

## Impact of Increased Radiology Staffing on After-Hours Radiology Reporting Efficiency and Quality

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**Abstract :** Objective / Introduction: Demand for radiology services from Emergency Departments (ED) continues to increase with greater demands placed on radiology staff providing reports for the management of complex cases. Queuing theory indicates that wide variability of process time with the random nature of request arrival increases the probability of significant queues. This can lead to delays in the time-to-availability of radiology reports (TTA-RR) and potentially impaired ED patient flow. In addition, greater "cognitive workload" of greater volume may lead to reduced productivity and increased errors. We sought to quantify the potential ED flow improvements obtainable from increased radiology providers serving 3 public hospitals in Melbourne Australia. We sought to assess the potential productivity gains, quality improvement and the cost-effectiveness of increased labor inputs. Methods & Materials: The Western Health Medical Imaging Department moved from single resident coverage on weekend days 8:30 am-10:30 pm to a limited period of 2 resident coverage 1 pm-6 pm on both weekend days. The TTA-RR for weekend CT scans was calculated from the PACs database for the 8 month period symmetrically around the date of staffing change. A multivariate linear regression model was developed to isolate the improvement in TTA-RR, between the two 4-months periods. Daily and hourly scan volume at the time of each CT scan was calculated to assess the impact of varying department workload. To assess any improvement in report quality/errors a random sample of 200 studies was assessed to compare the average number of clinically significant over-read addendums to reports between the 2 periods. Cost-effectiveness was assessed by comparing the marginal cost of additional staffing against a conservative estimate of the economic benefit of improved ED patient throughput using the Australian national insurance rebate for private ED attendance as a revenue proxy. Results: The primary resident on call and the type of scan accounted for most of the explained variability in time to report availability ( $R^2=0.29$ ). Increasing daily volume and hourly volume was associated with increased TTA-RR (1.5m ( $p<0.01$ ) and 4.8m ( $p<0.01$ ) respectively per additional scan ordered within each time frame. Reports were available 25.9 minutes sooner on average in the 4 months post-implementation of double coverage ( $p<0.01$ ) with additional 23.6 minutes improvement when 2 residents were on-site concomitantly ( $p<0.01$ ). The aggregate average improvement in TTA-RR was 24.8 hours per weekend day This represents the increased decision-making time available to ED physicians and potential improvement in ED bed utilisation. 5% of reports from the intervention period contained clinically significant addendums vs 7% in the single resident period but this was not statistically significant ( $p=0.7$ ). The marginal cost was less than the anticipated economic benefit based assuming a 50% capture of improved TTA-RR inpatient disposition and using the lowest available national insurance rebate as a proxy for economic benefit. Conclusion: TTA-RR improved significantly during the period of increased staff availability, both during the specific period of increased staffing and throughout the day. Increased labor utilisation is cost-effective compared with the potential improved productivity for ED cases requiring CT imaging.

**Keywords :** workflow, quality, administration, CT, staffing

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