

EFFECT OF TRANSVERSUS ABDOMINIS PLANE BLOCK ON POST-OPERATIVE MORPHINE CONSUMPTION IN TOTAL ABDOMINAL HYSTERECTOMY PATIENTS

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Declaration

I, Razeena Lockhat declare that this research report is my own, unaided work. It is being submitted for the degree of Master of Medicine in the branch of Anaesthesiology at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other university.

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Abstract

Background and objectives

Patients undergoing total abdominal hysterectomy experience moderate to severe post-operative pain. Peripheral nerve blocks such as the transversus abdominis plane block have been described to decrease post-operative pain in this population group. This study was conducted at the Rahima Moosa Mother and Child Hospital in Johannesburg, South Africa, amongst patients undergoing total abdominal hysterectomy. The primary aim was to assess the post-operative morphine consumption between patients who received a transversus abdominis plane (TAP) block, compared to those who did not receive a TAP block. In addition, pain scores and side effects were assessed between the TAP block and non-TAP block group.

Methods

One hundred and twenty six patient records were included in this retrospective study using a consecutive convenience sampling method. They were divided into the TAP block group and the non-TAP block group. Patient records assigned to the TAP block group had received TAP blocks by the anaesthetist after the induction of general anaesthesia, whilst the patient records assigned to the non-TAP block group only received a general anaesthetic. Both groups received intravenous analgesia as predetermined by the anaesthetist. Patients then received a patient controlled analgesia pump in the recovery room. The acute pain trainee documented the morphine consumption at Time 1, Time 2 and Time 3, the Numeric Rating Scale pain scores and any side effects experienced by the patient.

Results

There was no significant difference between the morphine consumption in the TAP block versus the non-TAP block groups at Time 1, Time 2 or Time 3. There was no significant difference of pain scores between the two groups.

Conclusion

TAP blocks did not decrease the amount of post-operative morphine consumed in patients who received a total abdominal hysterectomy, nor did it result in any differences in Numeric Rating Scale pain scores between the two groups.

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List of Abbreviations

ASA	American Association of Anesthesiologists
ERAS	Enhanced Recovery after Surgery
NRS	Numeric rating scale
PCA	Patient controlled analgesia
RMMCH	Rahima Moosa Mother and Child Hospital
TAH	Total abdominal hysterectomy
TAP	Transversus abdominis plane

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Section 1: Literature review

1.1 Introduction

Pain is defined by the International Association for the Study of Pain (IASP) (1) as an “unpleasant sensory and emotional experience, associated with actual or potential tissue damage or described in terms of such damage”(1). Generally, pain relates to an identifiable cause, either trauma, surgery or inflammation (2). This causes an acute systemic inflammatory response which can cause severe metabolic, endocrinological and neurological derangements which impact adversely on patient recovery (3, 4). It has also been suggested that acute pain, if poorly managed, tends to lead to chronic pain syndromes (5). Patients can also develop post procedural psychological conditions which further impact on overall morbidity (3, 5, 6). For these reasons, optimal intra-operative pain management is essential.

1.1.2 Physiology of pain

Pain is a physiological response to noxious stimuli. It is transmitted by A-delta, A-beta and C-fibres. These stimuli are transmitted by the pain fibres through a neurochemical reaction to the spinal cord (7). At the same time, there is a release of pro-inflammatory markers including interleukins, cytokines and Tumour Necrosis Factor alpha originating from the particular anatomical site stimulated (2, 8). This results in local oedema and increased tissue permeability which is associated with hyperaemia and stimulation of inflammatory cascades both locally and systemically (4). Transmission of pain is a complex process in the central nervous system. Noxious stimuli trigger a cascade, whereby substances are released by the surrounding injured tissues (8). These are loosely known as the “inflammatory soup” (2, 8), and are important in the stimulation of interneuron networks involved in pain transmission (2). This involves the sensitisation and wind up of neurons in the dorsal horn of the spinal cord (2, 8). Noxious stimuli are regulated and modulated by descending pathways and neurotransmitters such as noradrenalin and serotonin.

The modulated stimuli are then transmitted by afferents to the brain, where the final perception of pain is interpreted by the higher cortical centres (2).

1.1.3 Post-surgical Pain

Post-surgical pain is perceived as a double insult process (8); the first being the acute immediate sympathetic response from the surgical incision which stimulates mechanoreceptors, and the second being the release of pro-inflammatory mediators (2, 8). There is sensitisation of the central and peripheral nervous system which results in hyper-stimulation of nociceptors at an around the site of insult (2, 8) as well as in the spinal cord. Wind-up neurons fire repetitively in the spinal cord resulting in high intensity of the pain experienced. Allodynia, a neurochemical response which occurs as a result of the decreased threshold of secondary interneurons in the peripheral pathway (2). It results from the activation of wide dynamic range neurons, causing a non-noxious stimulus to be interpreted as a noxious stimulus. These mechanisms play a key role in post-surgical hyperalgesia and tend to lead chronic persistent surgical pain if not treated adequately.

Chronic post-surgical pain is defined as persistent pain for more than three months a surgical insult (2, 9). There are a variety of factors (2, 4-6, 9) which contribute to chronic pain post-operatively. The role of anaesthetists in the intra-operative period is to pre-emptively and adequately treat pain to minimise subsequent morbidity in the post-operative period (4, 8).

1.1.4 Gynaecological surgery

Although post-operative pain associated with gynaecological surgery is lower (9) than other abdominal surgery, patients still experience moderate to severe pain (6, 9, 10). Brandsborg et al (9) in Denmark demonstrated that up to 32% women undergoing total abdominal hysterectomy (TAH) experienced persistent post-operative pain (9). The authors showed that delayed mobilisation of these patients resulted in prolonged

hospital stay and exacerbation of pre-existing comorbidities (9, 11). In an attempt to minimise patients' pain experiences after TAH surgery, a thorough knowledge is required of the innervation of the abdominal structures for both anaesthetists and surgeons.

1.2 Anatomy and innervation of the abdominal wall

The anterior abdominal wall is innervated by the thoracolumbar nerves which consist of the intercostal, subcostal and lumbar nerves T6 to L1. These run in the transverse abdominis plane (TAP) and are aptly called the "TAP plexus" by Rozen et al (12). This plane is delineated by the linea semilunaris anteriorly, reinforced by the aponeuroses of both the external and internal oblique muscles (13). Posteriorly it is reinforced by the transversus abdominis fascia (8, 9). The subcostal margin merging with the latissimus dorsi muscle forms the superior border and the anterior iliac crest and inguinal ligament form the inferior border (12, 13). From the costal margin, nerves T6 to T9 arise and enter the TAP. Within the TAP, multiple networks of nerves are formed, with each subcostal nerve innervating the oblique muscles and rectus abdominis muscle (12). The ilioinguinal and iliohypogastric nerves arise from L1 and travel within the TAP becoming more superficial to supply the rectus abdominis muscle and the antero-lateral aspect of the abdominal wall (14) (12). Nerves from T7 to T9 run antero-laterally and supply sensory and motor fibres to areas superior to the umbilicus. The subcostal nerves arising from T12 supply the cutaneous and motor fibres inferior to the umbilicus.

In 2001 Rafi (15) described the lumbar plexus block, which described the "triangle of petit." This is bound by the latissimus dorsi superiorly, the external oblique laterally and the iliac crest as the base (12-15). The sensory nerves responsible for innervating the abdominal wall lie within this boundary. The loss of resistance technique described as the "double pop" (15), is achieved by passing a blunted needle through the two fascial planes of the external oblique muscle and the internal oblique muscle (15). Rafi's lumbar plexus block targeted this "triangle" as a means to improve analgesia in the peri-operative period (10, 15, 16). Over time this technique

has been modified and refined and has become known as the TAP block (13, 16, 17). The significance of this block in peri-operative analgesia will be discussed in section 4.2.2.

1.3 Pain Scales

Intensity of pain is related to a variety of factors, namely being patient, surgical and anaesthetic related. Pain perception is a subjective experience and affects recovery as well as overall patient morbidity (9, 17). Assessing post-operative pain can be done through different pain scales. Various methods have been used over the years to assess pain in various population groups. The most common are the Face Pain Scale, the Numerical Rating Scale (NRS), and the Visual Analog Scale (VAS). In paediatrics, the Face Pain Scale is effective as children tend to respond better to picture annotations of pain levels (2, 18). The Face Pain Scale Revised has been shown to be sensitive in measuring pain intensity in patients as young as four years old, and can also be used for adults who may be illiterate (18).

Other scales have been created based on numerical categories, namely the Visual Analog Scales (VAS) and Numerical Rating Scales (NRS). The VAS scoring system is an effective scale as it rates pain based on a group or category of numbers correlating to the severity of pain (19, 20). This scale does have limitations as it tends to overestimate pain which scores as “moderate” and is only accurate in measuring pain on the extremes of the spectrum (20).

The NRS is a numerical scale used with a scoring range from zero to ten; zero being no pain and ten being unbearable pain. This scale has been widely used in the clinical setting to assess acute pain (21). Breivik et al (21) compared the NRS, VAS and a Verbal Rating Scale (VRS), and found that of the three scales, the NRS had a more compliant and reliable way of assessing pain in patients (21). Unlike the VAS, the NRS can be used telephonically and data can be easily documented and captured in a quantitative manner (21). Brunelli et al (22) looked at pain

exacerbations in cancer patients using the NRS and the VRS. Better discrimination between chronic background pain and pain exacerbations were able to be assessed using the NRS compared to the VRS (22). In terms of assessing pain in the outpatient setting, it is noted to be useful (19). However, it has limitations as it has a tendency to underestimate a patient's pain classified as "moderate" pain; that is, pain rated between five to seven on the scale (20). Where pain discrimination at the higher end of the scale is required, it was unable to decipher acute variability (20). Another shortfall of the NRS is that it does not take into consideration the dynamic nature of pain experienced (19) (21). Despite this, it is still commonly used for pain assessment amongst patient groups.

1.4 Modalities of Pain Control

Pain is a sensation that involves complex pathways and modulation (2). As a result, there are a variety of analgesia options that the anaesthetist can choose from to target these pathways, thereby holistically treating peri-operative pain. It should be noted that not all agents and methods described are universally applicable to patients. Analgesia should be tailored to the patient's specific requirements.

1.4.1 Intravenous agents

Anaesthetists use a multimodal approach to pain control in the intra-operative setting. Of these, the intravenous route is the most common as the drugs bypass first pass metabolism and has a fairly rapid onset of action. These drugs are easily titratable during and after the surgical procedure. The most common drugs used are opioids and non-steroidal anti-inflammatory agents (NSAIDS), which will be discussed further. Other intravenous agents such as Gamma Amino Butyric Acid-pentanoids, alpha-2 agonists and N-Methyl-D-Aspartate antagonists are also used in the intra-operative setting, but will not be discussed in detail here.

1.4.1.1 Opioids.

Opioids are the most common intravenous drugs used in the intra-operative setting. These agents are synthetic derivatives of endogenous opiates (4, 23) which target opiate receptors in the brain and spinal cord (2). They have a fairly rapid onset of action and are for treatment of pain (4, 24). However, systemic opioids do not come without their side effects (23). These can range from mild symptoms of nausea, vomiting and pruritus to the more severe forms such as opioid related respiratory depression and opioid induced myoclonus (23-25).

1.4.1.2 NSAIDS

NSAIDS are popular due to the site of action on which they act. They inhibit the arachidonic acid pathway leading to a release of leukotrienes and cytokines (4). However, their vast side effect profile makes their use limited by the anaesthetist particularly in patients who have long standing cardiovascular and renal comorbidities (4).

The American Society of Anesthesiologists (ASA) Task Force (26) has recommended the use of multimodal analgesia in the management of pain (26). However, these strategies need to be individualised to the patient based on risk stratification, including present comorbidities, the type of surgery and side effect profiles of the agents(23). Since this poses a potential problem for the anaesthetist, other modalities of pain control other than intravenous or intramuscular administration are required for a holistic analgesic approach (2, 26, 27).

One of the recommendations made by the ASA is the use of patient controlled analgesia (PCA) pumps (26). These pumps generally contain an opioid based solution which is connected to the patient through an independent intravenous access line. The patient then self-administers opioid solution as required, which is

controlled by a lockout system built into the device. This prevents repetitive boluses and overdose (28). When comparing morphine based PCA pumps to continuous epidural infusions in patients undergoing laparoscopic colorectal surgery, Hubner et al (29) showed that there was no clinical difference between either of the groups. Furthermore, there was no difference between the groups regarding length of hospital stay and post-operative recovery (29).

1.4.2 Regional anaesthesia

As part of the Early Recovery after Surgery (ERAS) protocol, early mobilisation, feeding and discharge is promoted amongst patients in the post-operative period (30). As a result, sole intravenous analgesic techniques are being avoided, as these are shown to provide inadequate analgesia and delayed recovery (30). Anaesthetists are now being encouraged to use alternative modalities of pain control (26, 31) in the form of regional techniques such as neuraxial and peripheral block technique.

1.4.2.1 Neuraxial anaesthesia

Neuraxial anaesthetic techniques are widely used for thoracic and abdominal procedures to decrease post-operative pain (26, 32). The epidural technique has been used with much success for peri-operative pain management in patients undergoing abdominal surgery (33). Although spinal anaesthesia for abdominal surgery has been shown to be effective (34), epidural anaesthesia tends to be favoured (32, 35).

1.4.2.1.1 Epidural anaesthesia

The epidural anaesthetic technique specifically has been used successfully in thoraco-abdominal procedures for post-operative analgesia (30, 36). Epidural

techniques enables the preservation of respiratory function of the patient, thereby reducing post-operative complications such as atelectasis and nosocomial acquired pneumonia (3, 4). Practices of continuous epidural infusions together with general anaesthesia have been shown to decrease post-operative opioid requirements as well as improve overall pain control in the ward, enabling early mobilisation (3, 37). Post-operative ileus due to excessive intravenous opioid use also tends to be decreased in patients who have had an epidural anaesthetic (3, 38).

In 2009, Muller et al (39) looked at the use of epidurals in a fast track protocol to decrease patient hospital stay in patients undergoing open colonic surgery (39). The study was conducted in Switzerland involving four centres where elective patients were randomised to two groups. One group underwent the “fast track” (39) protocol where they received a strict regimen of fluid, nutrition and analgesia pre-operatively and an epidural catheter for intra-operative and post-operative analgesia. The second group did not receive any specific regimen regarding fluids and no epidural catheter was inserted (39). The results showed that the group randomised to the “fast track” group had fewer surgical complications and had a reduced length of stay in hospital compared to the control group (39).

However, neuraxial techniques have their limitations. Patients with coagulopathies or central nervous system pathology should not receive any neuraxial procedure due to the risk of haematoma formation and neurological complications (3, 32). In certain patients with valvular heart disease, neuraxial procedures should be done with caution or refrained from altogether (10, 32). Some clinicians tend to deter from epidurals due to hypotension and haemodynamic instability in patients without a significant reduction in post-operative pain (29, 30).

A study in 2015 by Hubner et al (29) suggested that epidurals have no significance in post-operative analgesia and recovery compared to PCA pumps (29). The authors' results supported the theory that epidurals can cause more haemodynamic instability than morphine PCA pumps (29). It also showed no difference in analgesia between patients who had an epidural compared to the patients who received PCA pumps in

the post-operative period (29). This could be due to the fact that laparoscopic abdominal surgery is not as painful to the patient compared to open abdominal surgery (29). Consequently intravenous multimodal analgesia in conjunction with peripheral nerve blocks would suffice in these cases (29).

1.4.2.2 Peripheral nerve blocks

1.4.2.2.1 The Origin and development of abdominal peripheral nerve blocks

ERAS protocol has shown the benefit of using peripheral nerve blocks in the peri-operative management of pain in conjunction with intravenous analgesia (30, 31, 38). There is enhanced post-operative pain management and earlier mobilisation leading to decreased hospital stay (30, 38). With detailed knowledge of the relevant anatomy, it has become easier to understand and perform peripheral block techniques successfully (40). The lumbar plexus block described by Rafi (15) in 2001 paved the way for further research to be conducted in regional abdominal blocks (41, 42). The use of magnetic resonance imaging has enabled researchers to assess the spread of dye injectate in cadavers, allowing for accurate sensory nerve mapping to be done of the anterior abdominal wall.

Rafi's landmark technique does, however, have its limitations. In obese patients the anatomy can be significantly distorted, resulting in the poor demarcation of the landmarks of the triangle of Petit. Furthermore, the "double pop" which is elicited while performing the landmark technique, is a largely subjective sign. This may result in the local anaesthetic agent to be injected in the wrong fascial plane, resulting in a suboptimal or failed sensory blockade (3, 10, 13, 43).

The use of ultrasound in the operating theatre as a bedside tool has improved the success rates of peripheral blocks while minimising complications. In regional abdominal blocks, visualisation of the different fascial planes allows for accurate

injection of the local anaesthetic into the correct site, while minimising the risk of peritoneal perforation (13, 17, 43). Ultrasound has also paved the way for innovative techniques of abdominal blocks (43, 44). Currently, the rectus sheath block and the quadratus lumborum blocks are being investigated (44-46), as well as techniques such as direct surgical site infiltration. These will be discussed later. However, though there is much interest in the new techniques, blocks such as the TAP block still seem to be more favoured for abdominal surgery (44, 45, 47).

1.4.2.2.2 The TAP Block

The extensive study of the sensory innervation of the TAP has led it to become one of the most widely used peripheral nerve blocks for abdominal surgery (12-14, 17, 48). The TAP block for both non-gynaecological and gynaecological surgery (10, 13, 49, 50) has been shown to decrease post-operative opioid requirements (10, 16, 51-53).

In 2007, McDonnell et al (16) conducted a landmark study in Ireland to assess post-operative pain in patients receiving bilateral TAP blocks after radical prostatectomy. The researchers used the anatomical landmarks of Rafi's (15) "triangle of petit" to enter the TAP. The concentration that they used of local anaesthetic was 0.375%, with a volume of 20 ml (16). The power of this study was 80% and only 34 patients were recruited, with the aim of achieving a 25% reduction in morphine requirements in the TAP group (16). Although the sample size used was small and randomisation was a stated limitation, the results highlighted the efficacy of TAP blocks for post-operative pain management after 24 hours, which was both statistically and clinically significant (16).

Subsequently, in 2008, Carney et al (10) conducted a study in Ireland which looked at TAP blocks used for post-operative analgesia specifically in patients undergoing TAH. The sample group in this study was 50 patients in order to achieve a power of 80% (10). The outcomes were to achieve a 25% reduction in post-operative

morphine consumption (10), the same as McDonnell et al (16). However, the concentration of local anaesthetic used by Carney et al (10) was higher than that of McDonnell et al (16). The results were similar to those of McDonnell et al (16), in that morphine requirements in patients who received a TAP block were significantly reduced compared to those did not receive a TAP block (10).

A well noted Cochrane review by Charlton et al (41) in 2010 looked at systematic reviews which assessed the efficacy of TAP blocks (41). It showed that TAP blocks decreased overall opioid consumption in TAP block groups compared to those that either received a placebo block or no TAP block (41). However, it was concluded that, although the systematic reviews showed promise for the use of TAP block and post-operative pain management (41), most of the studies up until 2010 comprised of very small sample groups to extrapolate results (41).

In 2015, Jakobsson et al (42) did a systematic review which looked not only at the studies (54, 55) using TAP blocks, but also reviewed those that assessed different approaches of the TAP block and their efficacy in post-operative analgesia (42, 44, 52). An interesting study by StØving et al (55) assessed the sensory pattern of distribution, the analgesic duration and the muscle relaxant nature of the TAP block. They found that the sensory distribution is varied and not uniformly dermatomal in distribution (55), and that variance is determined by an individual's anatomy. Furthermore, the block does not involve the midline where surgical stimulation is likely to occur (55), rendering the block's effect incomplete for analgesia (55). They also showed that TAP blocks may also have muscle relaxant effects of the external oblique, internal oblique and transversus abdominis muscles (55) (42).

The advent of using ultrasonography as a bedside tool to perform peripheral nerve has improved the success rates of peripheral nerve blocks. Hebbard et al (16) and Tran et al (14) both demonstrated that the use of ultrasound guidance increases the accuracy of TAP blocks and the success rates. Since then, other trials (13, 43, 52) have since been conducted to look at the effect of different approaches to the TAP

block. These approaches have been described as the subcostal, lateral and posterior approaches (44).

The posterior TAP block approach has gained popularity and interest and is seen to be the most accurate approach related to Rafi's lumbar plexus block (44). Magnetic resonance imaging of dye injectate spread in cadavers shows that the subcostal nerves as well as the iliohypogastric and ilioinguinal nerves are affected by the posterior TAP block (44, 52, 56), and therefore may also be useful to prevent visceral pain experienced in TAH surgery (44). In 2013, Abdallah et al (52) systematic review looked at posterior and lateral approaches to the TAP block (52). Although the number of studies reviewed was relatively small, they concluded that the posterior approach is superior to the lateral approach in reducing post-operative morphine consumption and pain scores (52). However, one of the major limitations of this systematic review is that the studies analysed were not direct comparisons of the different approaches to each other. Rather, the different techniques were compared to placebo blocks and were extrapolated (52).

In 2014, Lissauer et al (44) published a review article outlining the different approaches to the TAP block (44). Although there was limited data at the time, it showed that the posterior approach correlated well with the original lumbar plexus block outlined by Rafi (15, 44). Yoshiyama et al (56) had similar findings in 2016 in a retrospective study conducted in Japan (56). However, this study had limitations in that there was no randomisation of patients and that the concentrations used for the TAP blocks were not standardised (56). Although the posterior approach has been proposed to be a superior approach to the subcostal or lateral TAP block, there is evidence to negate this (42, 44, 52). Griffiths et al in 2010 (57) published a study in Melbourne, Australia, which evaluated the dermatomal spread of local anaesthetic in both the subcostal and posterior approach. Although their sample size was small (57), their findings confirmed that subcostal approach TAP blocks had a higher dermatomal level of distribution up to T8, compared to the posterior approach which only showed dermatomal spread to T10 (57). These findings were not confirmed on MRI. Rather gross sensory testing was conducted pre-operatively as a baseline, and compared after the block and surgery were complete. Interestingly enough, this was

in keeping with Rozen et al (12), who, in 2008, highlighted the difference in dermatomal distribution in cadavers (12).

Ma et al (58) looked at subcostal TAP blocks under ultrasound guidance in 2017. The study, which was conducted among patients in Zhejiang, China, looked at sensory involvement of the abdomen and the back at different time intervals after a subcostal TAP block was performed for laparoscopic colorectal surgery (58). They found that the subcostal TAP block provides effective analgesia for the anterior abdominal wall from the midline to the anterior axillary line (58). This approach, however, did not give effective sensory blockade on the postero-lateral aspect of the abdomen (58), and that another approach may be required to cause sensory blockade in that region (44, 58).

Patients who undergo TAH also tend to have shorter length of hospital stay and reduced overall morbidity when receiving a TAP block as opposed to those who do not (40, 59). In 2014, Kokulu et al (54) showed that patients who received TAP blocks tend to have a decreased hospital stay and earlier mobilisation than those who did not (54). The ERAS guidelines of 2016 also recommend that TAP blocks should be done as part of multimodal analgesic approach, to enable shorter hospital stay in patients undergoing laparoscopic surgery (30).

In 2016, in the Brogi et al (60) published a systematic review in the Canadian Journal of Anaesthesia. They looked at TAP blocks in comparison to other modalities of analgesia (60) in various types of abdominal surgeries (60). After reviewing 51 articles that fit their inclusion criteria, they found that TAP blocks were beneficial in post-operative pain management in gynaecological, bariatric and appendicular surgery (60).

With the studies comparing intrathecal morphine compared to TAP blocks in caesarean section patients, the studies reviewed found that those who received intrathecal morphine consistently had less pain post-operatively than those who received TAP blocks (60). This is in keeping with the findings of Baeriswyl et al (53)

and Puddy et al (34), which will be analysed further below. The limitations of this systematic review were that not all the literature was included. Furthermore, the type and dose of local anaesthetic agent used for the TAP blocks varied greatly between the studies analysed, which can have a significant impact on efficacy of the block (60). They also found that of the studies reviewed, very few showed comparisons between TAP blocks and other analgesic techniques, which would be beneficial in terms of tailoring protocols for abdominal surgery (60).

There has, however, been conflicting evidence regarding routine TAP blocks to minimise post-operative pain. In 2013, Gasanova et al (50) conducted a study in Texas which had showed that TAP blocks done with a 0.5% bupivacaine concentration, there was no statistical or clinical significance found compared to the non-TAP group (50). This study was driven by using a statistical power of 90%, and demonstrated that post-operative morphine consumption in the control group as compared to the TAP group were similar, suggesting that there was no difference in post-operative pain between the two groups (50). Subsequently, in 2015, they looked at patient groups who had TAP blocks compared to those who had local wound infiltration (49). This showed that TAP blocks had no superior effect on post-operative analgesia (49).

Puddy et al (34) published a study in United Kingdom where they looked at the use of TAP blocks in patients undergoing Caesarean section (34). Both patient groups received intrathecal morphine prior to surgery and subsequently were divided into the TAP and control groups. Interestingly, they found no significant difference in post-operative morphine requirements and pain scores between the groups (34).

Baeriswyl et al (53) supported the findings of Puddy et al (34) in 2015. Their systematic review comprised of 31 trials in Denmark. It showed that although 24 hour morphine consumption in the TAP block group was reduced, patients who received a spinal anaesthetic as well as a TAP block had no significant difference in morphine consumption compared to those who did not receive a TAP block (53).

The use of ultrasonography does not come without its limitations. The most common experienced is that the success of the block is dependent on the skill of the clinician. In two meta-analyses published, this was noted to be a factor that influences the success of a TAP block (53, 60). Brogi et al (60) noted that the competency of the clinician affected the outcome of an effective TAP block (60).

In 2012, Niazi et al (61) did a simulation training programme with anaesthesia residents and the success of peripheral nerve blocks (61). Residents in the control group were given four lectures on how to perform peripheral nerve blocks. Residents in the intervention group received four lectures in addition to an hour of simulation training. It was shown that the rate of success was significantly higher in the group where residents were given simulation training prior to administration of peripheral nerve blocks.

Following the publication of Niazi et al (61), other authors (62, 63) have looked at the benefits of simulation training among anaesthetists. Mariano et al (62) showed that after one day of practical simulation training, ultrasound guided perineural catheter insertions were improved among previously inexperienced anaesthetists (62). In 2017, Da Silva et al (63) illustrated that the success of a peripheral nerve block directly correlates with the training and simulation of trainees in performing the block (63).

As with most procedures, peripheral nerve blocks have complications which the treating clinician should be aware of. TAP blocks run the risk of haematoma formation, liver injury and bowel perforation (45). However, these risks have found to be rare and there is not sufficient data to suggest that the risks outweigh the benefits (64).

1.4.2.2.3 Other peripheral blocks

With the practice of abdominal peripheral blocks, other novel techniques have come into practice. The rectus sheath block is a block targeting the sensory nerves of T7 to T11 which lie between the rectus abdominis muscle and posterior rectus sheath (65). This provides periumbilical analgesia. Although it is a much denser block than the TAP block, it has a shorter duration of action and therefore it has been recommended that it is administered as an infusion (65). It is a procedure that is frequently done in paediatric cases for abdominal procedures and can be used in gynaecological surgery where a midline incision is used (45, 65).

A more recent technique, the quadratus lumborum block, has sparked interest among clinicians in post-operative pain management for abdominal surgery (47). This block initially was thought to be very similar to the posterior TAP block. However, it differs in that it targets the plane between the thoracolumbar fascia and quadratus lumborum muscle, which is deeper than the TAP (46). There are several approaches to performing this block, the most well-known being the anterior approach (47). This requires the patient to be positioned laterally (46). Although there is insufficient evidence to prove its superiority over the TAP block for analgesia, the quadratus lumborum block does show promise as an alternative regional technique for abdominal surgery.

1.4.2.3. Local infiltration

Another technique that is also been used is local anaesthetic infiltration under direct vision by the surgeon. The surgeon infiltrates the appropriate fascial planes and peritoneum under direct vision before closing the abdomen. This method has shown to be effective in post-operative pain outcomes and patient satisfaction scores (11, 31, 49, 66). A review article published by Wick et al (31) in 2017 showed that opioid overuse in the United States of America (USA) has resulted in dependence and abuse amongst post-surgical patients (31). This has led to more clinicians choosing

an opioid free analgesic approach, with post-surgical infiltration of the wound site becoming a fast evolving trend (31). Gasanova et al (49) found that surgical site infiltration is superior to performing an ultrasound guided TAP block in TAH patients (49). There is limited data on this technique, and more research regarding its effectiveness needs to be conducted.

1.4.3 Regional anaesthesia in the Southern African setting

The use of regional anaesthesia and peripheral nerve blocks has become part of standard practice of care in most developed countries as part of a multimodal approach to anaesthesia (31). In Southern Africa, there has been little published data regarding the use of peripheral nerve blocks and their effects on post-operative pain management. In 2016, Moyo et al (25) published a study done in Zimbabwe, Harare, which illustrated that TAP blocks done in a resource limited setting decreased the amount of intramuscular pethidine used post-operatively among TAH patients (25). The authors showed that the use of adjuncts, such as dexamethasone, with the use of local anaesthetics for a block enhance post-operative pain control compared to a block without (25).

In Cape Town, South Africa, Marais et al (40) conducted a prospective randomised controlled trial where 30 patients were randomised to two groups, with one receiving a TAP block of a 0.25% concentration and one as the placebo. They showed that ultrasound guided TAP blocks significantly decreased morphine consumption 24 hours post-operatively. It did not show any significant difference between the pain scores of the two groups (40). Although the study consisted of a small sample group of 30 patients, the outcomes were still significant (40). To date, no other data has been published regarding TAP blocks in South Africa.

In Johannesburg, the Rahima Moosa Mother and Child Hospital (RMMCH) is a dedicated facility for obstetric, gynaecological and paediatric healthcare. An acute pain service has been introduced to deliver optimal care for patients who are

undergoing gynaecological procedures, particularly TAHs. TAP blocks are done for patients undergoing TAHs prior to surgical incision. In the post-operatively recovery room, morphine PCA pumps are connected to an independent intravenous access line to the patients before being sent to the ward. Currently, there has been no review or study to evaluate whether the TAP blocks performed are beneficial in this population group. For this reason, the aim of the study is to assess whether TAP blocks performed on TAH patients at RMMCH are in fact beneficial in managing post-operative pain and whether they decrease post-operative opioid requirements.

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Online-only article

Kim JH, Choi SH, Jang JH, et al. Impaired insula functional connectivity associated with persistent pain perception in patients with complex regional pain syndrome. *PlosOne*. 2017;12:e0180479.

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Entire book

Barash PG, Cullen BF, Stoelting RK, Cahalan M, Stock MC. *Clinical Anesthesia*. 6th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2009.

Chapter in a book

Goldhaber-Fiebert S, Cooper JB. Safety in anesthesia. In: Dunn PF, Alston T, Baker K, Davison JK, Kwo J, Rosow C. *Clinical Anesthesia Procedures of the Massachusetts General Hospital*. 7th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2006.

Software

Epi Info [computer program]. Version 3.5.1. Atlanta, GA: Centers for Disease Control and Prevention; 2008.

Database

PDQ: NCI's Comprehensive Database. Bethesda, MD: National Cancer Institute. <https://www.cancer.gov/publications/pdq>. Updated September 13, 2016. Accessed June 21, 2017.

Web site

ASRA News. Pittsburgh, PA: American Society of Regional Anesthesia and Pain Medicine. Available at: <https://www.asra.com/page/293/asra-news>. Accessed June 3, 2017.

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Section 3: Draft article

Effect of transversus abdominis plane block on post-operative morphine consumption in total abdominal hysterectomy patients

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Conflicts of interest

We declare that we have no financial or personal relationships which may have
inappropriately influenced us in writing this paper.

Running head: post-operative morphine consumption in patients receiving transversus abdominis plane blocks

3.1 Abstract

Background and objectives: This study was conducted at the Rahima Moosa Mother and Child Hospital in Johannesburg, South Africa, amongst patients undergoing total abdominal hysterectomy. The primary aim was to assess the post-operative morphine consumption between patients who received a transversus abdominis plane (TAP) block, compared to those who did not receive a TAP block. The secondary objective was to assess any differences in Numeric Rating Scale (NRS) pain scores between the groups as well as the side effects at different time intervals.

Methods: One hundred and twenty six patient records were included in this retrospective study using a consecutive convenience sampling method. They were divided into the TAP block group and the non-TAP block group. The TAP block group received TAP blocks by the anesthetist after the induction of general anesthesia, whilst the non-TAP block group only received a general anesthetic. Both groups received intravenous analgesia as predetermined by the anesthetist. Boluses of morphine were administered through patient controlled analgesia pumps in the recovery room and in the post-operative period. The acute pain trainee documented the morphine consumption at Time 1, Time 2 and Time 3, as well as the NRS pain scores and any side effects experienced by the patient.

Results: There was no significant difference between the morphine consumption in the TAP block versus the non-TAP block groups at Time 1, Time 2 or Time 3. There was no significant difference of pain scores between the two groups.

Conclusion: TAP blocks did not decrease the amount of post-operative morphine consumed in patients who received a total abdominal hysterectomy, nor did it result in any differences in NRS pain scores between the two groups.

3.2 Introduction

Patients undergoing total abdominal hysterectomy (TAH) have been reported to experience moderate to severe pain, and tend to experience chronic post-operative pain due to sub-optimal intra-operative analgesia^(2, 5). This results in poor post-operative function^(5, 9). In an attempt to provide optimal analgesia in the peri-operative period, the American Society of Anesthesiologists Task Force⁽²⁶⁾ and the Enhanced Recovery after Surgery Guidelines^(30, 38) encourage anesthetists to incorporate multimodal analgesia in clinical practice^(26, 30, 38). This includes the use of intra-operative intravenous agents, patient controlled analgesia (PCA) pumps and regional anesthesia techniques in the management of patients undergoing TAH surgery⁽⁴⁾.

Peripheral nerve blocks have gained popularity among anesthetists as part of modern anesthetic techniques^(3, 26, 30, 31). Since Rafi's⁽¹⁵⁾ lumbar plexus block publication in 2001, there has been growing interest in the use of peripheral nerve blocks for abdominal and gynaecological surgery, specifically for patients undergoing TAH^(10, 14, 16). The transversus abdominis plane (TAP) block has been under investigation mainly in developed countries, where it has been assessed as to whether it is effective for post-operative pain management in this patient group^(10, 44, 52). Furthermore, the advent of ultrasound guided blocks has improved the accuracy of the TAP block^(13, 14, 17, 43, 56, 57).

Although there has been research on TAP blocks in developed countries^(10, 44), there is minimal research available to assess its effectiveness in patients who have TAH surgery in developing countries^(25, 40, 67). In South Africa, only one such study has been identified regarding the efficacy of TAP blocks⁽⁴⁰⁾.

50 The acute pain service at the Rahima Moosa Mother and Child Hospital (RMMCH) in
51 Johannesburg routinely monitors and manages the post-operative pain of patients undergoing
52 TAH. This is done by an acute pain trainee. In the intra-operative period, some of the patients
53 receive a TAP block which is performed either by using the landmark technique or by
54 ultrasound guidance. Patients who do not receive a TAP block only receive intravenous
55 analgesia. All patients receive a general anesthetic. In the post-operative period, all patients
56 then receive a programmed morphine PCA pump, which is started in the recovery room. The
57 aim of this retrospective study was to compare the post-operative morphine consumption
58 between patients who received a TAP block versus those who did not receive a TAP block.

3.3 Methodology

The study was approved by the University of the Witwatersrand Human Research Ethics Committee (Medical) as well as other relevant authorities. Using consecutive convenience sampling, data were collected from the acute pain records at the RMMCH. Data were collected starting from 31 August 2017 working backwards until the required sample size was achieved. In consultation with a biostatistician using STATA14[®] (StataCorp[®], USA), a minimum sample size of 92 patient records (46 records in each group) was calculated for each time interval, in order to achieve an 80% power and an α -value of 0.05.

The following information was required for the inclusion of acute pain records: age, ASA status, patients who had undergone a TAH, total morphine received post-operatively via the PCA pump, completed Numeric Rating Scale (NRS) pain scores and side effects experienced by the patients at the different assessment times. Patient records were excluded if the PCA pumps were removed before the second point of assessment.

At the RMMCH, the decision to perform a TAP block in TAH patients was made by the anesthetist allocated to the elective gynaecology list on that particular day. For those who received TAP blocks, a standard concentration and volume of 40 ml of 0.25% bupivacaine with adrenaline was used. This was injected either under ultrasound guidance using a Mindray M5 ultrasound machine with a linear transducer probe or using the landmark technique. A Gabler Medical CADD[®] Solis PCA pump was then set up for each patient in the recovery room by an acute pain trainee. At each patient assessment time in the ward, the acute pain trainee would review the patients. Patients were assessed at the following time intervals: Day 0, which was approximately 6 – 12 hours post-operatively (T1), Day 1, which was

approximately 24 hours post-operatively (T2) and Day 2 (T3), which was approximately 48 hours post-operatively. At each time interval the following information was documented: 1) total morphine administered using the PCA, 2) pain scores according to the NRS and 3) side effects from the morphine. At T3, after documentation of the necessary data, the PCA was removed by the acute pain trainee and analgesia was supplemented as per ward protocol in the form of oral paracetamol, non-steroidal anti-inflammatories and tramadol.

One author (R.L) was responsible for collecting and capturing the data from the acute pain records onto a Microsoft Excel[®] spreadsheet. In consultation with a biostatistician, descriptive and inferential statistics were done using STATA14[®] (StataCorp, USA). The Shapiro-Wilk test was used to assess normality of data. Categorical data were described using frequencies and percentages, and continuous data were expressed as means and standard deviations or medians and interquartile ranges. Comparisons were made between the two groups using the Student's t-test or Mann Whitney U-test, depending on the distribution of the data. A p-value of <0.05 was considered as statistically significant.

3.4 Results

One hundred and twenty six patient records were included in this study. A total of 63 patients' records were included in either the TAP block or non-TAP block group. By T2, one pump was removed prematurely. By T3, some PCA pumps had been removed prematurely. This resulted in 47 patients remaining in the TAP block group and 46 patients in the non-TAP block group. The demographics of the patients are shown in Table 1.

Weight was significantly different between the two groups with patients in the non-TAP block group weighing more. The ASA status distribution between the groups was similar.

A comparison of morphine consumption between the two groups is shown in Table 2. There was no statistically significant difference between the morphine consumption at T1, T2 and T3.

A comparison of the NRS pain scores between the two groups is shown in Table 3. There was no significant difference between the NRS scores of the two groups at T1, T2 and T3.

Side effects were reported at T1, T2 and T3. Specific side effects documented were pruritus, sedation and nausea and vomiting (N+V). At T2, data of one patient within the TAP block group was not available as the pump was prematurely removed. Twenty four (38.1%) patients experienced side effects in the TAP block group, whereas 21 (33.3%) patients from the non-TAP block group experienced side effects.

122 The side effects experienced by the patients as a result of the morphine PCA in both groups
123 are shown in Table 4. Sedation was the most common side effect experienced in the TAP and
124 non-TAP block groups at T1, T2 and T3. There were patients who either experienced more
125 than one side effect in both the TAP and non-TAP groups, or experienced the same side effect
126 at different time intervals.

127

3.5 Discussion

This retrospective study demonstrates that TAP blocks for patients undergoing TAH did not significantly decrease post-operative morphine consumption compared to those not receiving a TAP block. There was no significant difference in the pain scores between the two groups at T1, T2 and T3. Patients had experienced side effects of the morphine PCA pumps in both groups, with sedation being the most common side effect in the TAP block group.

The lumbar plexus block described by Rafi in 2001⁽¹⁵⁾ has been considered a breakthrough in regional anesthesia for post-operative pain management. This block has subsequently been investigated as a modality for post-operative analgesia in different types of abdominal surgery^(10, 16, 55). TAP blocks have been shown to decrease post-operative pain in TAH patients, with improved accuracy by using ultrasound guidance^(10, 14, 16, 43, 57). However, the TAP block does not guarantee complete sensory blockade^(14, 55). This was demonstrated by both Rozen et al⁽¹²⁾ and Tran et al⁽¹⁴⁾, where dye injectate spread viewed with magnetic resonance imaging showed no uniform dermatomal spread^(12, 14). This implies that TAP blocks may not always be successful in providing adequate analgesia for patients undergoing abdominal surgery in the post-operative period.

Sensory mapping under ultrasound guidance was performed by StØving et al⁽⁵⁵⁾, who concluded that TAP blocks do not result in a uniform distribution of local anesthetic. The authors demonstrated that the lateral aspect of the anterior abdominal wall was more affected by the TAP block and that full sensation still remained in the midline. Furthermore, they also found that there was no uniform dermatomal distribution of the block. This suggests that even

TAP blocks done under ultrasound guidance may not be effective as the sensory block is unpredictable and not dermatomal in distribution as originally thought ⁽⁵⁵⁾.

Regarding visceral pain management, the effectiveness of the TAP block is minimal. Yoshiyama et al ⁽⁵⁶⁾ and Abdallah et al ⁽⁵²⁾ both illustrated that different approaches of the TAP block influence the extent of sensory blockade for analgesia. The posterior TAP block approach was shown to be superior to the lateral or subcostal block approaches for effective pain management, when performed under ultrasound guidance ^(52, 56). The posterior approach of the TAP block incidentally correlates to the anatomical landmarks of the lumbar plexus block originally described by Rafi ⁽¹⁵⁾.

In this study, no significant difference was found for morphine consumption between the TAP block and non-TAP block groups. This could be attributed to different approaches undertaken to perform the TAP block at the RMMCH. Gasanova et al ⁽⁵⁰⁾ showed that the TAP block alone was not an adequate form of post-operative analgesia for TAH patients. Rather, TAP blocks should be used in combination with other intravenous analgesia or regional techniques for effective pain management⁽⁵⁰⁾.

A Cape Town study by Marais et al ⁽⁴⁰⁾ was conducted in 2015 to assess whether TAP blocks were effective in reducing post-operative pain in TAH patients. The study was a prospective randomised study which recruited a total of 30 patients ⁽⁴⁰⁾. The authors' findings showed a significant reduction in post-operative morphine use in the TAP block compared to the non-TAP block group ⁽⁴⁰⁾.

Though the sample size used in Marais et al ⁽⁴⁰⁾ was smaller (n = 30) than that of our sample group (n = 126), the authors showed a significant reduction in post-operative morphine consumption and pain scores ⁽⁴⁰⁾. The difference in the results between these two studies may be attributed to the fact that the TAP block in Marais et al (40) were performed by a single anesthetic consultant. In our study, the TAP blocks were performed by the anesthetist allocated to the gynaecological list on a particular day. This included medical officers and registrars supervised by a specialist anesthetist. The level of expertise of the anesthetist performing the block was not specified on the data collection sheet.

In 2011, Niazi et al ⁽⁶¹⁾ did a simulation training programme with trainees prior to administration of peripheral nerve blocks. It was shown that trainees who underwent the simulation programme had a higher success rate when performing the peripheral nerve blocks. In 2017, a study ⁽⁶³⁾ illustrated that the success of a peripheral nerve block directly correlates with the training and simulation of trainees in performing the block. (63). In meta-analyses performed by Brogi et al ⁽⁶⁰⁾ and Baerwyl et al ⁽⁵³⁾ it was illustrated that operator expertise played a major role in the success of a TAP block.

Weinstein et al ⁽⁶⁸⁾ defines performative expertise as a person who can “perform a skill well according to the rules and virtues of a practice” ⁽⁶⁸⁾. With respect to this study, this would be an anesthetic consultant who is proficient at peripheral nerve blocks. However, it has not been clearly defined in the literature as to how many peripheral nerve blocks a clinician needs to perform in order to become an expert. At the RMMCH which is a training hospital for anesthetists, the level of skill of the doctors administering peripheral nerve blocks varies, resulting in the possible discrepancies in success rates.

Our study did have limitations. It was a retrospective study. Intra-operative analgesia was not standardised. This may have affected post-operative morphine requirements in both the TAP and non-TAP group, which may have confounded the results at T1. By definition, pain is a subjective experience ⁽¹⁾. Although the NRS pain scale is a reliable scoring system, the data recorded on the collection sheets may have been inaccurately collected and recorded by the acute pain trainee. This may have altered the data recorded on the collection sheet. The TAP blocks performed in this study were not done by a single skilled person, which possibly resulted in fewer success rates.

Newer techniques since the TAP block have been proposed for abdominal surgery. Although the literature is scarce ⁽⁴⁹⁾, the quadratus lumborum block as well as direct surgical site infiltration have shown to be effective in post-operative pain management. Future research should be concentrated on looking at the comparisons of these newer techniques with the TAP blocks and their effects on post-operative pain management in the TAH population group.

Although the TAP blocks performed at the RMMCH have shown not to be effective in post-operative pain management, more research and investigation needs to be conducted at this facility. What is presently required is a prospective randomised study looking at each variable in order to optimise the TAP block administration and monitoring, as well as improved anesthetic training in TAP blocks. This, along with more standardised intra-operative analgesia regimes, may provide better analysis of the effectiveness of TAP blocks.

220 **3.6 Conclusion**

221

222 There was no significant difference in post-operative morphine consumption between TAH

223 patients who received TAP blocks as compared to those who did not receive a TAP block.

224 There was no difference in NRS pain scores between the two groups. The side effect profile

225 of the TAP block group and the non-TAP block group were similar.

226 **3.7 Acknowledgements**

227

228 This research was done in partial fulfilment of a MMed degree. I would like to acknowledge

229 my supervisors with their assistance on this submission.

3.8 References:

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Tables:

- 230 • Table 1: Demographics of patients

Variable		TAP block group	Non-TAP block group	p- value
Age (years) :	Mean	47.30	46.26	p=0.5096
	SD	10.00	7.43	
Weight (kg)	Mean	72.07	79.34	p=0.0144
	SD	15.58	15.16	
ASA status:	1	15	12	
	2	43	43	
	3	5	8	

231 • Table 2: Comparison of morphine consumption between groups

232 •

Morphine (mg)			
	TAP block group	Non-TAP block group	p-value
T1: Median (IQR)	6.00 (3.00 – 11.00)	8.00 (4.00 – 15.00)	p=0.0912
T2: Mean (SD)	23.25 (13.47)	23.06 (13.37)	p=0.9361
Median (IQR)	22.50 (11.30 – 32.05)	20.00 (12.50 – 34.50)	
T3 Median (IQR)	33.00(24.38 – 43.73)	36.00(24.30 – 46.50)	p=0.5489

233 • Table 3: Comparison of NRS scores between groups

234 •

NRS Score (/10)			
Time interval	TAP block group	Non-TAP block group	p –value
T1: Median (IQR)	3 (2 – 5)	4 (2 – 6)	p=0.4162
T2: Median (IQR)	2 (2 – 5)	3 (2 – 5)	p=0.4563
T3:Median (IQR)	2 (1 – 3)	2 (1 – 4)	p=0.4654

235 • Table 4: Side effects experienced between groups at T1, T2 and T3

236 •

TAP block group				Non – TAP block group			
Time interval	Pruritus n (%)	Sedation n (%)	N+V n (%)		Pruritus n (%)	Sedatio n n (%)	N+V n (%)
T1 (n=63)	1 (1.56)	10 (15.76)	3 (4.82)	n = 63	1 (1.63)	3 (4.78)	7 (11.10)
T2 (n=62)	4 (6.35)	8 (12.63)	0	n = 62	1 (1.57)	8 (12.67)	1 (1.63)
T3 (n=49)	2 (4.74)	1 (2.04)	1 (2.56)	n = 47	0	0	2 (4.25)

Section 4: Appendices

4.1. Postgraduate Approval

UNIVERSITY OF THE
WITWATERSRAND
JOHANNESBURG



Private Bag 3 Wits, 2050
Fax: 027117172119
Tel: 02711 7172076

Reference: Mrs Sandra Benn
E-mail: sandra.benn@wits.ac.za

22 November 2017
Person No: 0501358X
PAG

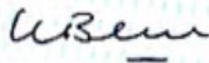
Dr R Lockhat
140 Smith Street
Fairlands
Johannesburg
2175
South Africa

Dear Dr Lockhat

Master of Medicine: Approval of Title

We have pleasure in advising that your proposal entitled *Effect of transversus abdominis plane block on post-operative morphine consumption in total abdominal hysterectomy patients* has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

A handwritten signature in black ink, appearing to read 'S. Benn'.

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

4.2. Human research ethics committee approval



R14/49 Dr Razeena Lockhat

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M170905

NAME: Dr Razeena Lockhat
(Principal Investigator)
DEPARTMENT: Anaesthesiology
Rahima Moosa Mother and Child Hospital

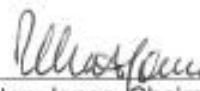
PROJECT TITLE: The Consumption of Morphine in Post-Operative
Total Abdominal Hysterectomy Patients using Two Analgesic
Treatment Modalities

DATE CONSIDERED: 29/09/2017

DECISION: Approved unconditionally

CONDITIONS: Title Change (15/12/2017)

SUPERVISOR: Helen Perrie

APPROVED BY: 
Professor P. Cleaton-Jones, Chairperson, HREC (Medical)

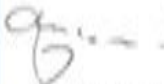
DATE OF APPROVAL: 16/10/2017

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the 3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand. I/We fully understand the conditions under which I am/we are authorised to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit to the Committee. I agree to submit a yearly progress report. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed, in this case, the study was initially review September and will therefore be due in the month of September each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

4.3. Hospital CEO permission letter

	GAUTENG PROVINCE REPUBLIC OF SOUTH AFRICA	
RAHIMA MOOSA MOTHER AND CHILD HOSPITAL		
Enquiries : Karen Marshall		
Tel : (011) 470 9284		
Fax : 086 553 4623		
Email : Karen.Marshall@wits.ac.za		
School of Anaesthesiology University of the Witwatersrand		
Dear Dr. Lockhat,		
RE: EFFECT OF TRANSVERSUS ABDOMINIS PLANE BLOCK ON POST-OPERATIVE MORPHINE CONSUMPTION IN TOTAL ABDOMINAL HYSTERECTOMY PATIENTS		
Permission is granted for you to conduct the research as indicated in the title above.		
The terms under which this permission is granted is contained in the Researcher Declaration form that you have signed. Failure to comply with these conditions will result in the withdrawal of such permission.		
It is crucial for you to inform the Research Coordinator, Karen Marshall of the actual start and end dates of your study. This could be done by e-mail.		
Should the study commence more than 12 months after receipt of this approval letter you will have to go through the process of applying again.		
You are strongly advised to keep a signed copy of the declaration form so as to ensure that the terms of this agreement are complied with at all times.		
Yours sincerely,		
		
DR F BENSON CLINICAL EXECUTIVE 2018/02/06		
ADDRESS: Cnr. FUEL & OUDSTHOORN STREET CORONATIONVILLE 2093 / PRIVATE BAG X20 NEWCLARE 2112 JHB		

4.4. Department of Anaesthesiology approval letter



GAUTENG PROVINCE

HEALTH

REPUBLIC OF SOUTH AFRICA

*Department of Anaesthesiology
Rahima Moosa Mother and Child Hospital*

Tel: (011) 470-9303

Fax: 0865194183

E-mail: kleyenstuber@hotmail.com

11 August 2017

Dear Dr Razeena Lockhat

I have received your written request to conduct your MMED study in the Department of Anaesthesia at Rahima Moosa Mother & Child Hospital. I hereby give you permission to access the acute pain records of the patients who present for total abdominal hysterectomy.

Kind Regards

Dr T Kleyenstuber

Head: Clinical Unit - Anaesthesiology
Rahima Moosa Mother and Child Hospital

4.5. Turnitin letter from supervisor



19th November, 2018

The Chairperson
Graduate Studies Committee
Faculty of Health Sciences
University of the Witwatersrand

Dear Madam,

Re: M Med: The effect of transversus abdominus plane block on post-operative morphine consumption in total abdominal hysterectomy patients

Dr Razeena Lockhat, student number: 0501358X, has submitted her research report to Turnitin which revealed a similarity index of 14%. These similarities appear not to be plagiarism but mainly the use of common terminology and phrases specific to the topic of the research.

Yours sincerely,

Helen Perrie
Supervisor

Turnitin results

0501358x:FINALDOC2.docx			
ORIGINALITY REPORT			
14%	9%	11%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS
PRIMARY SOURCES			
1	Submitted to University of Witwatersrand Student Paper	1%	
2	www2.kenes.com Internet Source	<1%	
3	&NA;, . "Abstracts and Highlight Papers of the 32nd Annual European Society of Regional Anaesthesia & Pain Therapy (ESRA) Congress 2013 : Invited Speaker Highlight Papers", Regional Anesthesia and Pain Medicine, 2013. Publication	<1%	
4	Matthew C. Hernandez, Jason Panchamia, Eric J. Finnesgard, Jennifer L. Leiting et al. "Transversus abdominis plane blocks with liposomal bupivacaine after open major hepatectomy is associated with reduced early patient-reported pain scores and opioid administration", Surgery, 2018 Publication	<1%	
5	open.uct.ac.za Internet Source	<1%	

Section 5: Research proposal

Effect of transversus abdominis plane block on post-operative morphine consumption in total abdominal hysterectomy patients

Razeena Lockhat

0501358X

Supervisor

Helen Perrie

Department of Anaesthesiology

Co-Supervisor

Juan Scribante

Department of Anaesthesiology

Co-Supervisor

Dr Thomas Kleyenstuber

Department of Anaesthesiology

5.1 Introduction

Pain is defined by the International Association for the Study of Pain (IASP) as an “unpleasant sensory and emotional experience, with actual or potential tissue damage or described in terms of such damage”(1). Pain can be classified as acute or chronic (2, 5). Post-surgical pain is a complex response which results in a systemic response throughout the central and peripheral nervous system (2). It is considered to be a double insult process which results in the stimulation of pro-inflammatory markers which are subsequently released by the damaged tissue and vasculature (2, 8).

Patients undergoing total abdominal hysterectomy (TAH) experience moderate to severe pain (9). In Denmark, a study showed that 32% of patients who undergo TAH experience have severe post-operative pain (9). This is generally exacerbated by movement. Studies (6, 9, 11) have shown that pain perceptions of these patients are determined not only by intra-operative pain management but also pre-existing comorbidities (11). Patients who undergo hysterectomy and have suboptimal intra-operative analgesic control develop chronic persistent pain (2, 5) and have poor post-operative function (5, 9).

The American Society of Anaesthesiologists Task Force (26) recommends that anaesthetists adopt a multimodal approach to pain management in the intra-operative setting (26). In conjunction with the Early Recovery after Surgery (ERAS) protocol (30, 38), anaesthetists are encouraged to incorporate different modes of analgesia in clinical practice (26, 30, 38). This includes the use of intra-operative intravenous agents, patient controlled analgesia (PCA) pumps and regional techniques (4).

PCA pumps contain an opioid based solution which is connected to the patient intravenously through an independent intravenous line. The administration is patient

initiated but the amount administered is controlled by a lockout system built into the device, thereby preventing repetitive boluses and overdose (26).

Neuraxial anaesthetic techniques have been used for thoraco-abdominal procedures with success in managing post-operative pain (17, 38). Both epidural and spinal anaesthesia have been used successfully in patients undergoing abdominal surgery (38). For TAH, neuraxial anaesthesia has been used with success in decreasing post-operative morphine consumption (30, 34, 38, 53).

Epidural anaesthesia has been shown (38) to decrease post-operative morphine consumption (3, 26, 38). It also decreases the risk of post-operative pulmonary splinting secondary to uncontrolled pain and poor gastrointestinal function (3, 38). Earlier mobilisation of patients results in a shorter duration of hospital stays and prevents significant post-operative respiratory and cardiovascular complications (3, 38).

Spinal anaesthesia is also considered to be effective for post-operative analgesia (34, 38, 53), as it causes a dense sensory block and is used for lower abdominal, perineal and lower limb surgery (38). In the context of TAH, there are benefits using spinal anaesthesia in conjunction with a general anaesthetic to minimise post-operative pain (38, 69).

Neuraxial anaesthesia is, however, not without complications (29). Hypotension, haematoma formation and complete paralysis (3, 29) are some of the complications that can result from neuraxial procedures. Careful risk stratification and risk assessment of patients should therefore be undertaken by the attending physician before an epidural is administered.

Because the evidence supports multimodal analgesic approaches (26, 30, 31), other methods (3, 31) of providing intra- and post-operative analgesia, besides intravenous

agents, are now used (3). Peripheral nerve blocks have gained popularity among anaesthetists (3, 26, 30, 31). Ever since Rafi's (15) publication in 2001 on the lumbar plexus block and the subsequent work of Rozen et al (12) in refining the anatomy of the innervation of the abdominal wall, there has been curiosity in peripheral nerve blocks for abdominal surgery. Using the work of Rafi (15), others (10, 14, 16) have proposed the use of the transversus abdominis plane (TAP) block for post-operative analgesia in patients undergoing lower abdominal surgery (16). In 2008, Carney et al specifically looked at the use of TAP blocks in patients undergoing TAH, which demonstrated that it decreases post-operative morphine consumption within the first 48 hours (10).

Since then, the use of TAP blocks for TAH surgery has been extensively reviewed (34, 41, 42, 49, 69). With the increase use of ultrasound in the theatre setting, the accuracy of TAP blocks has been improved (14, 43, 57). Various approaches to the TAP block have been studied (13, 17, 56) to assess which method enables the best dermatomal distribution (13). In addition, other novel techniques based on the TAP block approach have been created (45-47). There is evidence (34, 49, 53, 69) which suggests that TAP blocks are not solely adequate for post-operative pain control (ref 31-33) and have no added benefit over neuraxial anaesthesia (34, 49, 50). Despite this, TAP blocks continue to be used for abdominal and pelvic surgery.

5.2 Problem Statement

Pain is an unpleasant sensation which can be a severely debilitating experience for the post-operative patient (9). Abdominal surgery carries with it significant risk for post-operative pain (9) which, if left untreated, can result in persistent chronic pain (5, 9). For this reason, it is essential that the attending anaesthetist is knowledgeable and capable of managing this. Several modalities are used by anaesthetists for pain control in the intra-operative setting, the most common being intravenous analgesic agents (3, 4). However, global trends are moving away from this traditional approach due to the side effects of these agents and alternatives have been sought (3, 26, 31).

Regional anaesthetic techniques are becoming more favoured as part of multimodal techniques and the ERAS protocol (30, 31, 38). Neuraxial anaesthesia and peripheral nerve blocks have shown to be successful in controlling post-operative pain for abdominal surgeries (32). Specifically, the TAP block has been utilised to decrease morphine consumptions in patients undergoing TAH post-operatively (10, 16), with the use of ultrasound significantly improving success rates as compared to the landmark technique (43, 57).

In South Africa, there is limited data to support findings on this technique. In 2014, Marais et al (40) conducted a small scale prospective study at the University of Cape Town, showing that TAP blocks do improve post-operative pain in TAH patients. In Johannesburg at the Rahima Moosa Mother and Child Hospital (RMMCH), an acute pain service monitors pain in patients that have had TAH surgery. Morphine consumption is observed through a programmed PCA pump in these patients, regardless of whether they have received a TAP block. Currently, it is unknown as to whether this modality of pain management is effective in this population group.

5.3 Aim

The aim of this retrospective study is to compare the post-operative morphine consumption in TAH patients with TAP blocks versus those without.

5.4 Objectives

5.4.1 Primary objective

The primary objective of this study is to compare the post-operative morphine consumption between the two groups at Time 1 and Time 2.

5.4.2 Secondary objective

The secondary objectives of this study are:

- to compare the post-operative morphine consumption at Time 3 in the TAP block group versus the non-TAP group.
- to describe the patients' pain scores at Time 0, Time 1, Time 2 and Time 3 using the Numeric Rating Scale (NRS).
- to describe patients' side effects of the morphine PCA in the TAP compared to the non-TAP group.

5.5 Research assumptions

The following definitions will be used in the study.

Total abdominal hysterectomy: a gynaecological surgical procedure that involves removal of the uterus and fallopian tubes of the female reproductive system (70). It is a procedure which can be done from a midline or a Pfannenstiel approach (70).

Transversus abdominis plane block: is a peripheral nerve block where local anaesthetic is injected between the fascial planes of the internal oblique and transversus abdominis muscle (17).

TAP block group: this patient group will receive a TAP block after the induction of general anaesthesia. The block will be administered before the surgical incision is made. Intravenous analgesia will be titrated according to intra-operative vital signs and will also be at the discretion of the attending anaesthetist allocated to the gynaecological list on that particular day. Patients will receive a PCA post-operatively in the recovery room. This will be initiated by the acute pain anaesthetic registrar.

Non-TAP block group: this patient group will not receive a TAP block after the induction of general anaesthesia. Intravenous analgesia will be titrated to effect according to intra-operative vital signs. This is at the discretion of the attending anaesthetist responsible for the gynaecology list on that particular day. Patients will receive a PCA pump post-operatively in the recovery room. This will be initiated by the acute pain anaesthetic registrar.

Acute pain anaesthetic registrar: the anaesthetic registrar who is designated to the acute pain service. The responsibilities of the acute pain registrar involve the commencement of the PCA pump in the recovery room, the follow up of the patients in the ward and the documentation of the data as per the acute pain form (Appendix A).

Acute pain records: the records of the patients undergoing TAH at the RMMCH which have morphine consumption and pain scores documented at Time 0, Time 1, Time 2 and Time 3 (Appendix A).

Time 0: the time at which the PCA pump was connected and started on the patient. This would be when the acute pain anaesthetic registrar sees the patient in the recovery room post-operatively.

Time 1: the time of the first assessment. This is approximately 12 hours after surgery in the ward. The total morphine consumption is documented from the PCA. Pain score assessment is done by the attending acute pain anaesthetic registrar. Side effects from the morphine administered will be documented.

Time 2: the time of the second assessment. This is between 22 – 26 hours post-operatively. Total morphine consumption from the PCA is documented. Pain score assessment will be done by the acute pain anaesthetic registrar. Side effects from the morphine will be documented.

Time 3: the time of the third and final assessment. This is done within 36 – 48 hours of surgery. Total morphine consumption is documented from the PCA pump. Pain score assessment will be done by the acute pain anaesthetic registrar. Side effects of the morphine will be documented. Date and time of PCA removed is documented.

Morphine side effects: These are pharmacological side effects experienced as a result of intravenous morphine administered from the PCA. In this study, the side effects which will be described are nausea and vomiting, sedation and pruritus. This is assessed at Time 1, 2 and 3.

Pertinent information: the information required by the researcher to make this study representative. This would be:

- whether patients have had a TAH
- the type and amount of intra-operative analgesia received
- whether patients have received a TAP block in the intra-operative period
- the total morphine consumption at Time 0, Time 1, Time 2 and Time 3
- the pain scores at Times 0, 1, 2 and 3
- the side effects of the morphine at Time 1, 2 and 3.

5.6 Demarcation of the study field

The study will be conducted at the RMMCH theatre complex, which is affiliated to the Department of Anaesthesiology and Faculty of Health Sciences of the University of the Witswatersrand.

The RMMCH has 500 beds and four theatres consisting of two obstetric theatres, one gynaecological and one paediatric theatre. On average per year, 6 600 surgeries are done at the hospital. Approximately 700 TAHs are done annually at the RMMCH.

5.7 Ethical considerations

Submission to the Human Research Ethics Committee (Medical) and the Graduate Studies Committee of the University of the Witswatersrand will be made in order to obtain approval to conduct the study.

Approval will be obtained from the National Health Research Database, the RMMCH and Head of the Department of Anaesthesiology, the gatekeeper of anaesthesiology records (Appendix B).

Anonymity and confidentiality will be ensured by replacing the name and hospital number with a study number and only the researcher and the supervisors will have access to the raw data. The findings from the study will be conveyed to the Head of the Department of Anaesthesiology at the RMMCH. The data will be stored on a password protected database for six years after completion of the study.

The study will be conducted in accordance with the Declaration of Helsinki (71) and the South African Good Practice Guidelines (72).

5.8. Data collection

5.8.1. Research design

A retrospective, comparative descriptive and contextual research design will be followed in this study.

Retrospective study: a study where the causative factor is assessed from the past, the result is determined in the present (73). This study is retrospective as the patients' records before 31 August 2017 will be analysed.

Comparative descriptive: a study where the differences between two variables are investigated around the point of interest (74). This study is comparative as it is comparing two groups of patients and describing post-operative morphine consumption.

Contextual: A contextual study, as defined by de Vos et al (75), is a study of "small scale worlds" those for example, being "gangs, hospital wards, public drinking places, school classrooms". This study is a contextual study as it is done in the context of the RMMCH.

5.8.2. Study population

The study population will include all acute pain records of patients who presented to the RMMCH for elective TAH.

5.8.3 Study sample

5.8.3.1 Sample method

This study will use a consecutive convenience sampling method working backwards from 31 August 2017. Convenience sampling, as defined by Brink et al (73), involves “the choice of readily available participants or objects for the study”(73). It is associated with biases and may lead to certain elements being “over-represented or under-represented”(73). Consecutive convenience sampling is considered to be the strongest form of non-random sampling as it includes every individual within the chosen population (76).

5.8.3.2 Sample size

The sample size was determined in consultation with a biostatistician. The reduction in morphine that was determined to be significant in the TAP block group would be 25% compared to the non-TAP group (10, 50). A minimum sample size of 45 patient records in each group is required for the study to achieve power greater than 90% and a p value of <0.05 is needed for the results to be statistically significant. A sample size of 60 patient records will be used as it is anticipated that the number of patient receiving morphine may decrease from Time 1 to Time 3. This may be as a result of PCA pumps being prematurely removed.

5.8.3.3 Inclusion and exclusion criteria

The inclusion criteria for this study are:

- patients who underwent a TAH
- whose post-operative pain records were available
- patients who received a PCA pump post-operatively.

The exclusion criteria for this study are:

- records of patients who do not understand how to use PCA pumps

- patients who are less than 18 years of age
- records that are illegible and have incomplete pertinent information.

5.8.4 Collection of data

5.8.4.1 The RMMCH analgesia practice

At the RMMCH, TAP blocks are done on gynaecological patients who undergo TAH. The decision to do the TAP block is made by the designated consultant and registrar who are allocated to the elective gynaecology list on a particular day. This may be influenced by the experience of the allocated anaesthetist with TAP blocks, as well as the availability of the ultrasound machine for the anaesthetist to use to perform the TAP block. Patients who are last on the theatre list may not receive a TAP block as there may be a time constraint in performing a TAP block. The TAP block is done using ultrasound guidance. After a general anaesthetic is administered, a linear probe is used and the layers of the internal oblique muscle and transversus abdominis muscle are identified. A needle is advanced under vision into the TAP. The anaesthetist aspirates to exclude intravascular placement of the needle before injecting the local anaesthetic. The patient is injected with 20ml of 0.25% bupivacaine on each side, with a total volume of 40ml given. Separation of the fascia between the internal oblique and transversus abdominis is observed on the ultrasound screen. The surgery then commences.

In the recovery room, the PCA pump is prepared and connected to the patient on an independent intravenous line. The PCA pump used is the Gabler Medical CADD Solis pump. Each cassette holds 50 ml of solution, where each millilitre is equivalent to 1mg of morphine. The PCA device has a pre-programmed lockout of eight minutes. One millilitre is delivered when the PCA button is pressed by the patient. Each patient receiving a PCA is required to give verbal consent in the pre-operative period once counselled on how to use the PCA. The time of commencement of the PCA is documented by the acute pain anaesthetic registrar. This is documented as Time 0.

At Time 1, the acute pain anaesthetic registrar assesses the patient's pain post-operatively in the ward. This is approximately 12 hours after surgery. The registrar documents the total morphine used by the patient, which is available on the PCA pump screen. A pain score is documented using the NRS which is done verbally. Any side effects that the patient may experience due to the morphine are also documented.

At Time 2 the acute pain anaesthetic registrar assesses the patient within 22 – 26 hours post-operatively. The total morphine amount is documented from the PCA pump and a pain score assessment is done. Morphine side effects are documented.

At Time 3, a final assessment is done. The total amount of morphine and a pain score is documented. Any side effects are documented. The removal of the PCA is documented on the acute pain form, which is then filed in the Department of Anaesthesiology database.

5.8.4.2 Acute pain form

The acute pain form is adapted from the RMMCH Department of Anaesthesiology (Appendix A) acute pain assessment form. Each record will be allocated a study number and the data will be captured on a Microsoft® Excel spreadsheet.

The following information will be represented on the acute pain form:

- surgical procedure
- ASA status study number
- type of anaesthetic administered
- the volume and concentration used of local anaesthetic
- the time the PCA pump was connected to the patient and started (Time 0)
- the total amount of morphine used by the patient in the post-operative period at Time 1, Time 2 and Time 3
- the NRS score at Time 1, Time 2 and Time 3

- side effects of the morphine PCA at Time 1, Time 2 and Time 3
- date and time the morphine PCA was removed.

Once approval of the relevant authorities has been granted, patient records will be utilised on site and not to be removed from the hospital. The data will be entered only by the primary researcher.

5.8.5 Data analysis

The programme that will be used for data analysis will be GraphPad InStat™. Descriptive and inferential analysis will be done. Normally distributed numerical variables will be described using means and standard deviations and those not normally distributed, using medians and interquartile ranges. Categorical variables will be described using numbers and percentages. The comparison between morphine consumption of the two groups will be done using either an independent t-test or the Mann-Whitney U test, depending on the distribution of the data. Pain scores will be analysed as ordinal data. A p value of <0.05 will be considered statistically significant.

5.9 Significance of the study

Pain is defined as “an unpleasant sensory and emotional experience, associated with actual or potential tissue damage or described in terms of such damage” (1). In 2011, the World Medical Association released a resolution on the access to adequate pain treatment, which stated that “the right to access to pain treatment for all people without discrimination, as laid down in professional standards and guidelines and in international law, should be respected and effectively implemented” (77).

Post-operative pain is a serious complication which can cause significant patient morbidity if inadequately treated (5, 9, 78). Under the Health Practitioners’ Council of South Africa General Ethical Guidelines for Healthcare Professions, it is the duty of a healthcare worker to always act in the best interests of the patient with regards to treatment and healthcare (79) . This includes optimal pain management throughout

patient care (72, 80) . As a result, the best available methods should be utilised to achieve this (2).

At the RMMCH, the acute pain service offered is a means for the Department of Anaesthesiology to improve pain management and overall patient care in the post-operative period for TAH patients. The significance of this study is to assess whether the TAP blocks administered to these patients are effective in post-operative pain management.

5.10 Validity and reliability

Validity, as defined by Botma et al (74), is referred to as “ the degree to which a measurement represents a true value.” Depending on the way a study is structured and interpreted, one can assess if the outcomes are acceptable. Validity can be affected by both internal errors of the study as well external influences. These are necessary to be noted as it affects the reliability of the data (74). The reliability of a study refers to whether the methodology and results are reproducible if repeated (40).

Validity and reliability in this study will be ensured by the following measures:

- using an appropriate research method
- using a standardised data collection sheet
- all morphine PCA pumps used are standardised to administer a set concentration and volume bolus to the patient with a timed lockout
- data will be collected by one researcher
- analysing the data in consultation with a biostatistician.

5.11 Potential limitations

The study design poses limitations. The study, being retrospective, has limitations. Data capturing intra-operatively and post-operatively is not monitored by the researcher. Forms which were either misplaced or filled in inadequately by the acute pain anaesthetic registrar may cause misrepresentation of patients' analgesic consumption and as a result may distort the data. Although the NRS is a reliable pain scale, patient misinterpretation of the scale may result in inaccurate documentation of pain scores in the post-operative period. Patients' understanding of how to use the morphine PCA pumps may have an effect on the total morphine consumption used and documented.

The limitation of contextual studies is that the sample population is assumed to be a true representation of the general population (75). The sample of gynaecological patients undergoing TAH at the RMMCH may not be a general representation of TAH patients at the other academic hospitals affiliated to the University of the Witwatersrand and the rest of the country. The results from this study may, therefore, not be extrapolated to other population groups.

5.12 Financial planning

The Department of Anaesthesiology will bear the cost of printing and paper for the proposal, ethics and postgraduate approvals.

Budget

Item	Cost per item	Total
Paper and printing	R1 per page x 1200	R1200
Binding	3 copies at R200	R600
Total		R1650

5.13 Project Outline

ACTIVITY	July 2017	Aug 2017	Nov 2017	March 2018	June 2018	July 2018	Aug 2018	Sept 2018	Nov 2018
Proposal preparation									
Literature review									
Proposal submission									
Ethics approval									
Postgrad approval									
Data collection									
Analysis of results									
Review with supervisors									
Article									
Submission									

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5.15 Appendices

5.15.1 PCA pump data collection sheet

PCA PUMP PATIENT ASSESSMENT FORM

PATIENT STUDY NUMBER			
AGE		ASA CATEGORY	
SURGICAL PROCEDURE			
DATE OF PROCEDURE		WEIGHT	kg
ANAESTHESIA TYPE (GA, RA, GA + RA)			
INTRA-OP ANALGESIA			
DESCRIPTION OF REGIONAL ANAESTHESIA			

Has the patient been counselled on how to use the PCA pump	YES	NO
--	-----	----

TIME PCA PUMP STARTED	
-----------------------	--

REG:

DAY 0 ASSESSMENT

TIME OF ASSESSMENT	
--------------------	--

Does the patient understand how to use the PCA pump?	YES	NO
--	-----	----

TIME OF FIRST MEDICATION REQUEST	
TOTAL MORPHINE USED	

PATIENT Pain Score at **Rest**

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

SIDE EFFECTS:

SEDATION	YES	NO
PRURITIS	YES	NO
NAUSEA	YES	NO

REG: _____

COMMENTS:

DAY 1 ASSESSMENT

TIME OF ASSESSMENT	
--------------------	--

TOTAL MORPHINE USED	
---------------------	--

PATIENT Pain Score at **Rest**

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

SIDE EFFECTS:

SEDATION	YES	NO
PRURITIS	YES	NO
NAUSEA	YES	NO

REG:

COMMENTS:

DAY 2 ASSESSMENT

TIME OF ASSESSMENT	
--------------------	--

TOTAL MORPHINE USED	
---------------------	--

PATIENT Pain Score at **Rest**

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

SIDE EFFECTS:

SEDATION	YES	NO
PRURITIS	YES	NO
NAUSEA	YES	NO

REG:

COMMENTS:

DATE PCA REMOVED		TIME PCA REMOVED	
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**5.15.2 Appendix B: Letter of approval from the Department of Anaesthesiology,
Rahima Moosa Mother and Child Hospital**



GAUTENG PROVINCE

HEALTH

REPUBLIC OF SOUTH AFRICA

*Department of Anaesthesiology
Rahima Moosa Mother and Child Hospital*

Tel: (011) 470-9303

Fax: 0865194183

E-mail: kleyenstuber@hotmail.com

11 August 2017

Dear Dr Razeena Lockhat

I have received your written request to conduct your MMED study in the Department of Anaesthesia at Rahima Moosa Mother & Child Hospital. I hereby give you permission to access the acute pain records of the patients who present for total abdominal hysterectomy.

Kind Regards

Dr T Kleyenstuber

Head: Clinical Unit - Anaesthesiology
Rahima Moosa Mother and Child Hospital