

## The Impact of an Electronic Medical Record on Repeat Laboratory Test Ordering Across Four Australian Hospitals

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### Abstract

*In this study we examined the impact of an Electronic Medical Record (EMR) on repeat test rates (i.e., the same test ordered within a specified window of time) for a commonly ordered set of laboratory tests; Electrolytes, Urea, Creatinine [EUC], Full Blood Counts [FBC] and Liver Function Tests [LFT]. The results point to the potential that timely, evidence-based electronic decision support features can have on the efficiency and effectiveness of the pathology laboratory process and its contribution to quality patient care.*

### Keywords:

Computerised provider order entry, Evaluation studies, Hospital information systems, Laboratories

### Introduction

Electronic Medical Record (EMR) systems can include Computerised Provider Order Entry (CPOE) functionality, and provide for hospital-wide integration of electronic clinical and patient databases. In this study we examined the impact of an EMR on clinician laboratory test ordering patterns by comparing paper and EMR repeat test rates (i.e., the same test ordered within a specified window of time) for a commonly ordered set of laboratory tests (Electrolytes, Urea, Creatinine [EUC], Full Blood Counts [FBC] and Liver Function Tests [LFT]).

### Material and Methods

Laboratory data were extracted for the period of Aug/Sep 2008-2011 across four hospitals serviced by a single pathology laboratory service. The EMR was initially based on the Cerner PowerChart system Version 2007.16, and upgraded in May 2011 to Version 2010.02.16. The Laboratory Information System (LIS) was the Integrated Software Solutions (ISS) Omnilab v9.4.2 SR10 system. The electronic ordering system presented clinicians with information about previous test orders and results, and alerted clinicians when a repeat test was ordered within 24-hours of the previous test. Ethics approval was provided by the relevant Local Health District Human Research Ethics Committee (HREC: Project No. 11/146) The project was funded by an Australian Government Department of Health: Quality Use of Pathology Program grant.

### Results

Overall, for all the data collected, the percentage of repeat tests (which were ordered using either the EMR or paper) was 77.2% (136644/177096) for EUC, 75.1% (126070/167791) for FBC and 68.9% (68953/100019) for LFT. The results show significant ( $p < .0001$ ) reductions in repeat test rates within 1 hour following the introduction of the EMR. Tests for EUC decreased by 0.2% for EUC, 0.1% for FBC and 0.2% for LFT. For repeat tests within 12 hours, there were significant ( $p < .0001$ ) decreases in EMR repeat orders of 1.1% for EUC and 1.2% for FBC. There were also significant ( $p < .0001$ ) decreases of 1.8% for both EUC and FBC repeat tests within 24 hours. For LFT the EMR repeat test order rate increased significantly ( $P < .0001$ ) by 1.8% within 24 hours and 4% with 36 hours. These results indicate a greater concordance with best practice guidelines.

### Conclusion

Our results confirm previous evidence about the impact of the EMR on the rate of redundant or unnecessary tests [1,2]. Such improvements are connected to EMR's ability to provide clinicians with an overview of existing test orders for each patient along with a visual aid alerting them to repeat tests undertaken within a "too-short" re-test interval. Taken together these features can enhance clinicians' ability to monitor and regulate their test ordering practices.

### References

- [1] Georgiou A, et al. Troponin testing in the emergency department: a longitudinal study to assess the impact and sustainability of decision support strategies. *Journal of Clinical Pathology*. 2012;65(6):546-50.
- [2] Bates D, et al. A randomized trial of a computer-based intervention to reduce utilization of redundant laboratory tests. *American Journal of Medicine*. 1999;106(2):144-50.

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