

## With advances in information Technology can we Minimise errors in Histopathology?

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### Abstract

Accurate patient identification is key to ensure the correct administration of therapies. Mix-up of patients' identification and lack of a failsafe system remain common factors in producing erroneous pathology reports or giving the wrong treatment to patients with potential serious ramifications. This paper illustrates the importance of accurate patients' identification and appropriate action by the clinicians on histology reports. We document 5 cases in which mistakes happened with variable consequences despite robust clinical and laboratory safety measures.

### Introduction

The world health organisation has produced guidelines on ten essential objectives for safe surgery in 2009, with the first objective to ensure the operation is on the right patient and at the correct site [1]. With the introduction of the WHO surgical checklist, we can aim to reduce the incidence, but can never remove the impact, of human error in this situation. The implications can extend to jeopardise patient safety; the national patient safety quarterly summary indicated that between 2006 and 2008, 15% of cases with a patient identification error came to some form of harm [2].

Errors may happen upon sending specimens to the laboratory which can be divided into pre-analytical, analytical or post-analytical in origin [3]. The common pre-analytical mistakes are mislabelling of specimens, wrong information on request forms, and transportation problems. Analytical errors are mainly due to a mix up of specimens within the laboratory, mislabelling of slides or blocks, and misinterpretation of findings by the histopathologists. Post-analytical mishaps arise from lack of action by the clinicians on issued reports due to inadequate fail-safe systems or problems with transportation. Although there are numerous guidelines to minimise these errors, human factor remains an important source of error [3]

We report 5 cases in a histopathology department at a large district general hospital illustrating these problems. The errors highlight the difficulty of implementing advances in information technology (IT) on patients' safety. The cases also exemplify how human error is an important part of remedying the situation.

### Case 1

A middle-aged woman (A) presented with labour at term. She required caesarean section and requested tubal ligation for sterilisation at the same time. The operation was uneventful and segments of both fallopian tubes were submitted for histological examination. At microscopic examination, complete cross sections of both tubes were confirmed by the Histopathologist, but in addition a fragment of tissue showing a squamous cell carcinoma was also seen! Checking both containers and request forms matched the patient's details. Review of the macroscopic description also matched the additional fragment of tissue. The obstetrician was contacted and expressed total surprise to the finding as the pelvic and abdominal organs looked fine at surgery. Upon imaging of the whole body no external or internal tumours could be found. Attention was directed to the theatre list to check for any potential discrepancy. It transpired that on the same day an elderly woman presented with a vaginal tumour which was biopsied. The specimen was placed in a container but unfortunately was not labelled and a request form was not completed by the obstetrician or theatre staff. The sample was left in theatre. When Patient A came in for her surgical procedure the theatre staff thought that the container was empty and put one of the fallopian tubes in it together with patient A's label and details.

The problem which faced the histopathologist and obstetrician was how to prove that the squamous cell carcinoma did not belong to patient A. Tracing the elderly woman was unhelpful as she passed away in a Nursing Home and no post mortem examination was requested. A forensic laboratory was contacted to perform DNA analysis on the specimens. A blood sample was requested on patient A by the forensic lab. Fortunately, the analysis proved successful and confirmed that the fallopian tubes belonged to patient A whereas the squamous cell carcinoma displayed a

different DNA profile hence must belong to a different patient, most probably to the elderly woman.

The bill for carrying out the DNA analysis was covered by the hospital. Testing took a few weeks adding further stress to the patient.

### Case 2

Patient B presented to the surgical team with abdominal pain and was diagnosed with cholelithiasis. An elective laparoscopic cholecystectomy was carried out. At registration, the receptionist typed the unit number of the patient incorrectly with one different digit, which resulted in producing labels of a different patient's name and details (Patient X). These labels were not checked when filed in the case notes. At operation the sticky label for patient X was peeled off from the case notes of patient B and was put on the gallbladder container before submitting to histology. At the Laboratory the case was processed according to the information provided on the specimen and request form which matched and was reported by the histopathologist as chronic cholecystitis associated with cholelithiasis. A few weeks later, the surgeon sent a letter indicating that Patient X was not operated on and instead a cholecystectomy was performed on patient B with a missing histology report.

This incident was documented and relevant staff were informed to prevent the mix up from happening again.

### Case 3

A young woman (patient C) visited outpatient clinic with her mother for a routine cervical smear. Cervical sampling was performed by a gynaecologist and the specimen was submitted to the cytology department for assessment. The consultant histopathologist noted that the patient had a previous history of total abdominal hysterectomy. The age of the patient was also noted as 65 years but the smear showed no atrophic changes and appeared compatible with a young woman. Upon contacting the gynaecologist it became apparent that the sticky label which was used on the patient belonged to her mother! Unfortunately, both the mother and daughter had exactly the same first and surnames causing confusion at the time of registration.

It is only due to the robust procedure in cytology department where previous records of each patient have to be checked before interpreting cervical smears helped to identify and solve the problem.

### Case 4

A senior biomedical laboratory officer was carrying out cut up of skin specimens when was distracted and opened two containers belonging to two separate patients at the same time. To complicate the matter a frozen section specimen arrived for an urgent intraoperative diagnosis. The cut up had to be postponed but unfortunately the skin biopsies were returned to wrong containers. The cases were reported by the histopathologists as melanoma and seborrheic keratosis without knowing the earlier mix up. The dermatologist contacted the laboratory indicating that the results did not match the clinical findings. Upon conducting internal investigation the containers were correctly labelled and the laboratory officer did not recall the incident. DNA testing was requested and proved the identity of both patients and confirmed the mix up of the specimens at macroscopic examination.

A clinical incident report was filed and the importance of adhering to the cut up protocol was emphasised to the laboratory staff.

### Case 5

An orthopaedic surgeon biopsied a non-healing lesion on an index finger which was suspicious of squamous carcinoma. Histology confirmed the diagnosis but no further action was taken. The patient presented later with a clavicular lesion which was radiologically suspicious of metastatic tumour. Biopsy showed metastatic squamous cell carcinoma. The surgeon complained to the laboratory that the original histology report was not received. The incident was investigated and it became apparent that the histology results were sent to the patient's ward and not to the surgeon's secretary.

The address of the consultant was corrected on LIMS (laboratory computer system) and address of other consultants were also checked to make sure that they were correct. Although all laboratory results are digitally available on the hospital clinical portal system, the IT department and cancer services were asked if all cancerous reports could be flagged up to the clinicians automatically similar to radiology results. The directorate of surgery also implemented a new fail-safe mechanism to filter their cases.

### Discussion

All 5 cases illustrated the ease of human error with serious ramifications to the patients and clinicians. The pathway between a patient being registered by the healthcare system and receiving an intervention is well documented in the 1000 lives campaign [4]. This initial system of identifying the patient for the correct medical record has failed in cases 1, 2 and 3. Implementing more robust systems to accurately identify the patient in question is the aim of this campaign, but ultimately human error in this initial section can be missed despite technological advancement. In the context of human error, the realm of blood transfusion regularly makes advances in its technology but two thirds of errors remain from a simple incorrect patient identification at the bedside [5].

NHS Connecting for health in the UK and WHO Information Technology for Patient Safety Expert Working Group are both innovating new methods to improve patient care using technological advancement. The goal is to ultimately reduce any iatrogenic harm with the introduction of electronic solutions on a wider scale. So far there is no robust evidence to show that these innovations are producing a cost effective reduction in these events [6]. With the addition of the newer and more complicated identification methods, it is reasonable to assume that this can produce a new platform for human error to present itself. The national patient safety agency had been informed by the Head of the Royal Colleges of the mainstay of the medical workforces that there is inconsistent training on patient identification, and that staff are uncertain on the correct or most accurate way to identify a patient. [7].

In cases no. 1, 2 and 3 the information technology actually worked in identifying the patients but unfortunately protocols were not followed to check the patients' details. The cases illustrated how simple errors can be made, but without effective fail-safe mechanisms these mistakes can be extrapolated far enough down the line to potentially risk patient care. The availability of print-off sticky labels has made administrative processes quicker but could allow for complacency and carelessness. The current guidance from JPAC and NHS Evidence on blood transfusion for example, is that all patient identification should be done electronically, to reduce risk and save cost [8]. In this setting, labels produced electronically

via handheld devices linked to wristbands or Q.R codes at the bedside could feasibly remove this error but would not bypass the problem of generating the wrong wristband/QR code in the first place [9].

With the reduction of the cost of information technology there is increasing demand to use it across the world [6]. In the United Kingdom the NHS implemented guidelines to minimise errors which include: usage of a unique NHS identification number, pre-printed sticky labels of patient's details, electronic requesting of tests, documentation of incidents, clinical audits, investigation by special agencies and accreditation by authorised intuitions (ref 10). The current NHS number was introduced in its current format in 1996 which consists of 9 digits identifying the patient and 10th digit for confirming the validity of the NHS number. However, hospitals tend to use additional CRN numbers, and radiology and pathology departments generate their own episode numbers adding further confusion and increasing the chance of transcription errors. As indicated pre-printed sticky labels, which can be stored in the hospital case notes for quick usage, are not immune from human errors when used on the wrong patient.

Current studies showed that electronic requests for laboratory tests can improve patient's safety but again are not free from mistakes [7]. Clinical audits are helpful in generating information to minimise errors by identifying the pattern of mistakes and the individuals involved [11]. There are independent specialised agencies such as the National Patient Safety Agency and Health Care Safety Investigation Branch (2) which can help in these sensitive investigations.

It is essential to address the root cause of errors by educating laboratory staff, increasing awareness, reducing risk factors, identifying fatigue due to long working hours, changing of working practice, participating in quality controls and documentation of near misses [10].

The Royal Colleges issued numerous guidelines to the clinicians for best practice in their speciality. The Royal College of Pathologists recommended contacting the clinicians for unexpected results which is nicely illustrated in cases no. 1 and 3 [12].

In case no. 4 the error was different and highlighted the importance of adhering to the laboratory rules of not dealing with two cases at the same time on grossing of specimens. Although it was human error which caused the mix up of patients the individual involved did not recall the existence of the incident. Using bare coded containers and electronic request forms can help in all steps of laboratory processing and interpretation. Luckily DNA testing is available which is useful to solve the problem in cases no. 1 and 4.

For case no. 5 there were no issues with the identification process of the patient yet the system failed to deliver the histology result to the clinician. Amongst the lessons learnt in this case is to use advances in information technology to generate an effective failsafe system to filter outstanding awaiting action. Cancer services were also asked if all histological diagnoses of malignant conditions could be flagged up electronically to the relevant clinicians, similar to the failsafe system used for radiology and blood sciences laboratory abnormal results.

None of the cases described were due to misinterpretation of the findings by the histo- pathologists which is an additional known cause for laboratory errors [11]. Carrying out peer review of difficult cases with other histopathologists, participating in multidisciplinary meetings with the clinicians and radiologists, and referral of cases for expert opinion help to minimise these errors [10 and 11]. Again, advances in IT is

transforming this practice by helping the histopathologists to engage in these activities from their office via video-link or using digital images. This process became essential during Covid 19 crisis.

## Conclusion

Despite advances in technology, there is little available evidence to remove the element of human error in patient identification. Groups such as the WHO and Connecting for Health are pioneering new electronic methods that can incorporate into common practise to aid accurate identification of the patient. Until more failsafe methods can be added without over-burdening the workload in the system, there will always remain the room for human mistakes in patient identification risking their safety. The five cases above demonstrate simple relatable errors that could easily occur even with modern technology.

## Conflicting interests

The Authors declare that there is no conflict of interest.

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## Informed consent

Cases were obtained from archives of histopathology department. Consents were not sought as patients were anonymized.

## Ethical approval

Our institution does not require ethical approval for reporting individual cases.

## Guarantor

Not applicable.

## Contributors

Dr Mustafa Rashid wrote the paper. Dr Majid Rashid provided the cases and reviewed the manuscript. Dr Ian Thompson reviewed the manuscript.

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