Abstract
Errors will occur in medical laboratories at a rate that is no different to any complex industry. For the most part these errors have little or no consequence because the systems that are in place act as or provide barriers to prevent common and simple human errors from causing consequences for users of our services. From time to time a sequence of errors or departures from Standard Operating Procedures (SOPs) will occur that defeat systems that are in place and a consequence of these errors will be the outcome. Consequences can range from undetectable, for example a normal result from patient x is replaced by a normal result from patient y, through to inappropriate therapy dispensed to a patient based on an erroneous investigation resulting in serious morbidity or worse.

It is important therefore that errors are detected early and managed appropriately. The primary reason is to ensure that corrective action can be undertaken to eliminate or moderate the impact of the error. The important secondary reason is so that we may learn from the error and work to avoid the error in the future. The occurrence of errors is therefore an important trigger for quality improvement activity.

Laboratory systems are inanimate and require people to make them function. There are three behaviours expected from humans working within any system:
1. Human Error resulting from the inherent weaknesses of human performance
2. At-risk behaviour
3. Reckless behaviour
This triad of behaviours are to be expected within any workforce and our response as leaders needs to be appropriate in each behaviour type in order to assign the correct level of accountability.

Accountability for situations that develop purely from human error should entirely attach to the system and not the individual. Medium level accountability should be attached to those who undertake at-risk behaviour and should initially be centred on coaching. Individual accountability should escalate in repeat occurrences of at risk behaviour. Reckless behaviour where risks are known and deliberately ignored should have maximum individual accountability attached.

Achieving a better organisational understanding of human factors involved in error forms and a system of fair accountability will stimulate individuals to report errors that occur and openly contribute to a process improvement culture that seeks to learn from error and make systems more resilient and fail-safe.


Introduction
Medical laboratories are very complex organisations working in an industry where the consequences of error can be catastrophic. Health care overall, however, has a very poor record with respect to error, and human consequences are common as a result of mistakes made. There is a very poor understanding of the limitations of human performance in our industry. Overall, healthcare workers are very highly educated and this heavy reliance on education leads us to the conclusion that you can educate/train people to not make errors. Organisational cultures have developed within the health service that has created a culture of fear and shame amongst workers which has led to errors being hidden or suppressed. Key system frailties can remain un-managed for long periods of time even though important errors are being generated. These errors are often managed “under the radar” for fear of the consequences that may arise. The way we, as leaders in our laboratories, respond to errors when they occur has a profound effect on the quality of our business practices and our ability to see and act on key system vulnerabilities to the benefit of improved system performance in the future. There are now very well developed systems and algorithms to enable managers and Human Resources to quickly, fairly and consistently assign accountability for the human factors involved in system failures.

Developing a culture based on quality and safety
James Reason describes a safety culture that has the following attributes:

- Informed – collects and analyses data, disseminates quality and safety information.
- Reporting – a safe environment for people to report safety and quality incidents without fear of blame.
- Learning – a primary objective of the organisation is to learn from mistakes and make improvements.
- Just – errors and unsafe acts will not be punished if the act was unintentional. Deliberate unsafe acts or recklessness will be disciplinary matters.
- Flexible – easily able to adapt to changing circumstances.

This paper discusses the human elements contributing to quality and safety.

Human behaviour
David Marx describes three human behaviours expected for people working within developed systems.

1. Human error: This is the result of the fundamental capability of humans in terms of cognition, learning and performance. Typically human error is manifested as slips or lapses in concentration and is considered non-cognitive. It is possible to replicate human error through standardised studies in controlled environments. Error rates vary according to the nature and complexity of the task and the environment in which the task is required to be performed. Very simple errors occur at a much higher frequency in high stress environments. People who are highly familiar with a task generally have a lower rate of human error; however, boredom and task engagement issues increase error in this group. Human error is universal and occurs wherever humans are deployed to complete tasks. Examples of human error in the medical laboratory include; ticking the wrong box on a request form, loading the wrong reagent on an analyser, writing or entering information in the wrong place in a patient record.

2. At-risk behaviour: This behaviour is cognitive; it is often motivated by a lack of understanding of the reasons behind process steps or functions. It is undertaken with the express belief that there will be no consequences for the action. The risks for the action are often poorly understood. The behaviour often develops as the experience in a task increases and no bad consequences are observed following the behaviour.
Examples of at-risk behaviour in the medical laboratory include; not running quality controls at the required frequency, not following some steps within an SOP, not performing elements of maintenance on equipment e.g. not cleaning the probe every time when required as it does not appear dirty.

3. Reckless behaviour: This behaviour is cognitive. A departure from acceptable practise occurs even when the risks are known and bad consequences are likely. Examples are; attending work under the influence of drugs or alcohol, amending the results of unacceptable QC to avoid rerunning patient samples, deliberately not performing tasks required to check a result or that a process has completed correctly.

Just culture and management of error
The three types of error listed above have different human dimensions and therefore need to be dealt with in separate ways.

Human error
Human error is non-cognitive. The existence of the error is usually a surprise to the individual who has made it once it is discovered. Human error has two general causes; system design, and working environment. These are interlinked. A very poorly designed error-prone process can be completed reliably in a stress free, non time bound environment. Conversely, a robust process can still be subject to human error in highly stressful time poor situations. Errors resulting from human error deserve our focused attention as they are the most amenable to improvement through system redesign.

In pure human error there is no accountability for the individual involved. We know that human error will occur and our role with people affected is to support and console them.

Management of at risk behaviour
At-risk behaviour is cognitive and therefore there is some accountability due to those who choose to behave in these ways. What distinguishes at-risk behaviour from reckless behaviour is intent. At-risk behaviour is a choice. The key distinction is that the risks of that behaviour are not understood and believed to be low to nil. The behaviour is undertaken with the best intentions for outcomes.

Individuals that undertake at-risk behaviour are best coached to understand the risks and implications of the behaviour. There are known environmental factors as well and a review of these is appropriate. A good example of an environmental factor is, for instance, allowing people to go home early if a task is completed prior to finish time. This perversely incentivises shortcuts and rushing tasks.

Management of reckless behaviour
Reckless behaviour is founded in a lack of consideration of outcomes, knowing and willingly taking risks where bad outcomes are likely. Reckless behaviour, if proven, is almost always a disciplinary matter and is quite rare. It is possible that a behaviour initially categorised as at-risk behaviour may be dealt with as reckless behaviour if it is repeated.

Table 1. Summary

<table>
<thead>
<tr>
<th>Behaviour</th>
<th>Choose the Behaviour</th>
<th>Know the risks</th>
<th>Manager response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Error</td>
<td>No</td>
<td>No</td>
<td>Console</td>
</tr>
<tr>
<td>At Risk Behaviour</td>
<td>Yes</td>
<td>No</td>
<td>Coach</td>
</tr>
<tr>
<td>Reckless Behaviour</td>
<td>Yes</td>
<td>Yes</td>
<td>Discipline</td>
</tr>
</tbody>
</table>

Conclusion
We rely on the effective performance of individuals to ensure our processes generate the required outcomes. Errors are inevitable and every error discovered is an opportunity to learn and improve. Our emphasis needs to be on the lessons that can be learned while dealing fairly with the individuals involved. If we achieve this fine balance then trust is restored and information will flow within the organisation enabling significant system vulnerabilities to be addressed. There is individual accountability for actions; however, our processes to assign accountability must be demonstrably just and consistent in any given human performance situation. All laboratories could benefit from knowledge of process design methodology that manages the impact of human factors on process outcomes.

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References

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Dr Thomas H Pullar (Thos) was a champion and great friend of New Zealand Medical Laboratory Scientists. For many years he was involved with the gradual building up of professional laboratory standards throughout the country, and with the formation of the Medical Laboratory Science Board. He was intensely concerned and involved with the training and welfare of Medical Laboratory Scientists. He helped draft conditions of employment and prepared new syllabi for the intermediate examinations. Thos passed away in August 1966 and as a friend, teacher and lifelong champion of New Zealand Medical Laboratory Scientists it is fitting that NZIMLS continues to recognise his contributions to our profession through the TH Pullar Memorial Address.

Donald Mikkelsen delivering the TH Pullar Memorial Address at the opening of the NZIMLS Annual Scientific Meeting in Hamilton, August 2013.