Hysterectomy Pathways:
Systemic long-term impact on the reduction of open hysterectomy rates

by

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Hysterectomy Pathways:
Systemic Long-term Impact on the Reduction of Open Hysterectomy Rates

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Abstract

Clinical pathways are defined as evidence-based, multidisciplinary care algorithms that outline essential steps in the management of patients. The objective of this work is to observe the impact of hysterectomy pathways on the reduction of open hysterectomy rates and improved patient outcomes. In 2012, the UPMC Health System introduced an evidence-based pathway treatment algorithm for hysterectomy with an overarching goal of reducing variations in surgical care and abdominal hysterectomy rates, thereby promoting cost containment and decreased patient morbidity. My work on this project involved generating a follow up report to the 2016 publication that analyzed the results from 2012 to 2014. I collaborated with colleagues at UPMC Magee Women's Hospital to evaluate the rates of open hysterectomy procedures and complications to determine their long-term effects on patient outcomes.

UPMC Health System output from 2012 to 2019 was retrospectively identified for hysterectomy surgeries performed for benign indications. Health care outcomes by route of surgery and year were analyzed and tests for significance were administered to determine success of the implementation program by year.

From the beginning of 2012 to the end of the follow-up period in 2019, the implementation of the hysterectomy clinical pathway protocol demonstrated an absolute decrease of 22.3% of patients undergoing total abdominal hysterectomy (TAH) across the UPMC system. There was a statistically significant decrease in TAH in the follow-up period, from 17.1% at the end of 2014 to 5.5% at the end of 2019, despite the fact that active development and dissemination of the pathway program ended in 2014. The program continued to be successful past 2014 due to successful physician adoption and integration into the clinical workflow without significant additional education or other activities.

Our latest evidence regarding pathway utilization, consistent with initial studies, demonstrated that the proportion of TAH continued to decrease upon implementation of the pathway. Hysterectomy clinical pathways are effective instruments in decreasing the rates of open hysterectomies, thus reducing complications and undesired practice variability while providing consistent care. Thus, the public health relevance of this work lies in the applicability of similar initiatives across gynecologic practices as well as different disciplines.

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Preface

This work is a composite of the unending opportunities that the city and the University of Pittsburgh have gifted me over the past five years, the unwavering support of my program director and academic advisor, Dr. Nancy Glynn, and the expert mentorship of my collaborators at Magee Womens Hospital of the UPMC Health System. I would also like to extend my heartfelt gratitude to my family and friends, that have become family, through this journey.

1.0 Introduction

Hysterectomies, surgical operations involving the removal of all or part of the uterus, are the second most frequently performed surgical procedures for U.S. women of reproductive age (15 to 45). By the age of 60, more than a third of all women have had a hysterectomy(NWHN, 2015). Based on CDC data from 2011 to 2015, 10.6% of women aged 40 to 44 had a hysterectomy for various reasons, with medical reasons accounting for 89.6% of all hysterectomies(CDC, 2017). Such medical reasons include cases of life-threatening conditions such as invasive cancer of reproductive organs, unmanageable infection or bleeding, endometriosis, fibroids, or complications during childbirth (Mayo, 2019; NWHN, 2015). Benign medical reasons, such as uterine prolapse and pelvic pain, are also included in reasons for hysterectomy as they affect quality of life.

1.1 Establishing the Topic

Hysterectomies can be performed via one of two primary surgical approaches – minimally invasive or total abdominal. Minimally Invasive Hysterectomies (MIH) include vaginal, robotic, and laparoscopic approaches since they do not necessitate large abdominal incisions. MIH procedures are performed using instruments passed through small abdominal incisions, allowing for optimal precision and control(Varghese, Doglioli, & Fader, 2019). Total Abdominal Hysterectomies (TAH), on the other hand, require an incision in the lower abdomen through which the uterus is removed. As determined by extensive studies in the field, MIH should be performed whenever possible due to its preferable risk-benefit ratio compared to TAH.

Evidence indicates that TAH is overused in situations when MIH is suitable (Brownlee et al., 2017). A reduction in care variability can be achieved by the adoption of clinical pathways (A. Sanei-Moghaddam

et al., 2016). Compared to the experience of undergoing TAH, MIH is associated with a more satisfactory patient experience in factors such as reduced perioperative complications (i.e. surgical site infection), blood loss, pain, need for analgesics, Length of Stay (LOS), recovery time, and medical costs. An increased satisfaction with cosmetic outcomes has also been associated with MIH (A. Sanei-Moghaddam et al., 2016). Due to these observed benefits of MIH over TAH, practice patterns over the past decade have been indicative of decreasing TAH rates in favor of MIH.

Determination of surgical route for hysterectomy typically depends on patient factors such as uterus accessibility and extent of extrauterine disease, as well as provider factors, such as extent of physician training and availability of hospital technology. Despite clear benefits of MIH over TAH, provider factors such as physician training and experience serve as major barriers to MIH utilization. Final choice of surgical route should ideally take patient preferences into consideration while minimizing clinical risk and optimizing benefit (Matteson, 2019).

UPMC implemented the development of a novel hysterectomy pathway protocol built on evidence-based practice guidelines with a focus on performance evaluation. The objective of this clinical decision pathway was to reduce variations in surgical care and reduce TAH overuse in order to promote cost containment and decrease patient morbidity rates (A. Sanei-Moghaddam et al., 2016). The pathway was developed with a vision of serving as a unifying intervention for both physicians and patients to choose the optimal hysterectomy surgical approach (Amin Sanei-Moghaddam et al., 2017). This evidence-based, multidisciplinary care algorithm, that has become an essential part of patient care management as of the late 1990s, outlines essential steps in the medical management of clinical conditions and patient care (Pearson, 1999; Rotter et al., 2010).

1.2 Relevant Literature Review

1.2.1 Hysterectomies

Previous published work by our group have informed the follow-up investigation (2015 to 2019) discussed in this paper. One of the initial works investigated the effect of the hysterectomy pathway protocol implementation on the proportion of TAH performed from 2012 to 2014 (A. Sanei-Moghaddam et al., 2016). The development of this evidence-based clinical decision pathway was motivated by the goal of reducing variations in surgical care and reducing abdominal hysterectomy overuse, thereby promoting cost containment and decreasing patient morbidity. To determine if the objective was met, a retrospective medical record review of hysterectomies performed for benign indications from fiscal years 2012 to 2014 was conducted at UPMC hospitals. Noncancerous hysterectomies (n=6,664) were identified across 14 UPMC affiliated hospitals, with the majority being performed at Magee-Women's hospital, which has the largest gynecologic surgery residency program in Western Pennsylvania. In 2014, UPMC held 61% of the medical surgical market share in Allegheny County and 41% of the medical-surgical market share in Western Pennsylvania, which spans 29 counties. The cases were identified through Medipac and EpicCare, then analyzed by surgical approach (MIH and TAH), age, and indication of surgery. The MIH category was further broken down into vaginal, laparoscopic, and robotic approaches, and ages were categorized as less than 45, 45 to 60, and greater than 60 years of age. Indications of surgery, denoting the medical reason for the hysterectomy procedure, were not always mutually exclusive, and included reasons such as leiomyoma, pelvic pain, postmenopausal bleeding, and pelvic organ prolapse among others.

The pathway was developed using the 5 well-recognized steps of evidence-based practice guidelines (Dawes et al., 2005). First, a cost and quality analysis allowed for the translation of uncertainty into an answerable question. Next, the pathway definition was developed based on the systematic retrieval of the best available evidence, and physician engagement encouraged expert evaluation of the evidence. The pathway was then integrated into the electronic medical record system, at which point the pathway

protocol was put into practice. Lastly, the evaluation of the pathway performance was conducted, and is the point of emphasis in analyses conducted by this study team.

The pathway (Appendix), as published in 2016, prompts physicians to consider clinical factors in a systematic manner in order to determine which surgical approach is most suitable for the patient (A. Sanei-Moghaddam et al., 2016). First, the physician determines which indications (i.e. prolapse, abnormal uterine bleeding, etc.) the hysterectomy is based on. Then, the physician is guided through leading questions such as the ability to palpate and determine uterus size, suspicion of extrauterine disease, and accessibility of the uterus through the vagina. Lastly, upon consideration of various factors that lead the physician through the pathway protocol, a surgical approach is recommended (A. Sanei-Moghaddam et al., 2016).

All statistical tests were conducted in R 3.1.2.. A Cochran-Armitage test was conducted to assess linear trends for analysis of changes over time. An ANOVA test compared the mean ages of patients for each fiscal year, categorical data were analyzed using chi-squared or Fisher tests, and a generalized Cochran-Mantel-Haenszel test was conducted to test the association of factors stratifying on each other. The latter was applied to test the linear trend of hysterectomy routes over time while controlling for hysterectomy indication. It was found that the implementation of the hysterectomy pathway was associated with a decrease in the proportion of TAH hysterectomy procedures. In the age group of patients under 45 years old, the laparoscopic MIH approach was the most common. The most common indications for hysterectomy, by age group, were menstruation problems for those under 45 and leiomyomas for both those between 45 and 60, as well as those over 60. From 2012 to 2014, TAH rates demonstrated a statistically significant decrease from 27.8 to 17%. While the Cochran-Armitage test for linear trend demonstrated a statistically significant increase in the proportion of robotic and laparoscopic MIH approaches, the Cochran-Armitage test for vaginal hysterectomy was statistically insignificant, thereby indicative of no change over time. The results of this study demonstrated that the implementation of the hysterectomy pathway was associated with a decrease in the proportion of TAH procedures. As indicated in the 5 steps of evidence-based practice guidelines, this evaluation is an important step in building an evidence-based practice

protocol for hysterectomy procedures. This work was limited by the relatively short study period, which demonstrates the necessity of this current work that allows for a follow-up investigation from 2015 to 2019.

Next, the discussion of the hysterectomy pathway as the global engine of practice change outlines the implications of the protocol for the value in care (Amin Sanei-Moghaddam et al., 2017). This mixed methods study conducted in 2015, with aspects of both quantitative and qualitative analyses, considered physician and patient factors impacting the utilization of hysterectomy clinical pathways. Ninety-two gynecologic surgeons answered an online survey on Qualtrics with 24 questions on a Likert-scale. These questions explored physician attitudes and perceived barriers towards implementation of the pathway, while the patient survey, composed of 27 questions on Qualtrics, explored the patients' perceptions of the web-based educational pathway tool that was developed to inform decisions on the hysterectomy surgical approach. The objective of this tool was to empower women to become active partners in advocating for MIH rather than TAH when appropriate, thus improving their clinical prognosis by reducing their risk of adverse outcomes and costs associated with the hospital LOS, which has been shown to reduce by approximately 1.5 days for MIH (A. Sanei-Moghaddam et al., 2016). Information included in this web-based decision aid includes the types of hysterectomy procedures available, the benefits and complications associated with each type, and links to informational media that illustrate the procedures. Descriptive statistics were used to describe survey results and characteristics of both physician and patient populations, and a thematic analysis was performed on the verbal feedback submitted by study participants. Key points were coded and categorized into concepts to guide the formation of study results. Physicians responded that the clinical pathway was practical, beneficial to patients, and current with the latest evidence-based literature. While a unanimous response reporting the benefits of MIH for women that are suitable candidates for the procedure was observed, reported barriers to pathway implementation included perceived waste of time, inappropriateness for some patient groups, improper incentive structure, and excessive bureaucracy surrounding the process. Further qualitative data and explanation of these barriers are also explored in this work. Patients reported satisfaction with the tool's ability to guide the decision-making process of choosing

a hysterectomy route. These results support the use of pathways as a unifying framework that shapes and adds value to the care of patients requiring a hysterectomy.

The impact of the hysterectomy pathway and Same-Day Discharge (SDD) protocol implementation on patient complications and outcomes have also been evaluated. In order to explore the effect of hysterectomy pathway implementation on surgical outcomes, an analysis of health care outcomes by route of surgery using a chi-squared test for categorical data and non-parametric approaches for non-normal continuous variables from fiscal years 2012 to 2014 was conducted (F. Linkov et al., 2017). It was found that from 2012 to 2014, the proportion of patients with a hospital LOS of less than one day demonstrated a statistically significant increase from 59.15% to 74.53%. In addition, the rate of surgical site infections reduced by 47% in the 3 year period, with a p-value approaching statistical significance.(F. Linkov et al., 2017). Upon investigation of outcome and safety data associated with the implementation of SDD protocols, it was found that the SDD rate for MIH statistically significantly increased from 29% in 2014 to 75% in 2017, while the rate of complications also statistically significantly decreased over this time. The LOS decreased over time with no association being observed between the SDD protocol implementation and an increase in readmissions or return visits(Faina Linkov et al., 2019). The implementation of SDD was found to be applicable across various hospital sizes and surgical subspecialties.

1.2.2 Pathways

Pathway implementation in industries outside of healthcare demonstrated success in reduction of inefficiencies and elimination of waste by standardizing processes. In healthcare, similar results in the form of financial savings and improved patient outcomes have been observed. Buchert et. al. demonstrated that pathway implementation impact is maximized when pathways are interdisciplinary and multidisciplinary to encourage commitment to the sustainability of the pathway across organizational levels(Buchert & Butler, 2016). Flores demonstrated that healthcare systems can successfully use a framework and technology platform to support the development and dissemination of pathways across multisite institutions

through stakeholder engagement, development of pathway prototypes based on current literature, and development of tools for dissemination and impact assessment, etc.(Flores et al., 2019). Stakeholder engagement and successful pathway uptake is vital in generating impactful outcomes from clinical pathway implementation.

Historically, physicians were taught to make decisions through the integration of evidence, inference, and their personal experience. However, physician decision making without decision support systems oftentimes leads to unjustified variation in care and suboptimal health outcomes (Van Herck, Vanhaecht, & Sermeus, 2004). Over the past decade, the use of clinical pathways, tools used to guide evidence-based healthcare, has increased in many areas of healthcare delivery in order to decrease care variation and improve the patient outcomes (Busse, Klazinga, Panteli, & Quentin, 2019). At the heart of the pathways movement lies a desire to improve treatment options, including its outcomes, tolerability, efficiency, and value (Jackman et al., 2020). Van Herck et al. suggested that positive effects result from the implementation of clinical pathways (Van Herck et al., 2004). Thus, introduction of clinical pathways across health systems represent an opportunity to introduce a systematic and sustainable change with the goal of achieving improved health outcomes.

1.3 Point Out Gap

The need for hysterectomy pathways is underscored by data demonstrating that this surgical procedure is the second most common surgical procedure for women of reproductive age in the U.S. and the most common non-obstetrical surgical procedure. Surgical approaches to hysterectomy have changed dramatically in the U.S. in the past decade, with the transition from total abdominal hysterectomy (TAH) to minimally invasive approaches, especially for cases with benign disease. Due to the commonality of this

procedure, its appropriate delivery is paramount to achieving value-based care, defined as the best clinical outcome relative to cost.

1.4 Objective

The objective of this work is to analyze the follow-up data (2015 to 2019) to determine the long-term impact of hysterectomy pathway implementation on the reduction of open hysterectomy rates and improvement of patient outcomes.

2.0 Methods

2.1 Study Design

Implementation of the pathways in the UPMC system required sustainable changes in practice that took place in 2012 to 2014. Several processes have been implemented to integrate pathways into clinical practice, including introducing evidence-based guidelines across all of UPMC's institutions, engaging stakeholders in developing and assessing the pathway, ensuring provider and patient education, establishing physician incentives, and integrating the tool into the electronic medical records (EMR). Throughout the integration process, patient involvement in treatment decisions had been prioritized and patient-centered approaches were established. Patient engagement increased, dramatically contributing to the sustained success in practice change.

Since the publication of data from our initial follow up period (2012-2014), further follow-up in fiscal years 2015 - 2019 was conducted using the same methods from the initial analysis, utilizing data from EpicCare and Medipac. A retrospective medical record review of hysterectomies performed for benign indications from fiscal years 2012 to 2014 was conducted at UPMC hospitals. Noncancerous hysterectomies were identified across 14 UPMC affiliated hospitals in Western Pennsylvania, where UPMC held 43% of the medical-surgical market share in 2019.

2.2 Eligibility Criteria

To determine eligibility of the patients in the initial study from 2012 to 2014, ICD codes (Appendix) were used to identify patients who underwent hysterectomy for benign conditions. ICD codes inclusive of

hysterectomy for cancerous indications or patients in whom the surgery route had changes were indicative of exclusion criteria (A. Sanei-Moghaddam et al., 2016). The same eligibility criteria were used for the entire follow-up period.

2.3 Analysis

Data analyses for the follow-up period were performed using SAS. A frequency distribution for categorical analysis was conducted and a cross tabulation was created. Analytical methods remained the same throughout the initial study and follow-up study periods.

3.0 Results

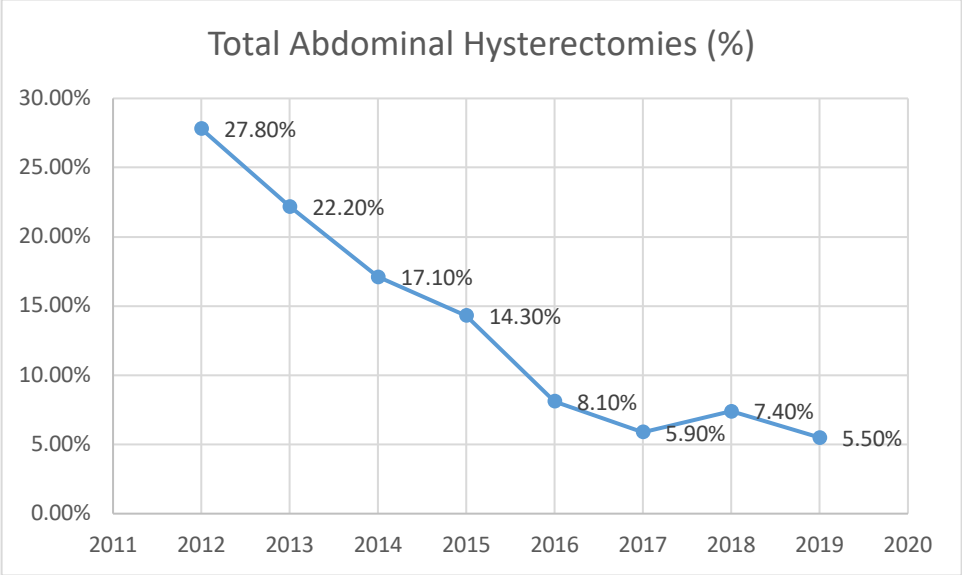
Since the publication of data from our initial follow up period (2012-2014), further follow-up in fiscal years 2015 to 2019 demonstrates a continuing decline in TAH (Figure 1) for non-cancerous (benign) hysterectomies. The pathway was implemented across all UPMC hospital for eligible patients, specifically focusing on non-cancerous indications. Our previous publication describes the pathway and outlines the key decision points involved in the process (A. Sanei-Moghaddam et al., 2016). From the beginning of the retrospective review in 2012 (27.8% TAH) to the end of the follow-up period in 2019 (5.5% TAH), the implementation of the hysterectomy clinical pathway demonstrated an absolute decrease of 22.3% of patients undergoing TAH across the UPMC system. There was a statistically significant decrease in TAH from 17.1% at the end of 2014 to 5.5% at the end of 2019, despite the fact that active development and dissemination of Pathway program ended in 2014. The program continued to be successful past 2014 due to successful physician adoption and integration into the clinical workflow without significant additional education or other activities.

Table 1.
Proportion of MIH and TAH for fiscal years 2012 to 2019.

FISCAL YEAR	TOTAL UNIQUE HYSTERECTOMY PATIENTS	MIH - N(%)	TAH – N(%)
2012	1,934	1,396 (72.2)	538 (27.8)
2013	2,186	1,701 (77.8)	485(22.2)
2014	2,424	2,011(82.9)	413 (17.1)
2015*	1,373	1,176 (85.6)	197(14.3)
2016*	1,351	1,241 (91.9)	110 (8.1)
2017*	1,487	1,400 (94.1)	87 (5.9)
2018*	1,347	1,247 (92.6)	100 (7.4)
2019*	1,437	1,358 (94.5)	79 (5.5)

*Novel follow up data

Figure 1.
Change in the Proportion of TAH for fiscal years 2012 to 2019.



The proportion of TAH performed continued to decrease in the follow up period (Figure 1). It was interesting to see a small decrease in the proportion of patients with commercial insurance (data not shown). Our previous work, as well as Jacoby et. al., suggests that women using non-commercial insurance such as Medicare or Medicaid are less likely to undergo MIH. However, our data suggests that the proportion of patients who underwent TAH declined despite a slight decrease in the proportion of patients with commercial insurance. Also, the proportion of patients that experienced complications, such as 30-day readmission, either remained constant or decreased in the follow period. Specifically, rate of blood transfusions was 1.6% for generalists, 6.4% for academic generalists covering the inpatient service, 0.7% for minimally invasive surgeons, and 0.4% for urogynecologists, which is a much lower rate than we reported for 2014 (F. Linkov et al., 2017). Overall, LOS and operation time remained stable or decreased in the follow up period, depending on the provider type.

4.0 Discussion and Conclusion

Upon evaluation of the rates of open hysterectomy procedures and complications, we found that the outcomes associated with the implementation of the hysterectomy pathway protocol in the follow-up period are consistent with initial results. Initial and follow-up data suggest that hysterectomy clinical pathways serve as an effective instrument for decreasing the rates of TAH, reducing complications, reducing undesired practice variability, and providing consistent care. Physician and patient factors that impact the utilization of hysterectomy pathways must be continuously investigated to ensure optimal quality of care. Our previous investigation of these factors demonstrated that both physicians and patients were largely satisfied with the tool(Amin Sanei-Moghaddam et al., 2017). While most physicians found the pathway to be practical, beneficial to patients, and up-to-date with the latest evidence based literature, some physicians (< 15%) found utilization of the pathway in their health care facility impractical, thus making this perception the greatest barrier to usage(Amin Sanei-Moghaddam et al., 2017).

Overall, our latest evidence regarding pathway utilization demonstrated that the proportion of TAH continued to decrease. Sustained change was a result of the establishment of patient-centered approaches and prioritization of patient involvement in treatment decisions throughout the integration process. Patient engagement increased, dramatically contributing to the sustained success in practice change. Implementation of MIH over TAH resulted in a decrease of surgical complications, thus leading to improved patient outcomes. These changes were implemented in conjunction with SDD initiative, with all of these measures potentially leading to decreasing the cost of care while improving the quality of care.

5.0 Strengths & Limitations

Our results are supported by national trends as practice patterns over the past decade have been indicative of decreasing TAH rates in favor of MIH(Morgan et al., 2018). Prior work evaluating the impact of the introduction of laparoscopic and robotics approaches in hysterectomy have demonstrated a significant reduction in the rate of abdominal hysterectomies nationally(Moen et al., 2014). Several authors, however, have expressed concern that despite vast evidence supporting the use of MIH over TAH, utilization of minimally invasive techniques are often limited by physician factors such as training and expertise(Burkett et al., 2011; Einarsson & Sangi-Haghpeykar, 2009; Einarsson, Young, Tsien, & Sangi-Haghpeykar, 2002; Pulliam & Berkowitz, 2009; Rogers & Julian, 2005; Schimpf, Feldman, O'Sullivan, & LaSala, 2007). It has been found that while laparoscopic approaches are typically performed exclusively by subspecialists with advanced training, the majority of TAH procedures are performed by generalists(Moen et al., 2014). These observations are suggestive of further opportunity to address surgeon factors as well as systematic deficiencies when deciding on a patients' treatment modalities. By addressing such factors, UPMC Health System's hysterectomy pathway further propagates the impact of this national trend towards MIH utilization. These trends, in addition to the pathway protocol, may have influenced study outcomes.

Additionally, although our group was unable to directly examine differences across race and SES due to the nature of the data used in the follow-up analyses, disparities associated with the route of hysterectomy and the implementation of the hysterectomy clinical pathway protocol were evaluated by conducting a retrospective analysis of fiscal years 2012 to 2014. It was found that sub-populations of MIH eligible women including non-European Americans, women aged 45 to 60, and traditional Medicaid and Medicare enrollees were more likely to undergo TAH than the general study population. Residence in a higher median income zip code (defined as an annual income of over $61,000) was associated with 60% lower odds of undergoing TAH. These results indicate that since non-European American women and Medicaid and Medicare recipients have higher odds of undergoing TAH, there is a significant disparity in

MIH utilization and further research needs to be done to determine how care standardization can alleviate healthcare disparities(A. Sanei-Moghaddam et al., 2018). Results of this work were supported by other studies including a cross-sectional study that indicated that the higher likelihood of African American women undergoing TAH can lead to disparities in outcomes, thus owing to the higher observed incidence of complications in the population(Pollack, Olsen, Gehlert, Chang, & Lowder, 2020). A review of demographic data from 2015 to 2019 provide reason to believe that these trends hold true for the follow-up period as well.

6.0 Public Health Significance and Future Work

With over a third of all women having had a hysterectomy by the age of 60, the public health impact of the proper utilization of the hysterectomy procedure is significant. In addition to the vast numbers of individuals affected by the procedure, the financial implications of this procedure to patients, providers, and health systems are important to consider as well, with an estimated annual cost of approximately 5 billion dollars (Matteson et al., 2006).

As we demonstrated that the integration of pathways leads to a sustained change in practice, we envision that the future work in this area will focus on implementing similar initiatives across gynecologic practices as well as in different disciplines. Other disciplines that may benefit from SDD approaches include orthopedics and plastic surgery. Expanded implementation will lead to systemic changes that will likely lead to improved healthcare outcomes locally and globally. Decision support tools are used in various clinical areas, but their application for hysterectomy is relatively new and should be examined in additional populations. Our future work will focus on improving our understanding of decision-making by both patients and providers and on expanding our understanding of how to achieve a sustainable change in clinical practice both locally and globally. Proposed directions for measuring sustained change include regular evaluation of physician factors and attitudes as well as patient education and attitudes surrounding procedural decision-making. Studies of hysterectomy pathways including cancerous indications are needed. Additionally, it is important to explore ways to reduce unnecessary hysterectomy across surgery type since overuse has been reported to be a problem for hysterectomy as well as for other conditions(Brownlee et al., 2017). Overtreatment diverts resources from addressing genuine needs, can potentially be harmful, and threatens the sustainability of the healthcare system(Moynihan et al., 2019). To address the issue of overtreatment, this research can be extended by development of clinical pathways for hysterectomy versus non-surgical treatment as well.

Appendix A

Appendix 0.1 **Eligibility Criteria (A. Sanei-Moghaddam et al., 2016)**

Appendix 0.1.1 **Inclusion Criteria Codes:**

- 68.31 Laparoscopic supracervical hysterectomy
- 68.39 Other subtotal abdominal hysterectomy, NOS
- 68.41 Laparoscopic total abdominal hysterectomy
- 68.49 Other and unspecified total abdominal hysterectomy
- 68.51 Laparoscopically assisted vaginal hysterectomy
- 68.59 Other vaginal hysterectomy
- 17.41 Open robotic-assisted procedure (secondary code)
- 17.42 Laparoscopic robotic-assisted procedure (secondary code)

Appendix 0.1.2 **Exclusion Criteria Codes:**

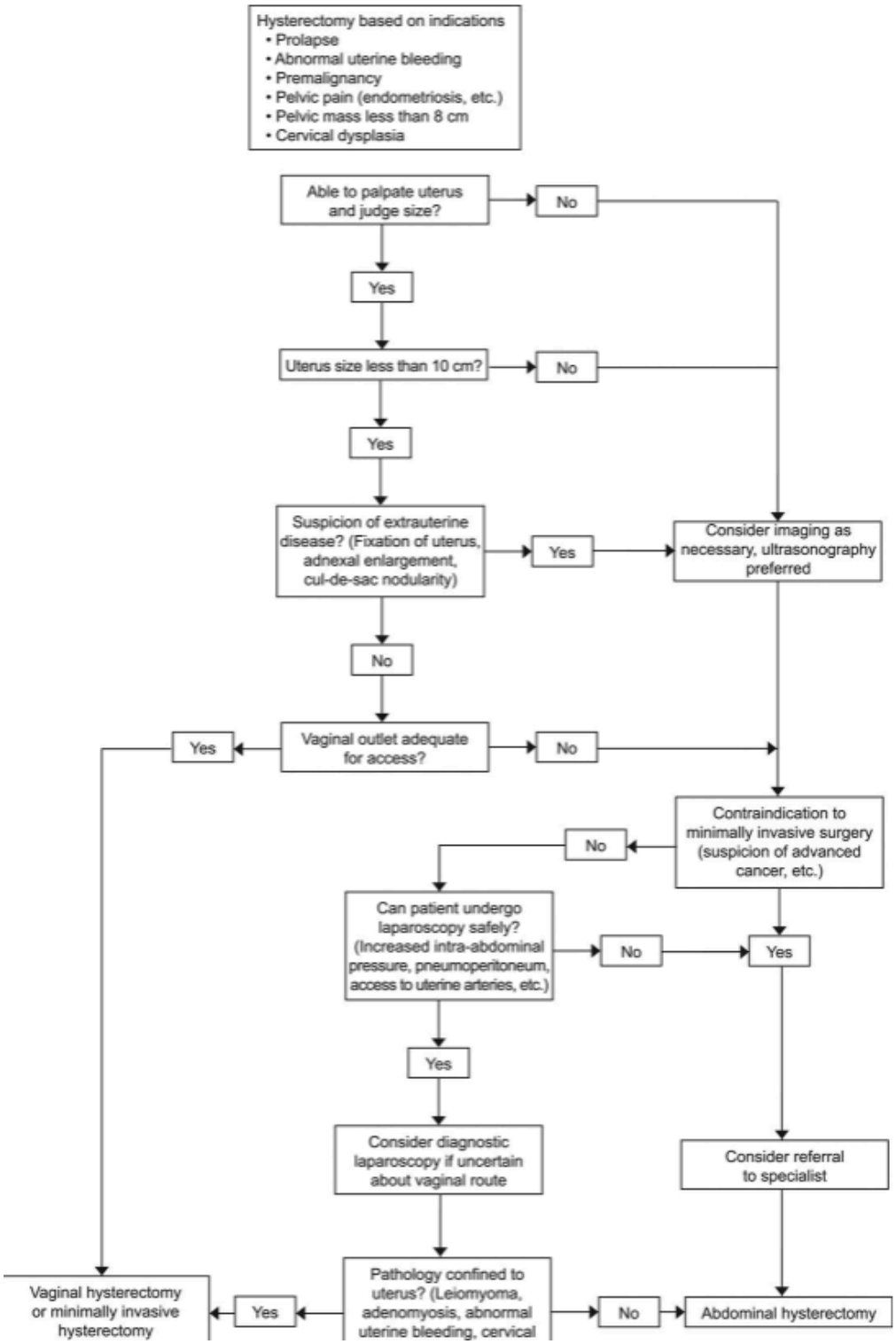
- 68.61 Radical hysterectomy (laparoscopic abdominal)
- 68.69 Radical hysterectomy (open abdominal)
- 68.71 Radical hysterectomy (laparoscopic vaginal)
- 68.79 Radical hysterectomy (open vaginal)
- V64.4 Closed surgical procedure converted to open procedure
- V64.41 Laparoscopic to open

Appendix 0.1.3 **Case Categorization:**

- Adnexal pathology
    - ○ 220 Benign neoplasm of ovary
    - ○ 221.0 Benign neoplasm of fallopian tube and uterine ligaments
    - ○ 221.8 Benign neoplasm of other specified sites of female genital organs
- Menstruation problems
    - ○ 626.2 Excessive or frequent menstruation
    - ○ 626.4 Irregular menstrual cycle
    - ○ 626.6 Metrorrhagia
    - ○ 626.8 Other disorders of menstruation and other abnormal bleeding from female genital tract
    - ○ 626.9 Unspecified disorders of menstruation and other abnormal bleeding from female genital tract

- ○ 627.0 Premenopausal menorrhagia
- Leiomyoma
  - ○ 218.0 Submucous leiomyoma of uterus
  - ○ 218.1 Intramural leiomyoma of uterus
  - ○ 218.2 Subserous leiomyoma of uterus
  - ○ 218.9 Leiomyoma of uterus, unspecified
  - ○ 219.1 Benign neoplasm of corpus uteri
  - ○ 219.8 Benign neoplasm of other specified parts of uterus
  - ○ 219.9 Benign neoplasm of uterus, part unspecified
- Prolapse
  - ○ 618.00 Unspecified prolapse of vaginal walls
  - ○ 618.01 Cystocele, midline
  - ○ 618.04 Rectocele
  - ○ 618.1 Uterine prolapse without mention of vaginal wall prolapse
  - ○ 618.2 Uterovaginal prolapse, incomplete
  - ○ 618.3 Uterovaginal prolapse, complete
  - ○ 618.4 Uterovaginal prolapse, unspecified
  - ○ 618.89 Other specified genital prolapse
  - ○ 618.9 Unspecified genital prolapse
- Pelvic pain
  - ○ 456.5 Pelvic varices
  - ○ 617.0 Endometriosis of uterus
  - ○ 617.1 Endometriosis of ovary
  - ○ 617.2 Endometriosis of fallopian tube
  - ○ 617.3 Endometriosis of pelvic peritoneum
  - ○ 617.4 Endometriosis of rectovaginal septum and vagina
  - ○ 617.5 Endometriosis of intestine
  - ○ 617.8 Endometriosis of other specified sites
  - ○ 617.9 Endometriosis, site unspecified
  - ○ 625.3 Dysmenorrhea
  - ○ 625.5 Pelvic congestion syndrome
- Endometrial hyperplasia and polyps
  - ○ 621.0 Polyp of corpus uteri
  - ○ 621.30 Endometrial hyperplasia, unspecified
  - ○ 621.31 Simple endometrial hyperplasia without atypia 62131
  - ○ 621.32 Complex endometrial hyperplasia without atypia
  - ○ 621.33 Endometrial hyperplasia with atypia
  - ○ 621.35 Endometrial intraepithelial neoplasia (EIN)
- Cervical problems
  - ○ 219.0 Benign neoplasm of cervix uteri
  - ○ 233.1 Carcinoma in situ of cervix uteri
  - ○ 233.39 Carcinoma in situ, other female genital organ
  - ○ 622.7 Mucous polyp of cervix
  - ○ 622.10 Dysplasia of cervix, unspecified
  - ○ 622.11 Mild dysplasia of cervix
  - ○ 622.12 Moderate dysplasia of cervix
  - ○ 795.00 Abnormal glandular Pap smear of cervix
  - ○ 795.01 Pap smear of cervix with atypical squamous cells of undetermined significance (ASC-US)
  - ○ 795.09 Other abnormal Pap smear of cervix and cervical HPV
  - ○ 795.10 Abnormal glandular Pap smear of vagina
- Postmenopausal bleeding
  - ○ 627.1 Postmenopausal bleeding

Appendix 0.2 **Hysterectomy Pathway Protocol**



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