

**Application and comparison of Resetting Sequential Probability Ratio Tests (RSPRT) and Variable Life Adjusted Displays (VLAD) on Victorian Admitted Episodes Dataset (VAED)**  
 Andrianopoulos N, Jolley D, Evans S, Cameron P  
 Centre of Research Excellence in Patient Safety, Department of Epidemiology and Preventive Medicine, School of Public Health & Preventive Medicine, Monash University, Victoria, Australia.

**Objective**

► To compare and contrast the implementation of RSPRT and VLAD as methods of quality control procedures to monitor 'in-control' versus 'out-of-control' states in Victorian public hospitals.

**Methods**

- We obtained VAED data from the Department of Human Services Victoria for 2004-7.
- We used logistic regression on 2004-5 data, adjusting for covariates and comorbidities, to obtain a realistic measure of expected mortality for three outcomes. In-hospital mortality for:
  - acute myocardial infarction (AMI)
  - heart failure (HF)
  - stroke
- Expected mortality risk for the separations between 2005-7 was calculated for patients admitted with these three diagnoses.
- For the 11 hospitals (de-identified) with the highest frequency of separations, VLAD and RSPRT were plotted for sequential separations for each of the three outcomes.
- Signalling limits for 30%, 50%, and 75% risk decrease and risk increase were determined and plotted for each VLAD utilizing risk-adjusted CumulativeSUM (CUSUM) techniques.
- If the VLAD signalled by intersecting with a limit, the limit was reset.
- Alert ( $p < 0.1$ ) and alarm ( $p < 0.01$ ) limits for doubling or halving of the odds of mortality were plotted for RSPRT, with the graph resetting if the cumulative log-likelihood ratio intersected with the alarm limit for a halving of the odds of mortality.

Crowe M, Duckett S, Skelcher-Baker K. (2008) Using control charts to monitor quality of care with administrative data. International Journal for Quality in Health Care, 20: 31-39.  
 Thompson D, Ozgocel S, Kinman R, Treweek T. (2003) Risk-adjusted sequential probability ratio tests: applications to Stroke, Shipman and adult cardiac surgery. International Journal for Quality in Health Care, 15: 71-81.



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**Results**

2004-7	N eligible separations	% of all separations	Deaths	%
AMI	8524	27.4	1059	11.9
HF	11124	40.8	616	5.5
Stroke	5857	25.8	1748	29.8

► The three logit models displayed good fit to the observed data.

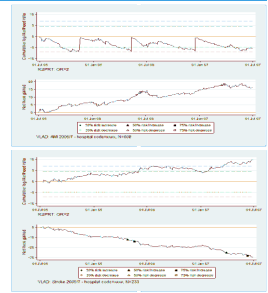
► Signals suggesting better than, or worse than expected performance were seen for all three outcomes.

► N=15 VLAD showed no signals. Within these:

- N=4 RSPRT signalled for decreased risk as an alert
- N=11 RSPRT signalled for decreased risk as an alarm

► N=10 VLAD signalled for risk decrease. With these:

- N=6 the RSPRT reset prior to the VLAD signalling
- N=2 RSPRT signalled for increased risk as an alert following the VLAD signal
- N=5 RSPRT signalled for increased risk as an alarm following the VLAD signal
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**Conclusions**

► RSPRT and VLAD intersecting with limits to signal potential 'out-of-control' states, may be an appropriate technique to help hospitals assess quality control.

► Preliminary work shows that the methodologies consistently arise to similar signals for increased risk or decreased risk.

► The timing of the signalling between the two methods may vary.

► Validation of signalling against patient records is needed.

► Further work to investigate what processes in hospitals may be resulting in signalling is needed.



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