



Benefits of a comprehensive results review system

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Reviewing the results of ordered tests is a fundamental part of clinical practice. At a time when doctors are being presented with ever-increasing quantities of information, having a comprehensive system for results review is both a clinical and legal necessity. Recent high profile cases have shown that the courts do not tolerate missed results. A system which enforces review is the safest way to improve clinical outcomes for patients and reduce the risk of litigation.



1. Introduction

It is estimated that doctors spend a quarter of their working life managing information [1], and much of this information is found in the medical records of patients. The presentation of clinical information plays an important role in a doctor's ability to rapidly assess a patient's condition. More importantly, *timely* review of the results of ordered tests, and the incorporation of those results into a wider context is a critical part of the clinical process. Poor presentation of data can lead to poorly informed clinical practice, medication errors, inappropriate repeat investigations and unnecessary referrals.[1] Failure to review results can lead to morbidity and mortality.

In this paper, we examine the issue of results review from the perspective of reducing risk and, ultimately, saving lives. In **Section 2**, we will consider the background to the problem. **Section 3** will examine some recent critical cases, some of which have resulted in civil and coroner's court proceedings. The literature which supports the effectiveness of a comprehensive results review system is surveyed in **Section 4**. Finally, **Section 5** will look at some of the issues involved in the design of an effective results review system.

2. Systemic issues

In a busy hospital setting, there are numerous demands on every doctor's time. One of these is the responsibility to review the results of ordered tests—from daily blood tests to radiological procedures and other more complex testing. The reality is that a single missed result, if significant, can lead to an adverse outcome for the patient, even death.[2] It is clear that this issue is rapidly becoming a public concern.[3]

It is a well established principle that the responsibility for reviewing test results lies with the doctor who ordered the tests. It is also relatively well established in practice that doing so can be a complex undertaking. It is imperative that every doctor has a system for tracking test results [4], and that the system can be shown to function effectively. A comprehensive results review system is essential for minimising the possibility of a legal claim arising from a failure to diagnose because of a missed result.[5–7]

Almost one third of doctors report having no reliable system for results review.

Despite the clear message from the literature, the use of effective results review systems are not widespread. Boohaker, Ward, et al. found that between 17 and 32% of doctors surveyed have *no reliable method* to make sure that the results of all tests ordered are received. One third of doctors did not always notify patients of abnormal results. One of the most common reasons for not notifying patients of abnormal test results was that the patient was expected to return to the clinic soon. Despite this, only 23% of doctors reported having a reliable method for identifying patients overdue for follow-up.[8]

The conventional medical record has become a relatively unwieldy document, serving administrative, regulatory, financial, legal and clinical needs. It has evolved to be largely a device for data storage, and is not designed with patient care in mind.[9] Compounded by the conventional hospital system in which there are multiple team members with varying degrees of responsibility for each patient, with staff rotating periodically and working different shifts, it is increasingly difficult to ensure that every result is seen by an appropriate clinician.



3. High-profile cases

Damages of over \$A 600,000 were awarded in a single case involving a missed result.

There have been several recent high-profile cases in Australia, and we will consider five of them in this paper. Four of the cases involve the death of a patient. So far, two of these cases have resulted in civil court proceedings (with damages awarded totalling over \$A 650,000), and two in coronial inquests.

3.1. *Kite v. Malycha*

This case [10] involved a 31 year old woman presenting to a surgeon with a breast lump. At the consultation, a fine needle aspiration biopsy was taken, but this procedure was not recorded in the doctor's notes. The patient was told to call the practice for the results later that day, and a follow-up appointment was made for one month later. The patient did not call, and did not attend the follow-up appointment. The surgeon never received the report for the results of the biopsy, though the pathology company convinced the trial judge that it was faxed to the rooms. At the appointment which the patient did not attend, the surgeon reviewed the notes, but did not realise that the pathology results were missing, since the procedure was not recorded. He concluded that there was no reason to contact the patient. The patient presented again almost 12 months later with more advanced disease, diagnosed as metastatic breast carcinoma at open biopsy. The patient later died. The surgeon was found to have been

negligent in failing to follow up the results of the biopsy. Again, the judge was critical of the failure to implement even the simplest of results review systems:

... if perchance the cytology report was not brought to [the surgeon's] attention, he should have made some inquiry to find out what happened to it ... Obviously the simplest of systems would have provided a more or less foolproof means of checking whether cytology reports had been forwarded to his rooms. All that would have been needed was a simple running sheet, recording that such a report had been requested, with provision for the particular entry to be ticked off when the report was received.[10]

Courts expect results to be reviewed, and systems cannot rely on patients acting for themselves.

Further, he concluded that the failure of the patient to participate in the follow up arrangements made did not excuse the breach of duty of care. In this context, it is important to remember that 'reasonable' care is not 'perfect' care[11], and that the High Court of Australia in the classic *Rogers v. Whitaker* [12] case emphasised communication as the critical component.

3.2. *Tai v. Hatzistavrou*

The issue here [13] was one of the procedure used by a gynaecologist to admit patients seen in his rooms for operation at a nearby hospital at some future date. However, the principle of patient follow-up remains the central theme. The doctor supplied the patient with a 'recommendation for admission' form, which the patient was supposed to present to the hospital. The hospital would then book the patient onto the gynaecologist's list. The gynaecologist did not keep a local copy of patients he recommended for surgery, but relied on the hospital receiving the form from the patient, and then booking the patient onto his list. After *two* failures of this system, the patient was found to have metastatic carcinoma when she finally did present for surgery. The patient mounted a case of negligence against the doctor on several grounds. Worse, the hospital admitted at trial to having mislaid one of the 'recommendation for admission' forms which caused a non-presentation for surgery. The trial judge found the doctor negligent for not contacting the patient when she failed to appear for the procedures, not to mention failing to disclose the consequences to her of not presenting. The trial judge's remarks included the assertion that 'there is no reason to think that such a process would create enormous practical or administrative difficulties for the doctor or be prohibitively expensive.' [13] The Court of Appeal added that there exists a duty of care to remind the patient of the necessity of the procedure, and that this duty continues to exist for as long as the doctor-patient relationship remains intact. This case clearly confirms that the courts expect medical practitioners to have in place systems to follow-up referrals and investigations.[14]



3.3. *Niki Kotzaitis*

A single missed result can lead to a patient's death.

In this case, which resulted in a coronial inquest in March 2004, but has not yet resulted in civil court proceedings, a 58 year old woman died at home after discharge from a hospital in New South Wales.[2] The Deputy State Coroner found that she died of renal failure, *despite blood test results being available prior to her discharge which indicated the diagnosis*. The results were simply never reviewed. Timely review would have allowed appropriate treatment to be instituted, and could have potentially saved the patient's life.

3.4. *Virginia Vassallo*

This case involved the death of a 59 year old woman due to cerebral infarcts as a complication of infective endocarditis.[15] The crux of the case hinges on a delayed diagnosis, but the Coroner describes a 'minor dispute ... [over] who caused the complete blood examination

to be conducted.’ A key feature of this case was the ‘handover’ of a patient between doctors at the end of a shift, and the findings highlight the importance of having a transparent approach to responsibility for ordered tests, and, in particular, a clear procedure for identifying who should review the results in a timely manner.

3.5. Caroline Anderson

Another case involving a lack of a well-defined system for results review was that of Caroline Anderson.[16] The 37 year old woman died of bacterial meningitis less than one month after an uneventful childbirth. The infection was secondary to an abscess which had formed after treatment with an epidural catheter for analgesia at delivery. Tragically, the diagnosis was even suggested at her admission, and appropriate tests to confirm it were performed, but the lack of an effective system for reviewing the results of ordered tests meant that the result was not seen in time for treatment to commence and be effective.

4. Effectiveness of results review systems

In a prospective time-series study involving over 20,000 patients, Rind, Safran, et al. sought to determine whether computerised alerts to doctors about rising creatinine levels in patients receiving nephrotoxic drugs led to more rapid adjustment of medications and subsequent protection of renal function.[17, 18] The study concluded that a computerised results review system altered doctor behaviour in a positive way: serious renal impairment was prevented and renal function was preserved. Additionally, the system was well accepted by clinicians.

Kuperman, Teich, et al. conducted a randomised, controlled trial to evaluate the effect of an automatic alerting system on the time until treatment was ordered for patients with critical laboratory results.[19] This study represents the typical day-to-day role played by a comprehensive results review system in a hospital setting. The authors found that patients in the study group had a 38% shorter median time interval to appropriate treatment ($p < 0.003$). Other studies have replicated this experience with similar results.[20–23]

Other studies have considered results review in a wider context. Pestotnik, Evans, et al. found, for example, that combining *in vitro* sensitivity results with information about antibiotic prescriptions produced an efficient method to identify errors in antimicrobial prescribing.[24]

5. Design of a results review system

Poor presentation of data can lead to poorly informed clinical practice and inappropriate repeat investigations.[1] Difficulties in using medical data can be divided into difficulties finding data and difficulties interpreting the data. Problems finding data include:

- Legacy systems are usually organised to facilitate data entry rather than data retrieval (e.g., the typical case notes system with laboratory results stored in reverse chronological order, separate from the main record)
- Data is often stored in an *ad hoc* structure (e.g., results stored completely separate from a patient's main record)
- There can be parallel or duplicate data sources (e.g., results recorded in two or more places).[1]

Once found, difficulties interpreting the data arise from problems such as:



- Comparing results that are spread over multiple tables is difficult (e.g., trying to identify a trend in a blood test parameter when results are presented on separate pages)
- Determining context can be hard (e.g., given a single result, what other results were current at the same time, and where are they?)
- Identifying trends can be hard (e.g., visualising the course of a parameter over time given only numerical results spread over numerous pages).[1]

Features such as timelines and summaries can help a doctor gain an overview of a patient's condition when attempting to extract information from the record.[25] An important principle is that key data should be placed where they will be seen and read first, whether this is by position, or by a system policy that enforces results review. Further, it has been shown that decision-making is faster and less error-prone if all data needed to support a decision can be viewed on a single page or screen, rather than several distinct places.[25]

6. Conclusion

Effective information management is essential in the modern clinical environment. A comprehensive results review system produces better clinical outcomes for patients, and reduces litigation risk. It is clear from both the literature and the courts that reviewing the results of ordered tests is a fundamental part of clinical practice.

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