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1. Names of all article authors and their positions/institutions in order of the importance of their contribution.
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Manuscripts format

- Title
- Abstract
- Introduction
- Methods
- Results
- Discussions
- Conclusion
- References

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Editorial

We mark a milestone of serial professional accomplishments as we steer into the year 2018 with the inaugural edition of The Kenya Journal of Anaesthesiology and Critical Care Medicine (KJACCM), the scientific publication of the Kenya Society of Anaesthesiologists (KSA).

The primary belief in safe anaesthetic practice, increasing the capacity of qualified and dedicated anaesthesia providers, training and countrywide access facilitation of safe and quality anaesthetics was the foundation of the KSA in 1993 and subsequent registration a year later. The few foreign trained physician anaesthesiologists who pioneered the practice and subsequent delivery of service to the Kenyan people have facilitated immense development and progress in anaesthesia and as such advancement both in surgical fields and allied medical practice.

The wealth of knowledge and experience garnered over this time has rarely been documented and /or published, beyond the regular clinical meetings and local conferences to which only a limited audience has access. Thus more often than not, it is assumed that not much research, audit or even innovative clinical interventions occur in our setting. Indeed, the mantra of "publish or perish" is pretty evident in the fact that many interventions - well intentioned but not beneficial and neither scientifically sound nor safe - are externally prescribed and initiated in this part of the world based on biased or inaccurate reporting simply because we rarely write and report our experiences.

Certainly, the dearth of local published works in both anaesthesia and critical care in our region translate to a lack of data that would ideally serve as a basis for coherent policy decisions in training projections, resource allocation, rational hiring and deployment of personnel as well as identifying new training sites with relevant skill mix for the changing face of the disease demographics.

This journal aims to give a platform for publication of previously undocumented and archived research material, clinical case reports, review articles as well as editorials in matters pertinent to both anaesthesia and critical care. It is intentioned that publications accord relevant academic circles sound scientific and progressive impact given the expanded scope of both medical training and subspecialty access in the region.

Great strides in provision of quality healthcare have been made though disparities still exist between super-specialized and highly equipped centers in comparison to marginal areas that have equipment and personnel challenges yet face significant surgical and medical workload with demand of anaesthesia and critical care attention.

The inaugural Kenya Journal of Anaesthesiology and Critical Care Medicine (KJACCM) edition highlights two case reports of successful interventions in some of these emergent settings.

Regular audit of the perioperative setting is a sure way of continually improving safety and efficiency in service delivery setting, especially so in Anaesthesiology. In a bid to improve post anaesthetic care, an evaluation of Post Operative Care Units (PACU) was conducted across public sector hospitals in Kenya. The significant findings, recommendations and bench marking are presented in this edition of the Kenya Journal of Anaesthesiology and Critical Care Medicine (KJACCM).

Fundamental analgesic use is of critical benefit in patient care. A review of paediatric application of opioid use in systematic and practical ways is included in this journal as the final article capping the inaugural edition.

A Case Presentation Of Pericardiocentesis For Massive Pericardial Effusion In A Low Resource Constraint Setting In Nakuru, Kenya

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Declaration

We the authors declare there was no funding, interests or conflict of interests when reporting this case summary.

Abstract

Cardiac tamponade with hemodynamic collapse is an absolute indication for emergency pericardial drainage via pericardiocentesis or surgical pericardiotomy. Pericardial effusion has been recognized as a potential cause of death for centuries.

The scoring index to determine whether to perform pericardioncentesis on a patient is based on three components: effusion size, hemodynamics and etiology. A score of 4 and above should have pericardiocentesis performed [7,8].

In 2015, update from the European Society of Cardiology (ESC) on management of pericardial disease, pericardiocentesis, guided by fluoroscopy of echocardiography, is the gold standard for pericardial drainage and biopsy.

Critically ill patients should be monitored continuously with both pulse oximetry and cardiac tracings, before, during and after pericardiocentesis [11,13].

Complications depend mainly on experience of the clinician, support team and the facility settings and include injuries to the pleura, liver, or stomach, irritation to the diaphragm and phrenic nerve resulting in bradycardia and shock due to vasovagal.

With focused assessment sonography in trauma (fast) and high dependency and intensive care units becoming common in most referral hospitals, early diagnosis and safe pericardiocentesis can safely be performed in emergency situations with limited resources.

Introduction

Pericardial effusion usually develops from pericardial disease, including pericarditis,several systemic disorders such as malignancies, tuberculosis, chronic renal failure, thyroid diseases, and autoimmune diseases among others. Transthoracic echocardiography is the most important tool for diagnosis, grading, guiding pericardiocentesis as well as follow up of pericardial effusion [1] Cardiac tamponade with hemodynamic collapse is an absolute indication for emergency pericardial drainage via pericardiocentesis or surgical pericardiotomy.

Case Presentation

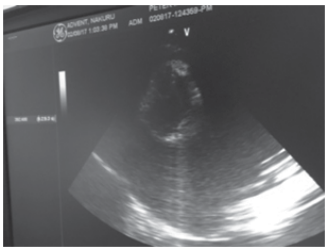
In this case presentation, we present patient P.M.N, a 19 year old young man who presented to our facility with light headedness, palpitations, cough, shortness of breath and chest pain and that progressively worsened over the last two weeks.

On physical examination, the positive findings were tachypnea of 22 breaths per minute, distended external jugular veins, pulsus paradoxicus, muffled heart sounds, dull percussion note left hemithorax.

Figure 1. Distended jugular vein

Transthoracic echocardiography revealed a black echo free space surrounding and constricting the heart as shown in the diagram below. Note the small constricted heart and fluid separating it from the pericardium below.

Figure 2. Echo free space around the heart



The patient was transferred to the high dependency unit (HDU) and attached to the monitor for blood pressure, electrocardiogram, pulse oximetry and temperature monitoring. Due to dyspnea and tachypnea, he was put on oxygen by rebreather mask at a flow of 3 liters per minute. His vitals taken were blood pressure 114/75 mmhg, pulse rate 98 beats per minute, respiratory rate of 22 breaths per minute, saturations on oxygen 3 litres per minute were 98%.

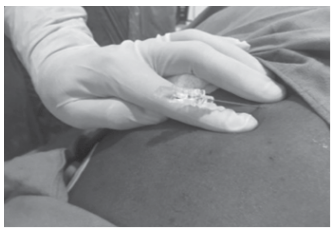
While lying supine, the patient was cleaned, draped and local anesthesia infiltrated around the subxyphoid area as shown below.

Figure 3. Draping and local anesthesia infiltration

Guided by ultrasonography, a puncture needle from the 8cm long pediatric central venous catheter kit attached to a 5cc syringe was advanced from the subxyphoid region towards the left shoulder. Advancing of needle ceased as soon backflow of a yellow coloured fluid was noted.

Figure 4. Needle advancement with aspiration

Figure 5. Back flow of yellow purulent pericardial fluid



Insertion of a guide wire was performed under ultrasound guidance and the lumen dilated after needle removal. A pediatric 8cm central venous catheter was then threaded through the guidewire and secured in place.

Figure 6. Dilating the lumen

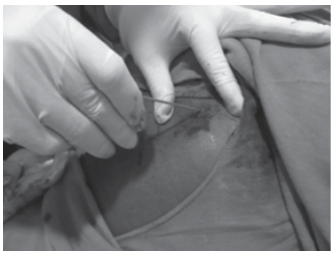


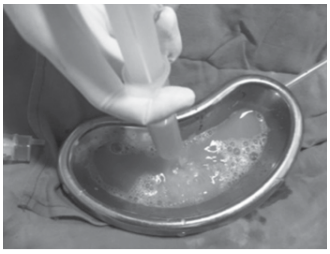
Figure 7. Threading the central venous catheter

Figure 8. aspirating pericardial fluid from secured central venous catheter

We drained over 1 litre of purulent yellow non foul smelling pericardial fluid. The echocardiograph findings after draining the pericardial fluid revealed reduction of the nonechogenic space (fluid) around the heart as shown below.

Figure 9. Echocardiogram after drainage. Note the reduced non echogenic space, expansion of the heart and the movement of the pericardium closer to the heart.

Figure 10. Purulent pericardial fluid



A specimen of the pericardial fluid was collected aseptically for biochemistry, microscopy and culture. Testing for acid fast bacilli was requested to rule out tuberculosis. The central venous catheter was attached to a vacuum drain and left for 24 hours before removal. The patient was covered with cefuroxime 1.5 grams for prophylaxis against infection.

Discussion

Pericardial effusion has been recognized as a potential cause of death for centuries. In 1653 for instance Riolanus suggested sternal trephination to release pericardial fluid and the Spanish physician Romero described intercostal surgical drainage in the early 19th century [2]. The first successful blind pericardial aspiration was performed by Viennese thoracic surgeon Franz Schuh in 1840 via a left parasternal approach [3]. Later in 1911, Marfan described the subxyphoid approach and despite safety concerns, this remained the standard approach for blind pericardiocentesis through the late 20th century [4]. Since 1970s echocardiography-directed pericardiocentesis has evolved as the procedure of choice due to its improved safety and efficacy however, blind subcostal or parasternal pericardiocentesis still remains a standard procedure for emergency pericardial drainage in resource constraint settings where ultrasound guidance may not be available[5].

In the 2015 update from the European Society of Cardiology (ESC) on the management of pericardial disease, pericardiocentesis, guided by fluoroscopy or echocardiography, is the gold standard for pericardial drainage and biopsy.

Recently, Halpernet al [6] suggested a "pericardial effusion scoring index" for deciding whether to perform pericardiocentesis. The scoring index consistsof 3 components obtained at initial presentation; effusion size onecho, echocardiographic assessment of hemodynamics, and etiologyof effusion. According to the authors, percutaneous pericardiocentesis could be performed when the score was 4 or above ideally by way of echocardiography guidance [7,8].

Echocardiography-guided pericardiocentesis can be performed inthe following sequences described below. This however may not apply universally and there may be modifications depending on setting of the facility where the procedure is being done. In an ideal set up this procedure should be performed in a cardiac catheterization laboratory (Cath lab). In our case, the procedure was performed in a high dependency unit (HDU) setting in a Nursing home, an equivalent of level 4 hospital.

1. Check clinical indications and medical history, such as taking anti-platelet or anti-coagulation drugs, and get a consent form.
2. Positioning and echocardiographic imaging. (In our case a GE Vivid E echocardiography machine with 3S-RS transducer for imaging).
    a. Position the patient in the semi-fowler position in bed.
    b. Perform 2D echocardiographic imaging at the apical view to gain insight into the effusion)
3. Determination of puncture site
    a. Choose sites with the biggest echo-free space for safe needleentry, and mark it using a pen or nail tip. (The subxyphoid area was used in our procedure).
    b. Image and determine the 3-dimensional direction of needle entry.
4. Preparation of puncture site
    a. Prepare all requisite tools for the paracentesis on the table and perform the sterile skin preparation.
    b. Cover the patient with a surgical drape and it may be necessary to cover the patient's eyes with eye patch to reduce tension and anxiety
    c. Infiltrate sufficient local anesthesia at the puncture site
5. Pericardiocentesis
    a. Perform a preliminary exploration with the local anesthetic needle (21 gauge) to confirm the direction of the needle approach and to feel the nature of the effusion.
    b. Attach a syringe to the puncture needle
    c. Gently insert and advance the puncture needle from the skin of the puncture site toward the heart in the breath holding state. The puncture needle must maintain the direction that was determined during the preliminary exploratory test.
    d. Feel the "pop" moment at the puncture and observe negatively drained fluid in the syringe.
    e. Stop the advancing puncture needle and hold the needle with your fingers to prevent further advancement. Insert a smoothtip guidewire through a back-hole in the syringe, sufficiently into the pericardial space.
    f. Remove the puncture syringe with the needle keeping the guidewire in the pericardial space.
    g. After dilatation of the pathway insert a double lumen indwelling catheter over the guidewire into the pericardial space (In our case, a pediatric central line catheter was deployed since we lacked an ideal catheter such as the 'pigtail' catheter).
    h. Remove the guidewire with the remaining indwelling catheter in the pericardial space.
    i. Confirm the success of the procedure by manual drainage with a syringe or a saline bubble test with echocardiography. The patient's reduced or relieved symptoms soon after the drainage even if it's a small amount, would be additional evidence of success.
    j. Suture the catheter on the skin and continue to drain the effusion into a bottle as way of catheter maintenance, a stopcock should be attached to the end of the catheter to allow for easier cleansing of the catheter to prevent clot formation. To maintain patency, the catheter can be left closed and filled with urokinase for most of the time that it remains in place. Every few hours, the urokinase is removed and the catheter is allowed to drain for one hour and is then refilled with urokinase and closed. We did not have urokinase and in our situation heparin was used for this purpose.

There are 3 approaches to needle entry during pericardiocentesis; left parasternal, subxyphoid, and left apical. In this particular case the subxyphoid approach was employed to perform the pericardiocentesis following a much as possible the protocol described above but with a few improvisations due to resource constraints.The puncture needle during the subxyphoid approachis inserted at an angle between the xiphisternum and leftcostal margin, towards the left shoulder at a 15 to 30 degree angleto the skin.[9]. This approach is usually recommendedeven when echocardiography is not available albeit with ECG monitoring and particularly in emergent situations and therefore it was the most favorable approach in our setting. We had to perform the procedure in our patient as a matter of urgency since he had features of impending cardiac tamponade on 2D echocardiography as evidenced by partial collapse of the RV wall in diastole.

Following the initial pericardiocentesis, the patient should be observed in a unit equipped to monitor the electrocardiogram, the patency of the pericardial catheter, and the rate of drainage into a sealed container under slight negative pressure. In most cases, pericardiocentesis does not completely evacuate the effusion, and active secretion of fluid or bleeding may result in reaccumulation of an effusion. For these reasons, the pericardial catheter should be left in place for 24 to 48

hours or until the volume of drainage is less than 25 mL/day. We managed to keep our patient in the HDU for 24 hours and during the entire period a total of 1.2L of pericardial fluid was drained. It's important to note that instantaneous drainage of large amounts of pericardial fluid (>1000mls) may lead to acute right ventricular dilatation, although this is a rare complication[10].

All critically ill patients should be monitored continuously with both pulse oximetry and cardiac tracings, before, during and after pericardiocentesis. Necessary interventions may range from supplemental oxygen to intubation and mechanical ventilation. It is important to beware that a sudden decrease in preload, as occurs with rapid sequence intubation and positive-pressure ventilation, can cause acute decompensation, including cardiac arrest, in patients with tamponade [11,13].

Various complications have been reported following this procedure which depends mainly on experience of the clinician, support team and the facility setting. Complications that may arise when using the subxyphoid approach, include injuries to the pleura, liver, or stomach, irritation to the diaphragm andphrenic nerve resulting in bradycardia and shock due to vasovagal response as well as procedure-related mortality have been reported with this approach. We did not however experience any immediate complication in our patient as much as we had to grapple with various constraints in the facility that we operated in. Other major complications of percutaneous pericardiocentesis include laceration of theheart and coronary arteries, hemothorax and pneumothorax, ventricular tachyarrhythmia,intercostal vessel injury requiring surgical intervention and Bacteremia.

Aortic dissection is a major contraindication of pericardiocentesis. Relative contraindications includeuncorrected coagulopathy, anticoagulant therapy, and thrombocytopenia <50000/mm3, and small, posterior, and loculated effusions. Surgical drainage, rather than percutaneous pericardiocentesis,is preferred in the following situations: traumatic hemopericardium, purulent pericarditis, recurrent malignant effusion, loculated effusion in the posterior side of the heart, as well as the need for pericardial biopsy [13-15].

Conclusion

With focused assessment sonography in trauma (fast) and high dependency and intensive care units becoming common in most referral hospitals, early diagnosis and safe pericardiocentesis can safely be performed in emergency situations with limited resources

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Anaesthetic Management of a Patient with Polymyositis for Caesarean Section: A Case Report

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Abstract

Polymyositis is a rare, chronic inflammatory myopathy of unknown aetiology. Very little has been published that describes anaesthesia for pregnant patients with this condition. We describe a case of a partiurient who presentedfor an urgent Caesarean section. General anaesthesia was administered without any untoward effects.

Background

Polymyositis is a rare,chronic inflammatory myopathyof unknown aetiology. The condition is characterised by symmetrical proximal muscle weakness and may be complicated by respiratory muscle weakness, interstitial lung disease, pneumonia, myocarditis and cardiomyopathy.[1, 2, 3] Polymyositis is found more commonly in women but pregnancy in affected patientsis rare. Very little has been published that describes anaesthesia for pregnant patients with this condition.[4]

Case Report

A 39-year-old Caucasian woman known to have polymyositis presented to a hospital in Kenya at 35 weeks' pregnancy for an urgent Caesarean Section. The indication for the section was intra-uterine growth retardation (IUGR) secondary to placental insufficiency, and foetal scalp oedema on an ultrasound scan. She had been diagnosed with polymyositis two years prior following an episode of severe proximal muscle weakness during which a CK level of 5469, and a positive Jo-1 antibody were found. Muscle biopsy and EMG were not performed. She was managed on oral prednisone and low dose aspirin with good response and C-reactive protein (CRP) levels used to track her progress. She had one episode of foetal loss early in the course of her illness. Steroid treatment was subsequently stopped 6 months prior to this admission due to symptom resolution. These were however restarted 3 days prior to presentation for the Caesarean Section, on the basis of wrist arthralgia and palmar erythema, that were thought to indicate that the polymyositis was flaring up. At the time of presentation for surgery, she was being managed on prednisone 60mg and aspirin 75mg od. She however had good exercise tolerance and was active. She had never had a general anaesthetic and there was no family history of problems with anaesthetics.

On examination, her blood pressure was 120/70. Heartrate, respiratory rate, temperature and oxygen saturations were all within normal limits. No palmar erythema was noted, and systemic examination was unremarkable. Her pre-pregnancy weight was 68kg (82 kg on admission), and she was 1.7m tall, giving her a BMI of 23.5. Her mouth opening was good, with a Mallampati score of IA. There was no restriction in range of neck movement.

Blood works done on arrival revealed the following results (references values for the lab used are shown in brackets):

Test	Result
Full blood count	Haemoglobin 12.4 g/dl (11-18) Total white cell count 8.4x1012(4-11) Platelets 172x109(150-400)
Bleeding time	2min 30sec(2-9mins)
Clotting time(min)	7 (4-10)
INR	1.24
APTT(sec)	36 (30-40)
Urea/electrolytes(mmol/l)	Na 137(135-145) K 3.8(3.5-5) Urea 1.76(0-7) Creatinine 47(<150)
C-Reactive Protein(mmol/l)	9(<5)
Serum enzymes	Creatinine kinase 11 U/l (24-140) SGOT 15 IU/l (6-40) LDH 159U/l(50-150)

An ECG and 2-D Echo were not requested, as there was no suggestion of cardiac dysfunction from history and physical examination.

Anaesthetic options were discussed with the patientand a combined spinal-epidural (CSE) technique offered. While CSE was the preferred anaesthetic technique, concerns regarding prolonged bleeding and the potential anxiety it might create in the patient necessitated change of anaesthetic choice to general anaesthesia. Pre-medication with ranitidine and metoclopramide was given and the patient advised to take her regular dose of oral steroids.

On arrival in theatre, the patient was given 25 mg of hydrocortisone intravenously. 0.3M sodium citrate was not available. Routine monitoring was attached and she was positioned supine with a left tilt. Pre-oxygenation was performed for 5 minutes following which a modified rapid sequence induction with propofol 150mg and rocuronium

50mg was performed. Her airway was secured using a cuffed endotracheal tube and cricoid released. Anaesthesia was maintained using sevoflurane and nitrous oxide in oxygen (50:50) with positive pressureventilation using a circle system. She had oxygen saturations of 99-100% throughout and end-tidal CO_2 levels that ranged between 35-36mmHg. Her heart rate ranged between 80-90/min. Blood pressure was monitored non-invasively every minute until the baby was delivered, and every three minutes thereafter. She had one brief episode of hypotension, with a systolic BP of 84mmHg just before the baby was extracted. This responded well to one 6mg bolus of ephedrine, the only available vasopressor at this institution. The baby was delivered uneventfully and had a good Apgar score. Morphine 15mg IV and paracetamol 1g IV were given upon delivery of the baby.

Fifty minutes after induction her capnography tracing indicated that the muscle relaxant was wearing off. We did not have a nerve stimulator to check her train-of-four. Since the rectus sheath had been closed by this time, no additional muscle relaxant was given. At the end of the surgery the muscle relaxant was reversed using 1.2mg atropine and 2.5mg neostigmine, and sevoflurane and nitrous oxide turned off, leaving her on 100% oxygen. She was noted to have good tidal volumes, with rhythmic respirations, was fully awake and able to sustain a head lift and was therefore extubated. The total duration of surgery was 65 minutes, with an estimated blood loss of 800ml.

The patient was transferred to ICU for close monitoring. She did not require any respiratory support during her stay on the unit and was discharged from ICU the following morning after an uneventful night.

Discussion

Polymyositis is a rare, idiopathic, inflammatory myopathy that occurs more commonly in women1. The mainstay of treatment is steroid therapy.

Unless a contraindication exists, regional anaesthesia is the technique of choice for the vast majority of patients undergoing Caesarean section. In the patient with polymyositis, general anaesthesia is particularly undesirable as it may result in prolonged muscle weakness from exposure to muscle relaxants and reversal agents. It also increases the risk of malignant hyperthermia from exposure to suxamethonium and halogenated inhalational agents[5].Patient refusal is one of the few absolute contraindications to a spinal or epidural.

In patients on long-term aspirin, and where the benefit of stopping aspirin outweighs the risk, the drug may be stopped for 7 to 10 days pre-operatively to allow the anti-platelet effectto wear off[6]. This is of importance for surgeries such as neurosurgery or eye surgeries where bleeding would have devastating effects. In the obstetric population however, the use of low dose aspirin has not been shown to increase the risk of an epidural haematoma orof maternal bleeding, even when bleeding time is prolonged [7,8]. There is equally no useful test of function that predicts the increased risk of bleeding from aspirin therapy. The chronic use of low dose aspirin therefore does not preclude the use of a spinal or epidural technique[8].

Conclusion

Obstetric patients with polymyositis presenting for surgery require multidisciplinary care involving a physician or rheumatologist, an obstetrician and an anaesthetist. CRP levels are not a useful indicator of the likelihood of patients suffering prolonged muscle weakness and possible respiratory failure after a general anaesthetic. If there are no absolute contraindications to a regional technique, a spinal epidural or CSE neuroaxial technique may safely be employed, even in patients on long-term low-dose aspirin. It is prudent however to have facilities available to provide respiratory support in this population post-operatively should this be required.

There will be instances in which patients with polymyositis will need surgery that cannot be performed under a neuro-axial technique. More data is therefore required to establish the safety of general anaesthesia in this population.

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A Baseline Audit Of The Immediate Post Anaesthesia Care Practice In Kenyan Public Hospitals

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Background

PACU is a specialized area where patients coming out of anaesthesia undergo initial monitoring before being discharged to the ward. The estimated overall PACU complication rate is 18-30%, with varying levels of monitoring and staffing. The nature our local practice and incidence of immediate postoperative complications have not been established. The objective of this audit was to evaluate the post anaesthesia care at The Kenyatta National Hospital (KNH) which is the main teaching and referral center in the country and compare it with other public hospitals.

Methods

A cross sectional descriptive study in KNH and other public hospitals was done in 2010. It involved characterization of the PACU, interviewing of PACU staff, enumeration of PACU equipment and emergency drugs. At the KNH, 280 consecutive adult patients post general anaesthesia were observed in the PACU until discharge. 40 patients were similarly followed up in another seven public hospitals. Complications referable to each of the different organ systems were identified and recorded.

Results

The audit revealed an overall adequate PACU bed space throughout the country. Theatre table: PACU bed ratio was 1.5: 1 in KNH, while the counties had a mean ratio of 1.15:1. There was an overall poor staff: patient ratio in the country i.e. 1:2.7 in KNH and a mean of 1:1.96 in the counties during peak PACU activity. In KNH, 100% of patients were on continuous ECG, SPO2, and automated NIBP monitoring with oxygen supplementation. 100%, 57.1% and 57.1 % of the counties had manual BP machines; SPO2 and ECG monitoring; andadequate oxygen therapy respectively. The resuscitation cart was 100% complete at the KNH and only 73.5% complete on average in the counties. The mean PACU complication rate was 5.3% in KNH and 9.1% in the counties. Pain score >7/10 on the numeric rating scale was the commonest complication in both settings. Hypoxemia was the least observed complication.

Conclusion

Generally, there was adequate PACU bed space, inadequate staffing, monitoring and resuscitation drugs in the country. The mean PACU complication rate was much lower than observed in literature, and higher in the counties than in KNH.

Introduction

Anaesthesia is defined as drug induced depression of the nervous system, resulting in loss of perception and response to noxiousstimuli (surgical incision).[1] General anesthesia provides loss of awareness, immobility, analgesia and blunting of both sensory and autonomic reflexes.[2] An ideal anaesthetic drug would induce anaesthesia smoothly and rapidly; and permit almost instantaneous recovery with a wide therapeutic window.

Emergence from general anaesthesia may be accompanied by a number of physiologic disturbances affecting various organ systems. Numerous studies involving > 18, 000 anaesthetics revealed an overall PACU complication rate of between 18- 30% [3,4,5.]

These complications may include delayed awakening from anaesthesia, airway perturbations and respiratory failure as well as hemodynamic instability which may lead to unplanned ICU admission. [6,7] Severe postoperative pain, nausea and vomiting have a major bearing on the overall PACU experience of the patient.[8,9,10]

American Society of Anaesthesiologists physiologic status above III, nature of surgery, age, preoperative low coma scale, organ failure and pharmacogenetics influence the occurrence of PACU complications. Pharmacokinetic andpharmacodynamic drug interactions play a major role too.[11, 12, 13]

PACU and Post Anaesthesia Care

In 1947, the Anaesthesia Study Commission of Philadelphia Medical County Society demonstrated that nearly 50% of the deaths occurring within 24 hours of anaesthesia were preventable through improved nursing care. Centralization of care in the form of recovery rooms, where one or more nurses could closely monitor the patients markedly reduced the mortality rate.[14]

All patients following any type of anaesthesia should be admitted to PACU for physiologic monitoring, analgesia; nausea and vomiting control coupled with detection and treatment of immediate postoperative complications.

The Association of Anaesthetists of Great Britain and Ireland (AAGBI), through The Health Building Note 26 (HBN, 26) recommended that the recovery suite should be in a central position within the theatre complex. It related the size of recovery room to the number of operating theatres served. A recovery room of 164 m2is adequate for 8 theatres.[15]

The number of beds should match the number of cases per session and average time spent in the recovery room. The ratio of PACU beds to operating theatres should be between 1:1.5 to 1:2 in a 24-hour period. There should be easy access to radiology equipment, resuscitation carts and clinical staff. It should be open plan, allowing observation of the recovery area at a glance with the provision of curtains for privacy.[16,17]

A minimum of 2 staff should be present at all times of day and at night where a patient may not be fulfilling the discharge criteria. A physician assigned to PACU is desirable. The anaesthesiologist manages analgesia, airway, cardiac, pulmonary and metabolic problems while the surgeon manages problems directly related to surgery.[18] In addition patients should be monitored using pulse oximetry, non-invasive blood pressure and electrocardiography.[19,20]

The PACU should also have its own supplies of basic and emergency drugs and equipment, separate from those of the operating room. Such include oxygen therapy, airway equipment and an emergency cart.

In order to prevent premature discharge from PACU, a well-defined discharge criteria must be put in place. The Alderete's scoring system takes into account the status the various organ systems, including temperature, the need for oxygen therapy and treatment of post anesthesia nausea and vomiting.21Its use is associated with a reduction of PACU length of stay by 24%.[22]

We evaluated the PACU practice in KNH and compared it with that in seven other public hospitals.

Methods

Approval of study design and patients' eligibility This cross-sectional descriptive study was approved by KNH and the seven public hospitals' (formerly Provincial General Hospitals) ethics and research committees. PACU staff were interviewed, together with physical enumeration of equipment and drugs. In KNH, 280 consecutive, adult, post general anaesthesia patients were observed until discharge. 40 patients were similarly observed in each of the other public hospitals. Patients undergoing regional anaesthesia were not included. PACU characteristics, staff numbers, drug and equipment availability were recorded in questionnaires; and compiled into an excel database.

Outcomes of interest PACU beds, operating room tables, PACU staff numbers at peak activity, PACU staff level of training; drug and equipment availability were used to evaluate the PACU practice. The number of organ- system complications was also recorded.

Data analysis PACU bed: theatre operating table ratio and PACU staff: patient ratio were calculated.Using SPSS, the incidences of various organ-system PACU complications were calculated as percentages for each hospital. The mean PACU complication rate for KNH was calculated and compared to that in the other hospitals.

Results

Data collection was carried out between April and May 2010. A total of 8 PACUs were surveyed. They include KNH (teaching and referral) PACU and seven other public hospitals (formerly the provincial general hospitals). A total of 560 consecutive adult PACU admissions were observed for possible complications (280 in KNH and 280 in the other hospitals).

Figure 1 (a): PACU Beds and Operating Room Tables

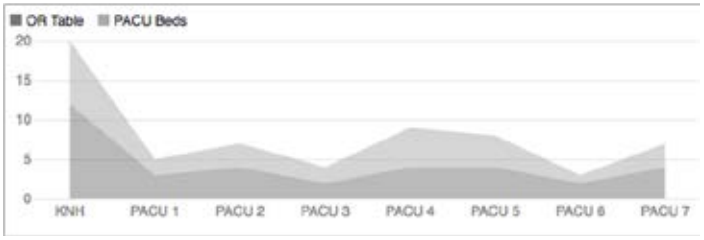
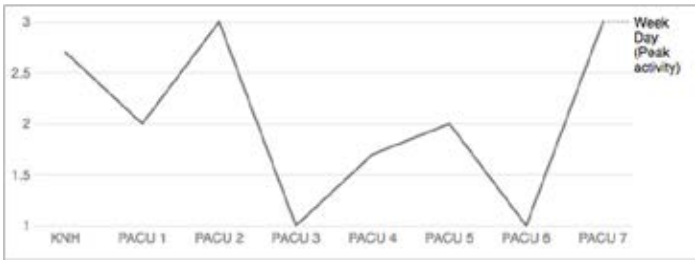


Figure 1 (b): PACU Bed: OR Table ratio

KNH had a PACU bed: operating theatre table ratio of 1:1.5, compared to a mean of 1:1.15 (1:2- 1:0.8) in the counties.

Figure 2: PACU stuff: Patient Ratio at Peak Activity



During peak activity, nurse: patient ratio was 1:2.7 in KNH, compared to a mean of 1:1.96 (1:1- 1:3) in the county hospitals.

Figure 3: PACU Staff Level of Training

KNH and one county PACU had a pool of six nurses each with varying levels of clinical skills. One county PACU had only two nurses trained in perioperative care. In the other counties had nurses randomly assigned PACU duty.

Figure 4: PACU Equipment

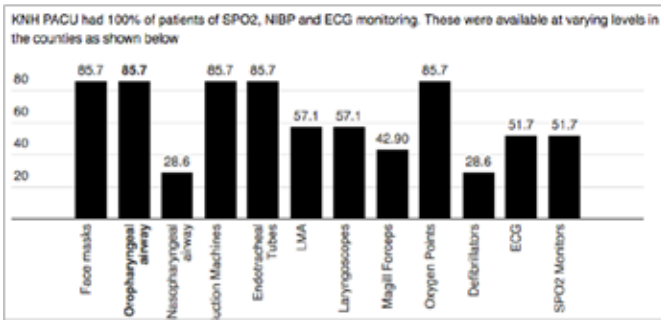
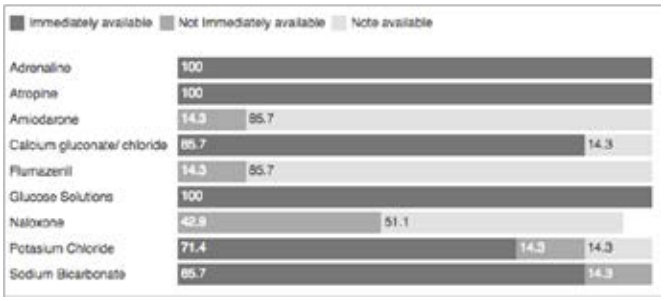


Figure 5 (a): Resuscitation Drug Availability

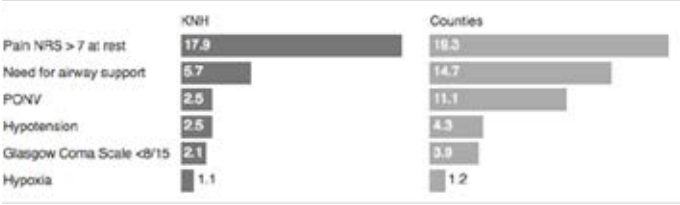
KNH had all emergency drugs immediately available within the PACU. In the county PACUs, there quite a number of drugs had to be outsourced from other locations.



Postoperative Complications

The overall mean PACU complication rate was 5.3% (1.1- 17.9%) in KNH compared to 9.1% (1.2- 19.3%) in the counties. Pain score > 7/10 on the Numeric Rating Scale was the commonest in both settings. Hypoxia was the least observed. It is worth noting that oximetry was not available in some hospitals.

Figure 6: Relative incidences (expressed as %) relating to specific organ systems.



Discharge Protocols

None of the PACUs had a structured discharge protocol. KNH had the longest duration of PACU stay of up to 120 minutes. However, this was due to logistic rather than medical reasons e.g. inadequate porters.

Discussion

Kenyan PACUs have varied recovery bed: operating theatre table ratios. Generally, there is adequate bed space in relation to the number of operating tables in a 24-hour period. This is in keeping with international recommendations of 1:2.15KNH demonstrated a higher PACU traffic compared to the other hospitals.

Staffing was inadequate as demonstrated by poor nurse: patient ratio during peak PACU activity, 1:3 in KNH and 1:2 in the counties, as opposed to a recommended ratio of 1:1. However staffing ratio was better on nights and weekends.16

The level of training was different amongst the PACUs. Very few nurses were trained in pediatric and adult advance life support. The rest were trained in basic and perioperative nursing. The AAGBI recommends that at all time, at least one staff member should be a certified advanced life support provider, and for children, hold an appropriate life support qualification.17

Functional manual NIBP machines were available in all PACUs. SPO2 and ECG were found in 57.1% of counties. Monitoring was however not continuous as equipment would be shared amongst patients. Oxygen was available in majority of PACUs. Functional defibrillators were rare (28.6% of counties). Emergency trolley was incomplete in majority of the counties. The PACUs surveyed did not meet the internationally accredited standards.

There was lack of a structured, nurse driven PACU discharge protocol. Discharge was upon attaining “stable vital signs” which was dependent on the level of monitoring. However, good airway control without evidence of surgical bleeding were pre-requisites for discharge. Those considered unfit for discharge would be reviewed by the primary anaesthetist or surgeon, who would determine the subsequent care of the patients.

KNH PACU had the longer length of stay compared to the other hospitals. This was related to staffing ratios; rather than perioperative complications. In the counties, most of the recovery would take place on the operating table, under close monitoring by the anaesthesia provider.

The mean PACU complication rate was higher in the counties compared to KNH, 9.1% versus 5.3%. Numerous studies have shown a higher rate of up to 30%. 3,4,5. In this study, only adult patients undergoing general anaesthesia were included. Thus the case mix was not assessed nor was the preoperative ASA status.

Pain score of > 7/10 (on the numeric rating scale) at rest was the commonest in both set ups, 17.9% in KNH compared to 19.3% in the counties. A study by Pramila Chari and colleagues established pain as the commonest complication (23.7%)

post spine surgery.23Pain should be adequately treated to allow for activity e.g. breathing for thoracic incisions to avert atelectasis and hypoxemia.24

Need for airway support was the second commonest PACU complication, 5.7% in KNH compared to 14.7% (0- 32.5%) in the counties. This was through the use of oropharyngeal airway in the PACU. Hines et al found the need for upper airway support to be 6.9% in >18, 000 consecutive PACU admissions.3 Proposed standards for best practice recommend that the need for airway support (manual jaw thrust, oral and nasal airway) should not exceed 5%, while re-intubation should not exceed 1% of the PACU admissions.17

Postoperative nausea and vomiting was found in2.5% and 11.1% (0-32.5%)in KNH and counties respectively. PONV has been reported in up to 30- 40% of PACU admissions.25

Hypoxemia despite oxygen therapy was the least observed PACU complication (1.1% versus 1.2%). Other studies have shown higher rates of immediate postoperative hypoxemia between 19% and 55%.26,27It worth noting that SPO2 monitoring was present in only 57.1% of the county PACUs.

Recommendations

1. Establishment and adherence to a PACU discharge protocol.

2. A need to equip the Kenyan PACU areas with pulse oximetry and functional defibrillators is key more so in the face of the increase in patients undergoing surgery who have cardiovascular ailments.

3. All theatre staff and more so those working in the PACU must have specialized training in basic and advanced life saving courses.

4. In order to improve hospital throughput and theatre turnaround, ancillary staff that facilitate patient movement form the theater to the ward must also be readily available.

5. A further survey on analgesic practice among anaesthesia care providers in Kenya needs to be carried out.

6. More focus as a policy on PACU equipping and staffing in the country is needed.

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Opioids in Children

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Introduction

With advancement of anaesthesia and surgery, very complicated and painful procedures are increasingly being performed in children with the need for use of strong analgesics including opioids. Opioids are the gold standard of pain control especially postoperative pain (Jitpakdee and Mandee, 2014). Even with this knowledge, children postoperative pain remain highly undertreated either because of apprehesion of side-effects of the opioids especially respiratory depression or the poor recognition of pain in children. There are many confounding factors that make pain assessment in children difficult including separation anxiety, unfamiliar environment, hunger and other discomforts (Kart, Christrup and Rasmussen, 1997; Lee and Jo, 2014).

Key Words: Opioids, Safety, Post- operative pain

Material and Methods

Literature review and search on major medical search engines such as scopus, ovid, NCBI, pubmed and discover for key words opioids, safety, post operative pain and children.

All articles dealing with postoperative pain in children were evaluated. The purpose was to find for obvious caveats about using opioids and especially morphine in children and infants. The available pain assessment tools were highlighted, evidence for side effects were sought. Also sought were superiority characteristics of the opioids over other commonly used pain therapies.

Results

More than 10,000 articles were found from the various search engines. Further refining with limiters and bolean phrases left 1036 articles.

Concerning our purpose, no article explicitly forbid the use of opioids in children even though use of liberal opioids in neonates and preterm babies was mainly in the ventilated children. There was evidence that opioids and morphine specifically was safe for use in this age group.

The use of pain assessment tools was highlighted in several articles and the aspect of psychological contribution to pain scores highlighted. In the older child, use of pain scores was seen as being an indicator of good use of the opioids.

While the use of morphine in day surgery was shown not to be superior to paracetamol and NSAIDS for orthopaedic surgery, it was however shown to be superior in tonsilectomy and adenoidectomy where as high as 56% of the patients required an opioid for their pain control.

Side effects of the opioids were well documented in the articles with apneas and respiratory depression being most serious while nausea, vomiting and itchiness being the most common and disturbing.

Discussion

Inadequate pain management may lead to prolonged hospitalization from prolonged recovery and increased complications (Boric et al., 2017). Well controlled pain on the other hand will increase patient and parent satisfaction and the shorter hospitalization will also lead to lower hospital costs.

Morphine is still the commonly used opioid in children and a review of its characteristics will help understand the use of opioids in children and neonates. Morphine's well documented side effects of respiratory depression, nausea and vomiting, pruritus, urinary retention and constipation remain a huge source of apprehension of clinicians using morphine. Balanced analgesia with opioid sparing remain the aim of pain management in children and neonates but no child should be denied an opioid when they deserve it (Silins et al., 2017). An understanding of the pharmacokinetics and pharmacodynamics of morphine in children and neonate will help increase the knowledge and hopefully safe use of the drug in this age groups.

Glucuronidation is the main mechanism of metabolism of morphine and occurs in the liver giving metabolites which are hen mainly excreted in the kidneys. This pathway is present at birth and continues to develop in the neonatal period. Thus term neonates, infants and children are well able to metabolize and excrete morphine. Renal excretion of unchanged morphine is higher in term neonates than in adults. The distribution of morphine has been described as two phased with an initial rapid distribution phase and a subsequent slower elimination phase. The half-life varies greatly among the different age groups with pre-term neonates at 9hrs, 6.5hrs for tem neonates and 2hours for infants and children. Clearance increases with age (Choonara et al., 1989; Kart, Christrup and Rasmussen, 1997). With these details we can see that morphine is safe for use in preterm, term neonates, infants and children.

The other opioids in use in children include fentanyl, remifentanil, sufentanil and codeine.

It is important to note that while opioids are safe in children, there must be rationalization in their use so that only deserving patients are given the same while not denying any child requiring the opioids for their pain control. The use of pain assessment tools and establishment of children's pain services in places where children are operated will go a long way in improving pain management for the children.

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