Appendix 8:  DNP Project Proposal Cover Page

Post-Operative Outcomes of TAP Block

Post-operative Outcomes Associated with Patients who Receive the Transverse Abdominis Plane (TAP) Block for Pain Management following Major Abdominal Surgery: A Systematic Review

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Post-operative Outcomes Associated with Patients who Receive the Transverse Abdominis Plane (TAP) Block for Pain Management following Major Abdominal Surgery: A Systematic Review

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Abstract

Background
More than 200 hundred million abdominal surgeries are performed worldwide annually.\textsuperscript{1} Pain is one the problems associated with abdominal surgery and can affect post-operative outcomes. A TAP block is a newer type of anesthesia used to relieve pain after abdominal surgery during the post-operative period.\textsuperscript{2}

Purpose
The purpose of this review was to examine the evidence on post-operative outcomes associated with patients who receive the Transversus Abdominis Plan (TAP) block for pain management following major abdominal surgery.

Methodology
A quantitative systematic review was completed utilizing the Joanna Briggs Institute process. A three-step search strategy was utilized in this review. Studies published in English and full text were considered for inclusion in this review as well.
Results

17 quantitative studies for this review. Length of stay: p=0.001645; Time to movement: p=0.1022; Post-operative nausea and vomiting: p <0.05; Time to bowel movement: p <0.05; Time to flatus: TAP block 3 days vs. Non-TAP block 4 days; Time to the patient’s first requested dose of narcotics: the values for both TAP and Non-TAP are the same (± 0.2 days). There was not enough evidence found on time to urination in the literature search, therefore this outcome could not be analyzed.

Conclusion

Final synthesis determined that utilizing the TAP block may be efficacious in decreasing the length of stay, earlier time to movement, reducing episodes of post-operative nausea and vomiting, earlier time to bowel movement, flatus and may decrease the time to the patient’s first requested dose of narcotics.

Evidence Transfer

The results of this study support the use of TAP block in clinical practice, educational and economic implementation. The use of TAP block may have an impact on cost efficiency, quality care and patient safety and should therefore, further be explored.

Review question/objective

The purpose of this review is to examine the evidence on post-operative outcomes associated with patients who receive the Transversus Abdominis Plan (TAP) block for pain management following major abdominal surgery.

Background

More than 200 hundred million abdominal surgeries are performed worldwide annually. These include caesarian sections, appendectomies, cholecystectomies, gastric bypass, hernia repairs, hysterectomies and colorectal surgeries. Pain is one of the problems associated with any of these surgeries. Reasons for the pain are multi-factorial and can be caused from the incision site, nothing by mouth (NPO) status, decreased mobility and various anesthesia and analgesia related side effects. Understandably, providing appropriate pain management is key during the post-operative period and is essential as it not only decreases the pain associated with surgery but also decreases post-operative nausea and vomiting (PONC), rates of postoperative ileus, postoperative morbidity, length of hospital stay and overall hospital costs.

Opioids are commonly used for pain management following abdominal surgeries. Unfortunately, the many side effects associated with these drugs can delay the healing process and increase complications. With the opioid epidemic on the rise, it is imperative that health care professionals find and support safer solutions to manage pain by decreasing or eliminating the use of opioid narcotics. Research suggests that with the use of a transversus abdominis plane block, (TAP), the need for opioid administration may decrease. Urigel and Molter report that use of intravenous morphine decreased with the practice of TAP block administration, resulting in reduced opioid related side effects.
A TAP block is a type of anesthesia used to relieve pain after abdominal surgery. First introduced by Rafi in 2001, TAP is a method of localized anesthesia in a multi-modal method. It’s use has become increasingly prevalent. The TAP block procedure is a peripheral nerve block that administers anesthesia between the transversus abdominis muscle and the fascial layer just below it. Incorporating the use of sonography with the administration of a TAP block assists the anesthetic to reach the targeted area. Furthermore, once the anesthetic is injected, it can be seen on the ultrasound as it diffuses into the transverse abdominal plane. Use of ultrasound guided TAP blocks during the peri-operative period is on the rise.

Critical assessments of patients who receive pain mediation via a TAP block include: initial flatus/bowel movement, lengths of stay, time to mobilization and time to urination. Evaluating each of these factors is necessary to prevent complications. In a meta-analysis of 600 laparoscopic colorectal surgical patients who received a TAP block, Hain, Maggiori, and Panis reported a significant reduction of postoperative use of opioids on the first post-operative day where the weighted mean difference (WMD) was (−)14.54 (−25.14; −3.94); \( P = 0.007 \) and a significantly shorter time to first bowel movement [WMD −0.53 (−0.61; −0.44); \( P < 0.001 \)]. Additionally, the TAP block was not linked to a significant increase in postoperative complication rates [OR = 0.84 (0.62–1.14); \( P = 0.27 \)]. A study done by Wang, Wu, Terry, et al. reported the use of rescue drugs in ultrasound guided Tap Block as being significantly lower, (OR = 0.16; 95% CI: 0.06, 0.40; \( p < 0.001, I^2 = 10.2\% \)) than for those patients who did not have a TAP block.

A search of Joanna Briggs Institute (JBI) Database of Systematic Reviews and Implementation Reports, Campbell Collaboration Library of Systematic Review, PROSPERO, MEDLINE, CINAHL, Cochrane Library and Google Scholar was completed to explore systematic reviews that may exist on the same subject matter. A total of six systematic reviews were discovered. A systematic review of the TAP Block found in CINAHL dated 2012 discussed analgesic effects on patients who have undergone laparotomy for colorectal surgery, laparoscopic cholecystectomy and open and laparoscopic appendectomy surgeries. This review differs from ours in that it is limited in examining overall outcomes of the TAP block procedure with major abdominal surgery. Although open appendectomy is included in the study along with laparoscopic surgeries, laparoscopy is considered a minimally invasive procedure not major abdominal surgery. Furthermore, outcomes on patient’s undergoing other types of major abdominal surgery, such as Caesarian Sections are not examined in that study.

A systematic review that was completed in 2012 discussed the clinical effectiveness of TAP block in abdominal surgery. However, this review primarily focuses on the effects of TAP block with Morphine use within 24 and 48 hours post-surgery. Abdallah, Halpern and Margarido investigated postoperative analgesia TAP block effects after Caesarean delivery performed under spinal anesthesia but focus their results on pain control and decreased morphine consumption. These reviews differ from ours in that we aim to explore multifaceted outcomes during the post-operative period and not pain management.

Lastly, three similar reviews were located in PROSPERO. One discussed outcomes of the TAP Block on length of stay. The second focuses on reduced pain levels and analgesic consumption after laparoscopic colorectal surgeries. The third review by Bacal, Rana, Chen, and McIsaac reviewed TAP block outcomes in hysterectomy patients as compared to no TAP block or Sham Tap. However, none of these three systematic reviews have been completed and many of the sections have not been documented.
There are substantial amounts of scholarly literature and studies on the use of TAP block. However, no existing systematic review synthesizes all the outcomes associated with the TAP Block administration. Therefore, we propose a systematic review of literature to examine outcomes associated with the use of TAP block in patients following major abdominal surgery. By gaining an enhanced understanding of the outcomes associated with TAP block other than pain management, health care team members can prepare for patients needs during the pre and post-operative periods, and clinical changes can be implemented into practice to foster optimal post-abdominal surgery outcomes for ideal recovery.

**Keywords**

TAP Block; abdominal surgery; anesthesia; enhanced recovery after surgery; length of stay

**Method**

**Inclusion criteria**

*Types of participants*

This review considered studies that included hospitalized, adult patients who were 18 years of age or older and have undergone major abdominal surgery. For the purpose of this review, major abdominal surgery includes: caesarian sections, liver, abdominal wall, hernia repair, gynecologic, abdominoplasty, deep inferior epigastric perforator free flap reconstruction, cystectomy, and colorectal surgeries.

*Types of intervention(s)*

This review considered studies that described post-operative outcomes associated with the TAP block intervention other than pain reduction/management interventions as compared to Non-Tap block interventions.

*Types of outcomes*

This review considered studies that include the following outcomes:

- length of stay
- time to first requested dose of narcotics
- time to mobilization
- time to urination
- post-operative nausea and vomiting
- first time to have flatus
- time to have bowel movement

*Types of studies*

The review considered randomized controlled trials, non-randomized controlled trials, quasi-experimental studies, before and after studies, prospective and retrospective cohort studies, case control studies and analytical cross-sectional studies for inclusion. The review also considered descriptive epidemiological study designs including case series, individual case reports and
descriptive cross-sectional studies for inclusion. Qualitative studies were excluded.

Search strategy

The search strategy aimed to find both published and unpublished studies. A three-step search strategy was utilized in this review. An initial limited search of Scopus, PubMed, Web of Science, Cochrane and CINAHL using keywords of TAP Block; abdominal surgery; anesthesia; enhanced recovery after surgery; length of stay was undertaken followed by an analysis of the text words contained in the title and abstract, and of the index terms used to describe article. An expanded second search using all identified keywords and index terms was then undertaken across all included databases. Thirdly, the reference list of all identified reports and articles was searched for additional studies (footnote chasing). Studies published in English and full text were considered for inclusion in this review as well. A timeframe for studies was not included to increase the sensitivity of findings.

The databases searched included:
Academic Search Premier
Scopus
Medline/PubMed
CINAHL

The search for unpublished studies included:
Google Scholar
Virginia Henderson Library

Initial keywords used were:
TAP Block; abdominal surgery; anesthesia; enhanced recovery after surgery; length of stay

Selection of Studies

Articles were first reviewed by title and abstract by two reviewers working independently. The full texts of articles that passed this initial screening stage were retrieved for further review. Disagreements on study inclusion were resolved between the primary and secondary reviewers by consensus, or with a third reviewer.

Assessment of methodological quality

Papers selected for retrieval were assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (JBI-MAStARI) (Appendix A). Any disagreements that arose between the reviewers were resolved
through discussion, or with a third reviewer. Papers must have meet any 7 out of 10 criteria on the JBI-MAStARI instrument to be included in the review. Also, to be included, papers must have scored a YES answer regarding the reliability of measurement and appropriateness of statistical tests used for analysis.

Data extraction

Quantitative data was extracted from papers included in the review using the standardized data extraction tool from JBI-MAStARI (Appendix B) based on study design. These data extracted included specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.

Data synthesis

Quantitative data were pooled in statistical analysis using JBI-MAStARI. All results were subject to double data entry. Comparison of p-values, Mean values, min-max values, SE values, correlation coefficient (for mean and median values) and their 95% confidence intervals were calculated. Where statistical pooling was not possible the findings were presented in narrative form including tables and figures to aid in data presentation where appropriate.

Characteristics of Included Studies

There were 301 articles initially identified. Sixty-seven full text articles were retrieved that met inclusion criteria based on their abstracts or title (Please see PRISMA diagram Appendix C). Upon review of each full article 50 of these were excluded. Most of those articles were excluded because either they included patients under 18 years of age, included findings from minor abdominal surgeries and/or did not meet the criteria for methodological quality. This resulted in the inclusion of 17 quantitative studies for this review; two of these were prospective cohort studies; eight were retrospective cohort studies, and seven were randomized control trials. Seven of the studies were conducted in the United States, three were conducted in Canada, each of the remaining seven studies were individually conducted in Australia, India, Tunisia, Turkey, Scotland, the United Kingdom and Serbia.

Meta-analysis is a powerful tool used to collect and review the knowledge in a research field, and to identify the overall measure of a treatment’s effect by combining several conclusions. However, it is a contentious tool, because even small violations of certain rules can lead to ambiguous conclusions. Meta-analysis is only possible when the results of studies can be rationally combined for statistical analysis. There are certain essential flaws associated with it, such as the location and selection of studies, heterogeneity, loss of information on important outcomes, inappropriate subgroup analyses, conflict with new experimental data, and duplication of publication. There are four critical issues need to be addressed in a meta-analysis:

- Identification and selection of studies
- Heterogeneity of results
- Availability of information
- Analysis of the data
In all there were 1,550 patients, 12 hospitals and 3 peri-operative settings, represented in this systematic review. However, in our review, there were different statistical parameters for each study having different outcomes and each outcome had to be statistically analyzed by different analytical methods. Hence, meta-analysis could not be performed in this work. Correlations studies were used for this review as there were clear relationships of LOS and other parameters having less days for TAP block intervention. Additionally, strength of relationship was also identified with these studies.

**Outcomes**

**Length of stay**

For length of stay, the reported mean, median, min-max LOS was compared graphically. \(^67-76,77,78,82\) The graphs were plotted for Length of Stay: Comparison for Mean, Median, Min-Max and LOS<=7 days values for TAP vs. Non-TAP patients. For all the comparisons, the values for TAP patients was slightly lower than that for Non-TAP patients. This indicates that patients with TAP block had a shorter length of stay (Parameters: Mean (Days/Hours), Median (Days/Hours), Min-Max (Days/Hours) & LOS <=7 days) as compared to patients with Non-TAP, who had a longer length of stay. Further, correlation analysis was performed, where Pearson’s correlation coefficient for mean and median values was determined.

Correlation studies were performed with “Pearson’s Correlation Analysis” in the dataset for Mean values for TAP vs Non-TAP block. Pearson’s Correlation Coefficient (r): 0.8707795 at p-value of 0.004885. \(^67,69-72,76,78,82\) There was a positive association between Mean values for Length of Stay (in Days) for TAP and Non-TAP. The “r” value lies within the 95 percent confidence interval. The absolute value of “r” indicates strong strength of relationship. These results show a strong linear relationship and statistical significance of patients who received the TAP Block had shorter lengths of stay than patients who had Non-TAP Block intervention. Since p-value is found to be <0.05 in most cases, the studies were found to be statistically significant. \(^68,72,75-77\) (Please see Figure 1).

Correlation studies were performed in the dataset for Median values for TAP vs Non-TAP block. Pearson’s Correlation Coefficient (r): 0.9876499 at p-value of 0.001645. \(^68,73-75,77\) There was a positive association between Median values for Length of Stay (in Days) for TAP and Non-TAP. The “r” value lies within the 95 percent confidence interval. The absolute value of “r” indicates strong strength of relationship. These results are statistically significant.

The distribution of data for Mean (Days) and Median values for patients with TAP Block was presented as a histogram. In the histogram for Mean, (Please see Figure 2) we see the distribution is negatively skewed (Skewness: -0.08694244) with the tail on the left side of the distribution. \(^67,69-72,76,78,82\) The value of kurtosis <3, (Kurtosis: 2.433739) \(^67,69-72,76,78,82\) depicts the distribution is platykurtic, which means the distribution is shorter, tails are thinner than the normal distribution.
The peak is lower and broader, which means that data are light-tailed or lack of outliers. These results indicate that patients with the TAP block had LOS >2 days (in the higher range). With these findings and with additional Boxplot analysis it was further confirmed that there were not many outliers in these data. (Please see Figure 3).

In the histogram for distribution of Median (Days) for Patients with TAP, we see the distribution is negatively skewed (Skewness: -0.5074137).  

(Please see Figure 4). The value of kurtosis <3 (Kurtosis: 1.944458) depicts the distribution is platykurtic. Thus, this data for Median (Days) for patients with TAP had more patients with LOS in the higher range and this data did not have many outliers.

Figure 1
LENGTH OF STAY: TAP VS NON-TAP: Comparison of p-values

From observation, we interpret that Whelbe, 2013; Thornblade, 2017; Khan, 2015; Fayezizadeah, 2016 and Erdogan, 2017 (All have P-values < 0.05) are considered to be statistically significant.
Figure 2

Distribution of Mean(Days) for LOS with TAP

Skewness: -0.08694244
Kurtosis: 2.433739
Figure 3

Length of Stay

Boxplot for Mean(Days) TAP and NonTAP patients

TAP NonTAP
Skewness: -0.5074137
Kurtosis: 1.944458

Time to Movement

For time to movement, graphs were plotted for comparing Mean time required for Movement for patients with TAP vs Non-TAP.\(^{72,78-79,83}\) It was observed that, the values for TAP patients was slightly lower as compared to that for Non-TAP patients. This means that patients with TAP block had a faster recovery with less time for ambulation than patients with Non-TAP, who took longer time for ambulation. To further study this association, Correlation Studies were performed with “Pearson’s Correlation Analysis. The p-value is 0.1022. (95% CI is (-)0.174, 0.945).\(^{72,78-79,83}\) The cor coefficient, (r) is 0.6662905 which lies within the 95% CI, t= 1.998 and df = 5.\(^{72,78-79,83}\) These results suggest that there is a moderate strength of relationship. Because the value of ‘r’ does not have a lower p-value, 0.1022, the results are not statistically significant. This however may be due to a small sample size for this correlation study.
Post-Operative Nausea and Vomiting

For post-operative nausea and vomiting, graphs were plotted for comparing percentages of mean number of times symptoms of nausea and vomiting occurred in patients with TAP vs Non-TAP. Overall, patients with TAP block had less or almost the same number of times nausea/vomiting symptoms as compared to patients with Non-TAP. To further study this association, Correlation Studies were performed for mean values with “Pearson’s Correlation Analysis”. The p-value is <0.05 which indicates statistical significance. TAP vs Non-TAP Correlation Coefficient for Median Values analysis produced a p-value of 0.1124. The upper 95% CI is (-0.1744798, the lower is 0.9180947. The correlation coefficient, (r) is 0.6045195 which lies within the 95% CI, t= 1.8589 and df =6. The absolute value of ‘r’ indicates a moderate strength of relationship. There is a positive association between the mean number of times for post-operative nausea/vomiting for TAP and Non-TAP, which indicates that patients with TAP block have less or almost the same number of episodes of nausea/vomiting symptoms compared to patients with the Non-TAP.

A Comparison of Min-Max Values for post-operative nausea and vomiting in patients who received the TAP Block vs. Non-TAP suggests that patients with TAP block have lower episodes of nausea and vomiting as compared to patients with Non-TAP. (Please see Figure 5).

Figure 5

![Graph showing comparison of min-max values for post-operative nausea and vomiting between TAP and Non-TAP]

Interpretation:
The plots for comparing range (min-max) values of episodes of symptoms occurring shows that patients with TAP block have lower episodes of nausea and vomiting as compared to patients with Non-TAP.
**Time to Bowel Movement**

Due to the small sample size, Correlation Studies were not able to be performed for time to have bowel movement. Graphs were plotted to compare the mean time required to bowel movement for patients with TAP vs. Non-TAP. It was observed that, the values for TAP patients was lower as compared to that for Non-TAP patients, suggesting that patients with TAP block had faster times to bowel movement than patients with Non-TAP intervention. In addition, plots for comparing range (min-max) values for time to have bowel movement shows that patients with TAP block had faster bowel movements as compared to patients with Non-TAP.

**Time to Have Flatus**

For Time to have flatus, graphs were plotted to compare the range values for patients to have flatus with patients with TAP vs. Non-TAP. Time to have flatus was measured in days. The mean values for having flatus after TAP block and Non-TAP were almost similar, TAP block was 3 days and Non-Tap block was 4 days. (Please see Figure 6). Minimum and Maximum Values were presented in percentage of days. TAP block was 2.82% -5.63% and Non-Tap block was 4.00%-6.00%. Comparison of Minimum-Maximum values for time to have flatus show that patients with Non-TAP block took longer to experience flatus, whereas patients with TAP experienced flatus earlier. (Please see Figure 7).

Figure 6

![Time to have flatus: TAP VS NON-TAP: Comparison of Mean Values (In Days)](image-url)
Time to First Requested Dose of Narcotics

For time to first Required Dose of Narcotics, comparison of Mean values of TAP vs. Non-TAP were plotted. Time to first requested dose of narcotics was measured in hours. Variations were noted in the comparison of mean values with one study showing a significant decrease and another showing a slightly higher time required for TAP Block patients to request first dose of narcotics for pain.

Discussion

TAP block is a newer type of intervention that is used to provide pain relief without the use of narcotics for patients undergoing abdominal surgeries. It is essential to explore outcomes other than pain management related to this type of intervention. This systematic review examined eight post-operative outcomes of patients who had major abdominal surgery with the TAP block compared to those who did not have the TAP block including length of stay, time to movement, episodes of post-operative nausea and vomiting, time to bowel movement, time to flatus, time to the patient’s first requested dose of narcotics, and time to urination. Final analysis suggests that utilizing the TAP block may be efficacious in decreasing the length of stay, earlier time to movement, reducing episodes of post-operative nausea and vomiting, earlier time to bowel movement and flatus and may decrease the time to the patient’s first requested dose of narcotics.
There was insufficient evidence found on time to urination, therefore this outcome could not be analyzed.

Numerous studies produced literature on the outcomes of patients receiving the TAP block for abdominal surgery and the results, in general, appear to be promising. However, there are few studies that combine all outcomes studied in this systematic review. Furthermore, many of those studies examined the individual outcomes in one peri-operative setting, whereas this study combined them and led to a global analysis of the findings. In addition, each individual study examined use of the TAP block in one specific type of major abdominal surgery, whereas this study combined various types of major abdominal surgeries performed with the use of the TAP Block, giving a more inclusive picture. There are some inconsistencies noted upon reviewing various studies on the outcomes of the TAP Block. Whereas some studies show no statistical difference in various outcomes, others do show significance. However, use of the TAP Block does not show outcomes to be inferior to opioid utilizing pain management interventions. Further studies should be performed to see if incorporating TAP Block use in pain management of a patient undergoing major abdominal surgery minimizes use of opioid administration.

In recent years, there has been a focus on decreasing the length of stay for patients in the hospital setting. Ensuring the patient’s health care needs are appropriately met while establishing a timely discharge is necessary to prevent readmissions to the hospital, nosocomial infections and to reduce overall costs. The establishment of Early Recovery After Surgery (ERAS) protocols has facilitated timely discharge goals in surgical practice. TAP Block may be an important piece to the ERAS plans of care with abdominal surgeries.

Another factor that directly relates to the need to study effects of the TAP block is the nationwide opioid crisis. With the opioid health crisis taking a toll on human lives, social and financial resources it is imperative that measures are put in place to reduce the risk of addiction and at the same time manage pain post-operatively. Health care treatments are one of the main causes of opioid use that leads to addiction. The health care profession has moral and ethical obligations to assist in the fight on this epidemic.

Limitations
There were a few limitations to this study. Some of the literature had small sample sizes which may have compromised the validity of each individual study. Another limitation is that only studies written in the English language were utilized in this CSR, this may produce bias and effect the validity of the results. Lastly, the TAP block is effective but not as strong as originally proposed due to the inability to perform a meta-analysis, which determines effectiveness.

Implications/Recommendations

Implications for Practice
Clinical Practice and education guidelines should be implemented into practice where utilization of TAP Block is practiced. Understanding the influences on opioid addiction along with the fact that the TAP block has only been in use for less than 20 years, allows the opportunity to provide educational training to health care providers to enhance their knowledge of care for the patient
receiving the TAP Block. Use of evidence-based practice guides the foundation for educational and health policies to be structured.

Knowledge transfer of the TAP Block should be provided to staff members caring for the patient who receives the TAP Block. Rationale for this implementation is based upon the TAP Block being only being in use in the past eighteen years. As its use gains more acceptance, many staff members will need to be made aware of the special care needed to assess for potential complications and to improve patient outcomes. In addition, medical personal must be aware of opportunities to support the decrease of opioid narcotic use. Evidence from various research articles on how the use of electronic systems and continuing education credits can be instrumental in this knowledge translation.

While rare, complications can occur with TAP Block intervention. This warrants the need to provide a method of educating those who provide care to these patients to foster optimal outcomes. A review of literature was conducted which was found to support the need to provide an educational module to health care workers to enhance practice standards.

Healthcare policy, quality and safety standards of care can also be influenced by use of TAP Block in the practice setting. Medical education implementation and policy making are parts of the preventative strategies that can reduce risk of opioid illicit drug use. Critical assessments of patients who receive pain mediation via a TAP block include initial flatus/bowel movement, lengths of stay, time to mobilization and time to urination. Evaluating each of these factors is necessary to prevent complications. These results can have a major impact on cost efficacy, health care management, health education processes, health care outcomes and warrant even further evaluations based on the findings.

There was mixed quality of the evidence with this review. Overall the studies used in this review were too heterogeneous. With various types of studies used for analysis, Levels of Evidence ranged from Level I, Grades A (high quality) and B (good quality) to Level III, Grade B (good quality).

**Implications for Future Research**

There are astounding economic implications that can be influenced by TAP Block. The Center for Disease Control and Prevention, (CDC) reports that the opioid epidemic has fiscal implications reaching upward of $78.5 billion a year in the United States, (U.S.) alone. According to National Institute of Drug Abuse the costs include legal involvement, healthcare intervention, loss of productivity and treatment for addictions. Community supports, which include health care team members are crucial in the fight to prevent misuse of opioids that can lead to addiction and death. The impact this has in terms of cost efficiency, quality and safety should further be explored.

Dissemination of this study’s finding should be shared with all stakeholders to ensure the sustainability of the TAP block intervention. Incorporating use of an educational module will be instrumental in enhancing the knowledge base of health care providers and consumers, improving patient outcomes and reducing risks of complications. With this understanding, stakeholders may be more likely to support the use of this intervention. Ongoing formative assessments of the TAP Block implementation processes should be done so that summative evaluations of the outcomes
can be completed. These processes must be realized as recordings of various outcomes of patients who receive TAP Block, such as pain control, length of stay, first time to flatus, use of opioids and morbidity rates will be evaluated and compared to recording of various outcomes of patients who do not receive the TAP Block to enhance major abdominal surgery patient outcomes during the post-operative period. Results from the evaluation can then be utilized to create a sustainability plan for ongoing use of the TAP Block intervention. These evaluations should then be discussed with administration, staff and various stakeholders so that sustainability plans can be formulated and implemented into practice. See Appendix D for the conceptual framework of how the Knowledge to Action, (KTA) framework is utilized for this project.

Results of this study can have profound effects on health care practice and should be disseminated through scholarship. The evidence can be shared and submitted to anesthesia, surgical and OB/GYN journals. In addition, these findings can be shared with various students and faculty of Rutgers medical and nursing schools. Future scholarship can include a systematic review on the effects of opioid reduction with use of the TAP Block in Major abdominal surgeries, a systematic review on the effects of opioid reduction with use of the TAP Block in laparoscopic and minimally invasive abdominal surgeries and a SR on the cost efficacy of surgeries where the TAP Block is utilized for pain management.

Summary

In conclusion, it is reasonable to consider use of the ultra-sound guided TAP block for pain relief in patients undergoing major abdominal surgery to increase the likelihood of improving post-operative outcomes and decreasing the length of stay. The significance of decreasing opioid consumption in this patient population, while improving the outcomes during the post-operative period may foster safety, cost efficacy and overall benefits to society.

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Appendix A

MAStARI Appraisal Instrument

JBI Critical Appraisal Checklist for Randomized Controlled Trials

Reviewer_________________________ Date_________________________

Author_________________________ Year___________ Record Number

1. Was true randomization used for assignment of participants to treatment groups?

2. Was allocation to treatment groups concealed?

3. Were treatment groups similar at the baseline?

4. Were participants blind to treatment assignment?

5. Were those delivering treatment blind to treatment assignment?

6. Were outcomes assessors blind to treatment assignment?

7. Were treatment groups treated identically other than the intervention of interest?

8. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?

9. Were participants analyzed in the groups to which they were randomized?

10. Were outcomes measured in the same way for treatment groups?

11. Were outcomes measured in a reliable way?

12. Was appropriate statistical analysis used?

13. Was the trial design appropriate, and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?
Overall appraisal: Include □ Exclude □ Seek further info □

Comments (Including reason for exclusion)

__________________________________________________________________________

__________________________________________________________________________
JBI Critical Appraisal Checklist for Quasi-Experimental Studies
(non-randomized experimental studies)

Reviewer __________________________________________ Date __________________________

Author __________________________________________ Year __________ Record Number ______

1. Is it clear in the study what is the ‘cause’ and what is the ‘effect’ (i.e. there is no confusion about which variable comes first)?
   □ Yes □ No □ Unclear □ Not applicable

2. Were the participants included in any comparisons similar?
   □ Yes □ No □ Unclear □ Not applicable

3. Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?
   □ Yes □ No □ Unclear □ Not applicable

4. Was there a control group?
   □ Yes □ No □ Unclear □ Not applicable

5. Were there multiple measurements of the outcome both pre and post the intervention/exposure?
   □ Yes □ No □ Unclear □ Not applicable

6. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?
   □ Yes □ No □ Unclear □ Not applicable

7. Were the outcomes of participants included in any comparisons measured in the same way?
   □ Yes □ No □ Unclear □ Not applicable

8. Were outcomes measured in a reliable way?
   □ Yes □ No □ Unclear □ Not applicable

9. Was appropriate statistical analysis used?
   □ Yes □ No □ Unclear □ Not applicable

Overall appraisal: Include □ Exclude □ Seek further info □
### JBI Critical Appraisal Checklist for Cohort Studies

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Unclear</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Were the two groups similar and recruited from the same population?</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>2.</td>
<td>Were the exposures measured similarly to assign people to both exposed and unexposed groups?</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>3.</td>
<td>Was the exposure measured in a valid and reliable way?</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>4.</td>
<td>Were confounding factors identified?</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>5.</td>
<td>Were strategies to deal with confounding factors stated?</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>6.</td>
<td>Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>7.</td>
<td>Were the outcomes measured in a valid and reliable way?</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>8.</td>
<td>Was the follow up time reported and sufficient to be long enough for outcomes to occur?</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>9.</td>
<td>Was follow up complete, and if not, were the reasons to loss to follow up described and explored?</td>
<td>□</td>
<td>□</td>
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<tr>
<td>10.</td>
<td>Were strategies to address incomplete follow up utilized?</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>11.</td>
<td>Was appropriate statistical analysis used?</td>
<td>□</td>
<td>□</td>
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Overall appraisal: Include □ Exclude □ Seek further info □
JBI Critical Appraisal Checklist for Case Control Studies

Reviewer
Date

Author Year Record Number

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Unclear</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Were the groups comparable other than the presence of disease in cases or the absence of disease in controls?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>2. Were cases and controls matched appropriately?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>3. Were the same criteria used for identification of cases and controls?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>4. Was exposure measured in a standard, valid and reliable way?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>5. Was exposure measured in the same way for cases and controls?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. Were confounding factors identified?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7. Were strategies to deal with confounding factors stated?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8. Were outcomes assessed in a standard, valid and reliable way for cases and controls?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>9. Was the exposure period of interest long enough to be meaningful?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>10. Was appropriate statistical analysis used?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

________________________________________________________________________

________________________________________________________________________
# JBI Critical Appraisal Checklist for Analytical Cross-Sectional Studies

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Unclear</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Were the criteria for inclusion in the sample clearly defined?</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2. Were the study subjects and the setting described in detail?</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3. Was the exposure measured in a valid and reliable way?</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4. Were objective, standard criteria used for measurement of the condition?</td>
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<td></td>
<td></td>
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<tr>
<td>5. Were confounding factors identified?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Were strategies to deal with confounding factors stated?</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>7. Were the outcomes measured in a valid and reliable way?</td>
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<td></td>
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</tr>
<tr>
<td>8. Was appropriate statistical analysis used?</td>
<td></td>
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</tbody>
</table>

Overall appraisal: Include □ Exclude □ Seek further info □

Comments (Including reason for exclusion)
Appendix B

JBI Data Extraction Form for Experimental/Observational Studies

Reviewer: ___________________________ Date: __________________

Author: ___________________________ Year: __________________

Journal: ___________________________

Record number: ________

Study method
- RCT
- Quasi-RCT
- Longitudinal
- Retrospective
- Observational
- Other: _______________

Participants
Setting: _____________________________________________

Population: _________________________________________

Sample size
- Intervention 1: ________
- Intervention 2: ________
- Intervention 3: ________

Interventions

Intervention 1

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

Intervention 2

_________________________________________________________________

_________________________________________________________________

Intervention 3

_________________________________________________________________

_________________________________________________________________
<table>
<thead>
<tr>
<th>Outcome</th>
<th>LOS in Hours</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of stay</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Total Time in Minutes</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to first requested dose of narcotics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time to mobilization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time to urination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time to have bowel movement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First time to have flatus</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix D

Knowledge to Action Conceptual Framework
