INDEPENDENT REVIEW OF CASES AT

LISTER SURGICENTRE

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1. Introduction

At the request of the NHS Midlands and East Medical Director, I have been asked to review the care four patients received following elective orthopaedic surgery at the Surgicentre, Lister Hospital Stevenage. The remit I have been given is to review the case records including the preoperative, operative and postoperative care, medical, nursing, surgical and anaesthetic. Three of these cases died after treatment and transfer, and one survived.

My review is conducted from my professional background as medical examiner, emergency and acute physician. I am not an expert in orthopaedic surgery, intensive care or anaesthesia and so will always defer to expert specialist opinion in these areas.

2. The perspective of the review

I am England and Wales first and probably most experienced medical examiner. I have operated in this role since March 2008 gradually increasing the scope of the Department of Health Sheffield Pilot of the new system at the heart of proposed Department of Health Death Certification Reforms. The medical examiner system was recommended by Dame Janet Smith in her review of the Shipman cases and published as part of her Inquiry. The purpose of a medical examiner's work is twofold:

- To ensure that all cases that need to be are referred to a coroner as quickly as possible, right first time every time. An appreciation of the subtlety of the law is essential in ensuring investigations are conducted in the correct cases.
- To ensure accuracy of certification of cause of death, which historically throughout the UK and the rest of the world has been notoriously inaccurate (up to 25 to 30% inaccuracy in published studies).

Since 2008 I have personal experience of reviewing nearly 9,000 cases in Sheffield. The Department of Health pilot has matured and allowed education of attending

doctors in completing medical certificates of cause of death (MCCD). I am the National Clinical Lead for e-learning for the future training of medical examiners and sit on several national committees as the reforms are being introduced.

In addition to this work since 2004, I am a full time NHS consultant in acute medicine and emergency medicine, having trained in emergency medicine, general medicine and anaesthesia. I am clinical lead for acute medicine and have formerly held posts as director of medical workforce, training programme director for acute medicine, and foundation programme director.

I believe a review of cases must be from the perspective of a pragmatic clinician in active practice who understands hospital systems in the full knowledge that perfection is not possible. Also, I respect that when establishing a cause of death or complication, and appreciating the factors contributing, there is a range of opinion. In compiling this report, I must emphasise that my findings are a matter of my opinion only (albeit informed by a deal of experience) and I fully recognise that attending clinicians and those involved in cases with intimate knowledge at the time of caring for patients may have a different point of view.

It is not the intention of this report to apportion any blame. It would be totally inappropriate to single out any one person for criticism and I have been careful that this is reflected in my report. Furthermore, it is very rare to be able to say if a death or complication could be prevented but for a different action or event. It is possible, however, to identify factors that may have influenced a patient's death or complication, making it more likely to occur when it did. In my experience, it usual to find there is a summation of several different factors rather than one single catastrophic event.

I hope this report is helpful and I would be very happy to talk through my findings at a future meeting if required.

3. Method

I have been sent a complete set of hospital medical records for four patients. The records comprise those from the Surgicentre and also the Lister Hospital, Stevenage where patients were transferred to. In the interest of keeping my report concise, I will not replicate the full factual records but instead will extract relevant information and present this as a timeline.

4. Cases

4.1 [redacted] Patient 1

[redacted] was [redacted] at the time of [redacted] elective knee surgery for osteoarthritis. [redacted] relevant past medical history included [redacted]

[redacted] 2012

Preoperative assessment conducted and identified the above past medical history and family history of ischaemic heart disease, with a note that [redacted]

Reviewed by consultant anaesthetist and plan included spinal anaesthesia and postoperative DVT prophylaxis.

Specific information regarding DVT, fasting, anaesthesia, and therapy provided and clarification with float consultant anaesthetist that preoperative LMWH not required.

Preoperative ECG taken. This was normal.

[redacted] 2012 (27 days after pre-op assessment)

07:45 admission. Observations taken: normal. Preoperative theatre checklist correctly and fully completed.

Anaesthetic assessment form completed. Additional history includes [redacted]

before. Medication of atenolol, aspirin, paracetamol, simvastatin and loratidine. ASA grade 3 recorded.

Spinal anaesthesia performed at L3/4 in standard fashion.

Two doses of intraoperative fentanyl and midazolam given initially but no further sedative or anaesthetic drugs given.

Entire cardiorespiratory normality during surgery 0900-1115.

Surgical note from SpR (assisted by consultant): standard uncomplicated left total knee replacement with tourniquet time 83 minutes. Postoperative instructions are standard.

Intraoperative theatre record of care fully completed with no identifiable concerns.

Received into recovery area with normal observations and entries of nursing care at 1115, 1140, 1150, 1200, and 1215 hours. Persistence of spinal block noted. Ropivacaine infusion in situ.

1300 hours: admitted to ward, normal observations and standard care. At 1745 hours mobilised with two and a frame to pass urine normally.

LMWH prophylaxis given at 1600 hours.

[redacted]2012 + 1 day from admission

Comprehensive nursing entries during the night. First sign of illness at 0630 hours: prior vomit, O_2 saturations 91% on air, given oxygen, abdominal distension, referred to RMO (reviewed at 0715 hours). EWS triggered at 0600.

Critical care outreach team (CCOT) referral at 0840 hours. No other symptoms but EWS still scoring at same level during the day. RMO reviews including reasonable blood tests at 0855 and 0930 hours.

Floating anaesthetist review at 1110 hours because 'CCOT unable to see patient at present as busy in the Trust'. No clinical medical entry but nurse has recorded assessment details.

CCOT review at 1300 hours because of low oxygen saturations. Review by Surgicentre anaesthetist. Plan in notes in the event of deterioration. Consultant orthopaedic surgeon review followed. CXR no major abnormality.

Anaesthetist review at 1540 hours: supplementary oxygen, positioning and physiotherapy recommended. Followed by multiple comprehensive nursing entries.

1900 hours RMO entry: O_2 saturations 95% on 2L oxygen, RR 24, Temp now 38.1 C, patient comfortable with slightly distended abdomen. Blood tests repeated. 'Escalated to medical reg: not able to see tonight due to emergencies. Will review in AM.' Verbal advice regarding antibiotic treatment given.

The failure of vital signs to improve led to a re-contacting of the CCOT and CB vomited green bile. The RMO reviewed at 22:00 hours after a nasogastric tube had been placed and an abdominal x-ray undertaken. The surgical registrar on duty was contacted and a diagnosis of paralytic ileus was made pending review. Blood tests were generally stable but CRP had risen to 220.

[redacted]2012 + 2 days from admission

The duty surgical registrar reviewed sometime around 02:00 hours and the nurse on duty as recorded the entry, along with the duty RMO (it appears the RMO had been on duty for over 24 hours by this point). A diagnosis of small-bowel obstruction/ileus was made. As far as I can see, observations were taken at one hourly intervals at least and EWS were triggering throughout but stable. A urinary catheter was inserted.

At 09:15 hours, the orthopaedic surgical consultant was informed and transfer to the Lister Hospital recommended after a surgical review. The surgical registrar was contacted again and a repeat abdominal x-ray recommended.

Arrangements were being made transfer via bed managers during the morning and the RMO (the same one as for every entry) reviewed CB at 10:00 hours. It appears [redacted] had improved somewhat and transfer appears to have been made shortly after 11:40 hours.

The next medical review was by the orthopaedic surgical SPR (untimed). An ultrasound of the left leg was performed at 16:00 hours and no DVT found.

[redacted] 2012 + 3 days from admission

I cannot see another medical entry until 08:41 hours on 21 September 2012. Consultant orthopaedic surgical ward round: patient's condition satisfactory. Evidence of observations checked, chest examination and abdomen considered.

[redacted] 2012 + 4 days from admission

The only clinical medical entry is from a core training year one orthopaedic doctor at 09:30 hours, commenting that the patient was well, had sat out of bed yesterday, oxygen needs diminishing, and [redacted] was opening [redacted] bowels, passing wind and tolerating fluids.

[redacted] 2012 + 5 days from admission

The only clinical medical entry I can find is at 23:45 hours. There are plenty of nursing entry is at various times during the patient stay but there is no reference to medical attendance besides those identified in this narrative. During this period, there were no triggers on early warning scores.

At 23:45 hours, a cardiac arrest call was put out because [redacted] had fallen and had become unresponsive. Blood pressure was low at 93/64 mmHg and patient had regained consciousness. Blood tests were performed and the case was discussed with the duty medical registrar (I presume this doctor attended but cannot see evidence until the retrospective note made at 09:00 hours by the medical registrar). A pulmonary embolus was clearly considered because LMWH at treatment dose was provided. Fluid resuscitation also was given. The orthopaedic FY1 doctor included senior review in his comprehensive plan but I cannot see a senior doctor attended before [redacted]'s cardiac arrest at 08:03 hours. Observations nevertheless improved and were conducted at regular short intervals during the night.

[redacted] 2012 + 6 days from admission

A cardiac arrest call occurred at 08:03 hours and the initial rhythm was pulseless electrical activity, followed by ventricular tachycardia and then pulseless electrical activity again from which [redacted] was not successfully resuscitated. A team decision to discontinue resuscitation attempts was taken and death confirmed at 10:30 hours. Observations were normal at 06:30 hours and the last nursing entry at 05:30 hours indicates [redacted] was restless, nauseous and had received oral morphine 10 mg along with cyclizine at 04:25 hours.

A coroner referral was faxed in written form at 11:30 hours, requesting a coroner's post mortem examination. I presume the case was taken for investigation.

Other information from medical records

On [redacted] 2011, [redacted] was referred by [redacted] GP for investigation of possible [redacted] leg DVT. There was a 10 day history of leg swelling and a raised D dimer at 900. A Wells risk score put [redacted] in the high-risk group and [redacted] was discharged after a single Doppler ultrasound scan with no clear diagnosis recorded as an alternative.

Coroner post mortem examination report

I have been provided with a short summary of the cause of death found at post mortem examination by Dr [redacted]

1a Ruptured left iliac artery aneurysm

2 Recent left knee replacement surgery

General remarks about [redacted] case

In my opinion, the preoperative, intraoperative and post-operative care provided to [redacted] at the Surgicentre was of good quality. I cannot see any omission or factor that would have influenced [redacted]'s post-operative problems. I note co-morbidities of angina and breathlessness on exertion (attributed to lifelong smoking) gave an ASA grade of 3 but I cannot see why such a patient could not undergo surgery like this at the Surgicentre. Similar cases are undertaken in the private sector elsewhere in the UK in my experience.

[redacted]'s cardiac arrest occurred several days after transfer to the main hospital and cannot in my opinion be attributed to [redacted] perioperative management. The transfer seems to have occurred in a timely way. The cause of death in this case is unexpected and co-incidental. I cannot see any prior reference to an iliac artery aneurysm and on balance cannot see how attending doctors at either the Surgicentre or Lister Hospital could have reasonably made the diagnosis. The pathologist's cause of death does not entirely chime with me because I cannot see how the recent knee replacement surgery contributed to the aneurysm rupture or the likelihood to succumb.

I realise that a treatment dose of LMWH was provided after the first cardiac arrest, when presumably the aneurysm had a contained rupture. With hindsight, this will not have helped [redacted] but on balance, I do not believe it materially contributed to the subsequent catastrophic rupture that occurred several hours later.

There are nevertheless some aspects of this case that deserve attention as possible areas of concern (if not specific to this case, then applicable to others in future, potentially).

Thromboprophylaxis in a patient with previous post-operative DVT

I am aware that there is a range of opinion on how, when, and where DVT prophylaxis is provided to patients undergoing major orthopaedic lower limb surgery. In [redacted]'s case, a decision was taken not to provide preoperative thromboprophylaxis and this may be a matter that the orthopaedic department would wish to consider for providing guidance for future cases. Furthermore, I am unclear whether [redacted]'s assessment in [redacted]2011 for possible DVT that was available to the decision-taking anaesthetist at preoperative assessment. Nevertheless, it is clear that VTE did not play a part in [redacted]'s death.

Access to Lister Hospital medical records for Surgicentre

It would be helpful to clarify if there is a policy for medical records being routinely available to Surgicentre staff at preoperative assessment. In this case, the 2011

assessment for DVT would have been conspicuous. Although a DVT was ruled out by ultrasound, many hospitals would undertake a follow-up scan at seven days to pick up false negative cases after first scan. It is possible (but unlikely) that [redacted] actually had a DVT in [redacted] 2011 despite hospital protocol being followed.

RMO cover at the Surgicentre

I am not certain of the cover arrangements for the inpatients at the Surgicentre, but the description of an RMO is familiar and commonplace in my experience in the private sector. That the same RMO made entries in the clinical records for over 48 hours at all times of day and night makes me concerned that this doctor was on an unacceptably arduous rota with little chance to rest because of his/her involvement with [redacted], who was unwell. I am not critical of this doctor's assessments or management in this case but would highlight how difficult it can be to manage patients safely when on a continuous 24-hour plus duty rota.

Access to main hospital specialty assistance

Daytime anaesthetic assistance was clearly available. I note that the Critical Care Outreach Team were unable to attend to assist when called initially (although they certainly did attend afterwards). Furthermore, I am concerned that the on-call medical registrar was unable to attend to assess [redacted] on [redacted] 2012 when called at 19:00 hours. It is remarkable that there seemed no prospect of review until the next morning.

+1 day from admission

Clinical direction for the RMO

I deduce that the first point of contact for nurses at the Surgicentre is the RMO; this is appropriate. I am not clear what the line of accountability is for the RMO, however. It is a matter of initiative for the RMO to contact a specialty doctor best placed to assist for a particular patient problem but there is a lack of clarity about what s/he does when the request for assistance is not responded to. The same applies to nursing staff caring for a patient.

In NHS settings, there is a named consultant for each patient and consultant cover out of hours (usually with a middle grade in between). This is an important safety net and provides a route of escalation when things are going wrong. This accountability and responsibility for escalating clinical problems is not obvious in this case and requires clarification. Put simply, there should be a senior doctor in charge of a Surgicentre patient to whom escalation can be made, 24 hours a day. This would avoid responsibility for the day to day management of Surgicentre patients to be solely the responsibility of the RMO, a junior doctor.

+ 6 days from admission

Night review after first 'cardiac arrest' on [redacted]2012

The fall and transient loss of consciousness was a potential herald of subsequent cardiac arrest. It is very difficult to be certain of the events, conversations, and instructions at this time. That the clinical records were maintained by the duty FY1 doctor in orthopaedics makes me wonder whether this doctor was left to manage [redacted]'s case on his/her own. This doctor has made a comprehensive assessment but an ECG appears not to have been done at this time. The last line of the plan for 'senior review' was appropriate but does not appear to have happened. The duty medical registrar has written comprehensive and detailed records in retrospect at 09:00 hours. There is a contradiction that an instruction to undertake an ECG was made in this retrospective note. Nevertheless, the decision to give a treatment dose of LMWH after discussion was appropriate and I suspect we will never know if a senior review or ECG would have made the difference at this time. The Lister Hospital may wish to consider the cover arrangements and responsibilities of attending on-call doctors, regardless of specialty, at cardiac arrest calls.

4.2 [redacted] Patient 2

At the time of surgery, [redacted] was [redacted] years of age. Despite having osteoarthritis of both knees, [redacted] had little in the way of us medical history, with minor ophthalmic complaints only. Having searched through the available records, I cannot find a preoperative assessment apart from the anaesthetic assessment conducted on [redacted] day of admission [redacted] 2012. I have, however, no reason to suspect that preoperative assessment would identify any special risk factor.

[redacted]2012

Admitted for surgery. Consultant anaesthetist and year seven specialty registrar assessment concluded ASA grade 2 and a plan for spinal anaesthesia. A standard spinal anaesthetic without complication at approximately 10:40 hours was subsequently supplemented by propofol at low-dose infusion. Gentamicin and flucloxacillin given at induction.

Standard right total knee replacement conducted by the consultant orthopaedic surgeon with tourniquet time 45 min. No complications described. Observations during analgesia satisfactory.

Post anaesthetic care records not available but patient admitted to ward at 15:40 hours. Ropivacaine intra-articular infusion and no concerns and nursing assessments at approximately 4 hourly intervals post-op. Clinical observations normal at this stage with no significant early warning score trigger.

[redacted]2012 + 1 day from admission

Nursing entries only. Gentle progress but no significant concerns raised. Observations within normal parameters and no early warning score triggers. One episode of vomiting at 15:00 hours.

[redacted]2012 + 2 days from admission

One episode of concern at low blood pressure but no early warning score trigger (correctly calculated). Otherwise progress was satisfactory with activities of daily living maintained with assistance. At 15:50 hours, a nursing entry notes that [redacted] was hallucinating. At 18:50 hours, [redacted] was finding it difficult to swallow and the RMO was informed. In keeping with all the other records I have been provided with in this case, I cannot see any clinical medical entries from the RMO on duty. It is possible these are located in other records, but I cannot find medical entries.

[redacted]2012 + 3 days from admission

There was an anticipation that discharge would be in place the next day. Arrangements for care to be in place for the evening of [redacted] 2012 were made at 10:10 hours.

The situation changed at 16:35 hours, when observations noted a fall in blood pressure. This coincided with a fall in the toilet and there is a nursing note that the RMO was informed and aware. I cannot see a medical entry at this point but a review at 18:50 hours occurred according to the nursing records. In the intervening period, hypotension persisted and early warning scores were triggering for the first time in a sustained way. The RMO intervened by commencing an intravenous infusion and the assessment included probable dehydration. The nursing notes remark that [redacted] complained of being lightheaded and was drowsy.

The critical care outreach team were informed of a trigger at three points on the early warning score at 21:00 hours. Verbal advice to involve the orthopaedic registrar on-call and diffuse more intravenous fluids was provided.

By 22:30 hours, continued triggering an early warning scores led the RMO to liaise with the medical registrar on duty and infuse more fluids. Once again, there are no clinical medical entries but the implication is that the RMO was in attendance.

[redacted] 2012 + 4 days from admission

Continued triggering of early warning score is during the night led to a further review, according to the nursing records, at 05:30 hours by the RMO. This led to the prescription of intravenous furosemide and slowing of the intravenous fluid infusion, portable chest x-ray, repeat blood tests, and medical/orthopaedic registrar review. The triggers were predominantly for low oxygen saturations (the first episode on high flow oxygen) and relative hypotension.

The nursing records indicate that at 07:00 hours [redacted] was reviewed by the medical registrar and orthopaedic registrar. The suspicion of chest infection was raised and the need to transfer to Lister hospital for further management described. The critical

care outreach team were made aware and subsequent entries describe that involvement.

The need for CPAP is first recorded at 08:30 hours and 'no machine available' is recorded. The last entry is at 10:00 hours in the Surgicentre records and describe [redacted]'s transfer to the high dependency unit at Lister hospital.

Events at Lister hospital are summarised by Dr [redacted] in a statement included in the medical records. I am not clear what the reason for this statement is. Dr [redacted] was a locum consultant in ITU/Anaesthetics. Dr [redacted] describes [redacted] arriving with low oxygen saturations, low blood pressure, and impaired renal function. Despite initial efforts to oxygenate further, [redacted] did not improve and intubation was conducted. Dr [redacted] describes 'during intubation patient vomited and then [redacted] was turned to [redacted] side promptly with minimal aspiration on suction'. Septic shock was diagnosed and active treatment with inotropes and antibiotics were commenced.

The admission details vary slightly: problems during intubation are described with regurgitation++++ recorded. Approximately 1 L of vomit whilst trying to secure the airway was present and oxygen saturations fell to 60% and required bagging to re-establish adequate oxygenation. CRP was 530.

[redacted]2012 + 5 days from admission

Despite full intensive care supportive treatment, [redacted]'s condition deteriorated and after discussion with [redacted] next of kin, [redacted], treatment was withdrawn and death was verified at 10:39 hours.

4 days after death

A referral to the coroner was made in writing on [redacted]2012. This referral took the form of a request to release medical certificate of cause of death with a backup Form 100A. The case was discussed with a coroner's officer and cause of death medically certified as:

- 1a bronchopneumonia
- 2 total knee replacement, acute kidney injury

General remarks about [redacted] case

[redacted] was an elderly [redacted] who enjoyed good health prior to [redacted] elective surgery. Although preoperative assessment details are not fully available to me, I have no reason to suspect that [redacted] was not suitable for surgery, or in the way that it was conducted. I cannot see any evidence that intra operative or anaesthetic practice influenced [redacted] subsequent complications.

The quality and standard of nursing records and observations are satisfactory. The first indication that [redacted] was becoming unwell was that 16:35 hours on [redacted] 2012. + 3 days from admission With hindsight, this represented the first indication that respiratory sepsis was developing but early warning scores were not sufficiently concerning to warrant immediate escalation to critical care at that stage.

By the time the decision to transfer was taken, I have no concerns regarding the timeliness that this occurred. Severe respiratory sepsis is a definite and recognised complication of major joint surgery, especially in the elderly.

Matters for further consideration are given below:

Response and escalation to early warning score triggers

I believe nursing staff escalated early warning score triggering to the RMO. This is appropriate. I am less clear about what actions followed, and it appears that the duty RMO was satisfied with discussion with medical registrar colleagues. The lack of clinical medical entries makes further comment difficult, which on its own reflect concern that the attendance by the RMO did not prompt clinical medical entries. By the time medical and orthopaedic registrar involvement directly was established, significant hypotension and sepsis (without antibiotic treatment) was already at least 12 hours established. There is evidence that telephone advice was sought and accepted rather than senior medical or surgical review out of hours. This acceptance appears to be on the part of both nursing staff and RMO. There is a wide differential diagnosis when a patient deteriorates postoperatively and attempts to make a

diagnosis were at a basic level. A persistent deterioration should be escalated to senior doctors responsible for the patient and not left to the RMO to manage on his/her own. The line of accountability for the RMO 24 hours a day requires clarification; at the very least this would provide him/her with the reassurance of senior support being available.

Recognition of significant sepsis

Early recognition of severe sepsis is well recognised as a very important step in avoiding mortality. Education and recognition of the likelihood is unclear in this case. Whilst this raises a concern, this is by no means unique to this case or this hospital. Opinion will be divided on whether earlier recognition and treatment would have inevitably prevented [redacted]'s further deterioration and death. My personal view is that severe sepsis is poorly tolerated in any elderly patient irrespective of their apparent lack of comorbidities and that on balance, it would be very difficult to show a chain of causation that would show earlier diagnosis and treatment would have prevented or delayed death.

Complications during intubation

It appears that there were significant respiratory complications at intubation. The clinical records describe appropriate action being taken but there is evidence that significant hypoxaemia occurred. On balance, I do not believe this played a material part in [redacted]'s death but consideration to circumstances of semi-elective intubation may be required.

Coroner referral

There are several aspects of this that surprise me. I am aware that written referrals to the coroner are used in several jurisdictions but this is the first occasion I have come across where the referring doctor indicates his/her preference for coroner decision. I agree the cause of death is known in this case (to the best of the attending doctor's knowledge and belief) but would have expected the Coroner to take view on whether or not a Form 100A is correct. There will be a view amongst some coroners that bronchopneumonia is a natural condition that can occur at any

time (as implied by the proposed cause of death). Others would take the view that [redacted] would not have died when [redacted] did but for the elective surgery for a non-life-threatening condition and then take the case for further investigation and/or inquest. In any case, the cause of death is poorly formulated and in my view, a more accurate medical cause of death would be:

- 1a multi-organ failure
- 1b bronchopneumonia
- 1c osteoarthritis of the right knee (operated)

4.3 [redacted] Patient 3

[redacted] is a [redacted]-year-old [redacted] only in [redacted] past medical history. [redacted] had osteoarthritis in [redacted] right knee for which [redacted] was admitted for surgery in [redacted] 2012. Preoperative assessment identified no significant risk factors and [redacted] had normal blood tests. Specifically, there was no history of prior limb ischaemia or predisposition to this.

[redacted] 2012 (1 day later)

The anaesthetic chart records the date as [redacted] 2012. I presume this is an error. ASA grade was assessed as 1. Spinal anaesthesia was undertaken without complication.

Surgery was performed by a specialist registrar in orthopaedics, assisted by an associate specialist. Tourniquet time was 98 min and the pressure is not recorded. Anaesthesia and surgery appears to have gone without incident with very normal observations throughout.

Post-operative recovery occurred between 17:50 hours and 19:20 hours and observations were normal. A Ropivacaine intra-articular infusion was used post-operatively.

There are many regular nursing records and matters appeared to be steady until 22:20 hours when significant pain despite stronger analgesia was noted. Persistence of numbness at 22:20 hours in the lower leg is recorded.

The nursing records describe persistence of numbness throughout the night.

[redacted] 2012 + 1 day from admission

By 10:10 hours, numbness still persistent. At 12:25 hours, the nursing records include: 'RMO asked to review right foot is still remains numb and cold, capillary refill is stable. RMO not too concerned: states Mr X's team should be around later...'

13:00 hours: RMO entry: 'asked to review patient due to numbness in operated foot. On examination no sensation or movement from right mid calf down; capillary refill good knee bending good, slight improvement since last night... X-ray mane (Doppler scan)

14:40 hours: 'asked RMO if patient should be referred to anaesthetist Re: block to foot, RMO states no not yet. States [redacted] will ring Mr X's registrar if has not come to the ward by one hours time.'

15:20 hours: 'seen by physio, states they can see a slight improvement in foot from this morning, however expressed concerns to RMO again, states [redacted] is contacting Mr X's registrar now.

16:00 hours RMO entry: 'patient haemodynamically stable. No improvement in sensation or movement in right foot. Mr X not available on mobile: left message. (Also for Mr Y *specialist registrar surgeon*). Patient reviewed by floating anaesthetist. Ropivacaine pump finished.'

16:05 hours: anaesthetist entry: 'asked to review as concerns re numb right foot. Otherwise stable. Apyrexial. Tested with ethyl chloride: cold approximately midcalf

level. Unable to dorsiflex foot 0/5. Minimal movement with plantar flexion 1/5. Knee flexion 4/5... Impression: slowly resolving block...'

17:30 hours nursing entry: 'RMO has tried Mr X and registrar several times and left messages. RMO states [redacted] will now contact on-call for an orthopaedic review. RMO states anaesthetist has referred for another anaesthetic review this evening.

18:10 hours RMO entry: 'tried to contact on-call orthopaedic team. On-call orthopaedic registrar not available on mobile. On-call orthopaedic SHO not answering the bleep.'

18:20 hours RMO entry: 'orthopaedic registrar contacted: will review patient at 9 PM.'

18:30 hours core trainee year one anaesthetic doctor entry: '... Right foot and shin down cool. Capillary refill three seconds (foot white after removal of sock) posterior tibial artery palpable, dorsalis pedis not palpable... Impression improving spinal block.'

21:30 hours: orthopaedic registrar (same registrar that undertook surgery): '... Sensations improved in the right leg but still no sensations in foot. No dorsiflexion of right foot but 1/5 plantar flexion. Capillary refill three second. Right foot is pink. Slightly cold than left. Right popliteal artery palpable Doppler ✓, right dorsalis pedis artery not palpable Doppler no, right posterior tibial artery weakly palpable Doppler tick. Discussed with surgical registrar on-call. [redacted] advised that it's not acute ischaemia. To start heparin infusion to prevent ? thrombus. Also advised to get duplex scan in the morning and call surgical team.'

[redacted] 2012 + 2 days from admission

Subsequent entries by nursing staff are very clear and extensive. These describe a subsequent surgical review at 00:30 hours.

Surgical registrar review notes the right leg had felt cold and pale during the day and symptoms and signs attributed to the effect of regional block and also dressing. The surgical registrar concluded the diagnosis was likely to be compartment syndrome and referred onward to the (different) orthopaedic registrar on-call. Diastolic blood pressure at this time ranged between 60 and 75 mmHg.

01:30 hours: orthopaedic registrar on duty: '... I contacted [consultant] who given the clinical picture and findings [redacted] suggested to go ahead with the compartment decompression.'

Transfer to Lister hospital operating theatre followed and surgery was undertaken at 03:15 hours. Fasciotomies were performed, good colour of muscles noted, no contraction of muscles and compartment pressures were noted as: posterior compartment 33, anterior/lateral 36 with BP 140/66 mm Hg.

Failure of the situation to improve lead to vascular surgical involvement and a return to the operating theatre at 16:30 hours. The diagnosis of a critically ischaemic right leg had been made and an attempted emergency femoral embolectomy, angioplasty, and then subsequent femoral popliteal bypass graft were performed. The anatomical diagram of the state of [redacted]s right leg demonstrates extensive wounds and scarring as a result of [redacted] surgeries.

Medical records cease shortly afterwards because treatment was ongoing.

General remarks about [redacted] case

I cannot see any evidence that post-operative complications could have been predicted in this patient's case. The development of post operative critical ischaemia was unheralded. I am not critical of the frequency or conduct of the nursing observations and interventions. Some of the nursing entries are of very high quality.

There are some aspects of this case that deserve further consideration and I raise these from my non-expert perspective. I would always defer to expert vascular surgeon or orthopaedic surgeon opinion but would highlight the following:

Tourniquet time

At 98 min this is longer than many but within most authorities' acceptable limit. That the pressure was not recorded in the records is a concern. Surgery was conducted by a registrar with associate specialist assistance. The surgery appears to have been conducted in a standard way. With hindsight, it is likely that acute arterial insufficiency developed at this time and as a recognised but rare complication went unnoticed.

Diagnosis of arterial insufficiency

There seems little doubt that the diagnosis of acute arterial insufficiency was delayed in this case. The first symptoms and signs appeared to be noticeable at 22:20 hours on [redacted] 2012 but were not formally diagnosed until the afternoon of [redacted] 2012, despite multiple anaesthetic, RMO, orthopaedic surgical, and general surgical registrar reviews. I am surprised that a consultant review did not occur prior to fasciotomies being conducted in the middle of the night. I am also surprised that the presence of a cold numb and apparently poorly perfused foot did not register to prompt consideration of acute arterial insufficiency as a possible diagnosis. I am equally surprised that the symptoms were attributed to the persistence of the spinal block.

Access to senior surgical reviews

The entries in the medical records describe many failed attempts by the RMO to contact surgeons conducting the initial operation, and subsequently the on-call orthopaedic team. It is a matter of concern that assistance from senior doctors, especially those conducting the surgery was not available until several hours after initial contact for review was made.

This once again highlights my concern about escalation arrangements for the nursing staff and RMO at the Surgicentre. If a response is not forthcoming or is inadequate, then the matter should be escalated ultimately to the consultant responsible for the patient and there should be a clear policy describing who this is and how it is to be done.

4.4 [redacted] Patient 4

[redacted] was [redacted] years of age at the time of surgery. [redacted] had hypertension on treatment, hypothyroidism, and osteoporosis. Otherwise, as far as I can tell, [redacted] had little in the way of significant medical problems. I cannot find a formal preoperative assessment besides the anaesthetic assessment conducted on the day of surgery, but I have no reason to believe there are any significant omissions.

[redacted]2012

Anaesthetic assessment by associate specialist: comprehensively completed with ASA grade 2 ascribed. Blood tests included: low haemoglobin 9.7 (unexplained) and low-sodium at 127 (again unexplained). A standard spinal anaesthetic was conducted at 11:10 hours without complication.

Surgery was conducted by an associate specialist in orthopaedic surgery. A left cemented Stanmore total hip replacement was inserted without any complications. As far as I can tell, the surgery was uneventful with no significant intraoperative change in physiological parameters.

Post-operatively [redacted] was admitted to the post anaesthetic care unit and observations were within normal limits until [redacted] return to ward at 14:30 hours. A significant change occurred at 16:30 hours with a substantial fall in blood pressure to 93/46 mmHg.

At 17:05 hours, the first entry describes: 'patient is unconscious and gasping. BP monitor shows BP 45/25 mmHg. Crash call has been activated at 1705.' Resuscitation with intravenous fluid and laying on bed led to a full and immediate recovery. As far

as I can tell, the cardiac arrest team arrived promptly and with a full complement. The medical registrar concluded that the cause of the collapse was 'likely vasovagal'.

The RMO has made entries at 17:40 hours and at 19:00 hours describing physiological stability and a post-operative haemoglobin 8.2 g/dL. It is noteworthy that all of the RMO entries are made by the same doctor with handwriting that is consistent. This doctor's shifts last for at least until 21:00 hours under consecutive from 10 April 2012 right up until [redacted]'s transfer to Lister hospital on 15 April 2012.

[redacted] 2012 + 1 day from admission

Observations remained normal but repeat haemoglobin showed a further fall to 6.7 g/dL. A three unit a blood transfusion was provided. The associate specialist surgeon attended and reviewed at 15:00 hours.

At 20:00 hours a temperature spike occurred at 38.9° C. Blood transfusion was stopped and the protocol followed.

At just after midnight, BP was noted to be low and the RMO was made aware. This had improved by morning.

[redacted] 2012 + 2 days from admission

In the nursing records, there is a first entry at 18:30 hours that describes slight stomach pains associated with passing a very small hard stool. Lactulose was offered but declined.

Further stomach pains at 20:10 hours are noted but not again until [redacted] 2012. following day

[redacted] 2012 + 3 days from admission

At 09:20 hours, there is a note that abdominal pain due to bowels not open for a few days was more prominent. Observations remained stable.

[redacted] 2012 + 4 days from admission

Grumbling pain continued but did not restrict mobilisation to the toilet with a Zimmer frame. The RMO made a summary at 21:00 hours describing [redacted]'s fall in haemoglobin once again to 7.9 g/dL and rising CRP, with the latest being 334 mg/L. The following is recorded: 'on this week patient was constipated but following laxatives, suppositories and enema [redacted] managed to open bowels: brown watery and hard faeces. No macroscopic blood visible on stool. Surgical wise: no surgical bleeding bruise at backside of thigh... Patient's medical story has been referred to on-call medical team tonight at patient accessed team handover. Medical advice: rectal digital examination, faecal cult blood test? If haemoglobin will drop again then gastroscopy required.'

[redacted] 2012 + 5 days from admission

The first significant further temperature spike occurred 08:30 hours with temperature 38.0°C. A digital rectal examination was conducted. This seems to be clear.

The records are very clear that at 10:40 hours, sudden abdominal pain in the lower quadrants developed. This occurred when [redacted] was trying to open [redacted] bowels. Tenderness is described diagrammatically by the same RMO. This doctor has made copious and comprehensive notes. The tenderness is sufficient, in my opinion, to be suspicious of peritonitis.

The RMO contacted the on-call surgical registrar who gave verbal advice for a rectal examination, repeat blood tests, abdominal x-ray, and to re-contact when the investigation results were available.

The RMO contacted the duty surgical registrar again at 14:45 hours and the records indicate the RMO impressed the clinical signs of peritonitis.

At 15:15 hours, the duty surgical registrar assessed [redacted] and concluded the diagnosis as either diverticulitis or an early perforation. A CT abdomen was recommended.

By 18:30 hours the RMO makes an entry that describes the CT scan showing a perforation. Transfer to Lister Hospital was recommended.

The different surgical registrar on-call made an entry at 21:55 hours describing diffuse peritonitis and the need for laparotomy. The duty surgical consultant and anaesthetist were informed. Nursing records are complete and observations are appropriately charted. Early warning score triggers occurred during the afternoon [redacted] 2012. There is a clear surgical entry that describes the high risk of surgery to correct the situation.

5 days after admission

There are subsequent comprehensive clinical entry is describing [redacted]'s reluctance to undergo surgery. In my view, there is sufficient consideration given to mental capacity and revisiting the decision that [redacted] took with [redacted] and [redacted] family on several occasions and subsequent days.

Progress

Against the odds, [redacted] rallied and improved to the point where discharge planning was considered by [redacted] 2012. Conservative treatment had therefore been successful.

15 days after admission

Rehabilitation and complex social care needs were being considered when a further acute deterioration occurred on [redacted] 2012. It appears this was an abrupt change compatible with an acute stroke. The attending consultant (medical) referred [redacted] for palliative care and the Liverpool Care Pathway was completed. The Liverpool Care Pathway records are not in the bundle of notes I have been provided with. It appears from the clinical entry is in the other medical records that [redacted] rallied a little again and the diagnosis of stroke was presumably challenged. Death was verified on [redacted] 2012.

30 days after admission

38 days after admission

From the original notification of death to the GP, I deduce that the initial Medical Certificate of Cause of Death was rejected by the Register Office because of the content and this required subsequent notification to the Coroner for a back up Form 100A. The cause of death was given as:

1a Faecal peritonitis

1b Bowel perforation (inoperable)

2 Ruptured neck of femur (operated on [redacted] 2012), hypertension, ischaemic heart disease

General remarks about [redacted] case

The development of post-operative peritonitis secondary to a sigmoid perforation in [redacted]'s case could not have been foreseen. Whilst surgery, dehydration, and opiate medication may have contributed to constipation, I cannot see any definite link to surgery in this case. The standard of anaesthesia, surgery, and post-operative care is generally of high quality.

I do not think there was a significant delay in diagnosis, with a definite index event of perforation in the morning of [redacted] 2012. The response and subsequent detention by the duty on-call surgical registrar is certainly within my experience of normal limits.

My concerns in this case are limited to three matters:

RMO duty rota

Until [redacted] 2012, the only medical doctor making clinical entry is was the same RMO, morning, afternoon, and evening. That this continued for five consecutive days is a concern. I have no reason to suspect the attending RMO made any error of judgement, but I believe the intensity of this rota deserves consideration.

Senior surgical review in Surgicentre

I do not believe it made any material difference in this case, but I am struck that the only doctor to have attended [redacted] was really only the RMO. The operating surgeon visited once on the first day post op but no other parent surgical senior doctor reviewed [redacted]. Once again, hierarchical arrangements for the RMO and nursing staff are not clear.

Preoperative investigation abnormalities and suitability for surgery

There is no evidence that the preoperative anaemia or hyponatraemia influenced postoperative events but it is remarkable that these definite abnormalities appear to be overlooked or not considered significant. I would not normally expect a patient to undergo elective surgery for a non life or limb threatening problem without documented investigation or explanation of a sodium of 127 and/or haemoglobin of 9.7. Taken together with [redacted]'s great age, I question the wisdom of undertaking [redacted] surgery at the Surgicentre.

Certification of medical cause of death

The medical cause of death proposed initially and written on a certificate contains errors and inaccuracies. These led to, as far as I can tell, the medical certificate being rejected at the Register Office, and a delay in registration for [redacted]'s bereaved family. Getting this right after death is an important matter that has often been overlooked, with task delegated to the most junior medical member of the team and is precisely why the medical examiner system is being introduced. This problem is not confined to Lister Hospital, of course.

The errors and inaccuracies are as follows:

- The bowel perforation deserves clarification
- The addition of the word inoperable adds little and is inaccurate (surgery was offered but declined)
- The total hip replacement was for osteoarthritis
- 'Ruptured neck of femur' makes no sense: a fracture, when it occurs is more appropriate
- There was no evidence of ischaemic heart disease
- I cannot see a contribution from hypertension

In my opinion, there was no need for coroner referral in this case and although I have not seen the final details of the Liverpool Care Pathway, I would recommend the medical causes of death being recorded as follows:

1a Septicaemia

1b Peritonitis

1c Stercoral perforation of the sigmoid colon

5 Summary of cases and findings

Each of these cases raises concerns in different ways. Nevertheless, from the records I have been presented with, I have confidence in the initial assessment prior to surgery, conduct of surgery, anaesthesia and post-operative care from the nursing perspective in all cases.

It is easy to find fault through a detailed review of cases like this. Every case, in every hospital would have some aspect of concern and the important matter is to determine if there are significant and especially recurrent problems. There is a great deal of learning from reviewing cases like this and I recommend harnessing the real-time value of learning from the future medical examiner system: these cases will automatically receive similar attention.

Overall, I do not believe the care these patients received is substantially different to that provided to many, many patients in the UK in similar circumstances but there are a few common themes that should be considered when assessing safety of surgery and inter-hospital interaction. I would divide the points for consideration as follows:

Surgicentre considerations

- Clinical direction for the RMO and escalation procedures
- RMO duty rotas and their safety

- Access to senior surgical, medical, and critical care reviews (including parent team)
- Education of medical (and to a lesser extent nursing) staff to post-operative complications of significant sepsis and acute arterial insufficiency
- Access to Lister hospital medical records for all surgical cases
- Protocol for thromboprophylaxis for patients with a previous DVT following major joint surgery
- Preoperative investigation abnormalities and decision to proceed with elective surgery

Lister hospital considerations

- Access to senior surgical, medical, and critical care reviews
- Education of medical staff to post-operative complications of acute arterial insufficiency
- Access to consultant surgeon review if compartment syndrome surgery is considered
- Cover arrangements and responsibilities of attending on-call doctors, regardless of specialty, at cardiac arrest calls
- Coroner referral system ('leading the witness') and formulation of medical cause of death

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30 November 2012