



Use of computer terminals on wards to access emergency test results: a retrospective audit

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Abstract

Objective To assess delay in clinicians obtaining emergency biochemistry test results when the telephoning of results by laboratory staff is supplanted by installation of computer ward terminals.

Design Retrospective observational study.

Setting Accident and emergency department and acute medical admissions ward of a teaching hospital.

Sample 3228 emergency requests for biochemistry tests sent from the accident and emergency department and 1836 from the medical admissions ward during August 1999 to January 2000 when there was no recorded telephone contact for results.

Main outcome measures Proportion of emergency biochemistry results accessed via a ward terminal within 1 or 3 hours of becoming available and the proportion never seen by this means.

Results The results from 1443/3228 (45%) of urgent requests from accident and emergency and 529/1836 (29%) from the admissions ward were never accessed via the ward terminal. Results from 794/3228 (25%) of accident and emergency requests and 413/1836 (22%) of admissions ward requests were seen within 1 hour of becoming available while a further 491/3228 (15%) and 341/1836 (19%) respectively were accessed between 1 and 3 hours. In up to 43/1443 (3%) of the accident and emergency test results that were never looked at the findings might have led to an immediate change in patient management.

Conclusions When used as the sole substitute for telephoning results, the provision of terminal access to laboratory results on wards can hinder rather than promote the communication of emergency blood results to healthcare staff.

Introduction

Traditionally, the results of emergency biochemistry and haematology requests have been telephoned by laboratory staff to the requesting clinician or ward area as soon as a specimen has been analysed. However, the process of telephoning can be time consuming for staff and has the potential for error when results are transcribed. In the past decade advances in laboratory and hospital computer systems have allowed some healthcare staff to access pathology results directly on the ward via computer terminals.^{1,2} Many laboratories, including the one in this audit, have taken this oppor-

tunity to dispense with the telephoning of results in the knowledge that they can be accessed on the wards by clinicians at their convenience.

One possible disadvantage of implementing such a policy is that it may introduce a delay between important laboratory results becoming available and their being viewed by hospital staff. We therefore undertook this study to establish the degree of delay in accessing the results of emergency requests for biochemistry tests sent from the accident and emergency department and the acute medical admissions ward of a typical large UK hospital.

Methods

As part of the implementation of a new laboratory computer system (Masterlab, Berkeley Computer Services, Glasgow) in July 1999, ward terminals for accessing authorised laboratory results were established in the accident and emergency department and the acute medical admissions ward of Hull Royal Infirmary. After the formal training of healthcare staff in how to use the equipment, the routine telephoning of results for emergency biochemistry tests (other than blood gases) to these areas stopped. The repertoire of urgent tests requested "out of hours" by these wards was mainly limited to "urea and electrolytes" (serum sodium, potassium, chloride, bicarbonate, urea, and creatinine), plasma glucose, amylase, creatine kinase, paracetamol, salicylate, and blood gases. The ward terminals require the user to enter a patient's hospital number to access his or her available blood results on a single screen.

We used the audit facility of the laboratory computer to identify the time between results becoming available and being viewed on any ward terminal in the hospital during the six months between August 1999 and January 2000. To ensure that the tests being requested were truly urgent (and not routine), we included only those conducted by the "out of hours" emergency service, from 5 pm to 8 am. According to protocol, any requests not marked as "urgent" are left for analysis the next working day. If a set of urgent results was telephoned, presumably in response to a call from the requesting staff, we excluded it from the study.

If a test requested by the accident and emergency department was never accessed by a ward terminal we examined the test results to see if they could have led to

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Delay between availability of results for emergency biochemistry tests to their being accessed on hospital ward computer terminal. Values as numbers (percentages)

Delay	Accident and emergency department (n=3228)	Acute medical admissions ward (n=1836)
Within 1 hour	794 (25)	413 (22)
1-3 hours	491 (15)	341 (19)
Over 3 hours	500 (15)	553 (30)
Never*	1443 (45)	529 (29)

*Includes the 66 results for accident and emergency and 27 for admissions ward where one or more unsuccessful inquiries had been made to the ward terminal before the results were ready but none was made after the results became available.

an immediate change in the management of the patient. The criteria used were arbitrarily defined as a potassium concentration <3.0 mmol/l or >6.0 mmol/l or an amylase concentration >500 IU/l. To make sure that these results had not in fact been documented before the final report was printed, we surveyed the accident and emergency notes and full case notes for the hypokalaemic or hyperkalaemic patients.

Results

In the six months after the establishment of ward terminals 4219 "out of hours" biochemistry tests were requested by the accident and emergency department. Of these, 991 were excluded because their results had been telephoned, leaving 3228 for our study. In the same period 2048 tests were requested by the acute medical admissions ward, and we included the 1836 that had not had their results telephoned.

The table shows the number and proportion of non-telephoned test results that were viewed on the ward terminals within 1 hour of their becoming available, between 1 and 3 hours, and over 3 hours. It also shows the number of results that were never accessed via a ward terminal. For these, the first indication to the requesting clinician of a patient's results was likely to be when the paper report was printed the following day and delivered to the ward by hospital post. Among these results that were never accessed were 66 examples from the accident and emergency department and 27 from the admissions ward in which one or more unsuccessful inquiries had been made to the ward terminal before the results were ready but none was made after the results became available.

Of the 1443 accident and emergency results that were never viewed on a terminal, 43 (3%) could have led to an immediate change in patient management (35 because of abnormal potassium concentrations and eight because of a raised amylase activity). Our survey of case notes from patients with hypokalaemia or hyperkalaemia found no evidence (hand written or otherwise) of the results being documented in 83% of cases before the final report was printed.

Discussion

Establishing computer terminals on wards is usually viewed as an improvement in the service to clinicians which frees laboratory staff from the need to telephone urgent and abnormal results. Our audit has shown that this perceived improvement may actually hinder the

communication of urgent laboratory results to clinical areas. Indeed, over a third of the emergency results we reviewed were never seen before the final report was printed the next day. Of the remaining results, over a third were accessed more than three hours after becoming available.

Potential limitations of study

Our conclusions would be flawed if test results, for whatever reason, were still being communicated to clinicians but that this action was not being recorded on the pathology computer. For example, this could happen if the laboratory staff making or receiving a telephone call did not follow protocol and record on the computer that the results had been passed on verbally. However, our survey of patient notes confirmed that in most (83%) of the cases with severe hypokalaemia or hyperkalaemia there was no evidence of this having occurred. These abnormal results are the very ones that laboratory staff would be most likely to telephone despite knowing that they would be available on a ward terminal. Thus, for the patients who did not have such abnormal biochemistry it would be reasonable to expect that there was even less than a 17% chance that their results would have been telephoned.

Reasons for staff not accessing results

A proportion of patients attending the accident and emergency department might not have their test results reviewed because they have left the department by the time the results are available. Shift working among clinicians in this department is especially common, so tests requested by one group of doctors may not always be followed up by a subsequent group. For these reasons, we also included another ward area in our study for comparison with the accident and emergency department. However, we found that even on the main medical assessment ward, where patients are expected to stay for days rather than hours, over a quarter of emergency laboratory results are not reviewed by electronic means.

The reasons for the failure to access results promptly or at all are speculative. It is possible that our findings primarily reflect the proportion of urgent requests for biochemistry tests that are not truly urgent (or have become less important with subsequent clinical events) and so do not require immediate attention. Alternatively, we may have shown how the introduction of an additional hurdle in obtaining results (a ward terminal) deterred clinicians from looking for their patients' urgent test results. Certainly, with the ward terminals in our study, users had to know that a patient had had blood taken and had to actively seek their results. Even then, the users had to estimate when the results were likely to become available. We found 93 examples of where it was obvious that the results had been looked for on several occasions before they had become available, only for the clinician to have "given up" looking by the time they ultimately appeared.

Implications of study

Whatever the reasons for staff not viewing test results, there could be considerable medical consequences for a patient if abnormal results were not acted on promptly. Likewise, there might be legal and financial

What is already known on this topic

Providing computer terminals on wards to access laboratory results is usually regarded as a service improvement for healthcare staff

Many laboratories that transmit results to ward terminals dispense with telephoning emergency blood results

What this study adds

Many urgently requested results are not looked at if hospital staff need to access a computer terminal to obtain them

If ward terminals are used as a complete substitute for the telephone, results that would have led to an immediate change in patient management may pass unnoticed

consequences for the clinician responsible and hospital trust if it transpired that harm to a patient could have been prevented if their emergency results (whether perceived urgent at the time or not) had been viewed in a timely manner. In our audit, up to 3% of the accident and emergency results that were never looked at could have led to an immediate change in patient management. This equates to more than one patient per week.

It is difficult to determine how transferable our findings are to other hospitals. Although a recent benchmarking exercise involving 104 UK biochemistry laboratories reported that most are capable of transmitting results to ward terminals,³ the actual number doing so is not known precisely. However, 30 other UK laboratories use the same laboratory computer system as the one in this audit.⁴ Some other laboratory and hospital computers prompt users (when they log on) to view all the results for their ward that have not yet been accessed. This should reduce the likelihood of tests never being looked at, but it might have less impact on reducing the delays in accessing results after they become available.

To our knowledge, only one other study has assessed the delay in viewing emergency laboratory test results with a ward terminal.⁵ In that study, in a US hospital, the time to access urgent inpatient haematology blood counts was shorter than we found (64% within one hour), and this finding was used to justify the need for local hospital laboratories rather than off site analysis. Curiously, however, no mention was made of the proportion of results that were never seen at all on screen by clinicians.

Solution to the problem

The problems we identified were solved in Hull by introducing "trickle" printers to the high intensity areas included in our audit that would print out an interim report on any patient in the ward or department as soon as the results became available. This introduced several benefits. Firstly, clinicians had immediate access to a patient's results even if they did not know that blood had been taken or, indeed, that the patient was present on their ward. Secondly, the printed record

reduced the risk of errors occurring in transcribing results from the terminal screen into the case notes. Staff in the accident and emergency department also agreed to forward results by telephone should the relevant patient have left the department by the time the results were printed. In other wards with computer access the telephoning of results was reintroduced if the results lay outside critical limits.

Conclusions

The electronic communication of emergency laboratory results should not be assumed to be inherently superior to traditional communication methods, since hospital staff cannot be relied on to look at many urgently requested results if they have to access a computer to do so. Hospitals that have implemented, or are about to implement, a similar strategy to the one we audited need to satisfy themselves that the system is of as much benefit to clinicians and patient care as it is to laboratory staff.

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- 1 Manor PG. Turnaround times in the laboratory: a review of the literature. *Clin Lab Sci* 1999;12:85-9.
- 2 Powsner SM, Wyatt JC, Wright P. Opportunities for and challenges of computerisation. *Lancet* 1998;352:1617-22.
- 3 *Pathology benchmarking feedback report (clinical biochemistry)* 1999. London: Clinical Benchmarking Company, 1999.
- 4 Berkeley Computer Services (www.berkeleycs.co.uk).
- 5 Winkelman JW, Tanasijevic MJ, Wybenga DR, Otten J. How fast is fast enough for clinical laboratory turnaround? Measurement of the interval between result entry and inquiries for reports. *Am J Clin Pathol* 1997;108:400-5.

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Correction

Randomised trial of personalised computer based information for patients with schizophrenia

An editorial error occurred in this article by Ray B Jones and others (7 April, pp 835-40). In the diagram of patient flow through the study (p 836) the number of patients in the computer only group who were lost to follow up after session 2 because of refusal should have been two (not 20). In addition, some superfluous arrows crept into the figure, wrongly linking the boxes of patients lost to follow up in the computer only group and in the community psychiatric nurse only group.

Endpiece

Training anaesthetists

Marshal Joffre, commander of the French armies in the first world war, noted that, "It takes 10 000 to 15 000 lives to train a major general." It doesn't take as many as that to train an anaesthetist, but it does take a certain number. After all, the anaesthetist takes them one at a time.

W Stanley Sykes,

in *Essays on the first hundred years of anaesthesia*,
Edinburgh: Churchill Livingstone, 1960

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