing quality of manufactured or assembled products. However, unlike a manufacturing process where the goods produced are generally homogenous in nature, patients' risks of surgical success are not. It has been proposed in the literature that the likelihood-ratio scoring method can be used to adjust for this difference in preoperative risk. On top of that, it is also intuitively naive to regard a patient who fully recovers from an operation, to be the same as another who survives but is stricken with post-operative complications for life. Hence, different grades of recovery need to be taken into account for patients who survive an operation. Therefore, it is reasonable for us to construct a risk-adjusted sequential probability ratio test procedure based on two or more outcomes, to test surgeons' performance. In this thesis, we will study the properties of the risk-adjusted sequential probability ratio test procedure and develop approaches for designing this test procedure.

KEY WORDS: Average stopping times; Collocation method; Odds ratio; Parsonnet scores; Surgical outcomes; Proportional odds logistic regression; Quality testing procedure.