Distribution Statement

Distribution A: Public Release.

The views presented here are those of the author and are not to be construed as official or reflecting the views of the Uniformed Services University of the Health Sciences, the Department of Defense or the U.S. Government.

Improving Success Rate of the Adductor Canal Block by Standardizing Technique: An Evidence Based Practice Project

Jared Hartman, Sean Hutchison, Stephanie Wallace

Copyright Acknowledgement Statement

"The author(s) hereby certify that the use of any original work by another author or copyrighted material used in the DNP project entitled: *"Improving Success Rate of the Adductor Canal Block (ACB) by Standardizing Technique: An Evidence Based Practice Project"* is either appropriately cited within the manuscript or used with formal written permission of copyright release by the owner of the original work."

Jared Hartman, BSN, RN, LT, USN
Daniel K. Inouye Graduate School of Nursing
Uniformed Services University
02 February 2018
[redacted]

Sean A. Hutchison, BSN, RN, LT, USN
Daniel K. Inouye Graduate School of Nursing
Uniformed Services University
02 February 2018
[redacted]

Stephanie E. Wallace, BSN, RN, LCDR, USN
Daniel K. Inouye Graduate School of Nursing
Uniformed Services University
02 February 2018
[redacted]

Table of Contents

CHAPTER

Abstract.....4

Introduction.....5

Significance of the Problem.....6

Clinical Question.....7

Organizing Framework.....8

Project Design.....9

Project Results.....10

Analysis of Results.....11

Organizational Impact/ Implications to Practice & Policy.....12

Future Directions for Research and Practice.....13

Conclusion.....14

References.....16

Appendices.....19

Abstract

Phase II Site: National Capital Region

DNP Project Title: Improving Success Rate of the Adductor Canal Block (ACB) by Standardizing Technique: An Evidence Based Practice Project

Authors: Hartman, J. L., Hutchison, S. A., & Wallace, S. E.

Background or Problem/Issue: The success of peripheral nerve blockade is an important determinant of patient satisfaction and length of stay after surgery. Recent evidence suggests that success rates for ACB can be as high as 94%. However, the success rate for ACB at KACC is 77%.

Clinical Question or Purpose: The purpose of this project is to find the best technique for ACB and standardize ACB at KACC.

Project Design: This is a pre- and post- implementation performance improvement project to standardize adductor canal blocks at KACC.

Analysis of the Results: Success rates of ACB before and after standardization were similar. Prior to implementation, the success rate was approximately 77%. Following standardization, the success rate was 76%. The volume of local anesthetic was reduced to 20 mLs with no reduction in efficacy.

Organizational Impact/Implications for Practice: Standardization of ACB did not improve the block success rate. However, we were able to reduce block volume by 10 ml, minimizing the potential for local anesthetic toxicity.

Introduction

Peripheral nerve blocks (PNBs) are a type of regional anesthesia often employed by anesthesia providers during orthopedic surgery to provide long-lasting, site specific, effective analgesia. Additionally, the use of PNB's have been shown to reduce morbidity and mortality (Chelly, Ben-David, Williams & Kentor, 2003; Tsui & Rosenquist, 2013). For surgeries on the knee and leg, trials suggest femoral nerve block (FNB), with its significant motor blockade, is associated with the risk of falling and prolonged time to ambulation due to reduction in quadriceps muscle strength. The newer adductor canal block (ACB), however is strength sparing as it targets the purely sensory saphenous nerve (Grevstad et al., 2013; Jaeger et al., 2013; Kim et al., 2014; Kwofie et al., 2013; Memtsoudis et al., 2015). Comparison trials between the newer ACB and the more traditional FNB demonstrate that ACB is not inferior to FNB when considering postoperative analgesia for lower extremity orthopedic surgery (Epselund et al, 2014; Grevstad et al., 2015; Patterson et al., 2015). Thus, ACB has the potential to provide equivalent analgesia, better safety, and faster recovery compared to FNB.

Safety and success of a PNB depend on accurate and consistent delivery of local anesthetic by the anesthesia provider (Tsui & Rosenquist, 2013). The ACB is particularly difficult to perform because of the small size of the saphenous nerve, the lack of anatomic landmarks, and the lack of a motor component (Manickam et.al., 2009). Ultrasound technology has improved success rates of PNBs since anesthesia providers are able to visualize in real time the size, depth, and precise location of the nerve and vital structures as well as the spread or distribution of the local anesthetic in the neural sheath (Tsui & Rosenquist, 2013). Visualization of anatomy and needle has also decreased complications (Tsui & Rosenquist, 2013). Despite ultrasound technology becoming the standard of care for PNB placement, failure still occurs resulting in inadequate loss of sensation to

the surgical extremity, wasted time and resources, increased reports of patient pain and opioid use, and decreased patient satisfaction.

There is no universal definition of block success. Success may be defined as Verbal Rating Scale (VRS) score below a certain maximum level postoperatively, or success may be defined as loss of sensation to pin prick within 30 minutes of block placement (Manickam, et.al., 2009). Additionally, due to time constraints, anesthesia providers may consider a PNB 'successful' by simply visualizing the spread and distribution of local anesthetic around the neural sheath via ultrasound guidance. For this project, the authors define success using the VRS score of 3 or below on arrival to PACU as has been customary at KACC.

Significance of the Problem

The success of ACB as a regional anesthetic is relevant to the military's medical mission. In a report to congress regarding TRICARE (the Department of Defense (DoD) health benefits program) the Defense Health Agency (DHA) (2015) identified four aims: increased readiness, better care, better health, and lower cost. Successful ACB administration has the potential to address these aims. As it is a purely sensory block, patients retain the motor strength of their quadriceps muscle, and consequently reduced the risk of falls. Additionally, successful ACB leads to improved analgesia and reduced postoperative opioid use, earlier ambulation, and reduced post anesthesia care unit (PACU) time (Kim et al., 2014; Mudumbai et al., 2013).

Lower extremity orthopedic procedures are common for active duty members and retirees. For example, a study by Enad (2013) reports that three of every 1000 active duty members will require surgical repair of their Anterior Cruciate Ligament (ACL). Additionally, Schwartz, Libenson, Astman, & Haim (2014) found that 41% of attrition from combat training was related to orthopedic causes with the majority, 71%, involving injuries to the low back and lower extremities.

While many of these injuries may not require surgery, the high number of orthopedic injuries highlights the need for successful postoperative pain control strategies.

Uncontrolled pain and intractable nausea may prolong PACU times directly increasing the cost of care. Successful placement of nerve blocks preoperatively can decrease PACU time by up to 40 minutes (Steinride, 2010). With a ten-dollar per minute cost of PACU time, savings to the MHS with successful PNB can be significant. Additionally, adequate pain control can improve patient satisfaction scores. Significant adverse effects associated with opioid use, such as constipation, respiratory depression, and potential dependence are reduced with successful block (Kane-Gil, Rubin, Smithburger, Buckley, & Dasta, 2014; Defense Health Agency, 2015). Peripheral nerve blocks, specifically ACBs, when successful, boost patient and surgeon satisfaction (Steinride, 2010). Thus, identifying best practice for ACBs is critical to achieving the goals of the quadruple aim as described above.

The success rate of ACB at KACC has historically been 77% which has led to more frequent rescue interventions. Patients have required more post-operative opioid and, in more severe cases, a post-operative rescue block. Both increase patient risk in the form of increased risk of opioid and/or local anesthetic side effects/toxicity. Patient satisfaction is also significantly diminished.

Clinical Questions

1. Which ACB technique is associated with the highest success rates postoperatively in lower extremity orthopedic surgeries for adults?
2. Will a standardized best practice approach to ACB improve success rates of ACB at KACC?

Focus Areas

This project had three primary focus areas: 1) conduct a systematic literature review to identify the best technique for ACB; 2) standardize ACB technique at KACC based on the findings of the literature review: and, 3) compare post-implementation ACB success rates to pre-implementation rates.

Project Short and Long Term Goals

The short-term goal of this project was to standardize ACB technique to reflect best practice, while the long-term goal of this project was to improve success rates of ACB at KACC. The larger impact of this project directly addresses the quadruple aim as it will decrease cost, improve care, improve health, and drive readiness.

Anticipated Global Impact

Military healthcare costs are rising (Department of Defense, 2011); and, determining methods to deliver value based care is paramount to achieving the quadruple aim (increasing readiness, reducing cost, improving care and improving health). As improving success rates of ACBs contributes to achieving all four components of the quadruple aim, standardization of ACB has high relevance to the entire MHS.

Organizing Framework

The organizing framework for this project was The Iowa Model of Evidence-Based Practice. This framework identifies problem and knowledge focused triggers, which if addressed have the potential to improve patient care through the translation of evidence into practice (see Figure 1 for the Iowa model flowchart developed for this project) (Titler, 2014).

Change Theory

Recent investigation has shown high success rates of ACB (Epselund et al, 2014; Grevstad et al., 2015; Patterson et al., 2015). However, the success rate of ACB at KACC has

been a disappointing 77%. These low success rates had the potential to worsen the patient experience and increase cost—both of which opposes the Defense Health Agency's (DHA) (2015) quadruple aim. Considering this, a change in practice was beneficial. Change theory focuses on the team within an organization and is an ideal model for the anesthesia department at KACC (White, 2012). Working as a team, KACC anesthetists rely on each other to provide the best possible anesthetic to their patients. Each individual benefits when the team succeeds. Buy-in to a team driven practice change was a feasible sell.

White (2012) describes the five tenets of Senge's theory as: systems thinking, personal mastery, mental models, building shared visions, and team learning. These characteristics are common to many anesthetists. Anesthesia providers take over for their colleagues to provide breaks; they may be called to the recovery room to provide care while the original provider is busy with another case; and, they use the same supplies and share rooms. Problems are therefore not isolated to one individual but, rather, are often the result of a system breakdown—poor supply management, provider turnover, etc. Framing the need for change as a system issue will use the current language of anesthetists. Moreover, focusing on personal mastery and mental models has significant promise to draw the KACC providers in. Anesthetists are a highly professional group, actively lobbying for independent practice (Malina & Izlar, 2014).

Project Design

General Approach

This project was a pre- and post-implementation, performance improvement project. After evaluating the evidence to determine a standardized approach to the ACB associated with the highest success rate, ACB was standardized at KACC. After standardization, success rates of ACBs were evaluated and compared to historical rates of success prior to implementation.

Setting

This project was undertaken in an ambulatory care center in the eastern United States. The ambulatory care center has four operating rooms and is staffed by four Certified Registered Nurse Anesthetists (CRNA) and one anesthesiologist. The patient population consists of active duty and retired military personnel and their eligible dependents in the National Capital Region deemed appropriate for ambulatory surgery.

Procedural Steps

Evidence Evaluation. PubMed and Embase databases were searched for articles relevant to the background question posed above. PubMed was searched using Medical Subject Headings (MeSH) and subheadings combined with 4 keywords. The MeSH term "Nerve Block" was searched with the subheadings: "methods/pharmacology/standards/therapeutic/therapy/ utilization". This was combined with the MeSH term "Anesthesia" and the subheadings: "administration and dosage/methods/pharmacology/ therapeutic/ utilization". The keywords "adductor", "canal", "saphenous", or "subsartorial" were added to the search to further specify the MeSH term search. Finally, the results were limited to English articles from 2006 to present on adult humans. The Embase search was completed using similar terms. Emtree indexing terms "nerve block" or "regional anesthesia" were searched combined with keywords "adductor", "canal", "saphenous", or "subsartorial". The terms "saphenous" and "subsartorial" were included because of some disagreement in the anesthesia community as to the best name for this block. Limits to this search were the same as those applied to the PubMed search. Three nurse anesthesia students read all articles, critically focusing on strength of findings and technique/procedure detailed. A matrix describing the articles is contained in Appendix A. Figure 2 shows the flowchart and breakdown of this search.

As discussed in the introduction, the findings of the literature review revealed ACB to be non-inferior to FNB for procedures on the lower leg (Epselund et al, 2014; Grevstad et al., 2015; Patterson et al., 2015). In addition, it resulted in less motor weakness, suggesting a lower fall risk for patient's post-operatively (Grevstad et al., 2013; Jaeger et al., 2013; Kim et al., 2014; Kwofie et al., 2013; Memtsoudis et al., 2015). In reviewing trials comparing ACB to FNB, we found an early article describing the technique by Manickam, et al. (2009). Additional work by Kim et al. (2014); Kirkpatrick, Sites, & Antonakakis (2010); and, Patterson et al. (2015) validated the Manickam, et al. (2009) technique for successful ACB.

Educational Intervention. A study by Manickam, et al. (2009) described a highly effective technique for ACB. Additional findings from Kim et al. (2014); Kirkpatrick, Sites, & Antonakakis (2010); and, Patterson et al. (2015) were included in the presentation. These studies validated the Manickam approach to ACB. The synthesized findings from these studies were included in a slide show presentation that also highlighted the relevant anatomy of the block and targets for injection. We presented this to the anesthesia department at KACC. Additionally, a cognitive aid with the relevant ultrasound picture was designed and placed in the regional block area. Finally, the anesthesia department at KACC standardized the type and volume of local anesthetic for this block. In order to provide long lasting pain control, 20 ml's of 0.5% ropivacaine was chosen. Additives such as dexamethasone and clonidine were omitted to limit variability.

Process Implementation. Adult patients who received an ACB for their orthopedic procedure at KACC were evaluated for block success on arrival to PACU. Success rates prior to standardization had already been documented. After standardization, success rates were evaluated and recorded using the same VRS metric.

HIPAA Concerns (IRB)

The information collected in this EBP project was exempt from IRB approval and did not qualify as PII. The information obtained included the type of peripheral nerve block utilized, the type and volume of local anesthetic administered, and post-operative VRS pain score. No PII was collected or stored from the patient's medical records. No additional information from the medical record was used for this project.

Project Results

Twenty-nine adductor canal blocks were placed from October 12th to December 31st following standardization. The incidence of successful block placement was 77% (22/29). These results do not differ significantly from the pre-standardization success rate. However, we were able to reduce the volume/dose of ropivacaine from 150 mg (30 ml's) to 100mg (20 ml's) without significantly altering sensory/motor blockade or overall block success rate.

Analysis of the Results

ABC success rate did not change following standardization. However, the reduced local anesthetic volume used for these blocks post-standardization showed similar efficacy to larger volumes used pre-standardization. This reduction increases patient safety.

Post-operative pain score of less than three may not be realistic for knee procedures even with a pre-operative nerve block. The rates of success reported in the literature did not use a VRS score of 3 or below as criteria for block success making this the likely disconnect between KACC's experience with ACB and that described in the literature. Manickam et al. (2009), for example judged success by loss of pinprick sensation in the saphenous nerve distribution.

Additionally, Patterson et al. (2015) rescued their ACBs only when patients reported pain greater than 5/10 in the saphenous distribution.

Organizational Impact/ Implications to Practice & Policy

The results of this EBP project suggest that KACC providers and patients must adjust their expectations for the role of adductor canal blocks in knee and leg surgery analgesia. In fact, since standardization, there has been discussion among KACC providers that their benchmark for success was arbitrarily determined. With hindsight, they feel a VRS score of three is too low as a gauge of success.

The EBP project implemented a standardized technique for this block that reflects best practice as described in the current anesthesia literature. While standardization did not change success rates of ACB when using the VRS score of 3, it did result in a significant reduction in the volume of local anesthetic used for these blocks. This is a significant benefit to patient safety.

Future Directions for Research and Practice

There is a current push in healthcare to reduce opioid consumption and the military health system is no different. One aspect of reducing opioid consumption is redefining patients' and healthcare workers' perception of pain control. We know that "pain is whatever the patient says it is" (McCaffery, 1968), and after 2001, The Joint Commission changed the way we assessed and treated patients' report of pain. More recently, the Army Surgeon General released a report on the Pain Management Task Force in 2010 which raised concerns that the numerical pain scale is an inadequate measurement of patient's pain. Buckenmaier, et al. (2013), identified that "variations in pain assessment practices, inconsistencies in rating scales and lack of "accountable care" for pain management … contribute to breakdowns in the ability to adequately treat pain in

these vulnerable populations. It is worth considering an alternative approach to assessing a patient's pain postoperatively which would impact the assessment of peripheral nerve blocks.

For example, a patient who received ACB and popliteal block for their ACL repair reports six out of ten pain on the numerical pain scale in the post-operative period. Does this mean his regional blocks were not successful? A femoral nerve block is done as a rescue technique and the patient reports relief to a five out of ten. That rating still qualifies as a failed block at KACC even though the patient has successful loss of sensory and motor function as expected. This is where the rates documented at KACC fail to demonstrate the success of PNBs and instead highlights the difficulty in gauging success of blocks. Educating patients and providers on what to expect in the post-operative period **prior** to their surgical procedure is crucial. Adequate pain assessment beyond a numerical rating scale is additionally important. This assessment should consider the patient's behavior, their activity level, and their ability to be discharged from the PACU. No tool of this kind currently exists.

Assessment of PNBs in the literature was done via "loss of sensation to pin prick within 30 minutes of placement" (Manickam, et al., 2009). This assessment is not ideal at KACC as patients are often under general anesthesia 30 minutes after block placement. Other studies used "post-operative numbness in the expected distribution" (Cody, et al., 2015), as an indication of success.

Conclusion

Peripheral nerve blocks are a valuable adjunct to anesthesia delivery that have been shown to reduce lengths of stay and increase patient satisfaction (Steinride, 2010). The success rate of the ACB at KACC remained low (76%) compared to success rates shown in the literature (94%) despite standardization. Standardization did reduce the amount of local anesthetic used in

ACBs with no significant difference in success rates. These authors suggest that the definition of a successful PNB used at KACC (verbal rating of three or below on a ten-point scale) should be adjusted to reflect that the ACB may be successful and yet the patient will still describe pain post-operatively. We suggest defining the success of the ACB not based on a numerical pain scale but based on whether a rescue block reduces the patient's previously reported pain. Changing our assessment and treatment of patients' pain is an important area of continued study. For now, ACBs remain an effective mode of long-lasting, site specific analgesia in our patient population (Chelly, Ben-David, Williams & Kentor, 2003; Tsui & Rosenquist, 2013).

References

Brevig, H., Colosimo, C., Jaditz, T., Krauss, R., Mandell, K., Morrow, R., Oi, J., Tsang, W. (2015). The quality-volume relationship: Comparing civilian and MHS practice. Retrieved from http://www.mcrmc.gov/public/docs/report/CNA-Public-Release-Version_B237-DIM-2014-U-009221-Final.pdf

Buckenmaier, C.C., Galloway, K.T., Polomano, R.C., McDuffie, M., Kwon, N., and Gallagher, R.M., 2013. Preliminary validation of the defense and veterans pain rating scale (DVPRS) in a military population. *Pain Medicine.*14 (1), 110-123. https://doi.org/10.1111/j.1526-4637.2012.01516.x

Chelly, J.E., Ben-David, B., Williams, B.A., Kentor, M.L. (2003). Anesthesia and postoperative analgesia: outcomes following orthopedic surgery. *Orthopedics*, *26*, 865-871.

Cody, S., Waisel, D., Matthes, K., Cravero, J., Brusseau, R., Boretsky, K., (2015). Measure technical success of peripheral nerve blocks in pediatric patients: a single institutional observational study. *Regional Anesthesia.*

Defense Health Agency. (2015). Evaluation of TRICARE program: access, cost, and quality. Available from http://www.health.mil/Military-Health-Topics/Access-Cost-Quality-and-Safety/Health-Care-Program-Evaluation/Annual-Evaluation-of-the-TRICARE-Program.

Enad, J.G., Zems, C.T. (2013). Return to full duty after anterior cruciate ligament reconstruction: is the second time more difficult? *Journal of Special Operations Medicine,13*(1), 2-6.

Grevstad, U., Mathiesen, O., Lind, T., Dahl, J.B. (2013). Effect of adductor canal block on pain in patients with severe pain after total knee arthroplasty: a randomized study with individual patient analysis. *British Journal of Anesthesia, 112*(5), 912--19. doi:10.1093/bja/aet441

Grevstad, U., Mathiesen, O., Valentiner, L.S., Jaeger, P., Hilsted, K.L., Dahl J.B. (2015). Effect of adductor canal block versus femoral nerve block on quadriceps, mobilization, and pain after total knee arthroplasty: a randomized, blinded study. *Regional Anesthesia and Pain Medicine, 40*, 3-10. doi:10.1097/AAP.0000000000000169

Jaeger, P., Zaric, D., Fomsgaard, J., Hilsted, K., Bjerregaard, J., Gyrn, J., Mathiesen, O., Larsen, T., Dahl, J. (2013). Adductor canal block versus femoral nerve block for analgesia after total knee arthroplasty. *Regional Anesthesia and Pain Medicine*, *38*(6), 526-532. doi: 10.1097/AAP.0000000000000015

Kane-Gil, S.L., Rubin, E.C., Smithburger, P.L., Buckley, M.S., Dasta, J.F. (2014). The cost of opioid-related adverse drug events. *Journal of Pain & Palliative Care Pharmacotherapy, 28*(3), 282-293. doi:10.3109/15360288.2014.938889

Kim, D.H., Goytizolo, E.A., Kahn, R.L., Maalouf, D.B., Manohar, A., Patt, M.L.,...YaDeau, J.T. (2014). Adductor canal block versus femoral nerve block for total knee arthroplasty. *Anesthesiology*, *120*, 540-50.

Kwofie, M. K., Shastri, U. D., Gadsden, J. C., Sinha, S. K., Abrams, J. H., Xu, D., & Salvis, E. A. (2013). The effects of ultrasound-guided adductor canal block versus femoral nerve block on quadriceps strength and fall risk. *Regional Anesthesia and Pain Medicine, 38*(4), 321-325. doi:10.1097/AAP.0b013e318295df80

Malina, D. P., & Izlar, J.J. (2014). Education and practice barriers for certified registered nurse anesthetists. *The Online Journal of Issues in Nursing,* 19, 23-25.

Manickman, B., Perlas, A., Duggan, E., Brull, R., Chan, V. W., Ramiogan, R. (2009). Feasibility and efficacy of ultrasound-guided block of the saphenous nerve in the adductor canal. *Regional Anesthesia and Pain Medicine, 34*(6), 578-580. doi10.1097/AAP.0b013e3181b

fbf84

Memtsoudis, S., Yoo, D., Stundner, O., Danniger, T., Ma, Y., Poultsides, L., Kim, D., Chisholm, M., Jules-Elysee, K., Gonzalez Della Valle, A., Sculco, T. (2014). Sub sartorial adductor canal vs femoral nerve block for analgesia after total knee replacement. *International Orthopedics, 39*, 673-680. doi10.1007/s00264-014-2527-3

Patterson, M.E., Bland, K.S., Thomas, L.C., Elliott, C.E., Soberon, J.R., Nossaman, B.D., Osteen, K. (2015). The adductor canal block provides effective analgesia similar to a femoral nerve block undergoing total knee arthroscopy-a retrospective study. *Journal of Clinical Anesthesia, 27*(1), 39-44. doi:10.1016/j.jclinane.2014.08.005

Steinriede, K., (2010). The financial impact of nerve blocks. *Outpatient Surgery Magazine*. Retrieved from http://www.raadvantages.com/wp-content/uploads/The-Financial-Impact-of-Nerve-Blocks.pdf

Schwartz, O., Libenson, T., Astman, N., & Haim, L. (2014). Attrition due to orthopedic reasons during combat training: Rates, types of injuries, and comparison between infantry and noninfantry units. *Military Medicine, 179*(8), 897-900. 10.7205/MILMED-D-13-00567

Tsui, B.C.H. & Rosenquist, R.W. (2013). Peripheral nerve blockade. In Barash, P. G., Cullen, B. F., Stoelting, R. K., Cahalan, M. K., Stock, M. C., & Ortega, R. (7th ed.). *Clinical anesthesia* . (pp. 937-944). Philadelphia, PA: J.B. Lippincott.

Van der Wal, M., Lang, S.A., Yip, R.W. (1993). Transsartorial approach for saphenous nerve block. *Canadian Journal of Anesthesia, 40*(6), 542-546.

Figure 1. Organizing Framework

Figure 1. Organizing Framework

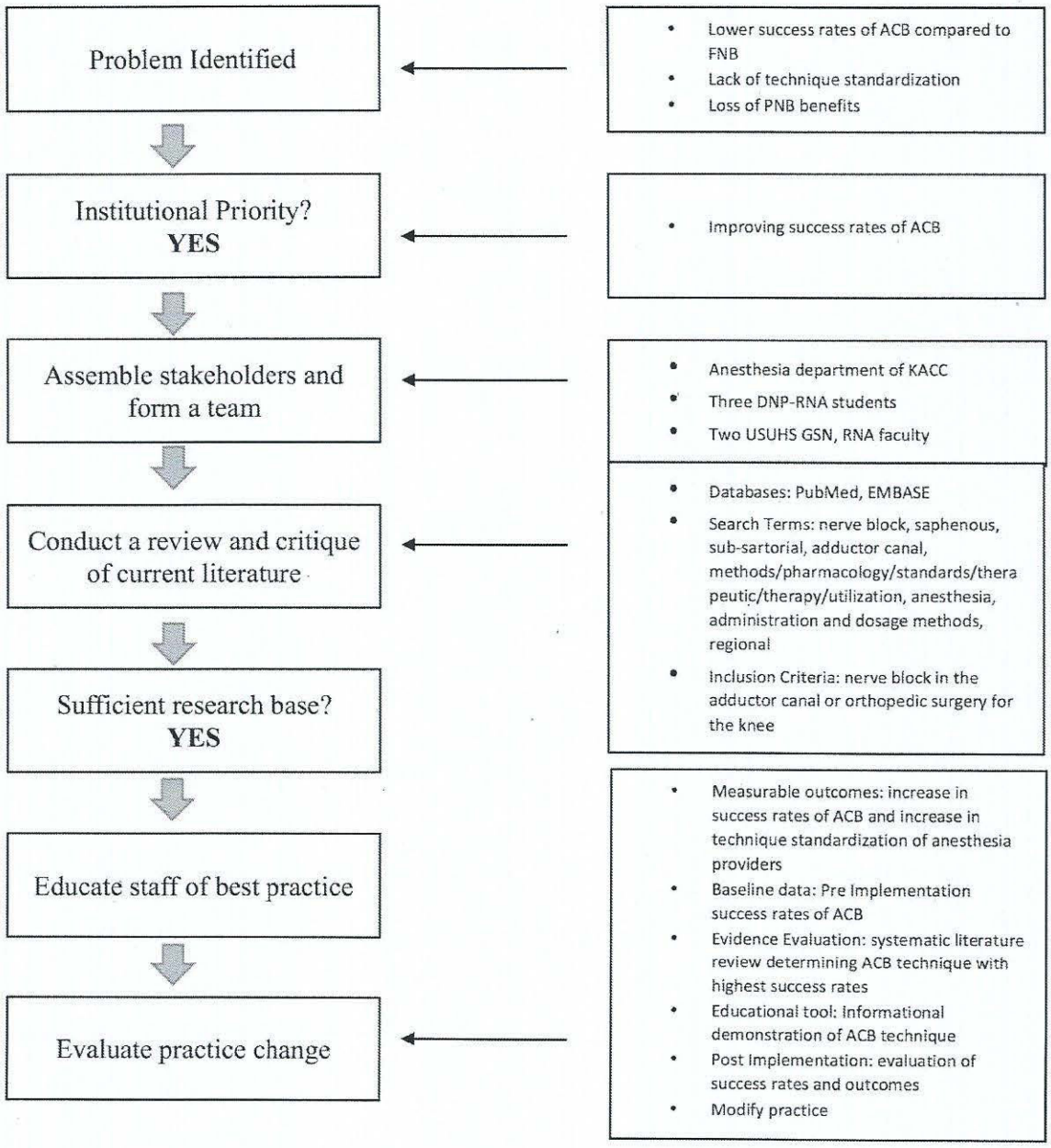
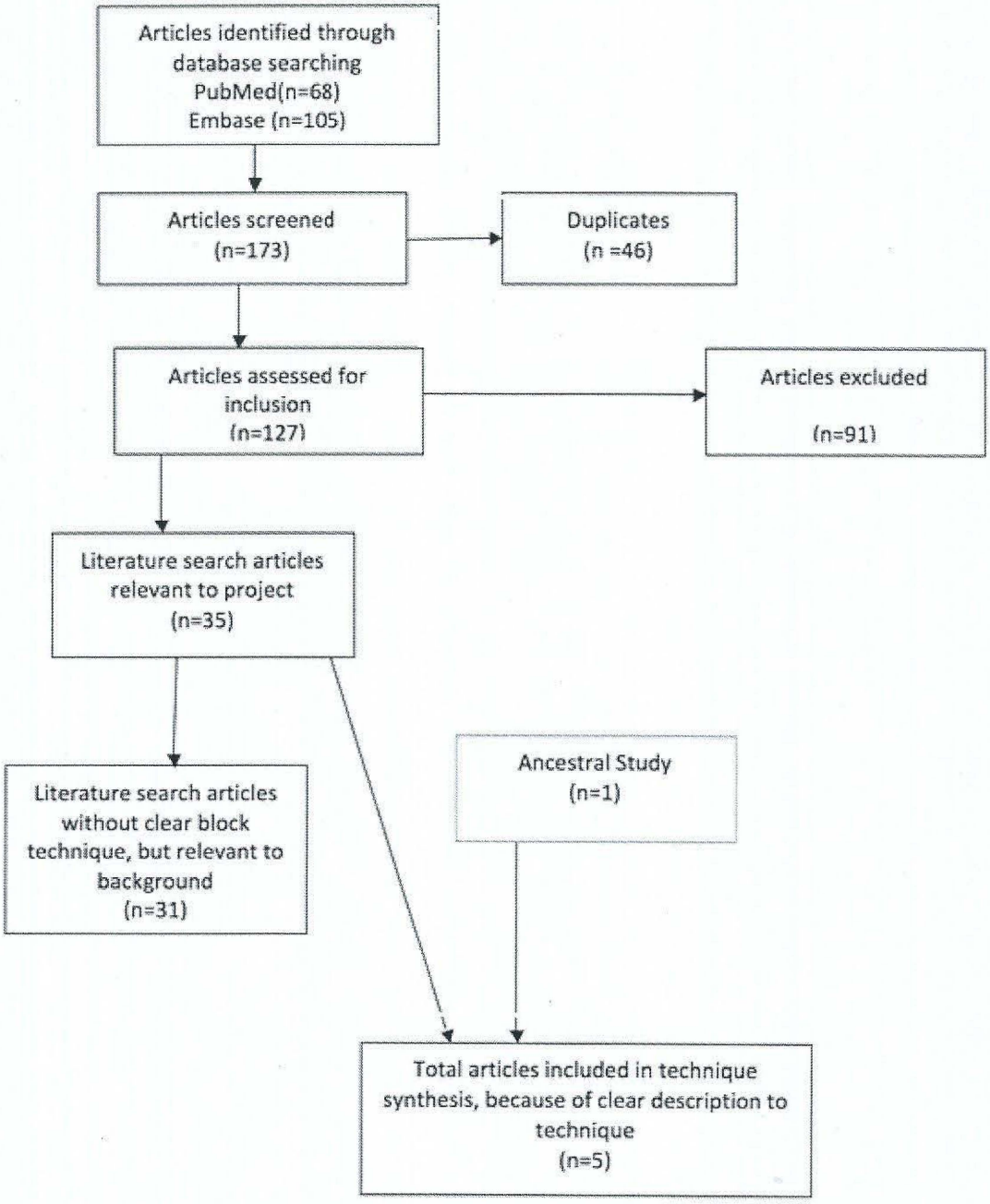


Figure 2. Literature review results.



APPENDIX A

Title	Author(s)	Year published	Journal	Purpose	Keywords	# of subjects analyzed	Inclusion criteria	Exclusion criteria	Study design	John Hopkins Quality rating (A, B, or C)	Strength of evidence (I, II, or III)	Inependent/ Subject Variable(s)	Dependent variables/ measures collected	Sensation measurement/success of block	Technique implications	Need for rescue, opioids use	Findings
Distribution of Injectate and Sensory-Motor Blockade After Adductor Canal Block.	Gautier, P. E., Hadric, A., Leong, J., Brichant, J.F., Kuroda, M.M., Vandepitte, C.	2015	Anesthesia Analgesia	Spread of injectate during adductor canal block	Adductor canal block	15 patients undergoing knee surgery	Patients undergoing knee surgery with ACB for analgesia	patients <18 years, pregnant, ASA status >3, BMI > 30 or a history of allergic reaction to local anesthetics or contrast media	Single case study	B	III	Adductor canal block	Sensation, motor evaluation, spread of injectate via ct scan	Sensation was rated as 3- similar to contralateral side, 2- slightly diminished, 1- markedly diminished, 0- absent via the pinprick test	Trans-sartorial approach with ultrasound and 21G needle, inserted approximately 15cm above the medial femoral condyle, next to the femoral artery and underneath the the sartorial muscle at the point just before the femoral artery courses through the adductor hiatus. 20ml of Mepivacaine 1% was inserted. 87% success rates.	Not discussed	The spread of injectate (20ml) to the popliteal fossa may contribute to the analgesic efficacy of adductor canal block. The
Ultrasound-guided saphenous nerve block-within versus distal to the adductor canal: a proof of principle trial	Head, S., Leung, R., Hackman, G., Seib, R., Rondi, K., Schwarz, S.K.	2015	Canadian Journal of Anesthesia	Compared two ultrasound guided techniques for saphenous nerve blockade, prone and supine.	Saphenous nerve block, adductor canal	Ninety one patients undergoing foot and ankle surgery	Patients undergoing foot and ankle surgery who were 19-60 years, ASA 1-3, and BMI <35.	Known history of allergy, sensitivity, or any form of reaction to local anesthetics, inability to comply with the procedures, language difficulties, medical history or concomitant disease, neurological or vascular condition that preclude eligibility for peripheral nerve blocked, suspected significant alcohol, drug, or medication abuse, regular treatment with analgesics, sedatives or any medication with CNS effects, previous inclusion in the study, participation in other clinical studies in the 14 days prior to admission, and third party liability.	Randomized, single-blinded, parallel group trial	A	I	Ultrasound-guided saphenous nerve block technique: supine adductor canal technique or prone peri-saphenous branch of the descending genicular artery (Peri-SBDGA))	Vascular landmark visibility, block success rate, median onset times	Vascular landmark visibility: 0=nerve not visible, 1=nerve visible with difficulty, 2= nerve easily visible. Sensory blockade via pinprick testing, 0=absent sensation, 1=decreased sensation, 2= normal sensation. Motor strength according to scale 1=normal strength, 2=mild weakness to knee extension against resistance, 3=moderate to severe weakness, 4= patient unable to extend knee. Assessments made at 5min intervals until 30mins.	No differences in nerve visibility, block success rate, or onset between the supine adductor canal block and the peri-saphenous branch of the descending genicular artery technique were found.	84% success rate in AC group and 81% in peri-SDGA group, no discussion of opioid use	No clinically important difference in saphenous visibility between the AC and Peri-SBDGA technique. The AC technique provided superior landmark visibility. Success rates were similar (84% and 81% respectively) as were speeds of onset.
Prospective randomized comparison between ultrasound-guided saphenous nerve block within and distal to the adductor canal with low volume of local anesthetic	Adoni, A., Paraskeuopoulos, T., Sarantzas, T., Sidiropoulou, T., Mastrokalos, D., Kostopanagiotou, G.	2014	Journal of Anesthesiology Clinical Pharmacology	Examine the effect of two different ultrasound-guided low volume injections of local anesthetic on saphenous and vastus medialis nerves.	Saphenous nerve block, sonographic, vastus medialis	Forty-four patients undergoing orthopedic surgery	BMI<30, scheduled for orthopedic surgery (knee arthroscopy and ankle fracture repair)	Patients younger than 18 years or older than 85, an allergy to local anesthetics, bleeding disorders, GCS <15, pregnancy, and neurological deficits	Prospective randomized comparison	A	I	Distal to the inferior foramina of the adductor canal (5ml), Within adductor canal (5ml)	Block progression in 5min for 15min	Block progression was monitored at 5 min intervals for 15 min in the sartorial branches of the saphenous nerve and the nerve to vastus medialis muscle. Sensory block was scored as 0=no sensory block, 1=decreased partial sensory block, 2=complete sensory block. Successful completion of saphenous nerve block if absence of sensation to pinprick developed in two different an atomic areas. Strength of vastus medialis contraction was rate 0=no motor block, 1=partial motor block, 2=complete motor block.	References 77-100% success rates seen in ultrasound guidance without description of actual technique.	<60% success rates with low volume of local anesthetic (5ml)	Low volume of local anesthetic injected within the adductor canal or distally leads to moderate success rate of the saphenous nerve block while only the injection within the adductor canal may result in vastus medialis nerve motor block.
Transsartorial approach for saphenous nerve block	Van der Wal, M., Lang, S.A., Yip, R.W.	1993	Canadian Journal Anesthesia	Initial cadaver study and then clinical study of three approaches to saphenous block	Anaesthetic technique, regional, anaesthetica, local, lidocaine	12 cadavers; 20 ASA 1 volunteers	ASA I patients, in whom they performed and compared the two previously published approaches with the transsartorial block of the saphenous nerve	None provided	Cadaveric anatomical study/clinical study	A	III	Transsartorial saphenous nerve block, femoral para-condylar field block, & below knee field block	Success of blocks, onset and duration of each successful block	A "successful block" was defined as loss of sensation to pinprick distal to the midpoint between the knee joint and the medial malleolus	First study to describe transsartorial approach. The level at which the needle was introduced was located by drawing a vertical line down from a point, one finger width above the patella in the supine extended leg	Not applicable	The highest success rate of successful blocks was achieved with the transsartorial approach (80%) when compared to the other 2 techniques studied
Impairment of sciatic nerve function during adductor canal block.	Gautier, P.E., Lecoq, J.P., Vandepitte, C., Harstein, G., Brichant, J.F.,	2015	Regional Anesthesia and Pain Medicine						Letter to the editor reporting a case	C	III				Ultrasound guided via transsartorial approach. 20ml of injectate with spread in the subsartorial space.		Analgesia with ACB is thought to result from the block of distal terminal branches of the femoral nerve and branches of the obturator nerve underneath the sartorial muscle. An occurrence of partial sciatic nerve block during ACB is being reported.
The adductor canal block provides effective analgesia similar to a femoral nerve block undergoing total knee arthroscopy-a retrospective study	Matthew E. Patterson, Kim S. Bland, Leslie C. Thomas, Clint E. Elliott, Jose R. Soberon Jr., Bobby D. Nossaman, Kristie Osteen	2015	Journal of Clinical Anesthesia	To determine the ability of an ultrasound-guided single-shot adductor canal block to provide adequate analgesia and improve performance during physical therapy.	Acute pain management, Adductor canal block, Femoral nerve block, Regional anesthesia, Total knee arthroplasty	39 patients received ACB and 41 patients received FNB	Patients who underwent a primary unilateral TKA with ultrasound guided ACB block	Incomplete medical records with desired data such as VAS scores or opioid usage	A retrospective chart review	A	III	Type of peripheral nerve block	Pain scores and opioid consumption were recorded at postanesthesia care unit discharge and again at 8 ± 3, 16 ± 3, and 24 ± 3 hours.	90% of ACB had successful blocks as determined by VAS pain scores <5 postoperative and no need for supplemental blocks	ACB was ultrasound guided sing shot with an median of 25ml of 0.5% Bupivacaine	Four of 39 ACBs required rescue (90%) success	There were no significant differences in pain scores or cumulative hydromorphone requirements between the adductor canal block group and the femoral nerve block group at any of the time points analyzed. Gait distance measured during physical therapy sessions in the adductor canal block group was superior compared with the femoral nerve block group.
Adductor canal block for post operative pain treatment after revision knee arthroplasty: a blinded, randomized, placebo-controlled study	Jæger P, Koscielniak-Nielsen ZJ, Schrøder HM, Mathiesen O, Henningsen MH, Lund J, Jenstrup MT, Dahl JB.	2014	PLoS One	The primary aim of this study was to examine the effect of adductor canal block on pain during knee flexion after revision TKA compared with placebo.	None provided	30	Eligible patients were Danish speaking adults, scheduled for revision TKA in general anesthesia, aged 40–85 years, with American Society of Anesthesiologists physical status I–III, and body mass index of 18–40 kg/m2.	Exclusion criteria were inability to cooperate, allergy to any drug used in the study, alcohol or drug abuse.	Prospective, blinded, randomized, placebo controlled trial	B	I	Placebo vs adductor canal block	pain during 45 degrees flexion of the knee at 4 hours postoperatively.		Previous reports of the ACB state that intermittent boluses are preferable, in order to ensure spread throughout the aponeurotic canal [5], [14]. However, intermittent boluses might be challenging in every day practice. In the current study, ropivacaine was administered as an initial bolus of 30 ml 0.75% ropivacaine, followed by an additional bolus of 15 ml 0.75% ropivacaine 6 hours later. Because we were not able to ensure proper administration of intermittent boluses thereafter, this was followed by an infusion of 0.2% ropivacaine 8 ml/h. Based upon the results in the current study it is not possible to interpret whether data are a reflection of a single injection block or continuous infusion. The ACB is a relatively new block and further research studies, including dose-ranging studies are required to find the optimal administration of local anesthetic.		Pain scores were consistently lower in the ropivacaine group including clinically relevant differences between groups. However, the mean differences varied and the only statistically significant difference between our groups was seen for pain during knee flexion at 4 hours postoperatively (primary endpoint).
Effect of adductor canal block versus femoral nerve block on quadriceps strength, mobilization, and pain after total knee arthroplasty: a randomized, blinded study.	Grevstad U, Mathiesen O, Valentiner LS, Jaeger P, Hilsted KL, Dahl JB.	2013	Regional Anesthesia And Pain Medicine	The aim of this study was to examine the effect of the ACB on postoperative muscle strength, with a postoperative preblock baseline using the FNB as comparative.	None provided	50	Unilateral TKA, VAS pain score greater than 60mm during active 45 degree flexion of the knee the first or second post operative day, age 30-85, ASA Class I-III, and BMI of 18-40.	Inability to cooperate, inability to understand, read, and speak Danish, medicine or alcohol abuse, allergy to ropivacaine.	Randomized, blinded, placebo-control trial	A	I	Adductor canal block vs femoral nerve block	Quadriceps strength, pain, mobilization		The ACB group received an ACB with ropivacaine 0.2% 30 mL		Adductor canal block provides a clinically relevant and statistically significant increase in quadriceps muscle strength for patients in severe pain after TKA.
Adductor canal blockade for moderate severe pain after arthroscopic knee surgery: a randomized controlled trial	Espelund, M., Grevstad, U., Jæger, P., Holmström F., Kjældsen, L., Mathiesen, O., Dahl, J.B.	2014	The Acta Anesthesiologica Scandinavica Foundation	Primary outcome was pain during flex ion of the knee, secondary outcomes were pain at rest and during flex ion of the knee, worst pain experienced during a walk, patients evaluation of muscles strength during walk, and amount of sufentanil administered during 90-min postoperatively.	None provided	50	Patients scheduled for arthroscopic knee surgery with final enrollment executed post operatives if subjects reapended with VAS pain score >40mm during flexion of the knee as well as ASA I-III, age 18-80, BMI 18-40.	Exclusion criteria included ACL reconstruction using graft types other than autologous hamstring graft, allergic reactions to study medications, pregnancy, language problems, and signs of infection in the vicinity of the entry point of the block needle, drug or alcohol abuse or a daily intake of opioid analgesics.	Randomized double blinded placebo controlled trial	A	I	Addactor canal block or placebo	VAS score during 45 degrees of active knee flex ion at 45min following initial ACB	The success rate of the block was assessed by testing for reduction in sensation along the saphenous distribution of the lower extremity. Subjects were asked to distinguish cold and warm before and after. One block was unsuccessful, possibly due to anatomical variation with a more proximal branch variant of the saphenous nerve (96%).	All blocks were performed using ultrasound guidance with a high frequency linear array. The transducer was placed in a transverse position, halfway between the superior anterior iliac spine and the base of the patella. The sartorious muscle, the femoral artery and femoral vein we've identified in order to localize the adductor canal. The saphenous nerve when seen was identified as a hypor-echoic structure lying lateral to the femoral artery. A 23gauge stimuplex needle was inserted in plane lateral to the femoral artery. The medication was injected perineal after aspiration initially and for every 5ml.		ACB was easy to perform, 96% success rate, clinically relevant impact on moderTe to severe post operative pain after arthroscopic knee surgery with preserved ambulation.
Sub sartorial adductor canal vs femoral nerve block for analgesia after total knee replacement	Memtsoudis, S., Yoo, D., Stundner, O., Danninger, T., Ma, Y., Poultsides, L., Kim, D., Chisholm, M., Jules-Elysee, K., Gonzalez Della Valle, A., Soulco, T.	2015	International orthopedics	The primary outcome was of the study was differential quantitative and qualitative pain postoperatively after TKA. Secondary outcomes included assessment of motor strength, achievement in physical therapy milestones, and patient satisfaction	Adductor canal block, femoral nerve block, total knee replacement, regional anesthesia	60	Bilateral TKA with no significant cardiopulmonary disease were classified as I or 2 according to the ASA and a BMI > 40.	History of chronic pain defined as daily or almost daily use of opioids for >3 months, had a history of peripheral neuropathy and or neurologic deficits, had contraindications to surgery or refused the use of peripheral nerve blocks, contraindications to spinal or epidural anesthesia and allergies or contraindications to standard medications used as part of the protocol.	Randomized controlled trial	A	I	Adductor canal block in one leg and femoral nerve block in the other leg for bilateral TKA	Qualitative and quantitative pain, motor strength, achievement in physical therapy milestones, and patient satisfaction.	Epidural anesthesia was also utilized so sensation was not measured	In plane ultrasound technique and 15ml Bupivacaine 0.25%	Not identified	ACBs vs FNBs in knee arthroplasty patients yielded similar results in absolute pain scores, motor strength, and patient satisfaction.
Adductor canal block can result in motor block of the quadriceps muscle	Chen, J., Lesser, J., Hadric, A., Reiss, W., Resta-Flarer, F.	2014	American Society of Regional Anesthesia and Pain Medicine	Case report of significant quadriceps muscle paralysis	None provided	One	One patient after ambulatory knee surgery		Case report	C	III			Full neuromuscular examination demonstrated the patient had a sensory deficit in the saphenous nerve distribution (the medial aspect of the knee and the medial anterior aspect of the lower leg extending down to the ankle. The sensory deficit area extended from the top of the knee to mid thigh	20ml of 0.5% ropivacaine was injected via 21 gauge 4inch stimuplex needle. The local was observed to separate the sartorial muscle and femoral artery and spread in the anterior and posterior area surrounding the artery.		Several studies have reported that ACB involves no motor blockade, however case report illustrates that the ACB can result in clinically significant quadriceps muscle paralysis.

Effect of adductor canal block on patients in severe pain after total knee arthroscopy: a randomized study with individual patient analysis	Grevstad, U., Mathiesen, O., Valentiner, L.S., Jæger, P., Hilsted, K.L., Dahl, J.B.	2015	Regional Anesthesia and Pain Medicine	The aim of this study was to evaluate the effect of ACB on pain during active flexion of the knee (primary outcome) and at rest (secondary outcome) in patients with severe pain after TKA, compared with placebo, and to evaluate the effect of the block in individual patients.	Auto pain, arthroplasty, replacement, knee, nerve block, pain, postoperative	50 patients	Inclusion criteria were unilateral TKA and a VAS pain score of >60mm during an active 45 degree flexion of the knee on the first or second postoperative day, age 30-85yr, ASA I-III, and BMI 18-40.	Exclusion criteria were inability to cooperate, inability to understand or speak Danish, allergy to Ropivacaine, and medicine or alcohol abuse.	Randomized, blinded study	A	I	ACB vs placebo	Pain during active 45 degree flexion	Block success rate, asses as the loss of sensation of cold, was 98%	30ml of study medication was slowly injected. The needle tip was placed anterior to the femoral artery, deep to the sartorious muscles, at the mid-thigh level, as described by Jaeger.		ACB is a promising option for rescue analgesia in patients in severe pain after TKA.
Adductor canal block versus femoral nerve block for total knee arthroplasty	Kim, D.H., Lin, Y., Goytizolo, E., Kahn, R.L.,Manlouf, D.B., Manohar, A., Patt, M.L., Goon, A.K., Lee, Y., Ma, Y., YaDeau, J.T.	2014	Anesthesiology	Test the hypothesis that ACB would be associated with less quadriceps motor weakness than FNB and provide analgesia that is not inferior as determined by NRS pain scores and opioid use.	None provided	46 patients received ACB, 47 patients received FNB	Elective unilateral TKA, planned combined spinal epidural anesthetic, age 18-90 year, ability to follow study protocol and ASA I-III.	Exclusion criteria included contraindication for neuraxial anesthetic, chronic opioid use, hypersensitivity and/ or allergies to local anesthetic, intraoperative use of volatile anesthetics, pre existing neuropathy on the operative limb, contraindicators to femoral or ACB, allergy to any study medications, aged younger than 18 or older than 90.	Prospective, randomized controlled trial	A	I	ACB or FNB	NRS pain scores and opioid use	Difficult to assess due to use of continuous epidural catheter in conjunction with ACB. Success rates as reported were 93.6% for ANB and 97.9 for FNB, defined as no loss of sensation within the saphenous nerve distribution.	An ultrasound guided ACB with 15cc of 0.5% Bupivacaine with a 5mcg/ml or epinephrine via a21 gauge 4 inch stimuplex A needle was performed at mid thigh level, as described by Manickam. (?)		The ACB was found to not be weaker than the FNB or have higher pain scores or more opioid use.
The efficacy of adductor canal blockade after minor arthroscopic knee surgery-a randomized controlled trial	Espelund, M., Fomsgaard, J.S., Haraszuk, J., Dahl, J.B., Mathiesen, O.	2014	The Acta Anesthesiologica Scandinavica Foundation	Investigate the efficacy of ACB on postoperative pain, opioid requirements and side effects (nausea, vomiting, dizziness, and sedation) after minor arthroscopic knee surgery	None provided	71	Patients scheduled for minor arthroscopic knee surgery with ASA I-II, aged 18-70 years with BMI 19-35.	Exclusion criteria were patients scheduled for ACL reconstruction, a history of allergic actions to any study medications, drug or alcohol abuse or a daily intake of analgesics.	Randomized controlled trial	A	I	ACB	Pain during standing assessed 2h after the ACB	Not assessed	The position for the nerve block was identified halfway between the superior anterior iliac spine and the base of patella. The transducer was placed in a transverse position across the thigh, the sartorious muscle, the femoral artery and femoral vein were identified; the saphenous nerve was identified lying laterally to the artery. A 70mm, 23 gauge stimuplex needle was inserted in plane until the tip of the needle in position lateral to the femoral artery. 30ml of 7.5mg/ml ropivacaine was injected after aspiration and for every 2ml, the expansion of the adductor canal being visualized.	Post operative ketobemidone consumption 0-2h postoperatively was significantly lower in ropivacaine group vs placebo.	No significant analgesic effect of the ACB could be detected after minor arthroscopic knee surgery with a basic analgesic regimen with acetaminophen and ibuprofen, except for a minor reduction in immediate requirements for supplemental opioids. ACB may however be a relevant option for treatment of patients with more intense pain after arthroscopic procedures.
Adductor canal block versus femoral nerve block for analgesia after total knee arthroplasty	Jaeger, P., Zaric, D., Fomsgaard, J., Hilsted, K., Bjerregaard, J.,Gym, J., Mathiesen, O., Larsen, T., Dahl, J.	2013	American Society of Regional Anesthesia and Pain Medicine	Aim of this study was to compare effects of ACB and FNB on muscle strength, pain, and mobilization in patients after TKA.	None provided	48	Patients scheduled for TKA with spinal anesthesia between ages 50-85 with an ASA I- III and a BMI18-40.	Inability to cooperate, inability to speak or understand Danish, allergy to any drug used, a daily intake of steroids or opioids, alcohol or drug abuse, rheumatoid arthritis, and if the spinal anesthesia had resolved before conducting the block.	Prospective, randomized, double blind trial	A	I	ACB vs FNB	Quadriceps strength	Spinal anesthesia was also provided so sensation/block success was not assessed.	Ultrasound survey at the medial part of the thigh, halfway between the superior anterior iliac spine and the patella. Via short axis view, the femoral artery was identified under the sartorious muscle with the vein just inferior, and the saphenous nerve just lateral to the artery. The needle was introduced in plane and the correct spread of 30ml of 0.5% ropivacaine bolus injection in a semicircular form around the artery was observed.	Not assessed.	ACB preserved quadriceps muscle strength better than FNB without a significant difference in postoperative pain.
Nerve Block of the Infrapatellar Branch of the Saphenous Nerve in Knee Arthroplasty	Hsu, L. P., Oh, S., Nuber, G. W., Doty Jr., R., Kendall, M. C., Gryzlo, S., Nader, A.	2013	The Journal of Bone and Joint Surgery	To see if the analgesic benefit of a block of the infrapatellar branch of the saphenous nerve improved the postoperative quality of recovery, decreases narcotic use and the inherent side effects narcotics, and improves mobility immediately following knee arthroscopy	None provided	68 patients	Simple knee arthroscopy included all soft-tissue procedures and osseous procedures no more substantial than microfracture or chondroplasty	Arthroscopic procedures involving osseous resection more substantial than microfracture were excluded. Patients with risk factors for block related complications were also excluded	Prospective, double-blinded, randomized, placebo-controlled trial	A	I	34 received 10 mL of 0.25% bupivicaine as a block of the infrapatellar branch of the saphenous nerve, 34 received a placebo of NS	Primary outcomes were early postoperative measures, including pain scores, analgesic requirments, side effects, time to discharge and mobilization, and quality of recovery (QOR). Secondary outcomes included short-term Lysholm knee scores.	Sensory assessments every minute until the plateau of sensory anesthesia was reached. Used a 21 gauge needle. Blocks were determined effective if there was dense sensory anesthesia in the cuteanous territories of either the saphenous nerve or the infrapatellar branch of the saphenous nerve. Group II (block group) success rate was 85%.	Gave details on procedure nothing ground breaking	Group I (placebo) needed more rescue analgesia (ketorolac) but it did not specifiy how many people in the study received it	No adverse reactions to the nerve block occured. Decreased early NRS pain scores and nausea. No difference in opioid consumption, mobility times, or 48 hour post anesthesia recovery scores.
The Effects of Ultrasound-Guided Adductor Canal Block Versus Femoral Nerve Block on Quadriceps Strength and Fall Risk	Kwofie, M. K., Shastri, U. D., Gadsden, J. C., Sinha, S. K., Abrams, J. H., Xu, D., & Salvis, E. A.	2013	Regional Anesthesia and Pain Medicine	Determine if an ultrasound-guided ACB can preserve quadriceps strength, thus minimizing weakness of knee extension comapred with ultrasound-guided FNB	None provided	16 healthy volunteers	Healthy ASA I-II, English speaking	BMI > 30 kg/m2, history of allergy to local anesthetics, preexisting gait disturbances, and any motor or sensory deficits. Also excluded were medical students or individuals with significant background in anatomy or medicine.	Blinded randomized trial	A	I	ACB vs FNB	Primary outcome was the percentage of maximum voluntary isometric contraction (MVIC) of knee extension preserved at 30 minutes after either an ACB or FNB. Secondary outcomes included MVIC of knee extension at 60 minutes, hip adduction at 30 and 60 minutes and assessment of fall risk with the Berg Balance Scale (BBS) at 30 minutes.	Adductor canal block was considered successful if the patient reported decreased or absent sensation at the medial midcalf to a pinprick stimulus using a 3-point scale (2=normal sensation, 1= decresed sensation, 0= no sensation) at 30 minutes after block.	Only decribed technique used for ACB block	Not applicable	ACB does not significantly affect the quadriceps motor function of balance, whereas FNB substantially decreases quadriceps motor function and increases the risk for falls as measure by the BBS.
Analgesic efficacy of ultrasound-guided adductor canal blockade after arthroscopic anterior cruciate ligament reconstruction	Espelund, M., Fomsgaard, J. S., Haraszuk, J., Mathiesen, O., & Dahl, J. B.	2013	European Journal of Anesthesiology	To investigate the analgesic effect of ACB in patients receiving a basic analgesic regimen of paracetamol and ibuprofen after arthroscopic ACL reconstruction under general anesthesia	None provided	50 patients	Scheduled for arthroscopic ACL surgery under general anesthesia, aged 18 to 70 years, with BMI 19 to 35 and classified as ASA I or II	History of allergic reactions to any of the study medications, drug or alcohol abuse, or with a daily intake of analgesics were excluded from the trial	Randomised, double-blind, placebo-controlled, parallel groups	A	I	ACB (30 ml ropivicaine 75%) vs placebo (NS)	Primary outcomes were pain during standing at 2 hours post-op, secondary outcomes were pain at rest 0,1,2,4,6,8 and 24 hours post-op, during standing, and after walking 5m. In addition, cumulative ketobemidone consumption, nausea, vomiting and sedation were also assessed	"All blocks were successfully performed and no complications were noted" doesnt mention how this was measured	Performed right after surgery. Position for the block was identified halfway between the base of the patella and the superior iliac spine	Extra opioid medication was given upon patient request	Results demonstrated no significant additonal analgesic effects of ACB after arthroscopic ACL reconstruction, neither at 2h postoperatively when patients were standing, nor at rest, during standing or after walking 5m from 0 to 24 h post-op
Adductor Canal Block versus Femoral Nerve Block and Quadriceps Strength	Jæger, P., Nielsen, J. K., Henningsen, M. H., Hilsted, K. L., Mathiesen, O., Dahl, J. B.	2013	Anesthesiology	Aimed to investigate the effect of the ACB in healthy volunteers on quadriceps and adductor muscle strength and the ability to ambualte	None provided	12 subjects randomized, 11 were analyzed	Men aged 18-30 years, BMI 18-25, ASA I	Intense exercise 24 before the tests, consumption of opioid or steroids within the last 4 weeks, any drug intake within the last 48 hours, pathology or previous surgery or trauma to the lower limb, diabetes mellitus, inability to cooperate, inability to speak or understand Danish, alcohol or drug abuse, or allergy to any drug used in the study	Randomized, double-blind, placebo-controlled, crossover study	A	I	Adductor canal block, femoral nerve block and placebo in the opposite limb	Maximum voluntary isometric contraction (MVIC), quadriceps strength, adductor strength, TUG test, 10-m walk and 30-s chair stand test.	In all limbs receiving active blocks, the subjects had complete loss of cold temperature discrimination, which indicated that there were no block failures. Tested all subjects for loss of cold sensation in the saphenous nerve innervation area, on the medial part of the lower leg	Short quick description of technique used for ACB	Not mentioned in this study	ACB reduced quadriceps strength by 8% compared with baseline and such reduction is not considered functionally important in patients. In comparison, the FNB reduced quad strength by 49% compared to baseline. All subjects could be mobilized with an ACB, and the ability to ambualte was better preserved with an ACB vice a FNB.
Prevalence of saphenour nerve injury after adductor-canal-blockade in patients receiving total knee arthroplasty	Henningsen, M.H., Jæger, P., Hilstead, K., L., Dahl, J. B.	2012	Acta Anaesthesiologica Scandinavica	To determine the prevalence of saphenous nerve injury in patients receiving adductor canal-blockade for pain treatment after total knee arthroplasty	None provided	97 patients who had previous TKA	Previous TKA	Death, emigration from Denmark and inability to cooperate	Retrospective comparative study	A	III	Adductor canal block	Sensory function was tested with pinprick (sharp vs blunt needle), temperature discrimination (cold swabs) and light brush with fingertip	Yes/No if they could feel the sensation or not. No scale. None of the 97 patients had altered temperature discrimination or altered sensation to light brush. 10 of these patients were not able to discriminate between blunt and sharp stimulation. (Medial crural branch of the saphenous nerve on operated knee). Block success rate not measured in this study.	Only describe the technique used for ACB when TKA was done 3-6 months prior to assessing sensation in all 97 patients	Not measured in this study	No indications of saphenous nerve injury caused by ACB at the mid-thigh level. However 84% of the patients were found to have signs of injury to the infrapatellar branch of the saphenous nerve of the operated knee. Such findings are well known complications to the surgical procedure.

Effect of adductor-canal-blockade on established, severe post-operative pain after total knee arthroplasty: a randomised study	Jaeger, P., Grevstad, U., Henningsen, M. H., Gottschau, B., Mathiesen, O., & Dahl, J. B	2013	Acta Anaesthesiologica Scandinavica	Aimed to investiage the adjunctive effect of ACB on established pain in the early post-operative period after TKA in patients receiving general anesthesia and a basic analgesic regimen with paracetamol, ibuprofen, and patient controlled intravenous morphine	None provided	41 were analyzed	Primary unilateral TKA, BMI 18-40, ASA I-III	Daily intake of strong opioids, alcohol or drug abuse, inability to cooperate, inability to speak or understand Danish, and allergy to any drug used in the study	Prospective, randomised, double blind, parallel group, placebo-controlled study	A	I	ACB vs Placebo	Primary endpoint was pain during 45 degree active flexion of the knee at 1 hour post operatively, 30 minutes after administration of study medication. Secondary endpoints included pain during active flexion of the knee and at rest, changed in pain scores from 0.5 to 1 hour post-op between groups, cumulated morphine consumption .5-6 hours post-op, post-op nausea and vomiting, ondansetron consumption and sedation	Measured as loss of sensation of cold in the saphenous area, was 95% (35/37).	Utilized mid-thigh entry. Refer to article for complete description of technique	It didnt specify how many patients used or required rescue analgesia it only mentioned that supplemental boluses were administered IV if a patient needed them	Pain during flexion of the knee for the interval 1-6 hours post-op was significantly reduced in the ropivicaine group compared with the placebo group: mean difference in averaged VAS= -12 mm, P=0.02. All other variables were not statistically significant
Anatomy and Clinical Implications of the Ultrasound-Guided Subsartorial Saphenous Nerve Block	Saranteas, T., Anagnostis, G., Paraskeuopoulos, T., Koulalis, D., Kokkalis, Z., Nakos, M., Anagnostopoulou, S., & Kostopanagiotou, G.	2011	Regional Anesthesia and Pain Medicine	To provide a detailed description of the saphenous nerve anatomy at the inferior foramina of the adductor canal, and the anatomic basis for ultrasound-guided saphenous nerve block was clinically evaulated	none provided	11 cadaver knees and 23 live volunteers	Not provided	Younger than 18 years or older than 80 years, had allergy to local anesthetics, bleeding disorders, pregnancy, neurologic deficits; or a BMI greater than 35	Cadaver study and case series	A	III	Subsartorial saphenous nerve block	Sensory block and the strength of the flexors of the thigh at the hip and the extensors at the knee	Sensory block was rated as follow: 0, normal sensation, 1, decreased sensory block, and 2, complete sensory block. Considered the sensory block successful if there was a complete absence of sensation to pinprick in 2 tested areas (just proximal to the medial malleolus and at the midpoint between the medial malleolus and the tibial tubercle). 22/23 (95.5%) underwent complete sensory blocks	Medial side of thigh, at the midpoint between the knee and the inguinal crease. Good description provided in the study	Not specified	The saphenous nerve always passes between the sartorius muscle and the femoral artery as it exits the inferior foramina of the adductor canal. Ultrasound-guided injection directly caudal from the inferior foramina of the adductor canal, between the sartorius muscle and the femoral artery, is a reliable and likely a safe approach for saphenous nerve block. It is a simple method because ultrasound ID of the saphenous nerve is not required and it can be performed without a nerve stimulator
Efficacy of an ultrasound-guided subsartorial approach to saphenous nerve block: a case series	Tsai, P. B., Kamwal, A., Kakazu, C., Tokhner, V., & Julka, I. S.	2010	Canadian Journal of Anesthesiology	To investigate the efficacy of an ultrasound-guided subsartorial approach to a saphenous nerve block	None provided	39 patients	Aged 18 to 64, ASA I-III, and elestive foot, ankle, or leg surgery below the knee	History of chronic pain or drug abuse, or preexisting neuropathy that was characterized as moderate to severe	Retrospective review of a small series of patients	B	III	Subsartorial approach to saphenous nerve block	Pre-block and post-block pain scores using a verbal rating system	Results were not recorded * A preoperative block was deemed successful if 1). the patient received either MAC or GA intraoperatively with the anesthesia record documenting minimal opioid administration (< 200 mcg of Fentanyl) and 2). the patient denied pain (VRS = 0) in the PACU and did not rewuire supplemental medication aside for the usually given Meperidine which is given for shivering. A postoperative block was deemed effective if the patient's VRS score was reduced to 0 within 30 minutes of injuection without additional analgesic dosing	Ultrasound at medial aspect of the leg at the midpoint between the knee and the inguinal crease	Information not provided	Subsartorial appraoch was moderately effective with a success rate of 77% 30/39 patients. Similar to Benzon et al for the transsartorial and perifemoral approach.
Preliminary Experience With a New Approach to Performing an Ultrasound-Guided Saphenous Nerve Block in the Mid to Proximal Femur	Kirkpatrick, J. D., Sites, B. D., Antonakakis, J. G.	2008	Regional Anesthesia and Pain Medicine	*Letter to the editor* To share a simple and effective ultrasound-guided technique of blocking the Saphenous Nerve in the mid to proximal femur	None provided	19 patients	Didn't specifiy	Didnt specify	Retrospective review of previous regional blocks completed	A	III	N/A	N/A	Tested block efficacy when they subjected patients to cold in the medial aspect of the lower leg (their standard testing location)	Good technique description that is similar to the one described by Lopez et al and Manickam et al.	Not provided	Easy to identify the superficial femoral artery in the mid to proximal femur using ultrasound.
Feasibility and Efficacy of Ultrasound-Guided Block of the Saphenous Nerve in the Adductor Canal *This article was referenced by Kim, et al, 2014 for technique purposes	Manickman, B., Perlas, A., Duggan, E., Brull, R., Chan, V. W., Ramlogan, R.	2009	Regional Anesthesia and Pain Medicine	To assess the feasibility of performing an ultrasound-guided SN block in the distal thigh	None provided	20 Patients undergoing ankle of foot surgery	Aged 18 to 80 years, ASA I-III, BMI < 35, and elective foot or ankle surgery	Language barrier, contraindications to regional anesthesia, pregnancy, known allergy to local anesthetics, bleeding diathesis, and preexisting neuropathy	Descriptive, prospective study	A	II	Saphenous nerve block at the adductor canal	Sensation (block success)	Sensation to pinprick was assessed using a 3 point scale: normal (2), decreased (1) and absent (0) in 3 areas, namely, the infrapatellar area, the proximal aspect of the medial leg, and the distal aspect of medial leg just proximal to the medial malleolus. Block was considered successfull if complete absence of sensation to pinprick developed within 30 minutes of local anesthetic administration in the 3 tested areas. All 20 patients in the study developed complete sensory anesthesia to pinprick by 25 minutes!	Best explanation of technique out of all my articles read	Not provided and not needed since success rate of all blocks was 100%	Ultrasound-guided SN block in the distal adductor canal is feasible, resulting in consistent nerve identification and block success
The Isolated Effect of Adductor Canal Block on Quadriceps Femoris Muscle Strength After Total Knee Arthroplasty: A Triple-Blinded, Randomized, Placebo-Controlled Trial with Individual Patient Analysis	Sorensen, J. K., Jaeger, P., Dahl, J. B., Gottschau, B., Stephensen, S. L., & Grevstad, U.	2016	International Anesthesia Research Society	To examine whether the ACB can increase functional muscle strength in a broad population of TKA patients with a planned subgroup analysis (for the primary end point), dividing patients according to postoperative preblock pain scores	None provided	107 patients screened, 64 enrolled. Only 63 completed study. Accounted for attrition of 1 patient.	Age 18 to 85 years; ASA I to III.	Inability to cooperate, inability to perform TUG test before surgery, peripheral or nerve block after surgery, inability to read or speak Danish, allergy to ropivacaine, alcohol or drug abuse, neuropathy in lower extremities & pregnancy	Single center, randomized, blinded, placebo-controlled trial	A	I	Group A= ACB block with 30 mL Ropivicaine at t=0 then 30 mL saline at t=60 Group B= ACB block with 30 mL saline then 30 mL Ropivicaine at t=60.	Difference between groups at t=60 in MVIC of the quadriceps muscle expressed as a percentage of the preblock value. Secondary outcomes were pain scores at rest, during active knee flexion and during the timed up and go (TUG) test and time to complete the TUG test	Tested the cutaneous sensory function of the saphenous nerve by swiping a cold gauze on the medial aspect of the tibia at t0 and t120. One investigator did all assessments.	Quick description of ACB technique utilized for this study	No medications administered before baseline measurement a. Patients had the option to take medications during the 3 hour study period however none of them did.	Quadriceps MVIC showed there was a significantly higher in group A = 170% compared to group B = 93%. No statistically significant difference between the groups in time to perform TUG test. All differences in VAS scores at t60 were in favor of group A during the TUG test, at rest and during knee flexion. ACB provides pain relief that converts into increased muscle strength but there needs to be more research to find adequate pressure and volume of anesthetic used for block.
The spread of injectate during saphenous nerve block at the adductor canal: a cadaver study	Andersen, H. L., Andersen, S. L., Tranum-Jensen, J.	2015	Acta Anaesthesiologica Scandinavica	To describe how the spread of dyed injectates is affected or limited by the connective tissue and muscles surrounding the neurovascular bundle at the adductor canal in lower limbs of fresh frozen unembalmed cadavers	None provided	15 unembalmed fresh frozen cadaver lower limbs	A preconditon for the study was taht the lower limbs were cut from the cadavers before they were made available for the study. The cut face of the limbs was a few centimeters proximal to the apex of the femoral triangle	None given	A comparative study using cadaver legs	A	III	Saphenous nerve block at the adductor canal	Measure the spread of injectate. 10 cadavers they used a resin and 5 they used an aqueous solution of methylene blue	N/A	Discuss anatomical considerations (updated to reflect current practice of the ACB) also discuss the first descriptions of the ACB. They utilized the same technique when they administered the block for this cadaver study.	N/A	Injection of 15 mL during the saphenous nerve block at the adductor canal spreads throughout the adductor canal and beyond both proximally and distally unless the injectate is placed in the subsartorial fat
The effect of adductor canal blockade on outcome after medial unicondylar knee arthroplasty	Brown	2015	bulletin of the hospital for joint diseases	to determine whether ACB shortens hospital stay after unicondylar knee arthroplasty	none	12	patients needing unicondylar knee arthroplasty	not stated	pilot study	C	I	Single shot acb comapred to usual lumbar plexus block	hospital length of stay, analgesia needs, motor strength				shorter duration of hospital stay with ACB, patients needed fewer PT sessions, ACB patients walked more, less narcotic use in ACB but that was not significant
Fluroscopic Evaluation of Contrast Distribution Within the Adductor Canal	Yuan, S. C., Hanson, N. A., Auyong, D. B., Choi, D. S., Coy, D., & Strodtbeck, W. M.	2015	Regional Anesthesia and Pain Medicine	To characterize the extent of contrast spread within the adductor canal via continuous infusion	None provided	10 adults	ASA II-III prior to unilateral TKA	None given	Case series	B	III	Adductor canal block	MVIC (pre and postop), contrast spread, pressure of contrast injected and saphenous nerve distribution (pinprick)	Pin-prick over the ipsilateral medial malleolus	Give detailed technique used in methods section	N/A	Contrast injected at similar pressures to continuous adductor canal infusions in vivo did not reach the level of the lesser trochanter of the femur, where the common femoral nerve is located (5 ml of contrast was administered in total)
Femoral nerve block versus adductor canal block for postoperative+	El Ahl M.S.	2015	Saudi Journal of Anesthesia	To evaluate the reliability of the postoperative pain control using adductor canal block (ACB) compared that using the femoral nerve block (FNB) in patients with anterior cruciate ligament reconstructions (ACLR)	Anesthetic techniques, anesthetics local, equipment, femoral, regional, ropivacaine, ultrasound machines	128 patients divided evenly between groups	One hundred and twenty eight patients (American Society of Anesthesiologist [ASA] I or II, aged 18-45years) who were scheduled for patellar graft ACLR were included in this study	Patients with ASA class III or IV, body mass index >35, patients with additional complex knee procedure or known allergies to ropivacaine were excluded	prospective controlled randomized double-blind study	A	I	Adductor canal block or femoral nerve block	post operative pain and motor function	The postoperative pain was assessed using the visual analog scale (VAS; 0 no pain while 10 is the maximum pain). If the VAS was 4 or more, a morphine increment (2 mg) was added	using an S-nerve machine (SonoSite Inc., Bothell, WA, USA), a linear US probe (HFL 38, 13-6 MHz, SonoSite Inc., Bothell, WA, USA), a 5-cm needle (21G, Locoplex from Vygon, France) and 15 ml of ropivacaine 05% (Naropin ®, AstraZeneca, AB, Sweden). For the ACB, the US probe was placed at the mid-thigh level. The superficial femoral vessels were identified; deep to the sartorius muscle. The needle was advanced (using the in-plane technique from lateral to medial) toward the adductor canal where the local anesthetic was injected.	2 patients had failed blocks	Patients with Adductor canal block had more quadriceps strength but also more pain than those in the FNB group. Morphine consumption was also higher in the ACB than the FNB group.

Adductor canal block with 10ml versus 30ml+	Jæger P., Koscielniak-Nielsen Z.J., Hilsted K.L., Fabritius M.L., Dahl J.B.	2015	Regional Anesthesia and Pain Medicine	We hypothesized that reducing the local anesthetic volume from 30 to 10 mL may lead to fewer subjects with quadriceps weakness.	None	enrolled 26 subjects	enrolled men aged 18 to 30 years with a body mass index of 18 to 25 and an American Society of Anesthesiologists status of I into the study.	Exclusion criteria were diabetes mellitus, intake of opioids or ste- roids within the last 4 weeks (except oral inhalation), any drug intake within the last 48 hours, any pathology, former trauma or surgery to the leg, inability to cooperate, non-Danish speakers, alcohol or drug abuse, or history of allergy to local anesthetics.	A Paired, Blinded, Randomized Study in Healthy Volunteers	A	I	30 vs 10 mL of ropivicaine into the adductor canal	Quadriceps muscle strength Quantitative sensory testing was performed using a tonic heat pain response test. In this test, we assessed pain response to a tonic heat pain stimulus using a computer-based thermode sys- tem (2.5 cm2, Thermotest; Somedic A/B, Hörby, Sweden). The probe was placed on the medial side in the middle third of the lower leg and heated to 45°C (ramp rate 5°C/s) for 30 seconds. Block success was judged by using an alcohol swab at 1 and six hours post injection.	100mm VAS to rate the pain from the heat	Using less LA does not spare more motor involvment than using 30mL.The ACB was performed under ultrasound (US) guidance (Venue 40; GE Medical Systems, Wuxi, China), as described pre- viously.3 A linear 12 L probe was placed in a transverse orienta- tion at the midthigh level, approximately halfway between the patella and the anterosuperior iliac spine. After skin preparation with chlorhexidine gluconate and isopropyl alcohol, we intro- duced a 22-gauge 80-mm-long insulated needle (Ultraplex; B. Braun Medical, Melsungen, Germany) in plane and lateral to the US probe. We identified the femoral vessels underneath the sartorius muscle and injected ropivacaine 0.1% (10 or 30 mL) in proximity of the saphenous nerve, usually found anterolateral to the femoral artery (Fig. 1). Ropivacaine was injected incre- mentally after negative aspiration to minimize the risk of intravas- cular injection	no	No differences between 30 or 10mL found. chair test found a difference but it was below the threshold of normal strength difference between legs
A comparison of two ultrasound guided approaches+	Mariano	2014	J Ultrasound Med	to compare proximal versus distal insertion catheter insertion sites for ***continuous*** adductor canal block looking primaruly at time to anesthesia	continuous adductor canal block; knee arthroplast y; musculosk eletal ultrasound ; perineural catheter; ultrasound -guided regional anesthesia	77 patients assessed for suitability; 50 enrolled	Adults (>18 years old) scheduled for unilateral knee arthroplasty with an adductor canal perineural catheter planned for postoperative analgesia	Patients unable to understand the study protocol or care for the infusion pump/catheter system or with any known contraindication to study medications or regional anes- thesia, insulin-dependent diabetes mellitus, neuropathy of any etiology in the affected extremity, hepatic or renal fail- ure, any additional surgical site outside the limb intended for catheter placement, chronic opioid use or active illicit substance abuse, pregnancy, or an inability to communi- cate with the investigators and hospital staff were exclude	randomized controlled trial but lacking true double blinding as the anesthesiologist knew what insertion technique he/she was using	A	I	proximal (just caudal to femoral traingle) or distal (mid thigh)catheter insertion	primary:time to complete sensory anesthesia of the saphenous nerve measured by pinprick in the medial calf proximal to the medial malleolus; secondary: catheter placement time, number of needle passes, amount of IV fentanyl, number of vascular punctures. discomfort with procedure. motor assessment.	0=no change in sensation, 1= partial loss of sensation, 2= complete loss of sensation measured at three minute intervals after bolus of mepivicaine. catheter placement time started when transducer first touched patient's skin and ended when needle was removed after catheter insert on. needle passes defined as each withdrawal of the placement needle more than 1 cm with redirection. amount of IV fentanyl administered and vascular punctures. Procedure related discomfort measure on NRS 0-10. Motor assessment of the quadri- ceps were performed by voluntary leg extension against resistance with the patient in the supine position and the hip passively flexed (0, no change from baseline; 1, diminished active contraction; 2, no active contraction. all measures by blinded RA	Proximal may offer better analgesia/anesthesia with no increased motor block. it is also out of the surical field of knee surgeries. blocks took same amount of time to administer but the proximal took longer to completely anesthetize the calf.	rescue not mentioned. both 100 percent effective by post operative time. opioid consumption similar although proximal group needed less opioid in the the first 24 hours (actually significant result statistically).	proximal may be better than distal as it doesn't increase motor block but analgesia might be improved
Local anesthetics spread in the adductor canal block, cadaver study a	Atchabahian, A., Sofer, M., López, A., Sala-Blanch, X	??	European Journal of Anesthesiology	cadaver study of spread of injectate into AC	abstract only	6 cadaver legs			cadaver study	A	III	A mixture of 27 mL of 2% lidocaine and 3 mL of methylene blue was injected under ultrasound guidance in the adductor canal	dye spread				This study demonstrates that the spread of local anesthetic during an adductor canal blockade involves, besides the saphenous nerve, the posterior branch of the obturator nerve during its course anterior to the adductor magnus, but does not typically ex tend to the popliteal area, or laterally or proximally to other branches of the femoral nerve.
A randomised controlled trial of ultrasound-guided blockade of the saphenous nerve and the posterior branch of the obturator nerve for postoperative analgesia after day-case knee arthroscopy	Westergaard B., Jensen K., Lenz K., Bendtsen T.F., Vazin M., Tanggaard K., Worm B.S., Krogsgaard M., Børglum J.	2014	Anesthesia	to investigate ultrasound-guided blockade of the saphenous nerve and the posterior branch of the obturator nerve for postoperative analgesia after day-case knee arthroscopy*	none	85 assessed for suitability; 60 allocated; 59 analysed	adults (≥ 18 years) scheduled to undergo day-case knee arthroscopy under general anaesthesia	ASA physical status > 3; scheduled for cruciate ligament reconstruction or suture fixation of tibial eminence fractures; unable to understand and cooperate; allergic to any study drugs; opioid-dependent; with a weekly alcohol intake > 14 (men) or 7 (women) units, or other substance abuse.	RCT	A	I	Saline vs Ropivicaine single injection after knee arthoscopy	primary endpoint was pain in the operated knee on active flexion to 45° during the first 24 post-operative hours. We instructed participants to score their pain on a numerical rating scale between 0–10 immediately before surgery, on arrival in the post-anaesthesia care unit (PACU), 30 min later, and then at1,2,3,4,6,8,12 and24h,Anurse recordedpain scores in the PACU on a chart that participants then used to record pain scores at home; also recordod: pain at rest; severity of nausea (scored 0–10) and the number of vomits; times and doses of morphine and anti-emetics; and time of discharge from recovery	NRS 0-10 pain scale	This study found no difference between saline and LA injected to the saphenous and posterior obturator nerve. Sono- Site EDGE ultrasound unit (SonoSite Inc., Bothell, Washington) with a high-frequency linear array trans- ducer (15–6 MHz, HFL 50) covered in a sterile plastic sheath (Safersonic Medizinprodukte Handels, Ybbs, Austria). We identified the saphenous nerve just lateral to the artery under the subsartorial fascia, with the trans- ducer at the mid-thigh level (midway between the lower border of the greater trochanter and the base of the patella) in a transverse plane (Fig. 2a,b). We injected 7.5 ml solution around the saphenous nerve through a 21-G, 30 bevel, 90 mm long Polymedic ultrasound needle (Temena SAS, Carri eres sur Seine, France). This was advanced medially in-plane from the lateral end of the transducer at 35–45° through the sartorius muscle	No statistical difference between saline and LA in opioid consumption	This study found no difference between saline and LA injected to the saphenous and posterior obturator nerve.
The impact of analgesic modality on early ambulation following total knee arthroplasty	Perlas A., Kirkham K.R., Billing R., Tse C., Brull R., Gandhi R., Chan V.W.S.	2013	regional anesthesia and pain medicine	examined the analgesic and reha- bilitation outcomes associated with 48-hour continuous femoral nerve block, local infiltration analgesia, or local infiltration analgesia plus ad- ductor canal nerve block.	none	298 patients	Inclusion criteria were age between 18 and 85 years, American Society of Anesthesiology (ASA) physical status classification I through III, and unilateral primary TKA under spinal anesthesia with intrathecal morphine	Exclusion criteria included chronic opioid use (>30 mg of oral morphine equivalents per day), revi- sion or bilateral TKA, and general anesthesia.	retrospective cohort study	A	III	continuous femoral nerve block vs local infiltration vs local infiltration plus ACB	primary: early postoperative ambulation Secondary outcomes include distance walked on postoperative days 2 and 3 (POD2, POD3) and the type of walking aid required (high or low walker), pain scores assessed by a numeric rating scale (NRS) at various predetermined intervals, total daily opioid consumption (expressed in intravenous morphine equivalents), the incidence of opioid-related adverse effects, the length of the patient's hospital stay, and discharge destination (home or rehabilitation facility). The occurrence of any major concurrent medical event requiring spe- cial diagnostic or therapeutic interventions was also documented.	pain scores assessed by a numeric rating scale (NRS) at various predetermined intervals, total daily opioid consumption (expressed in intravenous morphine equivalents)	Patients in this group received an ACB preoperatively in ad- dition to LIA. Under ultrasound guidance, the femoral artery and the saphenous nerve were identified in the middle one-third of the thigh, deep to the sartorious muscle in the adductor canal. The sartorious and adductor muscles form the roof and the floor of the canal, respectively. Following skin infiltration 20 mL of 0.5% ropivacaine was injected through an 80-mm, 22-gauge, short- bevel echogenic needle (SonoPlex; Pajunk, Norcross, Georgia) to surround the saphenous nerve within the neurovascular com- partment. An inverted U-shaped spread of local anesthetic was sought superficial to the femoral artery.	greater proportion of patients in the CFNB group required IV opioid "rescue"	LIA plus ACB was best for strength and pain as compared to CFNB The Results of this study were relatively strong and technique may be a good one to emulate

Effects of Adductor-Canal-Blockade on pain and ambulation after total knee arthroplasty: A randomized study	Jenstrup M.T., Jæger P., Lund J., Fomsgaard J.S., Bache S., Mathiesen O., Larsen T.K., Dahl J.B.	2012	ACTA ANAESTHESIOLOGICA SCANDINAVICA	to test whether the adductor-canal-blockade may reduce mor- phine consumption (primary endpoint), improve pain relief, enhance early ambulation ability, and reduce side effects (secondary endpoints) after TKA compared with placebo.	none	Seventy-five patients were randomized in a 1 : 1 ratio and 71 patients were analyzed	Eligible participants were patients scheduled for primary TKA under spinal anesthe- sia, aged 50–85 years, with an American Society of Anesthesiologists physical status classification of I–III, and a body mass index of 18–35	Exclusion criteria were inability to cooperate, inability to speak or understand Danish, allergy to any drug used in the study, a daily intake of strong opioids (mor- phine, oxycodone, methadone, fentanyl, ketobemi- done), alcohol or drug abuse or inability to perform the mobilization test (Timed-Up-and-Go (TUG) test15) pre-operatively	parallel double-blind, placebo-controlled rand-omized trial	A	I	ropivicaine or saline injected into AC	morphine consumption (primary endpoint),Secondary endpoints were pain at rest and during 45 degrees flexion of the knee, ambulation ability assessed with the TUG test, postoperative nausea and vomiting (PONV), ondansetron consumption and sedation	Pain was evaluated on a VAS with 0 mm = no pain, and 100 mm = worst imaginable pain Patients were assessed at 2, 4, 8, 24, and 26 h post-operatively. Recordings made at these time points included cumulative morphine consumption (0–24 h post-operatively), pain at rest, pain during 45 degrees flexion of the knee	The ACB was performed immediately post- operatively. At the midthigh level, approximately halfway between the superior anterior iliac spine and the patella, a high-frequency linear ultrasound (US) transducer (GE Logiq e, GE, Waukesha, WI, USA) was placed in a transverse cross-sectional view. Underneath the sartorius muscle the femoral artery was identified, with the vein just inferior and the saphenous nerve just lateral to the artery. From the lateral side of the transducer a 10-cm, 18-gauge Tuohy needle (Braun Medical, Melsungen, Germany) was inserted in plane, through the sarto- rius muscle. With the tip of the Tuohy needle placed just lateral to the artery and the saphenous nerve, 20 ml of study medication was injected to expand the adductor canal. A 21-gauge catheter was then inserted 5–8 cm through the canula. To obtain the correct position of the catheter tip, the catheter was slowly retracted during injection of a further 10 ml of study medication under US guidance, until an expansion between the fascia and the vessels could be visualized. All blocks were performed by one of three anesthesiologists (M. T. J., J. L., J. S. F.), all with considerable experience in US-guided nerve blocks	The success rate of the block was 94% (59/63, eight patients not tested), which is com- parable with the success rate seen in other studies investigating US-guided blockade of the saphenous nerve in the adductor canal.	the ACB significantly reduced mor- phine consumption and pain during 45 degrees flexion of the knee compared with placebo after TKA. Furthermore it significantly enhanced ambu- lation ability at 24 h assessed with the TUG test.

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COURSEWORK REQUIREMENTS REPORT*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Jared Hartman (ID: 4996936)
- **Email:** jared.hartman@usuhs.edu
- **Institution Affiliation:** Uniformed Services University of The Health Sciences (ID: 395)
- **Institution Unit:** GSN
- **Phone:** 760-540-1617

- **Curriculum Group:** OUSD P&R Human Research (Current)
- **Course Learner Group:** Biomedical Investigators and Research Study Team
- **Stage:** Stage 1 - Biomedical Investigators

- **Report ID:** 17009653
- **Completion Date:** 08/25/2015
- **Expiration Date:** 08/24/2018
- **Minimum Passing:** 80
- **Reported Score*:** 94

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED
Records-Based Research (ID: 5)	08/25/15
Vulnerable Subjects - Research Involving Children (ID: 9)	08/25/15
Vulnerable Subjects - Research Involving Pregnant Women, Human Fetuses, and Neonates (ID: 10)	08/25/15
FDA-Regulated Research (ID: 12)	08/25/15
Basic Institutional Review Board (IRB) Regulations and Review Process (ID: 2)	08/25/15
Informed Consent (ID: 3)	08/25/15
History and Ethics of Human Subjects Research (ID: 498)	08/25/15
Social and Behavioral Research (SBR) for Biomedical Researchers (ID: 4)	08/25/15
Genetic Research in Human Populations (ID: 6)	08/25/15
Populations in Research Requiring Additional Considerations and/or Protections (ID: 16680)	08/25/15
Recognizing and Reporting Unanticipated Problems Involving Risks to Subjects or Others in Biomedical Research (ID: 14777)	08/25/15
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	08/25/15
Avoiding Group Harms - U.S. Research Perspectives (ID: 14080)	08/25/15
Office of the Under Secretary of Defense (Personnel and Readiness) (ID: 912)	08/25/15
Module for Non-DoD Personnel Conducting Research Involving Human Subjects Supported by the DoD (ID: 16769)	08/25/15
Vulnerable Subjects - Research Involving Prisoners (ID: 8)	08/25/15

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

CITI Program
Email: citisupport@miami.edu
Phone: 305-243-7970
Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COURSEWORK TRANSCRIPT REPORT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Jared Hartman (ID: 4996936)
- **Email:** jared.hartman@usuhs.edu
- **Institution Affiliation:** Uniformed Services University of The Health Sciences (ID: 395)
- **Institution Unit:** GSN
- **Phone:** 760-540-1617

- **Curriculum Group:** OUSD P&R Human Research (Current)
- **Course Learner Group:** Biomedical Investigators and Research Study Team
- **Stage:** Stage 1 - Biomedical Investigators

- **Report ID:** 17009653
- **Report Date:** 08/25/2015
- **Current Score**:** 94

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT
History and Ethics of Human Subjects Research (ID: 498)	08/25/15
Informed Consent (ID: 3)	08/25/15
Social and Behavioral Research (SBR) for Biomedical Researchers (ID: 4)	08/25/15
Records-Based Research (ID: 5)	08/25/15
Genetic Research in Human Populations (ID: 6)	08/25/15
Vulnerable Subjects - Research Involving Prisoners (ID: 8)	08/25/15
Vulnerable Subjects - Research Involving Children (ID: 9)	08/25/15
Vulnerable Subjects - Research Involving Pregnant Women, Human Fetuses, and Neonates (ID: 10)	08/25/15
FDA-Regulated Research (ID: 12)	08/25/15
Office of the Under Secretary of Defense (Personnel and Readiness) (ID: 912)	08/25/15
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	08/25/15
Avoiding Group Harms - U.S. Research Perspectives (ID: 14080)	08/25/15
Basic Institutional Review Board (IRB) Regulations and Review Process (ID: 2)	08/25/15
Recognizing and Reporting Unanticipated Problems Involving Risks to Subjects or Others in Biomedical Research (ID: 14777)	08/25/15
Populations in Research Requiring Additional Considerations and/or Protections (ID: 16680)	08/25/15
Module for Non-DoD Personnel Conducting Research Involving Human Subjects Supported by the DoD (ID: 16769)	08/25/15

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

CITI Program
Email: citisupport@miami.edu
Phone: 305-243-7970
Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COURSEWORK REQUIREMENTS REPORT*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Sean Hutchison (ID: 4993284)
- **Email:** sean.hutchison@usuhs.edu
- **Institution Affiliation:** Uniformed Services University of The Health Sciences (ID: 395)
- **Institution Unit:** Graduate School of Nursing
- **Phone:** 5419082032

- **Curriculum Group:** OUSD P&R Human Research (Current)
- **Course Learner Group:** Biomedical Investigators and Research Study Team
- **Stage:** Stage 1 - Biomedical Investigators

- **Report ID:** 16996546
- **Completion Date:** 08/25/2015
- **Expiration Date:** 08/24/2018
- **Minimum Passing:** 80
- **Reported Score*:** 94

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED
Records-Based Research (ID: 5)	08/24/15
Vulnerable Subjects - Research Involving Children (ID: 9)	08/24/15
Vulnerable Subjects - Research Involving Pregnant Women, Human Fetuses, and Neonates (ID: 10)	08/25/15
FDA-Regulated Research (ID: 12)	08/25/15
Basic Institutional Review Board (IRB) Regulations and Review Process (ID: 2)	08/25/15
Informed Consent (ID: 3)	08/25/15
History and Ethics of Human Subjects Research (ID: 498)	08/25/15
Social and Behavioral Research (SBR) for Biomedical Researchers (ID: 4)	08/25/15
Genetic Research in Human Populations (ID: 6)	08/25/15
Populations in Research Requiring Additional Considerations and/or Protections (ID: 16680)	08/25/15
Recognizing and Reporting Unanticipated Problems Involving Risks to Subjects or Others in Biomedical Research (ID: 14777)	08/25/15
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	08/25/15
Avoiding Group Harms - U.S. Research Perspectives (ID: 14080)	08/25/15
Office of the Under Secretary of Defense (Personnel and Readiness) (ID: 912)	08/25/15
Module for Non-DoD Personnel Conducting Research Involving Human Subjects Supported by the DoD (ID: 16769)	08/25/15
Vulnerable Subjects - Research Involving Prisoners (ID: 8)	08/24/15

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

CITI Program
Email: citisupport@miami.edu
Phone: 305-243-7970
Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COURSEWORK TRANSCRIPT REPORT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Sean Hutchison (ID: 4993284)
- **Email:** sean.hutchison@usuhs.edu
- **Institution Affiliation:** Uniformed Services University of The Health Sciences (ID: 395)
- **Institution Unit:** Graduate School of Nursing
- **Phone:** 5419082032

- **Curriculum Group:** OUSD P&R Human Research (Current)
- **Course Learner Group:** Biomedical Investigators and Research Study Team
- **Stage:** Stage 1 - Biomedical Investigators

- **Report ID:** 16996546
- **Report Date:** 08/25/2015
- **Current Score**:** 94

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT
History and Ethics of Human Subjects Research (ID: 498)	08/25/15
Informed Consent (ID: 3)	08/25/15
Social and Behavioral Research (SBR) for Biomedical Researchers (ID: 4)	08/25/15
Records-Based Research (ID: 5)	08/24/15
Genetic Research in Human Populations (ID: 6)	08/25/15
Vulnerable Subjects - Research Involving Prisoners (ID: 8)	08/24/15
Vulnerable Subjects - Research Involving Children (ID: 9)	08/24/15
Vulnerable Subjects - Research Involving Pregnant Women, Human Fetuses, and Neonates (ID: 10)	08/25/15
FDA-Regulated Research (ID: 12)	08/25/15
Office of the Under Secretary of Defense (Personnel and Readiness) (ID: 912)	08/25/15
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	08/25/15
Avoiding Group Harms - U.S. Research Perspectives (ID: 14080)	08/25/15
Basic Institutional Review Board (IRB) Regulations and Review Process (ID: 2)	08/25/15
Recognizing and Reporting Unanticipated Problems Involving Risks to Subjects or Others in Biomedical Research (ID: 14777)	08/25/15
Populations in Research Requiring Additional Considerations and/or Protections (ID: 16680)	08/25/15
Module for Non-DoD Personnel Conducting Research Involving Human Subjects Supported by the DoD (ID: 16769)	08/25/15

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

CITI Program
Email: citisupport@miami.edu
Phone: 305-243-7970
Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Stephanie Wallace (ID: 4988019)
- **Institution Affiliation:** Uniformed Services University of The Health Sciences (ID: 395)
- **Institution Email:** Stephanie.Wallace@usuhs.edu
- **Institution Unit:** GSN
- **Phone:** 5705734343

- **Curriculum Group:** OUSD P&R Human Research (Current)
- **Course Learner Group:** Biomedical Investigators and Research Study Team
- **Stage:** Stage 1 - Biomedical Investigators

- **Record ID:** 16975333
- **Completion Date:** 24-Aug-2015
- **Expiration Date:** 23-Aug-2018
- **Minimum Passing:** 80
- **Reported Score*:** 92

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Records-Based Research (ID: 5)	24-Aug-2015	3/3 (100%)
Research Involving Children (ID: 9)	24-Aug-2015	3/3 (100%)
Research Involving Pregnant Women, Fetuses, and Neonates (ID: 10)	24-Aug-2015	3/3 (100%)
FDA-Regulated Research (ID: 12)	24-Aug-2015	4/5 (80%)
Basic Institutional Review Board (IRB) Regulations and Review Process (ID: 2)	24-Aug-2015	5/5 (100%)
Informed Consent (ID: 3)	24-Aug-2015	5/5 (100%)
History and Ethics of Human Subjects Research (ID: 498)	24-Aug-2015	7/7 (100%)
Social and Behavioral Research (SBR) for Biomedical Researchers (ID: 4)	24-Aug-2015	4/4 (100%)
Genetic Research in Human Populations (ID: 6)	24-Aug-2015	4/5 (80%)
Populations in Research Requiring Additional Considerations and/or Protections (ID: 16680)	24-Aug-2015	4/5 (80%)
Recognizing and Reporting Unanticipated Problems Involving Risks to Subjects or Others in Biomedical Research (ID: 14777)	24-Aug-2015	4/5 (80%)
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	24-Aug-2015	4/5 (80%)
Avoiding Group Harms - U.S. Research Perspectives (ID: 14080)	24-Aug-2015	3/3 (100%)
Office of the Under Secretary of Defense (Personnel and Readiness) (ID: 912)	24-Aug-2015	No Quiz
Module for Non-DoD Personnel Conducting Research Involving Human Subjects Supported by the DoD (ID: 16769)	24-Aug-2015	No Quiz
Research Involving Prisoners (ID: 8)	24-Aug-2015	4/4 (100%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?k66fa7aa1-493d-4af7-a602-535c93f045f2-16975333

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888-529-5929
Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 2 OF 2
COURSEWORK TRANSCRIPT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Stephanie Wallace (ID: 4988019)
- **Institution Affiliation:** Uniformed Services University of The Health Sciences (ID: 395)
- **Institution Email:** Stephanie.Wallace@usuhs.edu
- **Institution Unit:** GSN
- **Phone:** 5705734343

- **Curriculum Group:** OUSD P&R Human Research (Current)
- **Course Learner Group:** Biomedical Investigators and Research Study Team
- **Stage:** Stage 1 - Biomedical Investigators

- **Record ID:** 16975333
- **Report Date:** 25-Sep-2017
- **Current Score**:** 92

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
History and Ethics of Human Subjects Research (ID: 498)	24-Aug-2015	7/7 (100%)
Informed Consent (ID: 3)	24-Aug-2015	5/5 (100%)
Social and Behavioral Research (SBR) for Biomedical Researchers (ID: 4)	24-Aug-2015	4/4 (100%)
Records-Based Research (ID: 5)	24-Aug-2015	3/3 (100%)
Genetic Research in Human Populations (ID: 6)	24-Aug-2015	4/5 (80%)
Research Involving Prisoners (ID: 8)	24-Aug-2015	4/4 (100%)
Research Involving Children (ID: 9)	24-Aug-2015	3/3 (100%)
Research Involving Pregnant Women, Fetuses, and Neonates (ID: 10)	24-Aug-2015	3/3 (100%)
FDA-Regulated Research (ID: 12)	24-Aug-2015	4/5 (80%)
Office of the Under Secretary of Defense (Personnel and Readiness) (ID: 912)	24-Aug-2015	No Quiz
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	24-Aug-2015	4/5 (80%)
Avoiding Group Harms - U.S. Research Perspectives (ID: 14080)	24-Aug-2015	3/3 (100%)
Basic Institutional Review Board (IRB) Regulations and Review Process (ID: 2)	24-Aug-2015	5/5 (100%)
Recognizing and Reporting Unanticipated Problems Involving Risks to Subjects or Others in Biomedical Research (ID: 14777)	24-Aug-2015	4/5 (80%)
Populations in Research Requiring Additional Considerations and/or Protections (ID: 16680)	24-Aug-2015	4/5 (80%)
Module for Non-DoD Personnel Conducting Research Involving Human Subjects Supported by the DoD (ID: 16769)	24-Aug-2015	No Quiz

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?k66fa7aa1-493d-4af7-a602-535c93f045f2-16975333

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888-529-5929
Web: https://www.citiprogram.org

USUHS FORM 3202N
DANIEL K. INOUYE GRADUATE SCHOOL OF NURSING
EVIDENCE-BASED PRACTICE/PERFORMANCE IMPROVEMENT PROPOSAL

VPR Date Stamp

Project Number: T0619007 (VPR will assign)

Project Title: "Improving the Success Rate of the Adductor Canal Block by Standardizing Technique: An Evidenced Based Practice Project"

SECTION A: STUDENT POC INFORMATION

1. Name (Last, First, MI): Hutchison, Sean, A — Student E-mail: Sean.Hutchison@usuhs.edu

[redacted]

SECTION B: COMMITTEE CHAIR / SENIOR MENTOR INFORMATION

3. Name (Last, First, MI): Couture, Darren
4. Telephone: 360-649-9766 Fax: E-mail: Darren.Couture@usuhs.edu
5. USUHS Building/ Room No.: Building E-1050

SECTION C: PROJECT INFORMATION

6. Attach the Abstract for the proposal, including the following sections: Site Location of the Project, Title, Authors, Background or Problem/Issue, Clinical Question/Purpose, Project Design, Anticipated Organizational Impact/Implications for Practice and also include the Proposed Timeline. Single space the abstract and use Times New Roman font, size 12.
7. Is this proposal related to an active research project of the Chair/Senior Mentor identified in Section B? ☐ Yes ☒ No
   If yes, complete below; if no, proceed to Part 8.
   Project Number: _____
   Project Title: _____
   Project Start Date: _____ Project End Date: _____
8. Anticipated period of performance: Project Start Date: 2/1/2017 Project End Date: 5/1/2018
9. Performance Site(s): Kimbrough Ambulatory Care Center located in Fort Meade, Maryland
10. Does this project involve any classified information? (Contact the USUHS Security Office for guidance) ☐ Yes ☒ No
11. Do you have a funding source for this project? ☐ Yes ☐ No ☒ NA
    If yes, specify the funding agency and the amount provided:

SECTION D: SIGNATURES

The following signatures attest to the validity of the above information:

[redacted]

Student (Project Point of Contact for the Group)	(Signature and Date)	Chair/Senior Mentor	(Signature and Date)
[redacted]	4-21-2017		
Chair/Program Director	(Signature and Date)	Chair/Program Director	(Signature and Date)
[redacted]			
DNP Project Director or PhD Director	(Signature and Date)	Associate Dean for Academic Affairs, GSN	(Signature and Date)
[redacted]			
Associate Dean for Research, GSN	(Signature and Date)	Dean, DKI Graduate School of Nursing	(Signature and Date)

In light of the above signatures, the project is approved.

[redacted] 4/11/17

USUHS Vice President for Research — Date

UNIFORMED SERVICES UNIVERSITY
of the Health Sciences

OFFICE OF RESEARCH
4301 JONES BRIDGE ROAD
BETHESDA, MAYLAND 20814
PHONE: (301) 295-3303; FAX: (301) 295-6771

NOTICE OF PROJECT APPROVAL

Change Number: Original

VPR Site Number:	T0-GSN-61-9007-01
Principal Investigator:	Hutchison, Sean (GSN-61)
Department:	Graduate School of Nursing
Project Type:	Student
Project Title:	Improving the Success Rate of the Adductor Canal Block by Standardizing Technique: An Evidenced Based Practice Project
Project Period:	4/4/2017 to 6/30/2017

Assurance and Progress Report Information:

Name	Sup	Approval Type	Status	Approved On	Forms Received
Progress Report	0			To be Submitted	N/A

Remarks:
This Notice of Project Approval has been reviewed and approved. Please remember that you must submit a final Progress Report (Form 3210) upon completion of this project.

Questions regarding this approval should be directed to the following person in the Office of Research:
Ronda Dudley, (301) 295-9818.

[redacted]

Yvonne T. Maddox, Ph.D. Date
Vice President for Research
Uniformed Services University of the Health Sciences

cc: Hutchison, Sean (GSN-61)
Vernell Shaw
File
Darren Couture
Linda Wanzer

APPENDIX D

UNIFORMED SERVICES UNIVERSITY OF THE HEALTH SCIENCES
4301 JONES BRIDGE ROAD
BETHESDA, MARYLAND 20814-4799
www.usuhs.mil

September 29, 2017

MEMORANDUM FOR LT Sean Anthony Hutchison, DNP, P and R - Uniformed Services University of the Health Sciences (USUHS)

SUBJECT: USUHS IRB #1 (FWA 00001628; DoD Assurance P60001) Approval of Protocol Adductor Canal Block Success for Human Subjects Participation

Congratulations! The Initial Review for your human subjects research protocol TO-61-9007 entitled ***"Improving the Success Rate of the Adductor Canal Block by Standardizing Technique: An Evidence Based Practice Project"*** was reviewed and approved for execution on September 29, 2017 by Micah R. Stretch M.A, J.D, Exempt Determinations Official as an EXEMPT protocol under the provision of 32 CFR 219.101(b)(1). This approval will be reported to the USUHS IRB #1 scheduled to meet on October 12, 2017.

The purpose of this project is to implement a standardized approach to ACB, utilizing the most effective technique. The project examines whether the introduction of educational instruction will improve adductor canal block success rates at Kimbrough Ambulatory Care Center. Block success rates before and after education will be compared to determine the impact of this educational intervention. Data to determine effectiveness will come from a de-identified quality improvement database maintained at KACC.

You are required to submit amendments to this protocol, changes to the informed consent document (if applicable), adverse event reports, and other information pertinent to human research for this project. No changes to this protocol may be implemented prior to IRB approval. If you have questions regarding this IRB action or questions of a more general nature concerning human participation in research, please contact Chris Murphy at 301-319-0444 or christopher.murphy.ctr@usuhs.edu

[redacted]

Chris Murphy
IRB Analyst

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY MEDICAL DEPARTMENT ACTIVITY
2480 LLEWELLYN AVENUE, SUITE 5800
FORT GEORGE G. MEADE, MARYLAND 20755-5129

MCXR-DCA

31 May 2017

MEMORANDUM FOR RECORD

SUBJECT: Approval for Evidence Based Practice Project

1. PURPOSE: Uniformed Services University of the Health Sciences (USUHS) Graduate School of Nursing, Doctorate of Nursing Practice Anesthesia Program is requesting to conduct an evidenced based practice project in conjunction with Kimbrough Ambulatory Care Center's (KACC) Anesthesia Services in order to determine if adductor canal block (ACB) success rates can be improved through a standardized technique among anesthesia providers. Providers will be educated in the technique for ACB with the highest reported success rate.

2. JUSTIFICATION: This project is expected to improve success rates for ACB through a standardized approach which would lead to increased patient satisfaction, decreased length of Post Anesthesia Care Unit stays, and lower incidences of postoperative pain and nausea/vomiting. The chain of command for KACC supports the proposed project. This project will not collect any information directly from patient records, but will be provided with aggregated data quantifying the success rate of ACB during the relevant time intervals at KACC from a departmentally managed database. Project activities will not adversely impact the patient care mission and are being undertaken to improve current practice at KACC; therefore, the project is approved.

3. POC for this action is LTC Lori Lawhorn 301-677-8155.

[redacted]

Jody A. Brown, DNP, FNP-C
LTC, AN
Deputy Commander for Clinical Services
Kimbrough ACC

Uniformed Services University
of the Health Sciences

Manuscript/Presentation Approval or Clearance (Student)

INITIATOR

1. USU Principal Author/Presenter: **Jared Hartman, LT, NC, USN; Sean Hutchison, LT, NC, USN; Stephanie Wallace, LCDR, NC, USN**

2. Academic Title: **Students, Nurse Anesthesia Program**

3. School/Department/Center: **Daniel K. Inouye Graduate School of Nursing**

4. Phone: **(570)-573-4343**

5. Type of clearance: Paper __Article __ Book _X__ Poster X Presentation
___Workshops Abstract Other

6. Title: **Improving Success Rates of the Adductor Canal Block by Standardizing Technique: An Evidence Based Practice Project**

7. Intended publication/meeting: **USU Research Days (Poster, and presentation), final report for USU Archives**

8. "Required by" date: **ASAP**

9. Date of submission for USU approval: **23 March 2018**

Clinical Site and Research Director, Walter Reed National Medical Military Center

1. Name: **John Litchfield, LCDR, NC, USN, MSN, CRNA**

2. School/Dept.: **GSN / Nurse Anesthesia Program**

3. Date: **23 March 2018**

***Note:** *It is DoD policy that clearance of information or material shall be granted if classified areas are not jeopardized, and the author accurately portrays official policy, even if the author takes issue with that policy. Material officially representing the view or position of the University, DoD, or the Government is subject to editing or modification by the appropriate approving authority.*

Chair/Department Head Approval: [redacted] Date 23 MAR 18

RECEIVED MAR 28 2018

DEAN (OR VICE PRESIDENT) APPROVAL

1. Name: **Carol A. Romano, PhD, RN, FAAN, Dean and Professor**

2. School (if applicable): **Daniel K. Inouye Graduate School of Nursing**

3. Date:

4. __Higher approval clearance required (for University-, DoD- or US Gov't-level policy, communications systems or weapons issues review").

*Note: *It is DoD policy that clearance of information or material shall be granted if classified areas are not jeopardized, and the author accurately portrays official policy, even if the author takes issue with that policy. Material officially representing the view or position of the University, DoD, or the Government is subject to editing or modification by the appropriate approving authority.*

[redacted] 26 Mar 2018

Dean/VP Signature/Date

VICE PRESIDENT FOR EXTERNAL AFFAIRS ACTION

1. Name: **Sarah Marshall**

2. Date:

3. ✓ USU Approved or

__DoD Approval/Clearance required

4. __Submitted to DoD (Health Affairs) on (date):

Or __Submitted to DoD (Public Affairs) on (date):

5. __DoD approved/cleared (as written) or __DoD approved/cleared (with changes)

6. DoD clearance/date:

7. DoD Disapproval/date:

[redacted] 29 Mar 2018

External Affairs Approval Date

Appendix J: Daniel K. Inouye Graduate School of Nursing
DNP Project Completion Verification Form

DOCTOR OF NURSING PRACTICE PROJECT
Completion Verification Form

The DNP Project titled: "**Improving Success Rates of the Adductor Canal Block by Standardizing Technique: An Evidenced Based Practice Project"** was completed at the Uniformed Services University of the Health Sciences/ Kimbrough Ambulatory Care Center by the following student(s):

(type student name)	*(signature)*	*(date)*
Stephanie Wallace	[redacted]	4/12/18
Sean Hutchison		4/13/2018
Jared Hartman		4/13/2018

The DNP Practice Project Team verifies that the following components of the DNP project, accomplished by the above students, is of sufficient rigor and demonstrates doctoral level scholarship to meet the requirements for USUHS GSN graduation:

- Presentation of DNP project to the leadership/stakeholders at the Phase II Site,
- Abstract/Impact Statement (*Appendix F*), and
- DNP Project written report.

Verified by:

(type name)	*(signature)*	*(date)*	
			Senior Mentor
			Team Mentor
			Team Mentor
John Litchfield	[redacted]	13Apr18	Team Mentor & Phase II Site Director

For RNA Students only - add the following additional signature for final verification of project completion:

K. A. Wofford	[redacted]	**13APR18**
RNA Project Director *(type name)*		*(Date)*

Form Version: 26 Aug 2017