ANALYSES OF COMPLIANCE TO EVIDENCE BASED GUIDELINES IN THE AREAS OF HYPERLIPIDEMIA, MEN'S PREVENTATIVE HEALTH, AND STROKE/HEART DISEASE IN NEW JERSEY FAMILY PRACTICES

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A Qualitative and Quantitative Analysis Describing the Impact of Raising Awareness to Compliance to Evidence Based Guidelines in the areas of Hyperlipidemia, Men's Preventative Health, and Stroke/Heart Disease Prevention in New Jersey Family Practices

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ABSTRACT

BACKGROUND: Literature demonstrates that over the years primary care practices have been failing to comply with evidence based guidelines in treating their patients. One study demonstrated that only 50% of patients receive recommended preventative care, 60% receive recommended care for acute conditions, and 70% receive recommended care for chronic conditions. **[1]** As a result, studies show that many patients end up going to the emergency room repeated times for conditions that could have been properly treated by primary care doctors. **[2], [3]** Consequently, this study aims to determine how often primary care practices are complying with evidence based guidelines in select topics (i.e. treatment of hyperlipidemia, screening for men's preventative health, and screening for stroke/heart disease prevention), and whether or not raising awareness to lack of compliance will increase compliance. **METHODS**: Data was collected over a sample of 40 family practices in New Jersey between Academic years 2015-17. 344 students conducted analyses on an appropriate random selection of patient charts to determine how often their practices were meeting guidelines for a topic of interest. They then discussed the results with their preceptor and summarized the interaction as well as results in a 5-page paper. **RESULTS:** Post-discussion of results with preceptor, it was found that there were improvements to compliance to guidelines in 2/6 categories for treatment of hyperlipidemia, 6/12 categories for screening of men's preventative health, and 4/6 categories in screening for stroke and heart disease prevention. It was also found that there were statistically significant improvements in blood pressure readings and cholesterol levels for patients being treated for hyperlipidemia, however, there were no notable improvements in patients that were screened for appropriate treatment for stroke/heart disease prevention. **CONCLUSION:** Consistently raising awareness to

practice performance through the use of QA/QI data can increase compliance to evidence based practice as well as have an impact on patient outcomes. Further studies should investigate techniques that can assist providers in keeping up to date with their performance as well as the most recent literature.

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CHAPTER 1

INTRODUCTION

1.1 Background of Problem

The idea of evidence based practice has informally existed in healthcare ever since the time of Hippocrates, ~ 300 B.C. Evidence based practice involves providers using the most recent evidence and research to make clinical decisions. **[4]** In the late 1970s, American physician David Eddy introduced the idea of evidence based guidelines--a simplified platform of known information based on the latest research that can assist providers in decision making. **[5]** Ever since the establishment of this framework, millions of guidelines have been created based on the latest research. Practices that have been compliant with treating patients based on the latest guidelines have historically shown to deliver better quality care, produce better patient outcomes, and have resulted in higher patient satisfaction. **[6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23], [24], [25]**

1.2 Statement of the problem

Studies have demonstrated that primary care practices have been negligent in providing care to patients consistent with the most updated literature. Many studies show that primary doctors often fail to screen patients for appropriate preventative measures and provide them with appropriate treatments based on the latest guidelines. **[1], [2], [26]** Consequently, patients visit the emergency room multiple times for problems that could have been addressed if they had received appropriate treatment at their pcp. **[2]** Sometimes, patients even lose their lives when they do not have to. For example, one study demonstrated that 10,000 deaths per year could have been prevented had patients ages 65 years or older received a pneumonia shot. Yet, in 2005, it was found that only 56 out of 100 of these patients had received it. **[27]**

1.3 Objectives of the Study

The objectives of the study are as follows:

1) Identify how often a sample of New Jersey Family Practices are complying to the national guidelines for appropriate treatment of hyperlipidemia, for men's preventative health, and for prevention of stroke/heart disease.
2) Determine whether or not raising awareness to current performance through providing real time data will increase provider willingness to become more compliant.
3) Determine whether or not raising awareness will increase compliance to guidelines for appropriate treatment of hyperlipidemia, interventions for men's preventative health, and interventions for preventing stroke/heart disease over a span of two years.
4) Determine whether or not increased compliance to guidelines results in improved patient outcomes.

1.4 Significance of the Study

Historically, studies have demonstrated that increasing awareness to practice performance through educational interventions and other QA/QI initiatives have improved guideline compliance and/or patient outcomes. The following study conducted is unique in that not only does it intend to generalize this finding through looking at several different areas over a long period of time, but also it introduces a method for continuous quality improvement and care in practice through a student/preceptor teaching/learning collaborative.

CHAPTER 2

REVIEW OF LITERATURE

2.1 On Related Literature

2.1.1 On Evidence Based Medicine:

Since the time of Hippocrates, patients were provided treatments based on what the doctors knew was effective for that particular condition from either their own practice or from the practice of other physicians. The whole Hippocrates school of thought was that "all observations are factual and this information must be recorded so that other physicians can refer to it and use it in their own practice." **[4]** Knowledge was passed down this way for generations and as the practice of medicine became more sophisticated, scientists began to establish significance to these findings by conducting rigorous experiments and tests. These findings could have either debunked or solidified what was originally practiced.

When physicians practice medicine consistent with the latest research and literature in their field, they are said to be practicing "evidence-based medicine." This term was first introduced by David Eddy in the late 1970s. **[5]** Eddy also introduced the term of "evidence based guidelines", which are systematic rules consistent with the most recent literature that are used to assist providers in decision making. Since the foundation of evidence based practice is rigorous research, practicing evidence based medicine naturally leads to improved patient outcomes. Yet, we find that often times physicians do not refer to the latest published literature and findings when treating their patients. **[1],[27]**

2.1.2 On the Primary Care Crisis:

The primary care system is the foundation of healthcare in the United States. Primary care is divided into four subspecialties, namely, family medicine, internal medicine, pediatrics, and geriatrics. According to the Center of Disease Control, more than 50% of patients see a primary care physician as their first choice for outpatient doctor and this statistic has remained consistent over the last decade. **[28]** Literature demonstrates that primary doctors often fail to provide patients with care consistent with the latest literature. A study conducted in 2011 found that in primary care settings, only 50% of patients received recommended preventative care, 60% received recommended care for chronic conditions, and 70% received recommended care for acute conditions. **[1]** Consequently, patients end up either losing their lives or repeatedly going to the emergency room for conditions that were not appropriately managed at their primary care doctor. One study found that in 2005, only 56 out of 100 adults over age 65 received a shot for pneumonia—yet over 10,000 deaths from pneumonia could have been prevented each year with the one time vaccination. **[27]** Further studies demonstrate that only 1 in 20 women are consistently getting an annual breast cancer screening mammogram, despite the fact that regular mammograms are clearly associated with reduced risk of death from breast cancer, 30% of women did not have a pap smear in the last 3 years, and 25% of children in one study did not receive appropriate vaccinations. In a study conducted by the Robert Wood Johnson Foundation for minority and Medicaid patients in a Pennsylvania hospital, patients even stated that they preferred to go the emergency room for conditions that could have been simply treated by a primary care physician because they felt the emergency room provided them with better quality of care. **[29]** A patient's wife specifically stated: "*The [primary care doctor] never treated me or my husband aggressively to get blood pressure under control. I went to the hospital and they had it under control in four days. The [physician] had three years."*

Undoubtedly, many patient problems could have been prevented if they had received proper care from a primary care setting the first time around. Not only that, the United States would spend thousands less per patient. A study conducted by the commonwealth fund in 2011, found that among 11 industrialized countries the United States ranked last on several counts for the care provided and yet spent the most money per patient. **[30]** (see Figure 1).

COUNTRY RANKINGS

Top 2*
Middle
Bottom 2*

	AUS	CAN	FRA	GER	NETH	NZ	NOR	SWE	SWIZ	UK	US
OVERALL RANKING (2013)	4	10	9	5	5	7	7	3	2	1	11
Quality Care	2	9	8	7	5	4	11	10	3	1	5
Effective Care	4	7	9	6	5	2	11	10	8	1	3
Safe Care	3	10	2	6	7	9	11	5	4	1	7
Coordinated Care	4	8	9	10	5	2	7	11	3	1	6
Patient-Centered Care	5	8	10	7	3	6	11	9	2	1	4
Access	8	9	11	2	4	7	6	4	2	1	9
Cost-Related Problem	9	5	10	4	8	6	3	1	7	1	11
Timeliness of Care	6	11	10	4	2	7	8	9	1	3	5
Efficiency	4	10	8	9	7	3	4	2	6	1	11
Equity	5	9	7	4	8	10	6	1	2	2	11
Healthy Lives	4	8	1	7	5	9	6	2	3	10	11
Health Expenditures/Capita, 2011**	$3,800	$4,522	$4,118	$4,495	$5,099	$3,182	$5,669	$3,925	$5,643	$3,405	$8,508

Notes: * Includes ties. ** Expenditures shown in $US PPP (purchasing power parity); Australian $ data are from 2010.
Source: Calculated by The Commonwealth Fund based on 2011 International Health Policy Survey of Sicker Adults; 2012 International Health Policy Survey of Primary Care Physicians; 2013 International Health Policy Survey; Commonwealth Fund *National Scorecard 2011;* World Health Organization; and Organization for Economic Cooperation and Development, *OECD Health Data, 2013* (Paris: OECD, Nov. 2013).

Figure 1: The United States Ranks last in measures of Access, Equity, Quality, Efficiency, and Healthy Lives among 11 Industrialized Countries. Source: The Commonwealth Fund, 2014; Calculated by the Commonwealth Fund based on

2011 International Health Policy Survey of Sicker Adults; 2012 International Health Policy Survey of Primary Care Physicians; 2013 International Health Policy Survey; Commonwealth Fund National Scorecard 2011, World Health Organization; and Organization for Economic Cooperation and Development, OECD Health Data, 2013 (Paris OECD, Nov 2013), **[30]**

2.1.3 On Raising Provider Awareness to Compliance Issues:

Studies have shown that raising physician awareness to the need for practice improvement has resulted in improvement in quality of care provided as well as improvement in patient outcomes. **[6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23], [24], [25]** Awareness can be raised either through educating physicians or providing them with performance data. The Healthcatalyst states that providing physicians with real time performance data works because physicians are scientists and data driven individuals—on top of that they genuinely care about their patients so they will do what is best to give the patient the best outcomes possible.**[31]** Logically, post raising awareness, physicians will either implement a QA/QI initiative or consciously make changes to their practice to be more complaint with the guidelines.

2.1.4 The Importance of Physician Engagement in Improving Quality of Care

Physician engagement in a QA/QI initiative is extremely critical and important because physicians are the ones directly monitoring the patient, aware of their needs and at the same time understand the consequences of poor quality. Not only that, physician's engagement sets the vision for the movement and as a result the staff follow suite, pushing the whole practice forward. **[32]** The President and CEO of the Institute for Healthcare Improvement in Cambridge, MA reiterates the importance of physician leadership and involvement in quality improvement in the following quote:

> When you can marry the leadership skills and the clinical background, you have an opportunity to lead in a very distinct and different way. When you get someone who knows what quality looks like, and pair that with a curiosity about new ways to think about leading, you end up with people who are able to produce dramatic innovations in the field. **[33]**

Furthermore, according to Health Catalyst,

> Making significant improvements is not an achievement organizations can do without physician engagement, though. They need physicians to be on board. Why? The reality is that physicians play a large role in the complex mechanisms of healthcare delivery. From providing frontline care to filling leadership positions, physicians drive 75 to 85 percent of all quality and cost decisions. **[31]**

Not only that, a study titled "Physician leaders and hospital performance: Is there an association?" found that the hospitals that performed best were led by physicians—in fact, the study goes on to say that the overall quality scores for hospitals were 25% higher when physicians were in leadership positions. **[34]**

Additionally, below is a snapshot of the ranking of quality of hospitals done by U.S. News for Best Hospitals in 2013-14. It is notable that of the top 18 hospitals in the country, 10 are led by physicians, 5 of which encompass the top 5:

Physicians as Hospital Leaders

Rank	Organization	State	Name of CEO/President	Physician?
1	Johns Hopkins Hospital	MD	Paul B. Rothman	Yes
2	Massachusetts General Hospital	MA	Peter Slavin	Yes
3	Mayo Clinic	MN	John H. Noseworthy	Yes
4	Cleveland Clinic	OH	Delos M. Cosgrove	Yes
5	UCLA Medical Center	CA	David T. Feinberg	Yes
6	Northwestern Memorial Hospital	IL	Dean M. Harrison	No
7	New York-Presbyterian University Hospital of Columbia and Cornell	NY	Steven J. Corwin	Yes
8	UCSF Medical Center	CA	Mark R. Laret	No
9	Brigham and Women's Hospital	MA	Elizabeth G. Nabel	Yes
10	UPMC-University of Pittsburgh Medical Center	PA	Jeffrey A. Romoff	No
11	Hospital of the University of Pennsylvania	PA	Ralph W. Muller	No
12	Duke University Medical Center	NC	Victor J. Dzau	Yes
13	Cedars-Sinai Medical Center	CA	Thomas M. Priselac	No
14	NYU Langone Medical Center	NY	Robert I. Grossman	Yes
15	Barnes-Jewish Hospital/Washington University	MO	Richard Liekweg	No
16	IU Health Academic Center	IN	Dan Evans	No
17	Thomas Jefferson University Hospital	PA	Stephen K. Klasko	Yes
18	University Hospitals Case Medical Center	OH	Thomas F. Zenty III	No

U.S. News Best Hospitals 2013-14: the Honor Roll

Figure 2: Hospitals with Physicians as leaders have produced remarkable quality outcomes. Source: Physician Executive Journal, 2014; The Value of Physician Leadership, **[33]**

To add further solidification to these claims, it has been demonstrated in several studies that physician engagement and involvement in QA/QI initiatives makes tremendous difference to outcomes. One example was that UCLA was able to dramatically reduce central-line infections in its intensive care units (ICUs) because physicians bought changes into practice. **[35]**

A study by Chris Hayes titled "Case study of Physician Leaders in Quality and Patient Safety, and the Development of a Physician Leadership Network," conducted to specifically demonstrate the role of physicians in quality improvement initiatives found that physician involvement in leadership of the project led to a *"…67% sustained* *reduction in the use of unnecessary catheters over one year," when the original objective of the project was to reduce the number of urinary tract infections that were associated with catheter use."***[36]** Not only that, two of the physicians in the project were key in helping to change attitudes toward the process of doing morbidity and mortality rounds—the result was process improvement. In addition to quality improvements, these physicians were also successful in recruiting other physicians to engage in quality performance initiatives. Undoubtedly, physician involvement is critical to achieving these types of milestones for not only improving quality, but to also spread the importance of quality improvement.

In addition, as previously mentioned, another article written by Peter Rudd titled "Clinicians and Patients with Hypertension: Unsettled Issues about Compliance," reports on the improvements made in patients with hypertension after clinicians were involved in coming up with a steady treatment plan when they realized they were not following the guidelines. Post intervention, it was found that 33% of the patients that were impacted by the study had good control over their blood pressure. The physicians attributed the percentage not being greater to the fact that a lot of the factors that affect patient hypertension levels are beyond their management. **[37]** Some of these factors include, but are not limited to, patient non-compliance with individualized treatment plan, patient's genetic makeup (the disease expresses itself in different forms based on the patient, and interference with other medications. The providers, interested in the results, suggested a more personalized intervention to improve outcomes in the future.

A similar study conducted for improving management of cholesterol in patients also demonstrated that engaging physicians in quality improvement produces positive quality outcomes. The name of the study was "Efforts to Improve Compliance with the National Cholesterol Education Program," written by Linda Headrick. In a study conducted, it was found that clinicians were not compliant with the national guidelines for cholesterol management. To address this problem, a study was designed with the aim of educating physicians on the most recent guidelines for cholesterol management. **[25]** The physicians were divided into three groups and were educated in different ways. Upon completion of the study, it was found that all three groups reported improved compliance with guidelines: Group 1: 4.5%, Group 2: 7.6%, and Group 3: 10.6%.

Another study published in August 2009, titled "Measurement of Quality Improvement in Family Practice over Two-year period" demonstrated that QI intervention in family practices was responsible for improving the care delivered across 8 out 11 of quality indicators which includes diabetes control and follow up, hospitalization for chronic obstructive pulmonary diseases and congestive heart failure, and preventative medicine measures. **[38]** A striking finding of the study was that at the beginning of the study in 2003, the most important factor associated with better quality improvement outcomes was board certification while at the end of the study (in 2005), a repeat analysis found that being a female physician in a managerial position had a larger positive impact on quality improvement outcomes. This finding is particularly significant because enforces the literature on the importance of physician engagement and leadership in a quality improvement initiative. As shown in this case, physician leadership did demonstrate to have a larger impact on QI outcomes.

In addition to improving patient outcomes, physician engagement and leadership in quality improvement can also accomplish the following: **[33],[39]**

- Connect the front end with the leadership and governance of the organization
- Encourage a culture of change and respect with their physician colleagues since they understand the challenges of being a provider—therefore, they can make decisions sensitive to the needs and limitations of other providers, resulting in more productive conversations and feedback
- Take leadership roles in helping to transition healthcare in an ever changing healthcare environment
- Creating multidisciplinary teams that can provide a better understanding of the challenges physicians face to better tackle problems

The physician being involved and truly engaged in QA/QI will not only bring about significant change in patients outcomes, but can also save an organization hundreds of thousands of dollars. How can we get our physicians involved? According to Goode:

> The perception that healthcare quality does not need to improve is a significant barrier to changing behavior. The removal of this barrier will require, at the very least, that physicians be educated about quality and accept assessment of clinical performance as an opportunity to learn and improve. **[40]**

Undoubtedly, physician engagement in QA/QI efforts is absolutely critical to pushing the quality movement forward. As shown by the above studies, quality improvement/quality assurance tools are undoubtedly the answer to promising improvement in primary care. How do we put the two together? How can the barriers be removed, thus convince physicians to implement data driven quality improvement initiatives into their practice? As aforementioned, and as research shows, one-third of physicians do not even have access to their performance data. **[41]**

2.1.5 On Engaging Physicians to look at their quality of practice:

As we have seen from the previous section, obtaining physician engagement and cooperation is crucial to pushing our quality improvement forward. In order to do that however, it is important for to remove the misconceptions that they have about QA/QI.

Literature presents various methods through physician buy in can be attained. The American Hospital Association describes four methods through which physician buy in can be attained. One of these methods is educating physicians on the most current literature. A study reported in the New York Times reported that physicians would prefer 'periodic, modest-sized, open-book tests that incorporate relevant knowledge and updates.' **[42]** Another interesting study described by the article found that physicians are more likely to engage in changing their behavior another influential physician has done so successfully. Per the study, many physicians changed their diagnosing and prescribing behavior after being influenced by influential physicians that posted their findings and advice online. In addition, the study also reports allowing physicians to make decisions and opening the communication between physicians and administration can play a critical role in convincing them to act towards helping the organization objectives towards improved patient health. Last but not least, increasing physician access to decision making, educational technology can also play a role in engaging physicians. **[42]** As a whole, the article suggests educating physicians and opening communication to physicians through different means can encourage their buy in, and thus eliminate of some of the internal barriers.

Another article published by the Health Catalyst provides a list of ways to gain physician buy in, namely, 1) finding common goals, 2) talk about incentives, 3) as mentioned by the previous article, opening communication with physicians and allowing them to make decisions, 4) educating physicians about improvement initiatives, 5) using data to convince physicians there might be a problem, and 6) being confident and assure physicians that administration will take their objectives into consideration. **[31]**

Many of these buy in strategies are similar across the literature, **[43]** however may or may not work depending on the structure of a physician's organization and whether or not a QA/QI facilitator is allowed into the practice. For example, if the physician provides care in a private practice, there may not be room for incentives such as promotion. In addition, educating physicians involves equal interest and collaboration from both the clinical as well as administrative sides. How can then physicians be convinced to be educated? The information is accessible online, but there is no way we can ensure that they use these resources. In addition, the same way, they are not required to purchase new educational technologies and clinical decision making systems—as this may not be feasible with a given organization's budget. Last but not least, a facilitator is only allowed to get involved in a health care practice if the provider asks for one. Thus, the question of having outside forces encourage a provider to engage in QA/QI or even making the physician collect performance data does not even come into question if the provider is not willing to approach the topic. Then how can private practitioners and/or practitioners in general be engaged in QA/QI initiatives, when there is nothing binding them to do so? They must be interested in making change in order to make and effort to make one, so then, the real question is, how can the interested be created?

It is notable that the studies above as well as others, **[41]** have suggested and agreed that one of the tools in obtaining physician buy-in/interest is to provide them with timely, accessible, individual performance data since they are scientists, data-driven individuals, and at the same genuinely care about their patients. The idea behind QA/QI is that the awareness that comes from real time data will propel change. The problem stems from the fact that physicians are in general unaware of the quality of care they are providing (which is arguably the most important part of any QA/QI initiative—without data, we have no way of measuring performance or change). To further confirm this, a survey conducted by the Commonwealth Fund reports that only 1/3 of all physicians have access to any form of individualized performance data and the majority of physicians that had access reported that this data came from patient surveys. **[41]** However, as aforementioned, there is no way to force them to obtain the data—ideally, the data would come to them in their path, in a costless and non-intrusive manner.

2.1.6 Barriers to Improving Quality of Care:

Studies report that only 1/3 of all physicians have reported implementing a QA/QI initiative in their practice. Literature speculates that there are various reasons as to why more physicians have not implemented quality initiatives into practice, ranging from physicians are not interested in quality improvement to physicians are not educated enough about quality tools.

There are both internal and external barriers that prevent physicians and practices from implementing QI initiatives. Examples of internal barriers include indifference to the quality movement, the belief that high quality care is already being provided within the practice (or thus against the idea of not performing well), disbelief in the accuracy of quality methods, professional shame, fear of legal consequences, and disregard for the guidelines. **[40], [44]** Some physicians believe that the guidelines do not accurately address the individual conditions of the patient. According to Davies **[44]**:

> …quality improvement initiatives have typically been faltering, often failing to engage healthcare professionals, with the responses of many ranging from apathy to outright resistance. In particular, doctors, whose status and role make them pivotal to organizational change, have largely remained on the fringes of such initiatives.

Per literature, examples of external barriers that possibly prevent the quality movement include lack of time, lack of resources, lack of training/education on QI techniques, lack of performance data, a heavy workload, resistance from staff and/or other professionals, and other cultural barriers. **[45]**

Commenting on the physician's perspective of quality improvement initiatives, Davies goes on to say that:

> Health professionals are typically not involved because of a range of factors. These include: limited knowledge and understanding of current concepts and methods of quality improvement; differing definitions between health professions about what constitutes high quality care; and the widespread belief that high quality care is already being provided, at least locally.

As shown by Davie's analysis, there are plethora of reasons that physicians may not be engaging in quality improvement initiatives. From this analysis, from the physician's perspective, it appears that 1) there is no common ground between healthcare professionals when it comes defining what quality care is and 2) there is the impression that QA/QI drains time and energy from the practice without producing actual results. In order to push the quality improvement movement forward, undoubtedly addressing these concerns about QA/QI will go a long way in changing mindset. Addressing the concerns that the physician has is extremely crucial to pushing the quality movement forward because physician engagement is most critical in getting any QI initiative going.

2.2 On Methods:

2.2.1 On QA/QI:

Physicians that desire to bring about improvements in their quality of care delivered implement Quality Assurance/Quality Improvement (QA/QI) initiatives. Quality assurance/quality improvement initiatives are data driven initiatives designed to bring about improvements in quality of care as well as healthcare delivery. **[46]** The data generated through QA/QI brings awareness to current practice performance and paves the way for a goal for improved practice post intervention. QA/QI initiatives are conscious efforts, that have generally shown to bring about great improvements in healthcare quality as well as delivery. **[47]**

A QA/QI initiative conducted at Ellsworth medical clinic demonstrated that upon raising awareness of poor management of hypertension at the practice, there were improved outcomes in patient's systolic as well as diastolic blood pressures post intervention.[39] In addition, another study demonstrated that there was increased compliance to guidelines on management of cholesterol upon educating physicians as providing them with reminders. Additionally, table 1 summarizes QA/QI initiatives that have demonstrated that increasing provider awareness can not only necessarily result in improved quality of care, but also reduced costs of services and improved patient outcomes.

Table 1: A Summary of QA/QI Initiatives and their Impact on Clinician Guideline Compliance as well as patient outcomes		
Case Study #	Title	Summary
1	"Implementation of a Value-Driven Outcomes Program to Identify High Variability in Clinical Costs and Outcomes with Reduced and Improved Quality"	The objective of this initiative was to improve patient outcomes and reduce costs of services. The intervention involved doctors being provided information about outcomes and costs and then they were set up with process improvement experts. **[6]** A direct impact was recorded: costs were lower by 7% in the year of implementation and 11% the year after. Not only that, prior to the intervention period, the mean cost per day for lab testing was $138. During the intervention period, these costs were reduced to a mean on $123 per day.
2	"Improving Hospital Quality and Costs in Nonoperative Traumatic Brain Injury"	The objective of the study was to improve the outcomes for patients diagnosed with TBI. **[7]** The general name of the intervention that was put in place was BIG, and the intervention involved three different treatment protocols based on the situation: BIG 1: 6 hour period of observation in the emergency department for patients without the need for neurosurgical consultation or RHCT scan BIG 2: observed for 24 hours without an RHCT scan or neurosurgical consultation BIG 3: Hospitalization, neurosurgical consultation, and a follow-up RHCT scan Post implementation, it was found that there was a statistically significant reduction in neurological consultations, unnecessary imaging, and a significant improvement in patient outcomes and cost effectiveness.
3	"Improving Operative Flow during Pediatric Airway Evaluation"	Authors applied the PDSA method to improve processes in the operating room. **[8]** The study took place in a tertiary academic children's hospital and the interventions were as follows: 1) Meetings between surgeons and OR staff to discuss equipment that is needed 2) Improving surgeon case ordering and preference card review 3) OR sign on door to regulate traffic during airway procedures 4) Discouraging personnel breaks during airway procedures Post intervention, all desired outcomes were attained: 1) the rate of surgeons exiting the operating room

		decreased and 2) the operating time decreased, ultimately, decreased risk for the patient.
4	"The Effectiveness of a Multidisciplinary, Team-Based Approach to Cesarean Hysterectomy in Modern Obstetric Practice"	The objective of the study was to implement an approach that would improve patient outcomes for cesarean hysterectomy. **[9]** Data from quality assurance databases of hysterectomies after cesarean delivery was compared between years 2000-2005 and 2011-2013. The comparison revealed that there was an improvement of outcomes: the post-implementation group had fewer days in surgical intensive care than did pre-implementation group. In addition, the likelihood of postoperative febrile morbidity was higher during the pre-implementation period than the post-implementation period.
5	"Impact of Palliative Care Screening and Consultation in the ICU: A Multihospital Quality Improvement Project"	This study aimed to determine whether or not receiving palliative care consultation in the intensive care unit had better patient outcomes. **[10]** The implementation of palliative care consultation projects resulted in higher rates of hospice referrals, reductions of lengths of stay, and cost reduction.
6	"Effectiveness of a Quality Improvement Intervention for Adolescent Depression in Primary Care Clinics"	This study analyzes whether a QA/QI intervention with evidence based treatments to improve the outcomes adolescents diagnosed with depression was effective. **[11]** Five different healthcare organizations were involved in the intervention and it occurred from 1999-2003. Experts, care managers, training for the care managers, and education for the providers were available at each site. The intervention was successful. The patients that were involved in the intervention were reported to have fewer depressive symptoms, higher mental health-related quality of life, and greater satisfaction with mental health. The author summarized the study concluding that evidence based research on depression methods results in greater improved patient outcomes in comparison to traditional depression treatments.
7	"The Effect of a Quality Improvement Intervention on Perceived Sleep Quality and	The objective of the study was to determine or not a QI intervention would improve sleep, delirium/cognition in an ICU setting. **[12]** During the intervention, sleep promoting interventions were put into play as well as daily reminder checklists for the ICU staff. While the checklist item completion rates ranged from 86-94%,

	Cognition in a Medical ICU”	and there were improvements in perceived nighttime noise, incidence of delirium/coma, and daily delirium/coma-free status, there were not statistically significant improvements in perceived sleep quality.
8	“Integrating Palliative and Critical Care: Evaluation of a Quality-Improvement Intervention”	This was a study published in 2008 to determine whether or not a quality improvement initiative would improve palliative care at the ICU. **[13]** The intervention involved clinical education, local champions, academic detailing, feedback to clinicians, and system support. The outcomes were in general positive: there was an improvement in family QOODD, an increase in family satisfaction and a statistically significant reduction in ICU length of stay days before death.
9	“Improving the Coverage of the PMTCT Programme Through a Participatory Quality Improvement Intervention in South Africa”	This was a study written by Tanya Doherty with the objective of determining whether or not a quality improvement intervention will improve the rates of reaching HIV positive women in South Africa. **[14]** The project took place between 2008 and 2009 and exposures included initial assessments undertaken by a team of district supervisors, workshops to assess results, identifying weaknesses and set improvement targets and continuous monitoring to support changes. Post-intervention, it was found that there were improvements in programme indicators. Coverage of CD4 testing increased from 40% to 97%, uptake of maternal nevirapine from 57% to 96%, uptake of infant nevirapine from 15% to 68% and six week PCR testing from 24% to 68%.
10	“Alcohol Screening and Brief Counseling in a Primary Care Hypertensive Population: A Quality Improvement Intervention”	The objective was to determine whether a QI initiative will improve alcohol screening and brief counseling in hypertensive patients in a primary care setting. **[15]** The intervention took place across 21 primary care practices across the United States over a span on 2 years. Interventions included alcohol screening and brief counseling, and annual network meetings to share improvement strategies. The intervention improved alcohol screening rates and counseling rates. Both systolic and diastolic blood pressure decreased significantly among hypertensive patients receiving alcohol counseling.
11	“A Firm Trial of Interdisciplinary Rounds on the Inpatient Medical Wards: An	The objective was to determine whether or not interdisciplinary rounds on inpatient medical services would improve the process and outcomes of medical care on the inpatient wards. **[16]** The study found that there was a statistically significant lower length of stay

	Intervention Designed Using Continuous Quality Improvement”	and total charges for patients that were seen in by the interdisciplinary group.
12	“Effect of a Quality Improvement Intervention to Decrease Delays in Antibiotic Delivery in Pediatric Febrile Neutropenia: A pilot study”	The objective of this study was to determine whether a QI initiative would reduce the medical complications pediatric oncologic patients with febrile neutropenia. The project took place in the pediatric ICU and patients were undergoing chemotherapy with fever related to an infection. **[17]** The intervention involved leaving the first dose of broad spectrum antibiotics available in the emergency cart. As a result of the intervention, time to antibiotic delivery was significantly reduced in the post-intervention period from median of 164 minutes to a median of 55 minutes.
13	“How A Therapy-Based Quality Improvement Intervention for Depression Affected Life Events and Psychological Well-Being Over time: A 9-Year Longitudinal Analysis”	The objective of the project was to determine whether or not a QI initiative that targeted depression would reduce negative events and improve mental health. **[18]** The intervention took place in 46 primary care clinics over a time frame of 9 years. The practices were introduced to evidence based psychotherapy as an exposure. The study resulted in a reduction of occurrence of life events, further protecting subsequent mental health.
14	“The Impact of a Quality Improvement Intervention to Reduce Nosocomial Infections in a PICU”	The objective of the project was to determine whether or not a QI intervention could reduce nosocomial infection rates in a PICU and improve patient outcomes. The project took place at a 14-bed medical and surgical PICU in a university hospital for children. **[19]** The interventions involved included the creation of an infection control team, program targeting hand hygiene, and quality practices focused on preventing nosomial infections. The results of the study were that nosocomial infection rates were reduced, hospital length of stay was reduced, as well as mortality in the PICU.
15	“Effect of a Clinical Practice Improvement Intervention on	The objective of the study was to determine whether or not an intervention would increase C trachomatis screening by using urine tests for sexually active adolescent girls identified during their routine

	Chlamydial Screening Among Adolescent Girls”	checkups. **[20]** The tests would occur at 10 pediatric clinics in Northern California. Interventions involved showing practices their deficiencies and having monthly meetings aimed at improving performance. Post-intervention, the screening rates for C trachomatis significantly increased.
16	“Quality Improvement in a Primary Practice”	The objective of the QI implementation was to do what was necessary to help patients between ages 18-75 reach a blood pressure level of less than 140/90. **[21]** They intended to help at least 85% of their regular patients to reach this goal. The clinic tried to establish this using what they called a leadership team. The leadership team initiated the process and ensured that the focus of the clinic was to have patients control their blood pressure. The team members were informed that there would be raises if the blood pressure goals were accomplished since the clinic would receive greater reimbursement. This obviously served as a huge factor to help motivate the staff members to do a more thorough job when it comes to blood pressure care. The clinic held monthly meetings to review their progress and see what could be done to better accomplish their goals. Tools the clinic used include those from the Institute for Healthcare Improvement. Such tools included process maps and PDSA cycles to ensure good quality of work. The clinic broke up their plan into four specific parts to ensure that their QI target was met, namely, consensus building, population management, the actual patient visit, and staff training/collaboration. The clinic used their EMR system to develop an algorithm to manage the patient’s blood pressure readings. Using the system, the clinic was able to sort through the data for different age ranges, for different time periods, management factors, etc. The study results were analyzed in year 2012. It was found that 90% of the patients had controlled blood pressures, i.e. <140/90. The population of patients with diabetes and controlled blood pressure went up from 73% to 97%. The population of patients with IVD and controlled blood pressure went up from 68% to 97%.
17	“Clinicians and Patients with Hypertension: Unsettled Issues	The study found that guidelines were not being met through conducting an actual study to enforce hypertension treatment plants. Results were recorded to see what percentage of patients were able to achieve

	about Compliance**"**	control of their blood pressure. **[23]** The results were quantitatively measured: 134 patients were tested for blood pressure after consistent treatment to see whether or not their blood pressures were under control. A plan of action was produced to address this issue. A group of clinicians conducted a study to see whether or not up keeping a consistent treatment regimen would assist patients in gaining control of their hypertension. The study found that only about 33% of patients had good control over their blood pressure. The study demonstrates that its weakness is that it was not able to offer a full solution to the problem given the many variables that affect hypertension.
18	"Practice Facilitation to Improve Diabetes Care in Primary Care: A Report from the EPIC Randomized Clinical Trial"	This study investigates three different ways of implementing a model to improve the care of the diabetic population in practices. **[24]** The name of the model is the "Chronic Care Model." The three approaches are the following: 1) reflective adaptive process, 2) continuous quality improvement, and 3) self-directed approach: 1) "practice facilitation using a RAP approach to stimulate reflective conversations and improve the practice's capacity to manage change, applying the change process to diabetes care"[7] (Dickinson, 2014) 2) "practice facilitation using a CQI approach to implement quality improvement for diabetes to improve diabetes care"[7] (Dickinson, 2014) 3) "providing self-directed (SD) practices with information and resources about the Chronic Care Model and quality improvement to improve diabetes care, but without facilitation."[7] (Dickinson, 2014) Small and medium sized health community centers in Colorado were selected to participate in the study. A total of 40 practices participated in the study. After doing the analysis of charts, the researchers found that there was different improvement styles between the three groups. There was improvement however in all three of the groups. It was found that the improvement in CQI practices was much greater than improvement in the RAP or SD practices. Seventy two percent of the practices demonstrated some type of improvement. There were none that demonstrated that diabetes care got worse. The greatest improvements were found in the areas of foot examinations,

		cholesterol checks, flu shots, and nutrition counseling in practices that implemented CQI. Overall, all three of the approaches demonstrated significant improvement in the quality of diabetes care administered using the Chronic Care model.
19	"Efforts to Improve Compliance with the National Cholesterol Education Program Guidelines"	The study found that the national guidelines for cholesterol management were not being met. As a result, she devised a QI initiative to address this problem. **[25]** The study involved the researchers splitting resident doctors up into 3 groups. There were different interventions for each group in effort to see whether or not one intervention was better than the other in helping physicians learn and practice implementing the guidelines. Each group of physicians were taught the national guidelines for cholesterol management in different ways: 1) Group 1: Control group physicians i. Were lectured through the Physician Cholesterol Education Program (PCEP) 2) Group 2 i. Given the PCEP lecture and were also given reminders of the guidelines (attached to the patients' charts) 3) Group 3 i. Given the PCEP lecture, given feedback based on the patients that they saw, and also given instructions on how to proceed with each patient's treatment After the intervention, it was found that physicians in groups 2 and 3 demonstrated the greatest improvements in compliance with guidelines. Group 2 physicians improved by 7.6% and group 3 improved by 10.6%. Group 1 demonstrated the smallest improvement of only 4.5%. Unfortunately, although there were improvements in physician compliance to guidelines, there was no improvement in patient outcomes.
20	"Effect of a Quality Improvement Intervention with	The objective of the study was to implement a QI initiative to reduce the mortality of critically ill adults across 118 Brazilian Intensive care Units. **[48]** The study was conducted over academic years 2013-14.

	Daily Round Checklists, Goal Setting, and Clinician Prompting on Mortality of Critically Ill Patients”	The ICUs were given daily checklists and goals for doctors over 11 different care processes. Unfortunately, the project did not reduce in-hospital mortality. The author hypothesizes that the project was not successful because 1) the intervention period was too short and 2) the items specified on the checklist had little effect with mortality.
21	“Randomized Trial of Quality Improvement Intervention to Improve Diabetes Care in Primary Care Settings”	This was a study conducted to determine whether or not a QI intervention would impact on the quality of diabetes care delivered on primary care clinics. The study was conducted across 12 primary care practices over an 18 month period. **[49]** The clinic staff were trained in a seven step QI change process. The clinic staff were trained through videotapes. Unfortunately, the study failed to improve A1C, LDL, or blood pressure levels. The author suggests that such a QI change process should direct more attention to specific clinical actions and such as drug intensification and patient activation.
22	“The Results of A Randomized Trial of a Quality Improvement Intervention in the Care of Patients with Heart Failure”	The study was published on October 15, 2000. The objective of the project was to see if a QI initiative would improve outcomes in patients in community hospitals with heart failures. **[50]** The study took place over 10 community hospitals. Unfortunately, the intervention had no statistically significant effect on patient outcomes, but the intervention did reduce the length of stay of patients in the hospital.
23	“New obstacles to improving the quality of end-of-life care in ICU”	The objective of the study was to determine if a QI initiative can improve ICU end of life care. The study took place across 12 community hospitals in Washington state over a 4 year span from 2004 to 2008. **[51]** The exposures were physician education, local champions, academic detailing, clinician feedback of quality data, and system supports. Unfortunately, post-implementation there were no significant results. There was no improvement in , family-QODD, family satisfaction or nurse-QODD. In addition, there was no statistically significant reduction or increase in days in the ICU before death. There were no significant improvements with the interventions, however, author believes there should be more research on the types of interventions that should be implemented. He says “research efforts should be focused on interventions that target clinicians earlier in their training or interventions with more direct

		interaction with patients that can be customized to patient needs.”
24	“Failure of a Continuous Quality Improvement Intervention to Increase the Delivery of Preventive Services. A Randomized Trial”	The objective of the study was to determine whether a QI initiative can increase the delivery of eight clinical preventive services. **[52]** The study took place across 44 primary care clinics in Minneapolis. The only exposures involved in this study were surveys and chart audits. Only one preventative service demonstrated a statistically significant increase: pneumococcal vaccine. Delivery of only one preventive service-cholesterol testing—significantly increased in the intervention group compared with the control group.
25	“Randomized Clinical Trial of a Quality Improvement Intervention in Nursing Homes”	The objective was to determine whether or not a QI initiative would improve clinical practices and resident outcomes. The project took place across 113 nursing facilities. **[53]** The exposures were comparative quality performance data and education about quality improvement. there were no significant differences in resident assessment measures were detected between the groups of facilities. However, outcomes of residents in nursing homes that actually took advantage of the clinical consultation of the GCNS demonstrated trends in improvements in QIs measuring falls, behavioral symptoms, little or no activity, and pressure ulcers. Providing comparative performance feedback is not enough to improve resident outcomes.
26	“The Effects of a Team-Based Continuous Quality Improvement Intervention of the Management of Primary Care: A Randomized Controlled Trial”	The objective of the study was to determine whether or not a QI initiative can improve primary care practice outcomes. **[50]** There were 26 intervention and 23 control primary care practices involved in the study. A practice facilitator was involved in the study and helped the intervention groups select suitable topics for quality improvement and follow a structured approach to achieve improvement objectives. Checklists completed by an outreach visitor, questionnaires for the GPs, staff and patients were used to assemble data on the number and quality of improvement activities undertaken and on practice management prior to the start of the intervention . The intervention exerted a significant effect on the number and quality of improvement projects undertaken and self-defined objectives met. Failure of the effects of the intervention on the other dimensions of practice management to achieve significance may be due to the topics selected for some of the improvement projects

		being only partly covered by the assessment instrument.

2.2.2 On Review of Case Studies:

Of a total of 26 case studies analyzed, 19 demonstrated that there were successful improvements and outcomes post implementing QA/QI initiatives. This is a 73% success rate. Of the 26 case studies, 10 studies involved improving quality and outcomes in primary care practices. Of the 10 studies, 7 studies had successful outcomes post implementing QA/QI initiative.

2.2.3 On PDSA:

PDSA is one of the most commonly used approaches for quality improvement. PDSA is an acronym for Plan-Do-Study-Act. It is a process that propels continuous quality improvement through implementing a series of repeated cycles of small scale changes. **[55]** It involves first identifying an issue of interest and developing a plan order to address it. After the plan is implemented, the appropriate personnel will review the outcomes of the plan, and determine how effective the plan was in terms of process flow and meeting goals. The necessary modifications are made to the plan before the next cycle is initiated.

The success of the PDSA approach depends on several organizational factors as well as how well defined and manageable the plan and goals are. **[56]** PDSA is found to be most effective when used to make change on a small scale, since process change is manageable and thus more effective on a small scale. In addition, there must be sufficient organizational resources such as staff and monitoring costs to make the change possible. Last but not least, staff cooperation as well as responsiveness is necessary to make any change possible.

2.2.4 On Measuring Qualitative Success of Quality Improvement Initiative:

2.2.4.1 On James Prochaska's Transtheoretical Model of Behavioral Change:

James Prochaska described intentional behavioral change as occurring in a series of 6 steps, namely, pre-contemplation, contemplation, preparation, action, maintenance, and termination. **[57]** The subject is said to be in a stage of pre-contemplation when he/she denies that there is a problem with his/her behavior. When in a stage of contemplation, the subject acknowledges that there is a problem, but has not resolved his/her ambivalence. In a stage of preparation, the subject gets ready to make a physical change sometime in the near future. When in action, the subject makes noticeable changes to himself/herself and/or to his/her surrounding environment. In maintenance, the subject maintains his/her newfound behavior. Last but not least, a stage of termination marks the end of the behavioral process. A subject is defined as being in a stage of termination when he/she has successfully implemented the new change into his/her lifestyle, such that it becomes a normal part of his/her routine. However, relapse can occur at anytime.

Prochaska's model has successfully been used to describe various different bio-psycho-social problems, such as domestic violence, HIV prevention, child abuse, and smoking cessation. **[58]** In addition, his model has been widely used to describe how one can improve his own management of diseases such as cancer, and diabetes. In addition, Prochaska has published literature on how his model has been used to improve patient overall preventative health in a primary care setting—to quit smoking, to eat overall healthily, and to receive mammograms.

2.2.5 On Measuring Quantitative Success of Quality Improvement Initiative: Methods of Statistical Analysis

2.2.5.1 On Univariate Analysis

Univariate analysis is used to describe data with only one variable. It does not deal with causes or relationships. The objective of the univariate analysis is to describe data—it summarizes the data and describes patterns within the data. **[59]** Univariate analysis describes the data's central tendency (such as the mean, median, and mode), the range, frequency distribution, quartiles, variance, standard deviation as well as confidence intervals for the mean. Univariate analysis allows the user to generate frequency distributions, bar charts, histograms, and pie charts.

In this study, PROC UNIVARIATE in SAS 9.4 was used to determine the proportion of patients that were either screened or treated appropriately for each category and then used to calculate confidence intervals. Other standard PROC UNIVARIATE output was suppressed as it did not add any applicable information to the study. The following code was used to obtain required information from PROC UNIVARIATE:

```
DATA variable;
        INPUT compliance;
        DATALINES;
X
```

```
Y
Z
;
RUN;
title 'Proportion of patients were treated/screened appropriately ( year X)';
ods select BasicIntervals;
PROC UNIVARIATE DATA = variable cibasic(alpha=0.05);
RUN;
```

2.2.5.2 On Chi-Squared Analysis

The difference of proportions chi-squared test can be used to compare two binomial proportions to determine whether or not one proportion is statistically greater than another. **[60]** In order to conduct the hypothesis test, two hypotheses must be generated, i.e. H_0 and H_a. The null hypothesis for one tailed difference of proportion test used in this study is P_1-P_2≥0. On the other hand the alternative hypothesis used was, P_1-P_2<0, where P_1 represents the proportion of patients that were positive/appropriately screened/appropriately treated in Academic year 2015-16 and P_2 represents the proportion of patients that were positive/appropriately screened/appropriately treated in Academic year 2016-17. N_1 represents the total amount of patients screened in the first sample and N_2 represents the total amount of patients that were screened in the second sample.

A z-score test statistic is computed through using the following equation:

$$Z = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\frac{\hat{p}(1-\hat{p})}{n_1} + \frac{\hat{p}(1-\hat{p})}{n_2}}}$$

The Z-score generated by this test is used to find the appropriate p-value for the correct number of degrees of freedom (N-1) using a Z-table.

Statistical significance is then established through comparing this p-value to an assigned significance level. There are commonly three different significance levels that are used: 0.01, 0.05, and 0.10. Of these three values, p=0.05 is most commonly used. The null hypothesis is rejected for p-values less than the significance level. Alternatively, the null hypothesis cannot be rejected for values greater than 0.05.

The difference of proportions test was used in this study to determine whether or not there was significant change in the proportion of instances the providers were in a particular stage of mindset from one year to the next. The null hypothesis was that "In academic year 2015-16, the proportion of instances that preceptors were in a stage of -_______________ was greater than or equal to the proportion of instances that preceptors were in that same stage in Academic year 2016-17." The alternative hypothesis was that "In academic year 2015-16, the proportion of instances that the preceptors were in a stage of _____________ was less than the proportion of instances that preceptors were in that same stage in Academic year 2016-17." In addition, the difference of proportions test was used in this study to determine whether or not there was a statistically significant increase in compliance to guidelines for each category from the first year to the next post intervention. The null hypothesis was that "The proportion of patients that were appropriately screened for/treated appropriately _____________ in Academic year 2015-16 was greater than or equal to the proportion of patients that were appropriately screened for/treated in Academic year 2016-17." The alternative hypothesis was that "The proportion of patients that were appropriately screened for/treated appropriately in Academic year 2015-16 was less than the proportion of patients that were appropriately screened for/treated for in Academic year 2016-17."

Below is the code used in SAS 9.4 to conduct chi-square analysis using PROC FREQ:

```
data YesNo;
	input Year $ NumYes Total;
	Response="Yes"; Count=NumYes; output;
	Response="No"; Count=Total-NumYes; output;
	datalines;
	Year1  x1 n1
	Year2  x2 n2
	;

	proc print noobs;
		var Year Response Count;
		Run;

proc freq order=data;
	weight Count;
	table Year * Response / chisq riskdiff;
	run;
```

2.2.5.3 On Two Sample T-test

The Two-sample t test is used to compare the means between two samples to determine whether or not their differences are statistically significant. **[61]** The test is first performed by first creating null and alternative hypotheses which generally take the form: H_0: The mean in sample population 1 is greater than the mean in sample population 2, and H_a: The mean is sample population 1 is less than the mean in sample population 2 and then by computing a t-score using the following equation:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{N_1} + \frac{s_2^2}{N_2}}}$$

Where x_1 and x_2 are the means of sample populations 1 and 2 respectively. Once the z-score is computed, a p-value is assigned to the score based on the number of degrees of freedom. The p-value is then compared to a significance level to assign significance to the result. Common significance levels are p=0.01, 0.05, and 0.10. For the purposes of this study, a p-value of 0.05 was used. If the computed p-value is less than the significance level, the null hypothesis is rejected. If the p-value is greater than the significance level, the null hypothesis cannot be rejected.

In this study, the one sample t-test was used to compare the means of different categories of patient data between academic years to determine whether or not there was a significant change in outcomes from one year to the next, post intervention. Categories analyzed included systolic blood pressures, diastolic blood pressures, total cholesterol, HDL levels, and LDL levels.

PROC TTEST was used in SAS 9.4 to complete the computation. The code below was used to generate results for the study:

```
data variable;
    input year $ reading;
    datalines;



;
run;
ods graphics on;
proc ttest data=variable alpha=0.05;
    title variable Difference Analysis Between Academic Year 2015-16 and
2016-17 for patients screened for appropriate category name';
    class year;
    var reading;
run;
ods graphics off;
```

2.3 CONCLUSION OF THE LITERATURE REVIEW:

Provider involvement in quality improvement initiatives have demonstrated to have an impact on quality of care provided as well as patient outcomes. Literature states that providing them with real time data about their performance not only has potential to improve their compliance to guidelines, but also induce them to initiate quality improvement initiatives. Their engagement can be qualitatively measured using James Prochaska's Transtheoretical Model of Behavioral change and quantitatively measured using statistical measures of change such as the chi-squared test as well as t-test.

2.4 RESEARCH QUESTIONS AND HYPOTHESES

The following are the questions that study aims to answer, as well as hypotheses:

1) How often are patients in New Jersey Family Practices being treated/screened in accordance with the latest guidelines for hyperlipidemia, men's preventative health, and stroke/heart disease prevention?

    a. Providers are in generally non-compliant with treating/screening patients with the latest guidelines.

2) Will raising awareness to compliance to guidelines/latest literature increase provider willingness to improve compliance to guidelines?

    a. Null Hypothesis: H_0: There is a statistically significant increase in the proportion of providers that decide to improve their compliance to guidelines in Academic year 2016-17 than in Academic year 2015-16.

    b. Alternative Hypothesis: H_a: There is not a statistically significant increase in the proportion of providers that decide to improve their compliance to guidelines in Academic year 2016-17 than in Academic year 2015-16.

3) Will raising awareness actually improve compliance to guidelines?

    a. Null Hypothesis: H_0: Raising awareness to a provider's compliance to guidelines will increase their compliance to guidelines.

    b. Alternative Hypothesis: H_a: Raising awareness to a provider's compliance to guidelines will have no impact on their future practice.

4) Does improving compliance to guidelines have an impact on patient outcomes?

    a. Null Hypothesis: H_0: There are statistically significant improvements to patient outcomes when providers are more compliant to guidelines.

    b. Alternative Hypothesis: H_a: There are no notable improvements in patient outcomes as providers increase compliance to guidelines.

CHAPTER 3

RESEARCH METHOD AND DESIGN

3.1 Objectives:

-Determine how often NJ Family Practices are complying with the latest evidence based guidelines for treatment of hyperlipidemia, men's preventative health, and stroke/heart disease prevention

-Determine whether or not there is an increase in compliance to the latest evidence based guidelines in treatment of hyperlipidemia, men's preventative health, and stroke/heart disease post QA/QI intervention

-Determine whether or not there were improvements in patient outcomes post QA/QI intervention

3.2 Data Source:

The data obtained for this study was collected through a QA/QI initiative started by Dr. Steven Keller across 40 New Jersey Family Practices, under IRB Pro20170000623. Each student randomly selects a topic and uses an appropriate random selection method to obtain a given number of patient charts. Upon obtaining those charts, the students screen the charts to determine whether or not their practice were meeting all the guidelines for treating that patient for a topic of interest. The results are recorded in a in a Microsoft Excel document. This data is then sent to Dr. Steven Keller. Data was collected over the span of two years, Academic year 2015-16 and Academic year 2016-17, over a span of 16 rotations. Each rotation consists of anywhere between 20-25 students.

In addition, to collecting raw data, students write up a 5 page paper summarizing the results of their study as well as their interaction with their preceptor about the results at the end of each rotation. In addition, surveys were sent out to the students at the end of each rotation and preceptors at the end of each academic year using the RedCap software.

3.3 Research Design:

The QA/QI initiative follows the Plan-Do-Study-Act (PDSA) approach. Each student is assigned a family practice in New Jersey, and shadows their attending preceptor over a period of 5 weeks. During the duration of their stay, in addition to learning how to conduct a history and physical, diagnose, and come up with a treatment plan for patients, they are also required to conduct a study to see how well their practice is doing with complying with the most recent guidelines in a particular area. The student selects a topic of interest (in this case, hyperlipidemia, men's preventative health, or stroke/heart disease prevention) and conducts an analysis to see what proportion of patients were appropriately screened for a given category. They also create confidence intervals for each category to get an estimate of how often their providers are treating patients in their practice appropriately. Upon completing this process, the students discuss their findings with their preceptor, and ultimately summarize their findings as well as interaction with their preceptor in a 5 page paper.

Analysis of study results was conducted qualitatively through applying James Prochaska's Transtheoretical Model of Behavioral Change, as well as quantitatively using univariate analysis, chi-squared analysis, as well as t-test analysis in SAS 9.4.

3.4 Data Elements:

The most popular topics selected by students for analysis were the following: 1) whether or not their providers were appropriately treating patients for hyperlipidemia, 2) whether or not male patients were screened for appropriate preventative measures, and 3) whether or not at risk stroke/heart disease patients were screened for appropriate preventative measures. With the exception of data that described certain patient characteristics (such as gender, race, etc.) and measures of patient health (such as cholesterol readings, blood pressures, etc.), most of the data elements were binary in nature, only assuming a value of 0 or 1. Tables 2,3, and 4 summarizes the information that was obtained from each patient chart per category:

Table 2: Criteria that was used for screening patient charts to determine whether or not they were appropriately treated for hyperlipidemia

Item #	Criteria	Coding
1	Sex	M=Male F=Female
2	Age	Value
3	Race	Race names kept
4	Total Cholesterol	Value
5	LDL	Value
6	HDL	Value
7	Is LDL $\geq$ 190?	0=No 1=Yes

8	Was patient fasting ≥ 12 hours before lipid panel?	0=No 1=Yes
9	Systolic blood pressure	Value
10	Is patient currently receiving medical treatment for hypertension?	0=No 1=Yes
11	Does the patient have diabetes?	0=No 1=Yes
12	Is the patient currently a smoker?	0=No 1=Yes
13	Does the patient have a history of heart disease or stroke?	0=No 1=Yes
14	Are category A patients being appropriately treated?	0=No 1=Yes
15	Are category B patients being appropriately treated?	0=No 1=Yes
16	Are category C patients being appropriately treated?	0=No 1=Yes
17	Are category D patients being appropriately treated?	0=No 1=Yes

Table 3: Criteria that was used for screening patient charts to determine whether or not eligible males received the recommended preventative care

Item #	Criteria	Coding
1	Was the patient screened for colorectal cancer?	0=No 1=Yes
2	Did the patient have a colonoscopy done within 10 years?	0=No 1=Yes
3	Did the patient have a sigmoidoscopy within 5 years?	0=No 1=Yes
4	Has the patient had a fecal blood test within the last year?	0=No 1=Yes
5	Was the patient screened for depression when staff assisted depression care supports were in place?	0=No 1=Yes
6	Did the patient have a Tdap vaccine once after age of 19?	0=No 1=Yes
7	Did the patient have 3 doses of HPV vaccine through the	0=No 1=Yes

	age of 21 for all males (some up to age 26?)	
8	Is the patient at risk for prostate cancer?	0=No 1=Yes
9	Was the patient screened for prostate cancer?	0=No 1=Yes
10	Was patient counseled on smoking cessation?	0=No 1=Yes
11	Is the patient at risk for AAA?	0=No 1=Yes
12	Was the patient screened for AAA?	0=No 1=Yes
13	Were patients over age of 45 recommended aspirin if benefits>risk for GI bleeding?	0=No 1=Yes
14	Were the eligible patients on aspirin?	0=No 1=Yes
15	Did patients have carotid screening?	0=No 1=Yes
16	Did patients $\geq$ 35 years of age have a lipid panel drawn?	0=No 1=Yes

Table 4: Criteria used to determine whether or not high risk patients received the appropriate preventative care for stroke/heart disease

Item #	Criteria	Coding
1	Systolic Blood pressure	Number
2	Diastolic Blood pressure	Number
3	Was the patient newly diagnosed with hypertension?	0=No 1=Yes
4	Was a dose increased or a new blood pressure med started?	0=No 1=Yes
5	Was a lipid profile obtained within the last 13 months?	0=No 1=Yes
6	Is the patient on aspirin or other antithrombotic?	0=No 1=Yes
7	Was the patient’s smoking status updated within a year?	0=No 1=Yes
8	If the patient is a smoker, is there documentation of smoking cessation advice?	0=No 1=Yes
9	Was the patient screened for diabetes?	0=No 1=Yes

10	Is the patient diagnosed with diabetes?	0=No 1=Yes

Other topics were not included due to lack of sufficient data for comparison (please see Table 5 below). Selecting adult vaccinations for analysis would not have been ideal for comparison since there were only 16 available data points to compare to the 1,101 points that were available in academic year 2016-17. In addition, upon looking at the data available for Women's Preventative health, it was found that many data values were missing—therefore conducting a comparison analysis would provide very little meaning. Last but not least, there were only 41 data values available for osteoporosis in Academic year 2015-16 to compare the 249 data values that were available in academic year 2016-17. For the sake of completeness, therefore, the top three categories were selected.

Table 5: Number of Data Points Available for Common Topics Students Selected		
Category	Academic year 2016-16	Academic year 2016-17
Hyperlipidemia	**1936**	**1044**
Stroke/Heart Disease Prevention	**448**	**488**
Men's Preventative Health	**226**	**195**
Adult Vaccinations	16	247
Women's Preventative Health	172	201
Osteoporosis	41	249

3.5 Sample Population:

In academic year 2015-16, there were a total of 1,936 patients screened for appropriate treatment of hyperlipidemia. In order to limit the sample population to strictly patients that were diagnosed with hyperlipidemia, combinations of the following diagnosis codes were used: ICD-9= 272.0 or ICD-10= E78.1+E78.2+E78.3+E78.4+E78.5

(since prior to October 2015, ICD-9 codes were still in use). In academic year 2016-17, there were a total of 1,044 patients screened using the same criteria.

In academic year 2015-16, there were a total of 226 males that were screened to determine whether or not they received recommended preventative care. The students limited their sample population to males aged 18 or above. In academic year 2016-17, there were a total of 195 patient screened using the same criteria.

In academic year 2015-16, there were a total of 448 patients that were screened to determine whether or not they received recommended care for prevention of stroke/heart disease. In academic year 2016-17, there were a total of 488 patients that were screened using the same criteria.

3.6 Measurement of Exposure and Outcome Variables:

There were two objectives of the experiment: 1) to determine whether or not over time compliance to guidelines would increase after physicians were aware of their performance and 2) to determine whether or not there would be an improvement in patient outcomes if there were improvement in compliance. Therefore, the exposure and outcome variables were the same.

There were categorical as well as numerical variables involved in the experiment (please refer to Tables 2, 3, and 4). Of these variables, some described the characteristics of the sample population (independent variables), some describe guideline compliance (dependent variables), and some described patient outcomes (dependent variables). The variables that described guideline compliance were binary variables—they were either assigned a value of “Y” or “N” (yes or no, respectively). For example, one of the criteria required for appropriate screening for patients diagnosed with hyperlipidemia is to ensure that the patient had a lipid panel drawn within the last 13 months. If the patient had a lipid panel drawn, the student would indicate "Y" for yes. If not, they would indicate "N" for no. Students indicated exact numerical values for variables such as age and blood pressure. Last but not least, for categorical variables such as race, students would indicate the appropriate name.

3.7 Statistical Analysis:

In order to analyze sample characteristics for each topic for each academic year (such as age, race, and gender), pie charts and histograms were created and descriptive statistics were computed using SAS 9.4 and Microsoft Excel 2016. SAS 9.4 was also used to compare differences in characteristics, generate difference of proportions analyses, as well as conduct several t-tests.

In addition to analyzing sample characteristics, the exposure and outcome variables were also analyzed. Proportions were calculated, descriptive statistics were computed, and confidence intervals were constructed. In addition, a difference of proportions analysis was conducted to determine whether or not there was a statistically significant change over time ($p<0.05$).

Last but not least, change in outcomes were measured for variables such as systolic blood pressures, diastolic blood pressures, and cholesterol levels. The one-sided two sample t-test at a significance level of 0.05 was used to measure the significance in change of outcomes over time.

3.8 Data Handling and Pre-Processing:

All of the data was collected from the Excel spreadsheets submitted to Rutgers New Jersey Medical School Department of Family Medicine. The most common topics selected for analysis were hyperlipidemia, men's preventative health, and stroke/heart disease prevention. All of the data in each individual spreadsheet for each topic were combined into one master spreadsheet. This was repeated for academic year 2016-17. Spreadsheets that did not follow the specified format for reporting data were eliminated. Additionally, spreadsheets with incomplete data were eliminated.

Once all of the eligible data were together in an Excel spreadsheet, all binary variables that were originally assigned "Y" or "N" were converted to "1" or "0" respectively for easier processing. Descriptive statistics were computed respectively.

CHAPTER 4

RESULTS

4.1 On current compliance to evidence based practice:

In academic year 2015-16, there were a total of 177 QA/QI studies conducted in family practices across New Jersey. 98% of the studies identified a problem with the preceptor complying with evidence based practice. For the purposes of this study, data was selected from 3 commonly chosen QA/QI study topics, namely hyperlipidemia, men's preventative health, and heart disease/stroke prevention to determine how often family practices were meeting the latest guidelines when treating their patients.

4.1.1 Hyperlipidemia:

4.1.1.1 Sample Characteristics for Patients Screened for Appropriate Treatment of Hyperlipidemia—Academic year 2015-16:

There were a total of 1,936 patients screened for appropriate treatment of hyperlipidemia in Academic year 2015-16. Of these 1,936, 966 were documented as female and 970 were documented as male (see Figure 3).

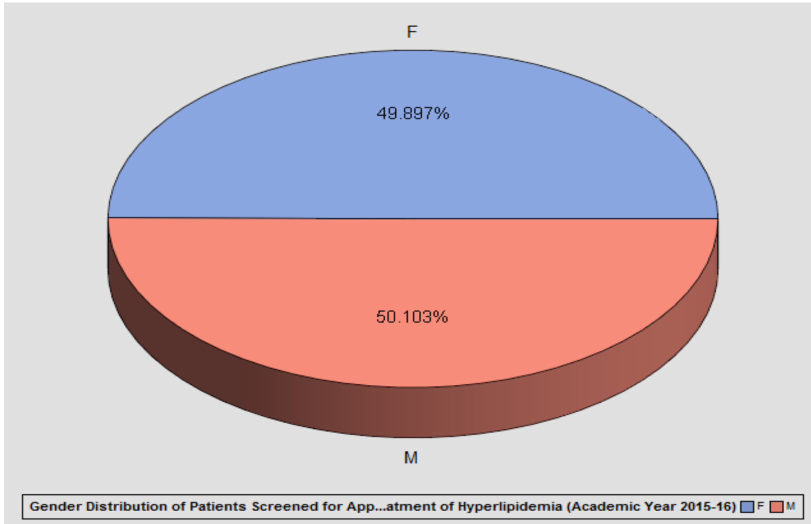


Figure 3: Gender Distribution of Patients Screened for Appropriate Treatment of Hyperlipidemia (Academic year 2015-16)

The ages of the patients within the population sample ranged from 21 to 94, with the average patient being about 61 years old.

Age Distribution of Patients that were Screened for Appropriate Treatment of Hyperlipidemia (Academic Year 2015-16)

Basic Statistical Measures			
Location		Variability	
Mean	61.07645	Std Deviation	12.5120446
Median	62.00000	Variance	156.551259
Mode	61.00000	Range	73
		Interquartile Range	17

Modes	
Mode	Count
61	71

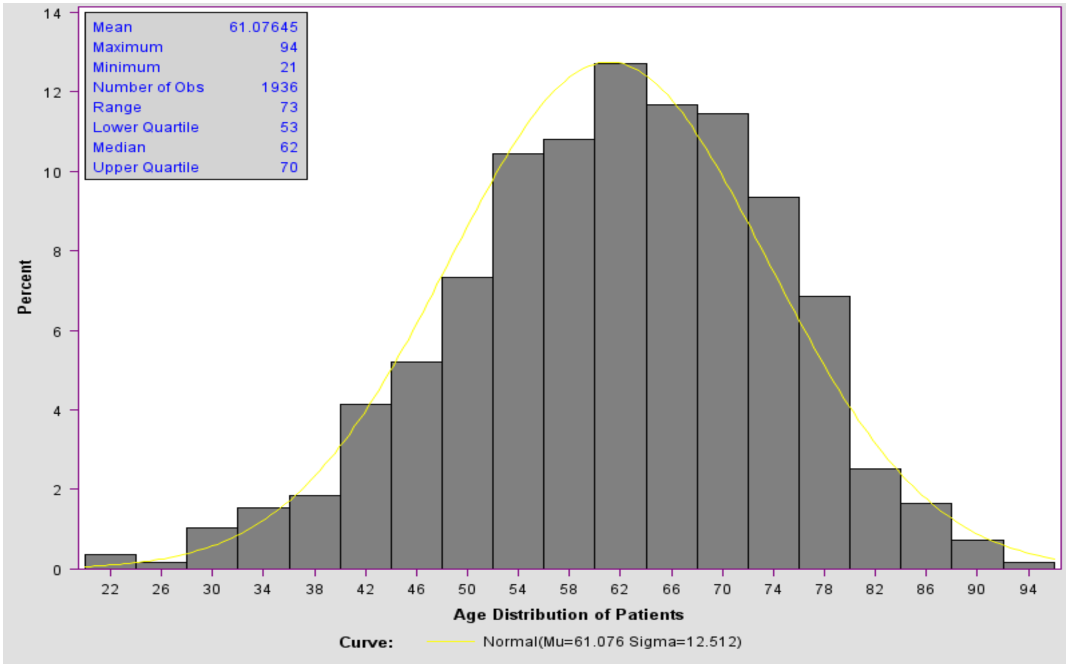


Figure 4: Age Distribution of Patients that were Screened for Appropriate Treatment of Hyperlipidemia, Academic Year 2015-16

Figure 4 is a summary of the descriptive statistics generated by SAS 9.4 to describe the distribution of the data. As shown, the age distribution of the sample population is almost normal with a mean of 61.07, median of 62, and mode of 61. The range of the sample population is 73.

As shown in Figure 5, the sample population was primarily of Caucasian descent (about 67%), with Hispanic (10.80%) and Black (9.76%) following as the next categories with the largest amount of patients respectively.

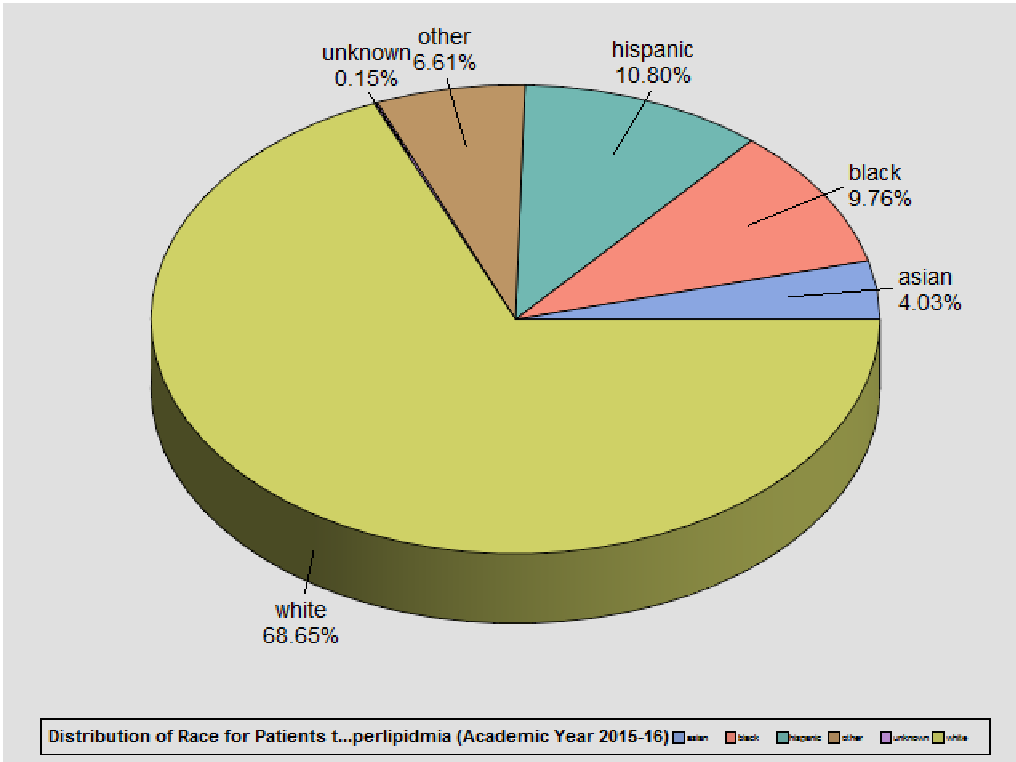


Figure 5: Racial makeup of patients that were screened for Appropriate Treatment of Hyperlipidemia (Academic year 2015-16)

The population consisted of 579 diabetic patients, about 29.8% (SD 0.46). Constructing a 95% confidence interval, at best 27.9% of the population is diabetic and at worst 32.0% (see Figure 6).

Proportion of patients that were diabetic in sample population screened for appropriate treatment of hyperlipidemia (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: diabetic1

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.29922	0.27880	0.31965
Std Deviation	0.45804	0.44405	0.47294
Variance	0.20980	0.19718	0.22368

Figure 6: Descriptive statistics generated by SAS 9.4 describing proportion of patients that were diabetic in Academic year 2015-16

There were 180 documented smokers in the sample population, about 9.3% (SD 0.29). Upon conducting a 95% confidence interval, at best 8.0% of the population are smokers and at worst 11.6% of the population are smokers (please see Figure 7).

Proportion of patients that were smokers in sample population screened for appropriate treatment of hyperlipidemia (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: smoker1

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.09312	0.08015	0.10609
Std Deviation	0.29068	0.28179	0.30014
Variance	0.08449	0.07941	0.09008

Figure 7: Descriptive statistics generated by SAS 9.4 describing proportion of patients that were smokers in Academic year 2015-16.

In addition, there were 247 (12.8% SD 0.335) patients that were documented as having a history of heart disease or stroke. With a 95% confidence interval, at best 11.4% of the patients have a history of stroke and at worst 14.3% (see Figure 8).

Proportion of patients that had a history of heart disease/stroke in sample population screened for appropriate treatment of hyperlipidemia (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: heart1

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.12811	0.11318	0.14304
Std Deviation	0.33430	0.32407	0.34520
Variance	0.11176	0.10502	0.11916

Figure 8: Descriptive statistics generated by SAS 9.4 describing proportion of patients that had a history of heart disease or stroke (Academic year 2015-16)

The distribution of systolic blood pressures for the patients included in the sample were also analyzed. After a statistical analysis was conducted, it was found that the average systolic blood pressure was 127.32 (SD 14.88, 95% CI [126.66,126.99]) (see Figure 10). The distribution of systolic pressures (see Figure 9) was approximately normal, with a median of 126.00 and mode of 130.00.

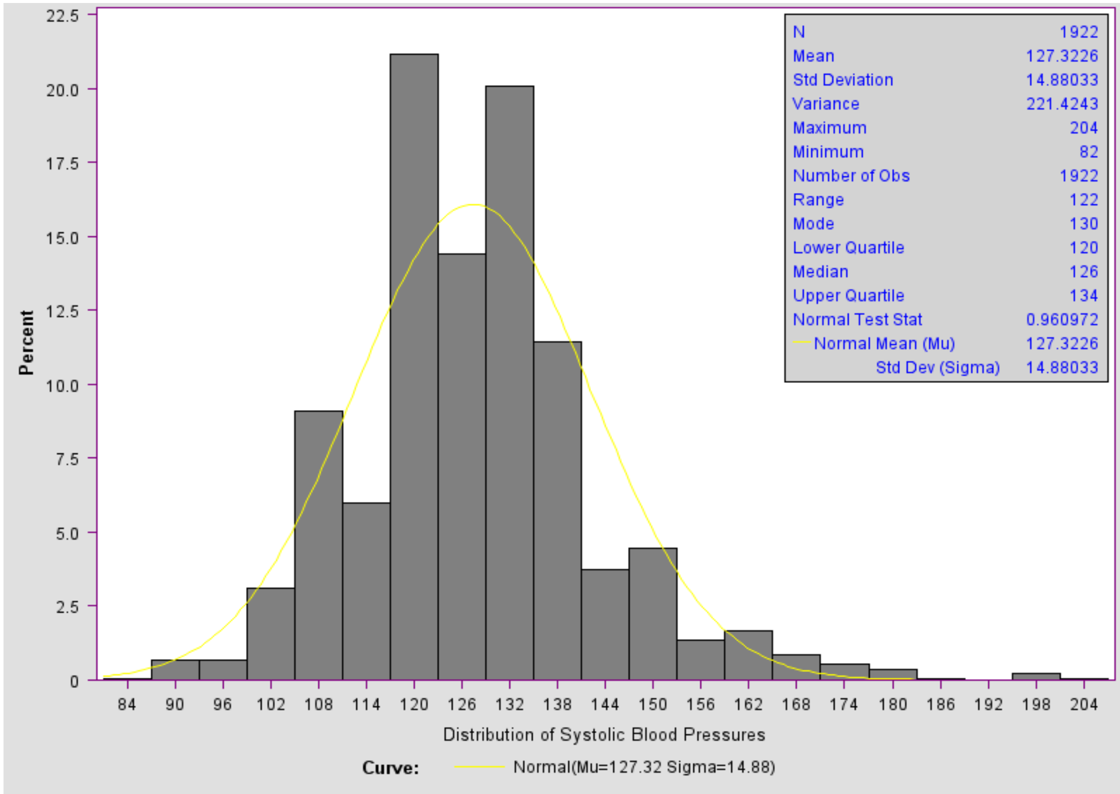


Figure 9: Distribution of Systolic Blood pressures for patients in sample population screened for appropriate treatment of Hyperlipidemia (Academic year 2015-16)

Distribution of Systolic Blood Pressures in sample population for patients screened for appropriate treatment of Hyperlipidemia (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: systolic1

Moments

N	1922	**Sum Weights**	1922
Mean	127.322581	**Sum Observations**	244714
Std Deviation	14.8803313	**Variance**	221.424258
Skewness	0.77253947	**Kurtosis**	2.06735022
Uncorrected SS	31582974	**Corrected SS**	425356
Coeff Variation	11.6871109	**Std Error Mean**	0.33941881

Basic Statistical Measures

Location		**Variability**	
Mean	127.3226	**Std Deviation**	14.88033
Median	126.0000	**Variance**	221.42426

Basic Statistical Measures

Location		Variability	
Mode	130.0000	**Range**	122.00000
		Interquartile Range	14.00000

Basic Confidence Limits Assuming Normality

Parameter	Estimate	95% Confidence Limits	
Mean	127.32258	126.65691	127.98825
Std Deviation	14.88033	14.42436	15.36629
Variance	221.42426	208.06222	236.12273

Tests for Location: Mu0=0

Test	Statistic		p Value	
Student's t	**t**	375.1194	**Pr > |t|**	<.0001
Sign	**M**	961	**Pr >= |M|**	<.0001
Signed Rank	**S**	924001.5	**Pr >= |S|**	<.0001

Quantiles (Definition 5)

Level	Quantile
100% Max	204
99%	172
95%	153
90%	146
75% Q3	134
50% Median	126
25% Q1	120
10%	110
5%	106
1%	95
0% Min	82

Extreme Observations

Lowest		Highest	
Value	**Obs**	**Value**	**Obs**
82	20	196	1719
88	905	198	756
90	1844	198	1035
90	1795	200	1725
90	1741	204	1584

Figure 10: Summary of Descriptive statistics of systolic blood pressures for sample of patients screened for appropriate treatment of hyperlipidemia (Academic Year 2015-16)

4.1.1.2 Analysis of patients that were screened for appropriate treatment of hyperlipidemia (Academic year 2015-16):

4.1.1.2.1 Did patients fast>12 hours before lipid panel?:

For monitoring statin therapy The American College of Cardiology/American Heart Association recommends that a fasting lipid panel be drawn "…within 4-12 weeks after initiation or dose adjustment, and every 3-12 months thereafter." **[62]** There were a total of 1465 patients that were documented to have fasted greater than 12 hours prior to the lipid panel (0.759 SD 0.428). Upon conducting a 95% confidence interval, at worst 74.0% and at best 77.8% percent of patients were documented to have fasted (see Figure 11).

Proportion of patients that fasted >12 hours before lipid panel (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	**Estimate**	**95% Confidence Limits**	
Mean	0.75907	0.73997	0.77816
Std Deviation	0.42776	0.41468	0.44170
Variance	0.18298	0.17196	0.19510

Figure 11: Descriptive statistics generated by SAS 9.4 describing proportion of patients documented to have fasted greater than 12 hours before lipid panel (Academic year 2015-16)

4.1.1.2.2 Were patients currently receiving treatment for hypertension?

An amendment to the ACC/AHA guidelines for hyperlipidemia published in 2014 required that providers treat patients with hyperlipidemia for hypertension since doing so will reduce the patient's risk of cardiovascular disease. **[63]** There were a total of 1,110 patients in the sample that were documented to have received treatment for hypertension (0.573 SD 0.495). With a 95% confidence interval, there are at best 59.5% and at worst 55.1% of patients receiving treatment for hypertension (See Figure 12).

Proportion of patients that are currrently receiving treatment for hypertension in sample population screened for appropriate treatment of hyperlipidemia (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: hypertension1

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.57335	0.55130	0.59540
Std Deviation	0.49472	0.47961	0.51081
Variance	0.24475	0.23003	0.26093

Figure 12: Descriptive statistics generated by SAS 9.4 describing proportion of patients currently Receiving treatment for Hypertension (Academic year 2015-16)

4.1.1.2.3 Analysis of proper treatment of patients within stratified 4 treatment categories based on diagnosis of clinical arteriosclerotic cardiovascular disease (ASCVD), cholesterol levels, diabetes, and estimated 10-year ASCVD risk

4.1.1.2.3.1 How often are category A patients treated appropriately?

The ACC/AHA guidelines describe category A patients as those whose LDL levels were greater than or equal to 190 mg/dL or had ASCVD. The guidelines indicate that these patients should be treated with a high-intensity statin such as Atorvastatin 40-80 mg or Rosuvastatin 20-40 mg. **[64]**

In the sample population, there were a total of 332 Category A patients. Of these patients 152 patients or, 45.7% [SD 0.495] were documented to have been treated appropriately. Constructing a 95% confidence interval, it is found that at worst 40.3% and at best 51.1% of patients are being treated appropriately (see Figure 13).

Proportion of Category A patients were treated appropriately (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.45783	0.40396	0.51170
Std Deviation	0.49897	0.46368	0.54012
Variance	0.24897	0.21500	0.29172

Figure 13: Descriptive statistics generated by SAS 9.4 describing proportion of category A patients that are being treated appropriately (Academic year 2015-16)

4.1.1.2.3.2 How often are category B patients treated appropriately?

The guidelines describe category B patients as those with diabetes who do not fit in category A. These patients should be treated with a moderate-intensity statin such as Atorvastatin 10-20 mg, Rousuvastatin 5-10 mg, Simvastatin 20-40 mg, Pravastatin 40-80 mg, Pitvastatin 2-4 mg, Lovastatin 40 mg, or Fluvastatin XL 80 mg. **[64]**

There were a total of 511 patients that fell under category B in academic year 2015-16. Of these 511 patients, 364 (0.712 SD 0.451) were treated appropriately. A 95% confidence interval indicates that at worst 67.6% and at best 75.5% of patients are being treated appropriately (see Figure 14).

Proportion of Category B patients were treated appropriately (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.71233	0.67295	0.75171
Std Deviation	0.45312	0.42694	0.48275
Variance	0.20532	0.18228	0.23305

Figure 14: Descriptive statistics generated by SAS 9.4 describing proportion of category B patients that are being treated appropriately (Academic year 2015-16)

4.1.1.2.3.3 How often are category C patients treated appropriately?

Category C patients are patients that did not meet criteria to fit in category A or B and have an ASCVD risk that is greater than 7.5%. These patients should be treated with the same moderate intensity statin that category B patients would be treated with. **[64]**

Proportion of Category C patients were treated appropriately (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.63984	0.59749	0.68219
Std Deviation	0.48053	0.45240	0.51242
Variance	0.23091	0.20467	0.26258

Figure 15: Descriptive statistics generated by SAS 9.4 describing proportion of category C patients that are being treated appropriately (Academic year 2015-16)

There were a total of 497 patients that were stratified as being in Category C in academic year 2015-16. Of these patients, 318 [0.640 (SD 0.481)] were documented to have been treated appropriately. A 95% confidence interval reports that at worst 59.7% and at best 68.2% of the time patients are being treated appropriately (See figure 15).

4.1.1.2.3.4 How often are category D patients being treated appropriately?

Category D patients are described as those that did not fit the criteria to be classified as categories A, B, or C. The guidelines recommend that category D patients be counseled on lifestyle modifications (examples: incorporating a healthy heart diet, exercising regularly, achieving and maintaining a healthy weight, and keeping away from tobacco products.) **[64]**

There were a total of 727 Category D patients in the sample population. Of the 727, 626 [0.861 SD (0.346)] were documented to have been treated appropriately. A 95% confidence interval indicates that at worst 83.6% and at best 88.6% of the time category D patients are being treated appropriately (see Figure 16).

Proportion of Category D patients were treated appropriately (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.86107	0.83587	0.88627
Std Deviation	0.34611	0.32919	0.36488
Variance	0.11979	0.10836	0.13314

Figure 16: Descriptive statistics generated by SAS 9.4 describing proportion of category D patients that are being treated appropriately (Academic year 2015-16):

4.1.2 Men's Preventative Health

4.1.2.1 Sample Characteristics for Population of Patients selected for study on Appropriate Screening of Men's Preventative Health—Academic year 2015-16

There were a total of 226 male patients that were screened for appropriate preventative measures in Academic year 2015-16. Of these 226, 46 or 20.9% (SD 0.407) were at high risk for prostate cancer (see Figure 17). Using a 95% confidence interval, at worst 26.2% of the population and at best 15.5% were at risk. Additionally, there was a total of 70 (31.3% SD 0.465) patients that were at risk for AAA (see Figure 18). Predicted by a 95% confidence interval, at least 25.1% of the population is at risk and at most 37.4%. 26.8% (SD 0.445) were at risk for GI bleeding, with a 95% confidence interval of [0.205,0.333] (Figure 19). Last but not least, 16.97% of patients were at risk for I, and upon constructing a 95% confidence interval, it is found that at worst 22% of population is at risk and at best 11.9% of the population is at risk (Figure 20).

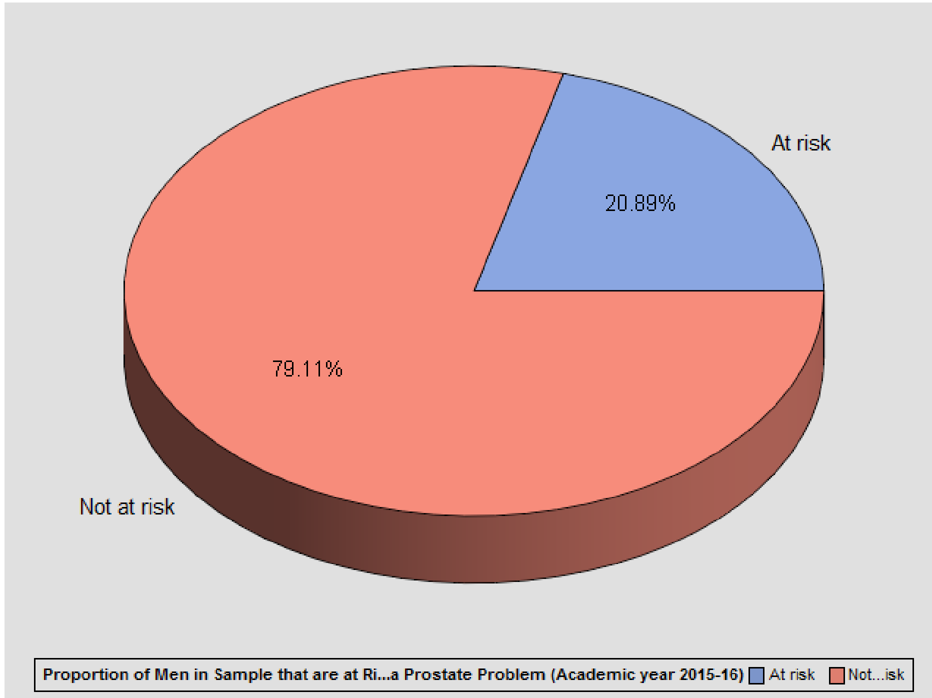


Figure 17: Proportion of male patients that were at high risk for prostate cancer (Academic year 2015-16)

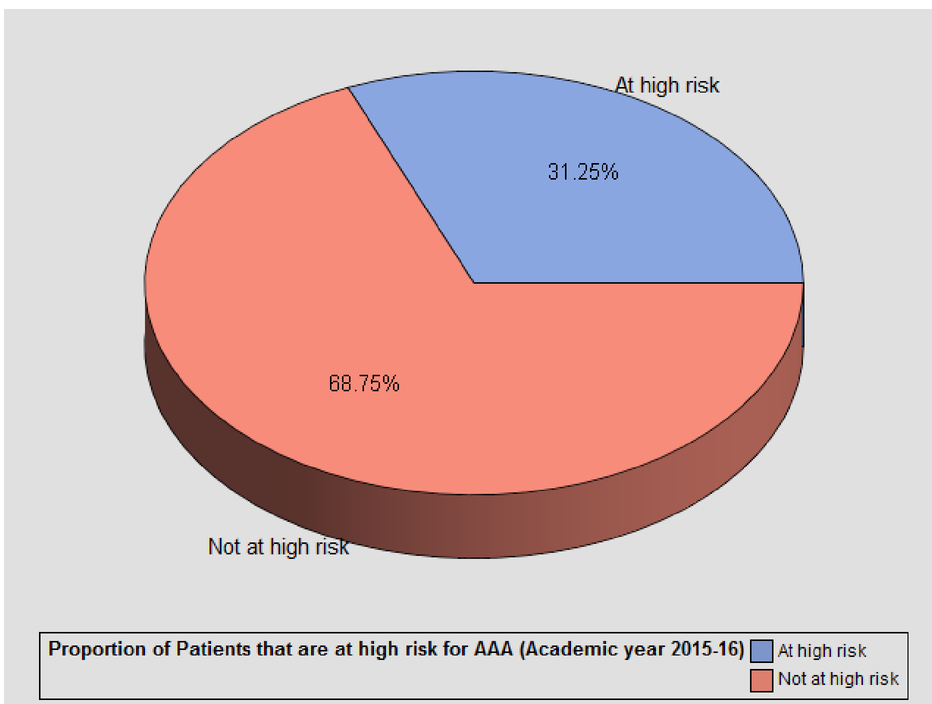


Figure 18: Proportion of male patients at high risk for AAA (Academic year 2015-16)

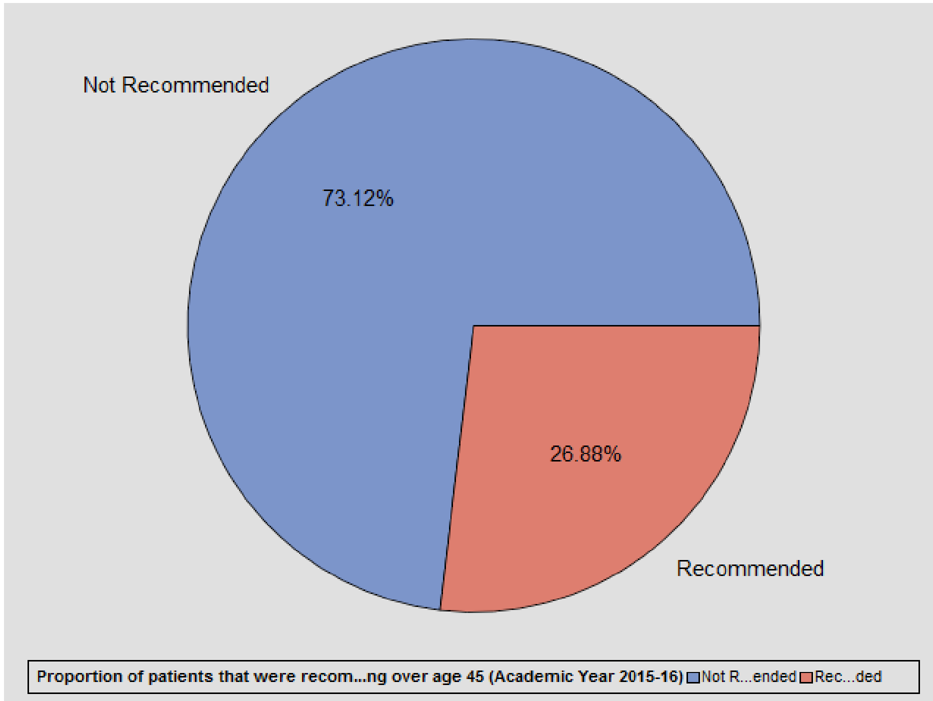


Figure 19: Proportion of male patients that were at risk for GI bleeding (Academic year 2015-16)

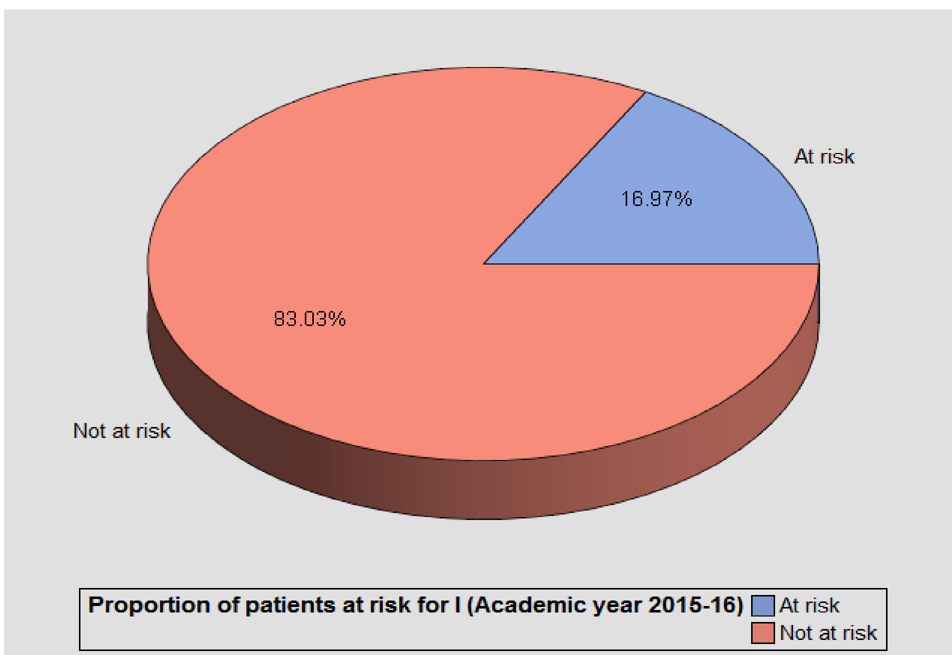


Figure 20: Proportion of male patients at risk for I (Academic year 2015-16)

4.1.2.2 Analysis of patients that were screened for appropriate Male Preventative Screening (Academic year 2015-16)

4.1.2.2.1 How often were men appropriately screened for colorectal cancer?

The U.S. Preventive Services task force provides appropriate preventative screening guidelines for patients. The USPSTF recommends screening for colorectal cancer using any of the following methods: fecal occult blood testing, sigmoidoscopy, or colonoscopy in adults, beginning age 50. **[65]** Of a total of 194 eligible patients, 131, or 67.5% were screened correctly for colorectal cancer. Upon constructing a 95% confidence interval, it can be concluded that at worst 60.9% of patients in New Jersey family practices are being screened correctly for colorectal cancer, and at best 74.2%.

There were 117 (52.7%) patients that had a colonoscopy done within 10 years. At worst, 46.1% of the patient population had a colonoscopy done and at best 59.3%. There were a total of 3 patients (1.4%) of patients that had a sigmoidoscopy done within 5 years (95% CI [0,3.0]). Additionally, there were only 18 (8.5%) patients that occult blood testing in Academic year 2015-16 (95% CI [4.7,12.3]).

4.1.2.2.2 How often were men screened for depression when staff assisted depression care supports are in place?

The latest guidelines for depression screening in adults were published by the USPSTF in 2015. There is strong evidence to suggest screening for depression (inclusive of proper diagnosis, effective treatment, and required follow up) with the appropriate systems in place leads to better patient outcomes. **[66]**

During Academic year 2015-16, 124 or 55.6% (SD 0.498), of male patients were appropriately screened for depression with at worst 49.0% and at best 62.2% being screened. Please see Figures 21 and 22 below for summary statistics and visual distribution.

Proportion of patients that were screened for depression when staff assisted care supports were in place (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	**Estimate**	**95% Confidence Limits**	
Mean	0.55605	0.49034	0.62177
Std Deviation	0.49797	0.45564	0.54903
Variance	0.24797	0.20761	0.30143

Figure 21: Summary statistics for number of males that were appropriately screened for Depression (Academic year 2015-16)

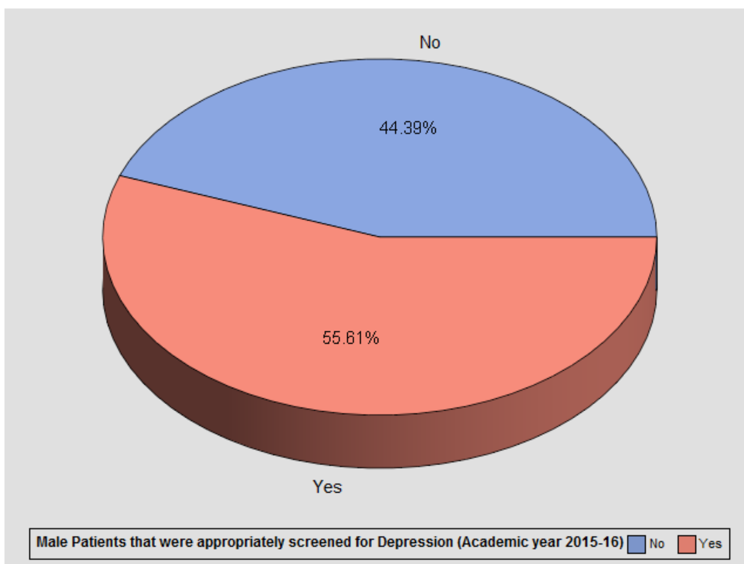


Figure 22: Proportion of males that were appropriately screened for Depression Academic year 2015-16)

4.1.2.2.3 Have male patients been given TDAP vaccine after age of 19?

The Advisory Committee on Immunization Practices (ACIP) recommends that adults aged 19-64 years should receive a single dose of TDAP to replace tetanus and diphtheria toxoids vaccine (Td) for booster immunization against tetanus, diphtheria and pertussis if they received their last dose of Td ≥ 10 years earlier and they have not previously received TDAP. **[67]**

Of the sample population, 142, 64.8% (SD 0.479) of eligible male patients in the sample population were documented to have received the TDAP vaccine in Academic year 2015-16 (see Figure 23). Upon construction a 95% confidence interval, at worst 58.5% and at best 71.2% of the eligible males received the vaccine (see Figure 24).

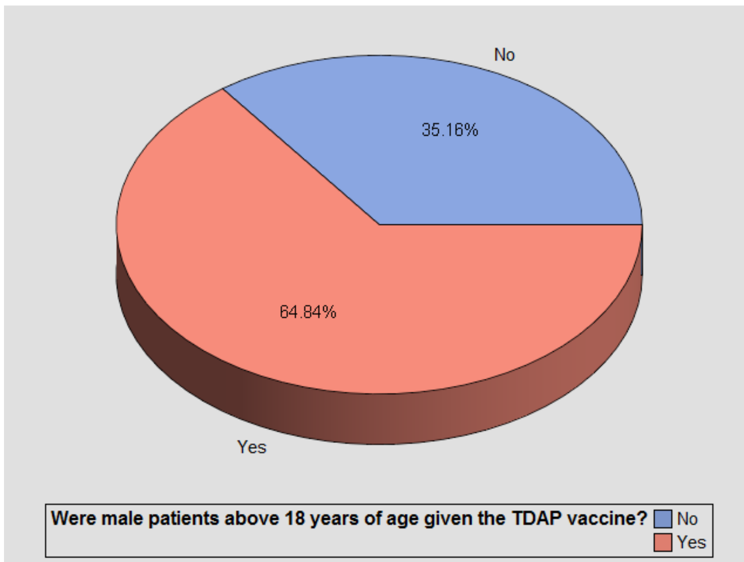


Figure 23: Proportion of males patients that were documented to have received the TDAP vaccine Academic year 2015-16)

Proportion of patients that were given the TDAP vaccine after age 19 (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.64840	0.58467	0.71214
Std Deviation	0.47856	0.43755	0.52813
Variance	0.22902	0.19145	0.27892

Figure 24: Summary statistics for proportion of males that were appropriately documented to have received the TDAP vaccine (Academic year 2015-16)

4.1.2.2.4 Have male patients between ages 21 to 26 received 3 doses of the HPV vaccine?

The most recent guidelines by the ACIP recommends that males between the ages of 21-26 are vaccinated with 3 doses of HPV vaccine at 0, 1-2, and 6 months. **[68]**

Of the sample population, only 7, or 4.7% (SD) of male patients screened received the shots as appropriate (see Figure 25). Using a 95% confidence interval, at worst 1.3% of patients received the shots and at best 8.1% (see Figure 26).

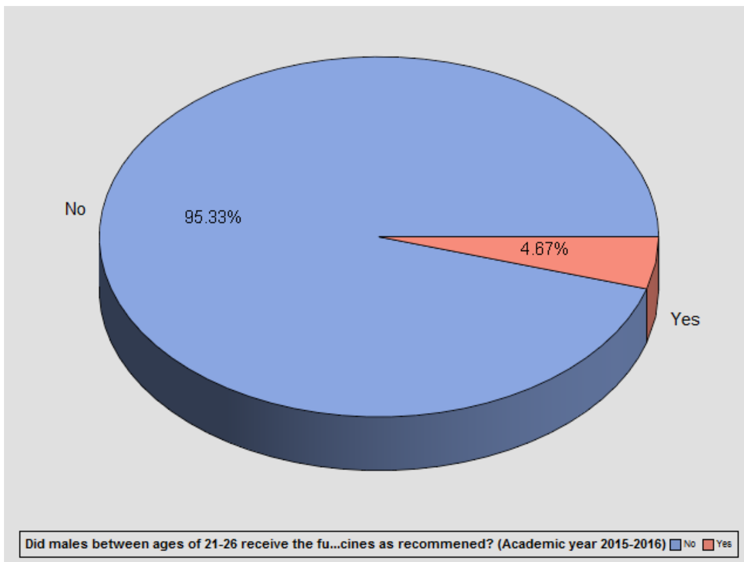


Figure 25: Proportion of males that were documented to have appropriately received 3 doses of HPV vaccine (Academic year 2015-16)

Proportion of patients that were given 3 doses of the HPV vaccine through age 21 and some up to age 26 (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.04667	0.01252	0.08081
Std Deviation	0.21163	0.19009	0.23872
Variance	0.04479	0.03613	0.05699

Figure 26: Summary statistics for proportion of males that were documented to have appropriately received 3 doses of HPV vaccine (Academic year 2015-16)

4.1.2.2.5 Have eligible male patients been counseled on smoking cessation?

The USPSTF recommends with Grade A evidence that all adults should be screened for tobacco use and provide the appropriate cessation advise. **[69]** If appropriate, patients should be provided behavioral interventions, and pharmacotherapy approved by the FDA.

In Academic year 2015-16, there were a total of 191 smokers in the sample population. Of the 191, 168 (88% SD 0.326) were appropriately counseled (see Figure 27). Using a 95% confidence interval, at worst 83.3% are being appropriately counseled and at best 92.6% (See Figure 28).

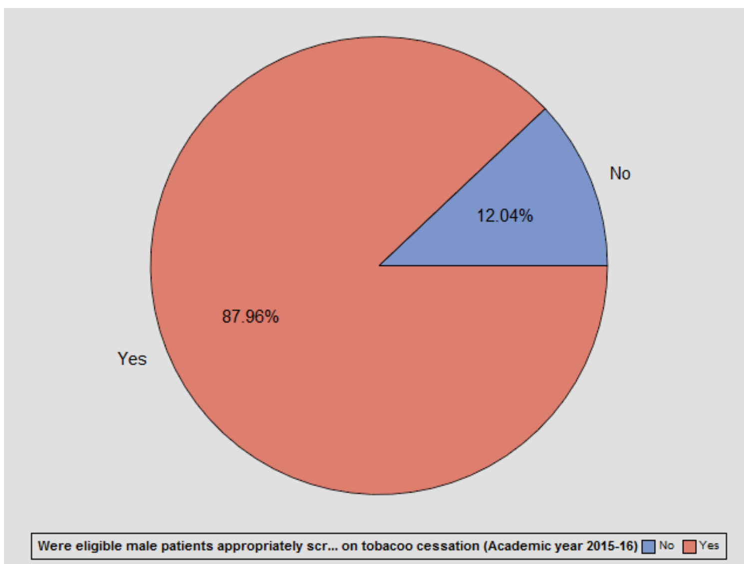


Figure 27: Proportion of eligible males that were being appropriately counseled for smoking cessation (Academic year 2015-16)

Proportion of patients that were asked about smoking and if eligible, counseled on smoking cessation (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.87958	0.83301	0.92615
Std Deviation	0.32631	0.29654	0.36277
Variance	0.10648	0.08793	0.13160

Figure 28: Summary statistics for proportion of male patients that were appropriately counseled on smoking cessation (Academic year 2015-16)

4.1.2.2.6 Have male patients been screened appropriately for AAA?

The USPSTF recommends that men between ages 65-75 be screened for Abdominal Aortic Aneurysm (AAA) with ultrasonography if they have ever smoked. **[70]**

There were a total of 137 eligible patients that required screening for AAA in Academic year 2015-16's sample population. Of the 137 patients, 22 (16.1% SD 0.031) were appropriately screened (Figure 29). Constructing a 95% confidence interval, it is demonstrated that at worst 9.8% and at best 22.3% of patients are being screened appropriately for AAA (Figure 30).

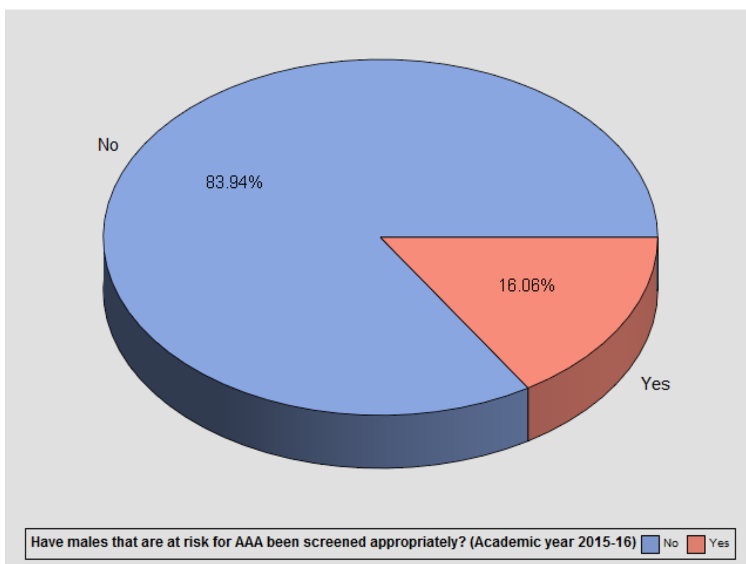


Figure 29: Proportion of patients at risk for AAA that were appropriately screened (Academic year 2015-16)

Proportion of patients that were appropriately screened for AAA (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.16058	0.09833	0.22284
Std Deviation	0.36849	0.32942	0.41817
Variance	0.13579	0.10852	0.17486

Figure 30: Summary Statistics for proportion of males that were at risk for AAA that were appropriately screened (Academic year 2015-16)

4.1.2.2.7 Are male patients on aspirin being appropriately screened for GI bleeding?

A study by Whitlock (Annals of Internal Medicine, April 2016) demonstrated that patients on aspirin for prevention of cardiovascular disease had an increased risk for GI bleeding by 58%. Consequently, the USPSTF recommends that the provider performs an individual assessment of aspirin on bleeding risks and screen appropriately. **[71]**

In academic year 2015-16, there were a total of 118 (53.9 SD 0.499) patients that were appropriately screened for GI bleeding (Figure 31). Using a 95% confidence interval, at worst 47.2% and at best 60.5% of patients are being screened appropriately. (Figure 32).

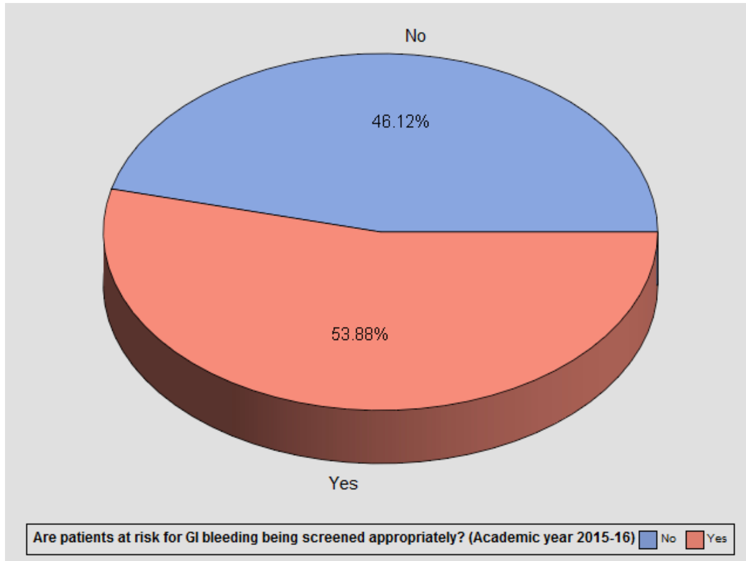


Figure 31: Proportion of patients that are being appropriately screened for GI bleeding (Academic year 2015-16)

Proportion of patients that were appropriately screened for GI Bleeding (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.53881	0.47227	0.60535
Std Deviation	0.49963	0.45681	0.55138
Variance	0.24963	0.20868	0.30402

Figure 32: Summary statistics of patients that are being appropriately screened for GI bleeding (Academic year 2015-16)

4.1.2.2.8 Are male patients being appropriately screened for high blood pressure?

A USPSTF update in October 2015 for detecting hypertension in adults recommends that adults aged 18 years or older be screened for high blood pressure. **[72]** It also recommends that measurements of blood pressure should be obtained outside of the clinical setting before starting treatment on patient.

In academic year 2015-16, there were a total of 176 (81.9% SD 0.386) patients that were appropriately screened for high blood pressure (see Figure 33). Upon constructing a 95% confidence interval it is shown that at worst 76.7% and at best 87.1% of patients are being screened for hypertension (see Figure 33).

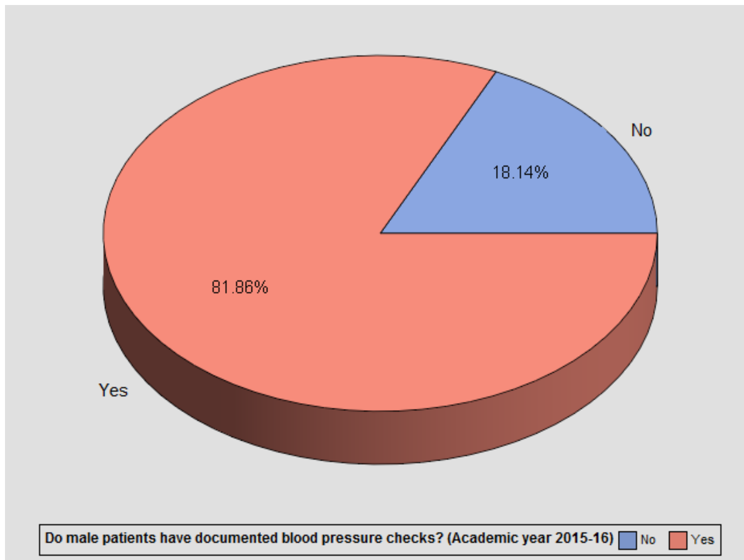


Figure 33: Proportion of males that had their blood pressure checked (Academic year 2015-16)

Proportion of patients that their blood pressure checked (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.81860	0.76668	0.87053
Std Deviation	0.38624	0.35286	0.42666
Variance	0.14918	0.12451	0.18204

Figure 34: Summary Statistics describing proportion of patients appropriately screened for high blood pressure (Academic year 2015-16)

4.1.2.2.9 How often are male patients being screened appropriately for carotid artery stenosis?

In an update in 2014, the USPSTF recommended against screening for carotid artery stenosis unless the patient was symptomatic. **[73]**

There were a total of 50 (22.2% SD 0.417) males in the sample population that were correctly screened for carotid artery stenosis in academic year 2015-16 (Figure 35). Using a 95% confidence interval, at worst 16.7% and at best 27.7% of male patients are being screened correctly for carotid artery stenosis (Figure 36).

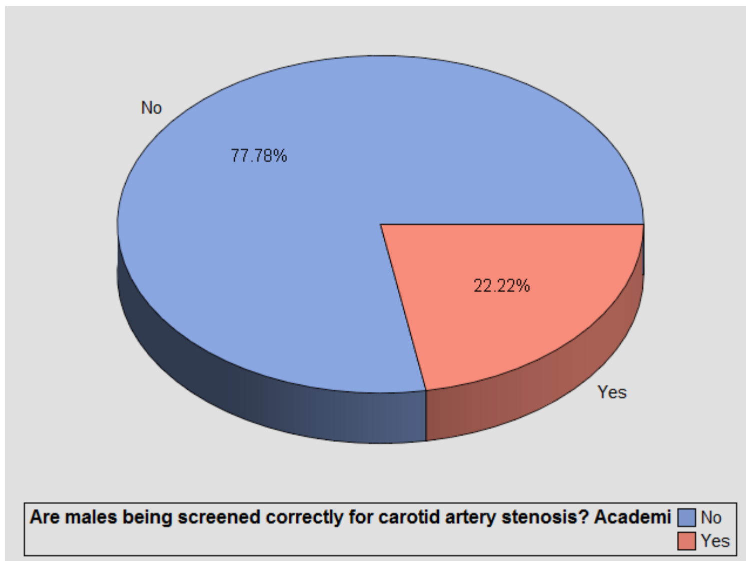


Figure 35: Proportion of males being correctly screened for carotid artery stenosis

Proportion of patients that were screened for carotid artery stenosis (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.22222	0.16748	0.27696
Std Deviation	0.41667	0.38140	0.45918
Variance	0.17361	0.14546	0.21085

Figure 36: Summary statistics describing how often males are being screened appropriately for carotid artery stenosis

4.1.3 Prevention of Stroke/Heart Disease

4.1.3.1 Sample Characteristics for Population of Patients selected for study of Appropriate Stroke/Heart Disease Prevention Measures—Academic year 2015-16

There were a total of 448 patients screened in Academic year 2015-16 for appropriate prevention of stroke/heart disease. After a statistical analysis was conducted, it was found that the average systolic blood pressure was 130.41 (SD 14.96, 95% CI [129.06,131.77]) (see Figure 37). The distribution of systolic pressures (see Figure 38) was approximately normal, with a median of 130.00 and mode of 130.00.

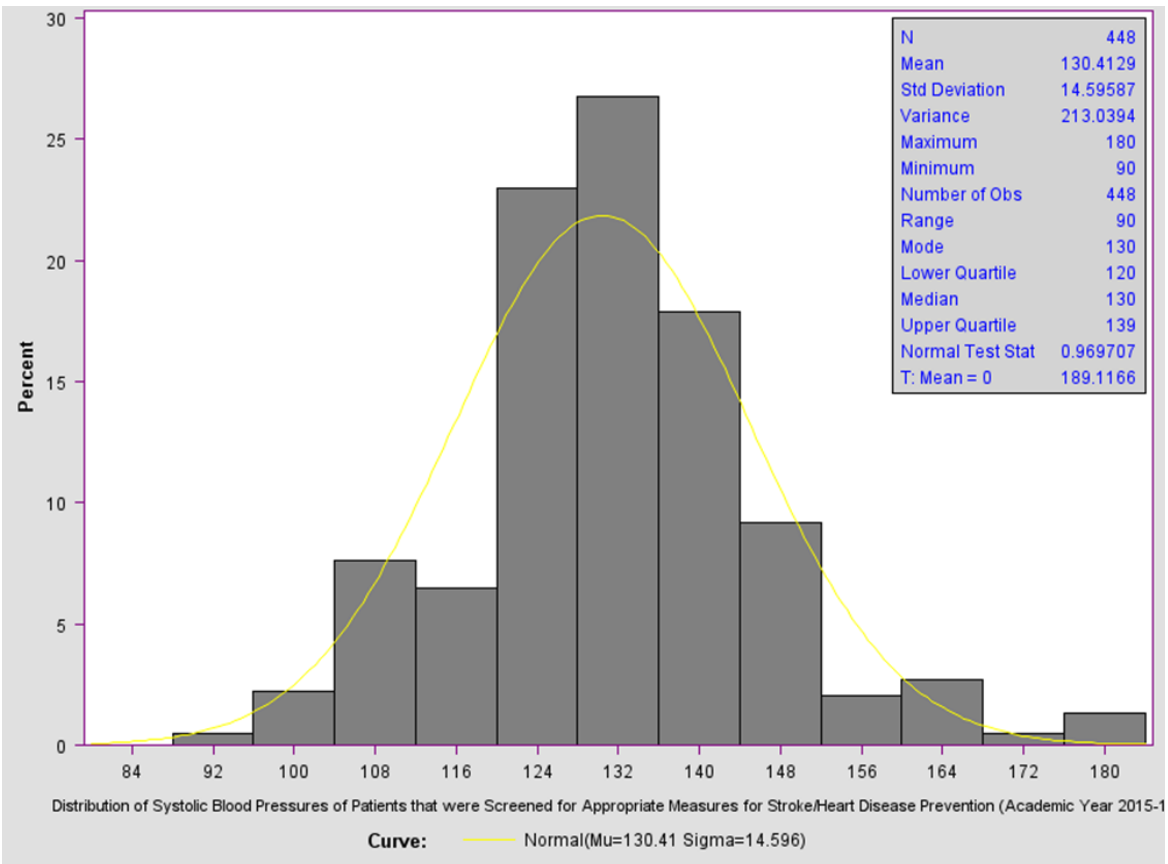


Figure 37: Distribution of Systolic Blood pressures for patients in sample population screened for appropriate measures for Stroke/Heart Disease Prevention (Academic year 2015-16)

Distribution of Systolic Blood Pressures for Patients screened for appropriate stroke/heart disease preventative measures (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: systolic

Moments

N	448	**Sum Weights**	448
Mean	130.412946	**Sum Observations**	58425
Std Deviation	14.5958688	**Variance**	213.039385
Skewness	0.52959298	**Kurtosis**	1.02057201
Uncorrected SS	7714605	**Corrected SS**	95228.6049
Coeff Variation	11.1920397	**Std Error Mean**	0.68958998

Basic Statistical Measures

Location		**Variability**	
Mean	130.4129	**Std Deviation**	14.59587
Median	130.0000	**Variance**	213.03938
Mode	130.0000	**Range**	90.00000
		Interquartile Range	19.00000

Basic Confidence Limits Assuming Normality

Parameter	**Estimate**	**95% Confidence Limits**	
Mean	130.41295	129.05771	131.76819
Std Deviation	14.59587	13.69863	15.61984
Variance	213.03938	187.65244	243.97942

Tests for Location: Mu0=0

Test	**Statistic**		**p Value**	
Student's t	**t**	189.1166	**Pr > |t|**	<.0001
Sign	**M**	224	**Pr >= |M|**	<.0001
Signed Rank	**S**	50288	**Pr >= |S|**	<.0001

Quantiles (Definition 5)

Level	**Quantile**
100% Max	180
99%	179
95%	158
90%	150

Quantiles (Definition 5)

Level	Quantile
75% Q3	139
50% Median	130
25% Q1	120
10%	110
5%	110
1%	100
0% Min	90

Extreme Observations

Lowest		Highest	
Value	**Obs**	**Value**	**Obs**
90	359	179	397
92	330	180	140
98	194	180	250
98	84	180	369
100	443	180	423

Figure 38: Summary of Descriptive statistics of systolic blood pressures for sample of patients screened for appropriate preventative measures for stroke/heart disease prevention (Academic Year 2015-16)

The average diastolic blood pressure for the patients in the sample was 78.05 (SD 9.82, 95% CI [77.14,78.97] (see Figure 39 for complete summary of statistics). The distribution was approximately normal and symmetrical with a median and mode of 80 (see Figure 40).

Distribution of Diastolic Blood Pressures for Patients screened for appropriate stroke/heart disease preventative measures (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: diastolic

Moments

N	448	**Sum Weights**	448
Mean	78.0535714	**Sum Observations**	34968

Moments

Std Deviation	9.81993524	**Variance**	96.4311282
Skewness	0.24339678	**Kurtosis**	0.48245812
Uncorrected SS	2772482	**Corrected SS**	43104.7143
Coeff Variation	12.5810198	**Std Error Mean**	0.46394833

Basic Statistical Measures

Location		**Variability**	
Mean	78.05357	**Std Deviation**	9.81994
Median	80.00000	**Variance**	96.43113
Mode	80.00000	**Range**	60.00000
		Interquartile Range	12.00000

Basic Confidence Limits Assuming Normality

Parameter	**Estimate**	**95% Confidence Limits**	
Mean	78.05357	77.14178	78.96536
Std Deviation	9.81994	9.21628	10.50885
Variance	96.43113	84.93987	110.43597

Tests for Location: Mu0=0

Test	**Statistic**		**p Value**	
Student's t	**t**	168.2376	**Pr > |t|**	<.0001
Sign	**M**	224	**Pr >= |M|**	<.0001
Signed Rank	**S**	50288	**Pr >= |S|**	<.0001

Quantiles (Definition 5)	
Level	**Quantile**
100% Max	110
99%	100
95%	98
90%	90
75% Q3	82
50% Median	80
25% Q1	70
10%	70
5%	60
1%	56
0% Min	50

Figure 39: Summary of Descriptive statistics for distribution of diastolic blood pressures for sample population patients that were screened for appropriate measures to prevent stroke/heart disease

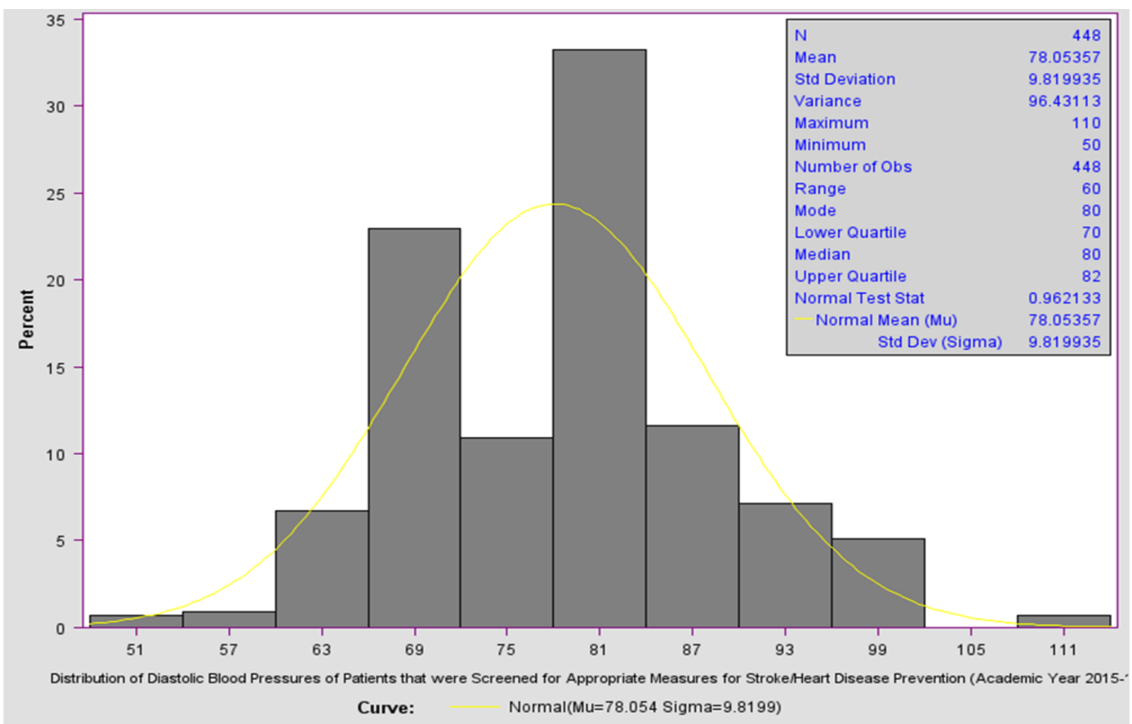


Figure 40: Distribution of diastolic blood pressures of sample population for appropriate preventative measures for stroke/heart disease (Academic year 2015-16)

Of the sample population, 58 (13.0% SD 0.336) patients were documented smokers (see Figure 41). Constructing a 95% confidence interval, at worst 9.8% and at best 16.1% are smokers.

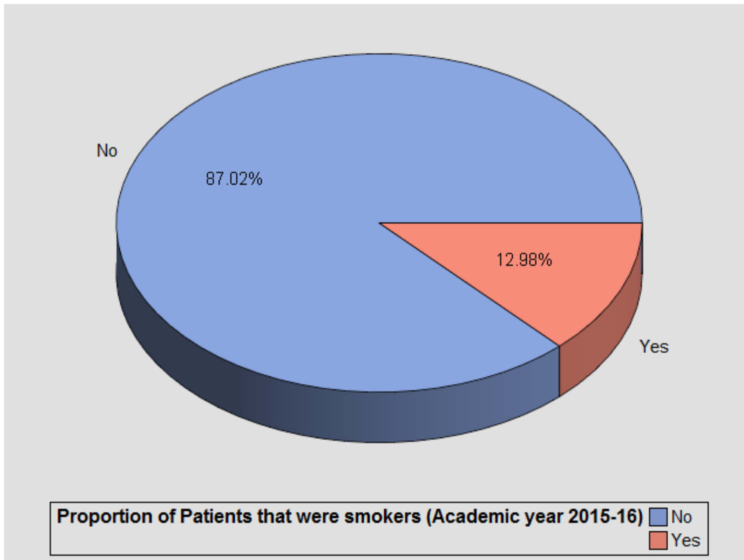


Figure 41: Proportion of patients that were smokers in sample population that were screened for appropriate prevention of stroke/heart disease (Academic year 2015-16)

In addition, a total of 101 (22.6% SD 0.419) patients in the sample population were documented to be diabetic (see Figure 42). Using a 95% confidence interval, at worst 26.5% and at best 26.5% of the population is diabetic.

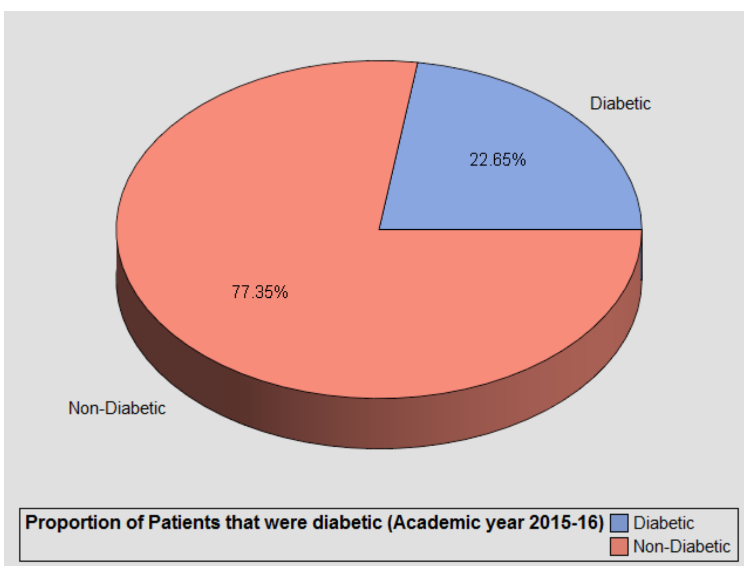


Figure 42: Proportion of patients that were diabetic in sample population that were screened for appropriate prevention of stroke/heart disease in Academic year 2015-16

Last but not least, a total of 7 patients (1.56% SD 0.124) were newly diagnosed with hypertension (see Figure 43). Using a 95% confidence interval, at worst 2.71% and at best only 0.41% were newly diagnosed.

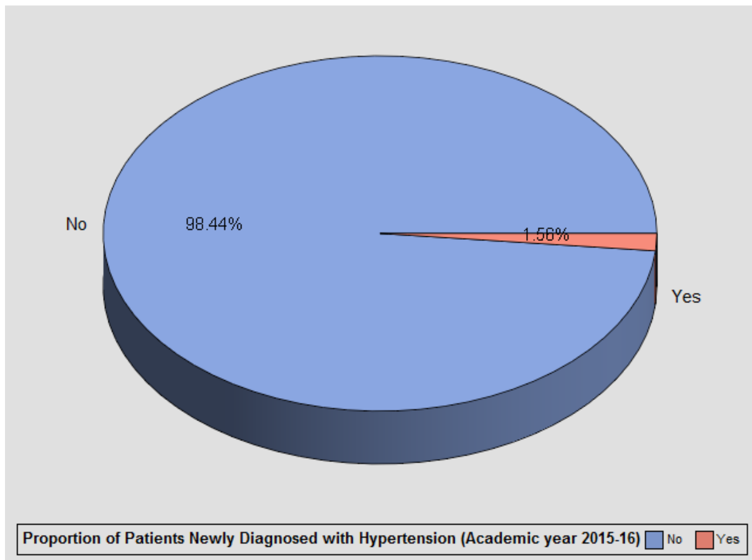


Figure 43: Proportion of patients that were newly diagnosed with hypertension (Academic year 2015-16)

4.1.3.2 Analysis of patients that were screened for appropriate measures for prevention of Heart disease/stroke (Academic year 2015-16)

4.1.1.3.1 Is the patient on aspirin or any other antithrombotic?

The latest guidelines on aspirin use to prevent cardiovascular disease (CVD) were published in April 2016 and are summarized by the U.S.P.S.T.F as follows: **[74]**

- Low dose aspirin should be initiated for prevention of cardiovascular disease and colorectal cancer in adults between the ages of 50-59 who have a 10% or greater

CVD risk, are not at increased risk for bleeding, have a life expectancy of at least 10 years, and are willing to take low-dose aspirin daily for at least 10 years

- Adults aged 60-69 can use low dose aspirin as per their discretion if they have a 10% or greater CVD risk and are willing to take it for at least 10 years.

In academic year 2015-16, there were a total of 117 (27.5% SD 0.447) out of a total of 426 eligible patients were documented to have been on aspirin or another antithrombotic (see Figure 44). Upon constructing a 95% confidence interval, this means at worst 23.2% and at best 31.7% of the population are on aspirin/another antithrombotic (see Figure 45).

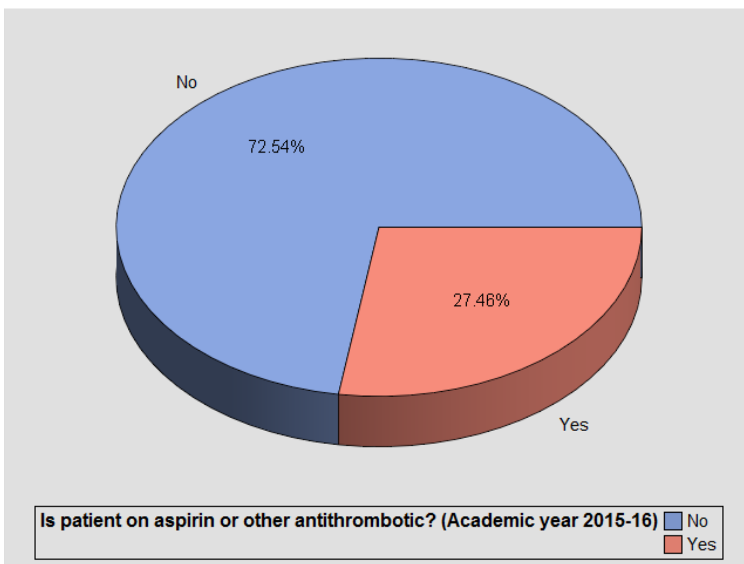


Figure 44: Proportion of patients that are on aspirin or other antithrombotic (Academic year 2015-16)

Proportion of patients that were on aspirin or other antithrombotic (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	**Estimate**	**95% Confidence Limits**	
Mean	0.27465	0.23209	0.31720
Std Deviation	0.44686	0.41873	0.47907
Variance	0.19969	0.17534	0.22951

Figure 45: Summary Statistics estimating proportion of patients on aspirin or other antithrombotic (Academic year 2015-16)

4.1.1.3.2 Has the patient's smoking status been updated within the last year?

The latest guidelines summarized by the U.S.P.S.T.F requires that clinicians inquire all adult patients about tobacco usage. **[69]**

In academic year 2015-16, it was found that there was a total of 383 (91.6% SD 0.277) patients that had their smoking status updated within the last year (see Figure 46). A 95% confidence interval predicts that at worst 89.0% of patients had their smoking status updated within the last year and at best, 94.2% (See Figure 47).

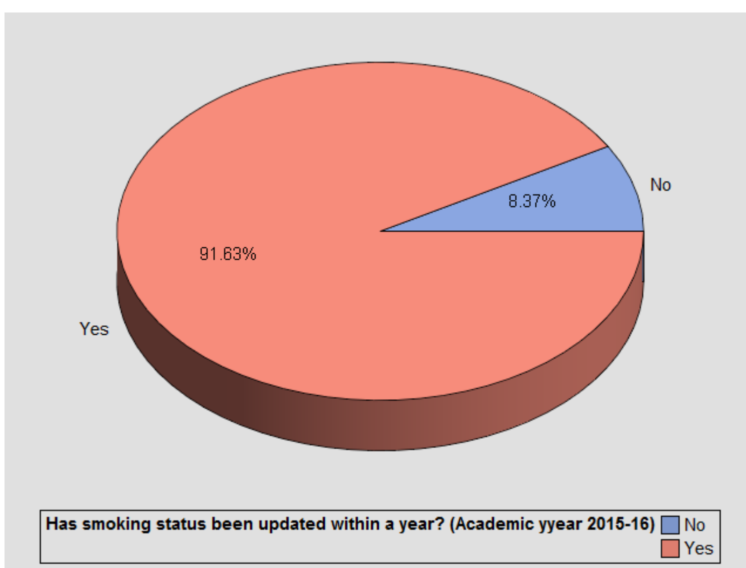


Figure 46: Proportion of patients that had their smoking status updated within the last year (Academic year 2015-16)

Proportion of patients that were asked about their smoking status in the last year (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.91627	0.88961	0.94293
Std Deviation	0.27732	0.25971	0.29751
Variance	0.07690	0.06745	0.08851

Figure 47: Descriptive statistics summarizing proportion of patients that had their smoking status updated within a year (Academic year 2015-16)

4.1.1.3.3 Has the patient been counseled about smoking cessation if appropriate?

In addition to inquiring about smoking, U.S.P.S.T.F requires that clinicians counsel smokers on tobacco cessation, provide behavioral interventions, and start FDA approved pharmacotherapy. **[69]**

In academic year 2015-16 there were 58 documented smokers. Of those 58 smokers, 30 (51.7% SD 0.504) were documented to have been appropriately counseled on cessation (Figure 48). Using a 95% confidence interval, it is found that at worst 38.5% of patients are being counseled and at best 65.0% (see Figure 49).

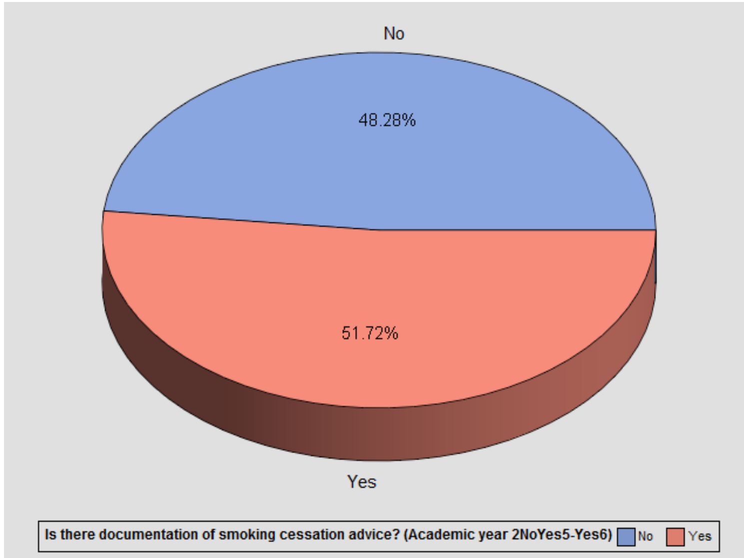


Figure 48: Proportion of patients that were counseled on smoking cessation (Academic year 2015-16)

Proportion of smokers that were counseled on smoking cessation within the last year (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.51724	0.38470	0.64978
Std Deviation	0.50407	0.42614	0.61714
Variance	0.25408	0.18160	0.38086

Figure 49: Descriptive Statistics estimating proportion of patients that were appropriately given smoking cessation advice (Academic year 2015-16)

4.1.1.3.4 Were patients appropriately screened for diabetes?

The U.S.P.T.F published a recommendation in October 2015 requiring that clinicians screen patients aged between 40-70 for diabetes as a part of the cardiovascular risk assessment for overweight and obese patients. **[75]**

In academic year 2015-16, there were a total of 392 patients (87.7% SD 0.33) appropriately screened for diabetes (see Figure 50). Upon conducting a 95% confidence interval, it is found that at worst 84.6% of patients are being screened and at best 90.8% percent patients are being screened (see Figure 51).

Proportion of patients that were screened for diabetes (Academic year 2015-16)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.87696	0.84639	0.90753
Std Deviation	0.32885	0.30862	0.35195
Variance	0.10814	0.09524	0.12387

Figure 50: Descriptive statistics for patients that were screened for diabetes (Academic year 2015-16)

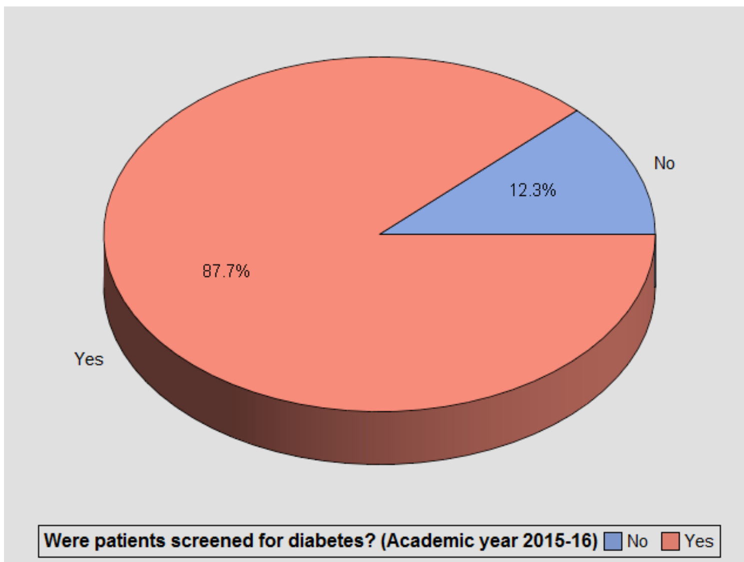


Figure 51: Proportion of patients that were screened for diabetes (Academic year 2015-16)

4.2 On Preceptor Reactions Post Discussion of Results

4.2.1 On Preceptor Behavioral Changes Post listening to results of studies

There were a total of 177 students that participated in the QA/QI study in academic year 2015-16. Of these 177, 175 had a discussion with their assigned preceptor about the results. In addition, there were a total of 167 students that participated in the study in academic year 2016-17. All of the students in academic year 2016-17 had the discussion with their preceptor about the results of their study.

Of the 175 discussion summaries in academic year 2015-16, there were 11 instances where preceptors exhibited pre-contemplative behaviors, 42 instances where they exhibited contemplative behavior, 101 instances where they were prepared to make change, and 17 instances where they began to act towards a more guideline compliant practice (see Figure 52). It should also be noted that there were 3 instances where the students stated that the preceptors were already meeting and exceeding the guidelines, so their focus was to maintain their current practice.

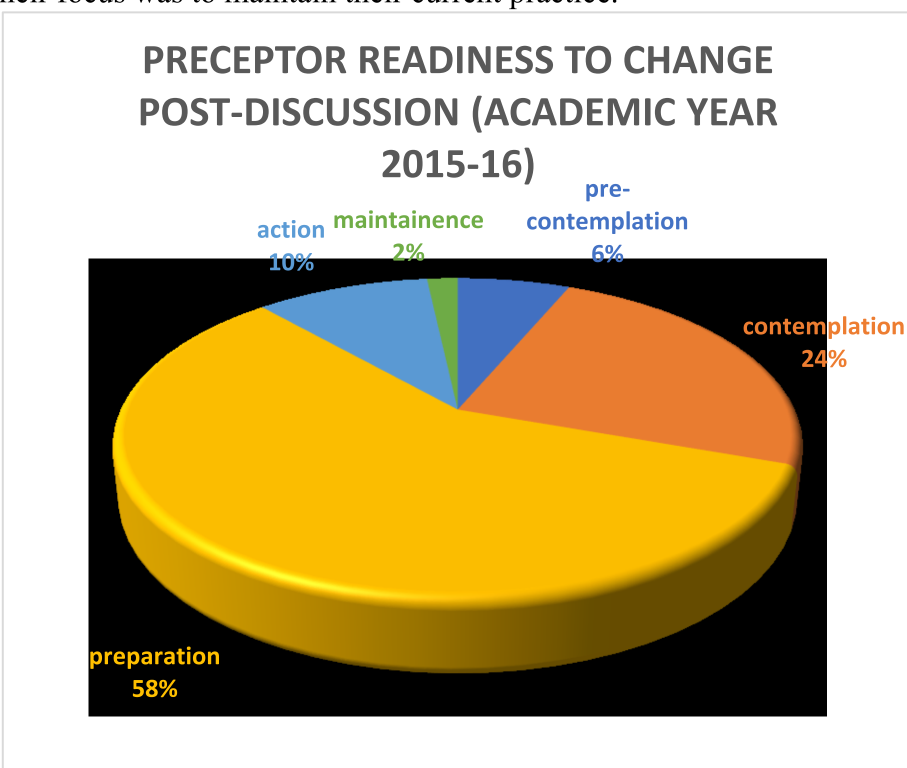


Figure 52: Preceptor readiness to change post-discussion (Academic year 2015-16)

In academic year 2016-17, there were 14 instances where preceptors exhibited pre-contemplative behaviors, 35 instances where they exhibited contemplative behavior, 77 instances where they exhibited preparatory behavior, and 31 instances where they acted upon listening to feedback (see Figure 53). Additionally, there were 10 instances that the students noted that the practice was already meeting and exceeding expectations for a particular topic.

If the null hypothesis (H_o) is that the proportion of instances that a provider is in a stage of ___________ in academic year 2015-16 is greater than the proportion of instances that the provider is in that stage in academic year 2016-17, and the alternative hypothesis (H_a) is that the proportion of instances that a provider is in a stage of ___________ in academic year 2015-16 is less than the proportion of instances that the provider is in that stage in academic year 2016-17, the results are as follows (please see Table 6):

Table 6: One-sided Difference of Proportions test for significance of change in Preceptor behavior between Academic year 2015-16 and Academic year 2016-17			
	Academic year 2015-16	Academic year 2016-17	Hypothesis Test
Category	Proportion		p-value
Pre-contemplation	6.2%	8.4%	0.0474
Contemplation	24%	21%	0.6015
Preparation	57%	46%	0.0519
Action	10%	19%	0.0194
Maintenance	2%	6%	0.0474

Using the one-sided difference of proportions test, it was demonstrated that the changes in both the proportion of instances that providers were contemplative as well as the proportion of instances the providers were in a stage of preparation were not statistically significant. Also, it was demonstrated that the increase in the proportion of instances the providers demonstrated behaviors of action and the increase in the proportion of instances that providers exhibited maintaining practice were statistically significant between academic years 2015-16 and 2016-17.

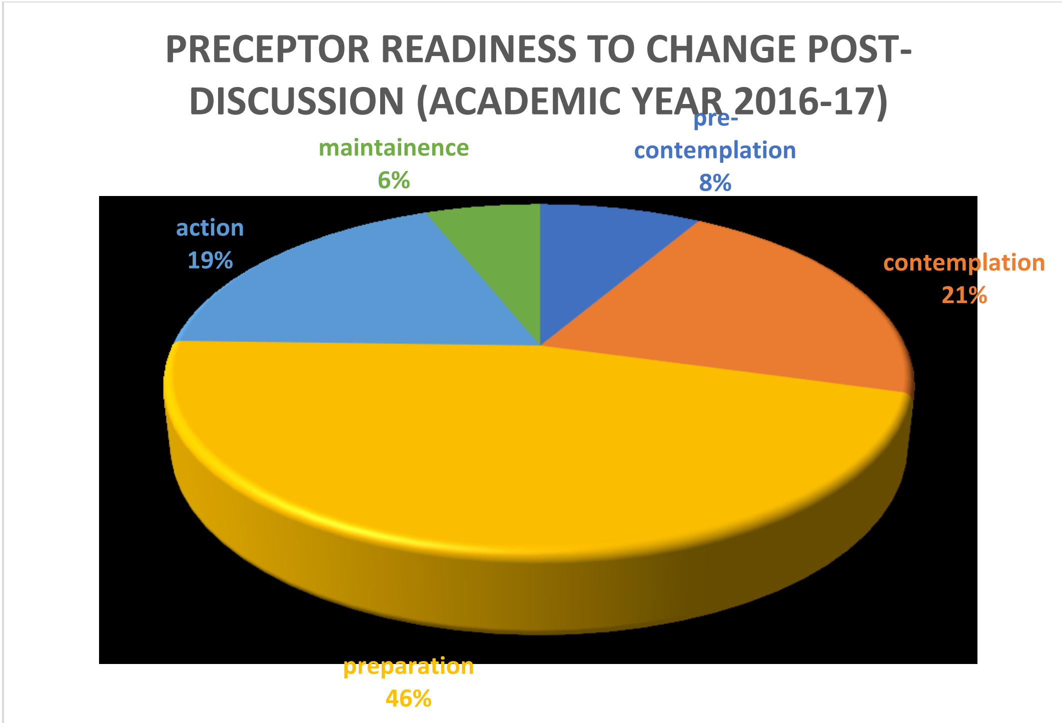


Figure 53: Preceptor readiness to change (Academic year 2016-17)

4.2.2. On Preceptor Feelings/Attitudes about Study post listening to results of study

There were a total of 143 students that responded to the student survey sent via RedCap in academic year 2015-16 and a total of 141 students that responded to the

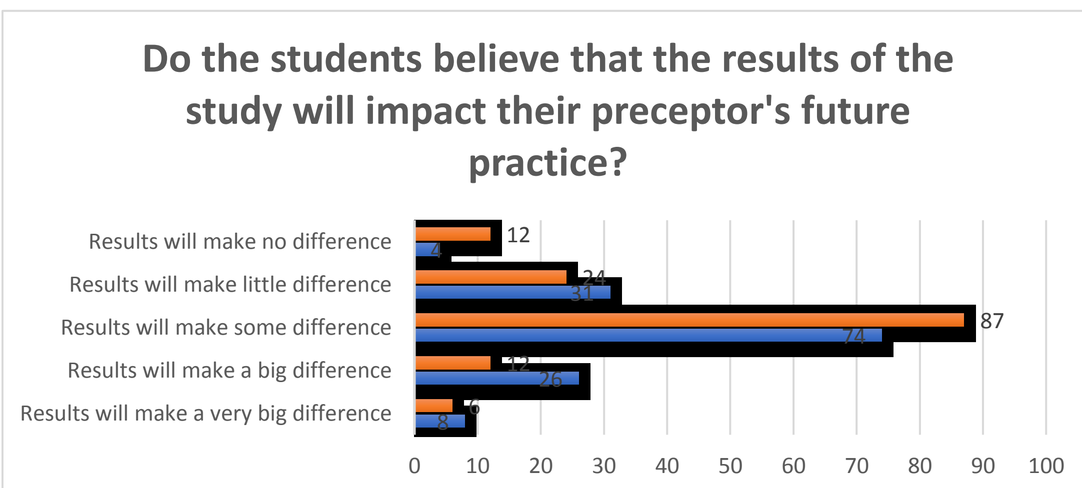


Figure 54: Did students believe that results of the study will impact their preceptor's future practice? Academic year 2015-16 and 2016-17

student survey in academic year 2016-17. 108 students in academic year 2015-16 and 105 students in academic year 2016-17 felt that the results of the study would make a difference in their preceptors future practice while (see Figure 54). The change was not statistically significant at a 0.05 significance level (p=0.4184).

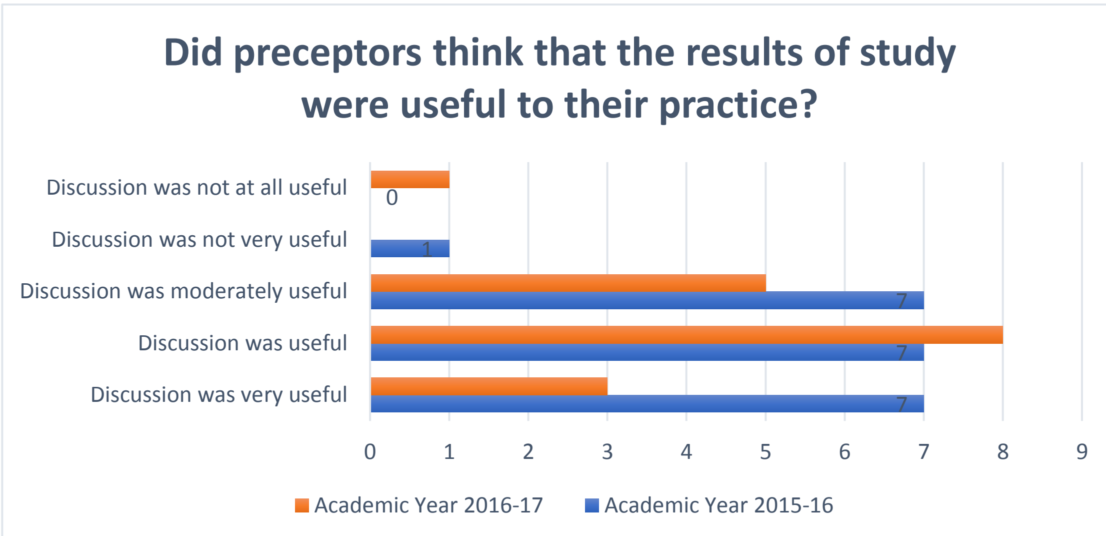


Figure 55: Did preceptors believe that the results of the study were useful to their practice?

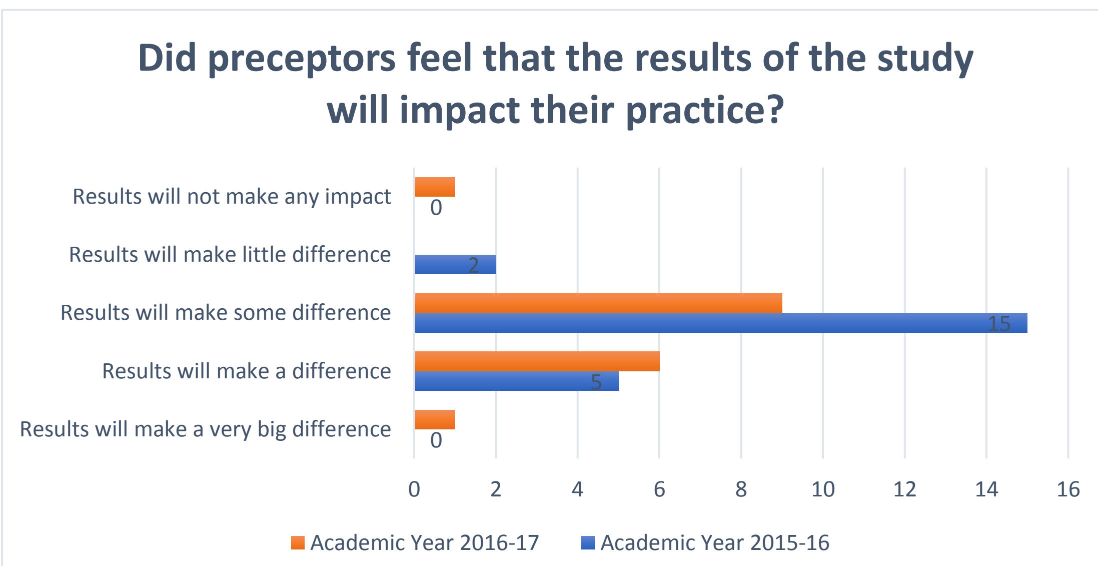


Figure 56: Did preceptors feel that the results of the study would impact their practice? (Academic year 2015-16 and Academic year 2016-17)

There were a total of 22 preceptors that responded to the survey sent via RedCap in academic year 2015-16 and 17 preceptors that responded to the survey in academic year 2016-17. When preceptors were asked if they felt if the results of the study were useful to their practice, in academic year 2015-16 21/22 and in academic year 2016-17 16/17 preceptors indicated that the results were at least moderately useful (see Figure 55). When they were asked if the results of the study would impact their practice, 20/22 preceptors in academic year 2015-16 and 16/17 preceptors in academic year 2016-17 indicated that the results would make some difference to their practice (Figure 56).

4.3 On Current Compliance with evidence based guidelines (Academic year 2016-17)

In academic year 2016-17, there were a total of 167 QA/QI studies conducted in family practices across New Jersey respectively. 94% of the studies identified a problem with the preceptor complying with evidence based practice.

4.3.1 Hyperlipidemia

4.3.1.1 Sample Characteristics for Patients Screened for Appropriate Treatment of Hyperlipidemia—Academic year 2016-17

There were a total of 1,044 patients screened for appropriate treatment of hyperlipidemia in academic year 2016-17. Of these 1,044, 550 patients were female and 494 were male (see Figure 57). The ages of the patients in the sample

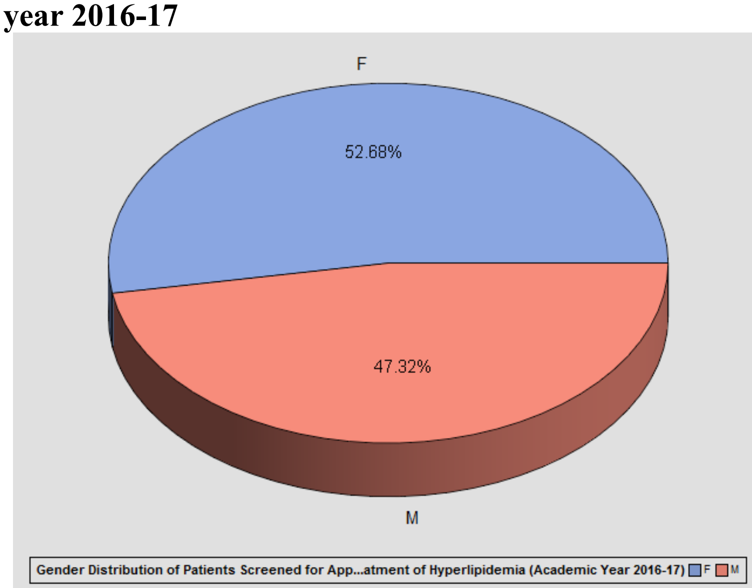
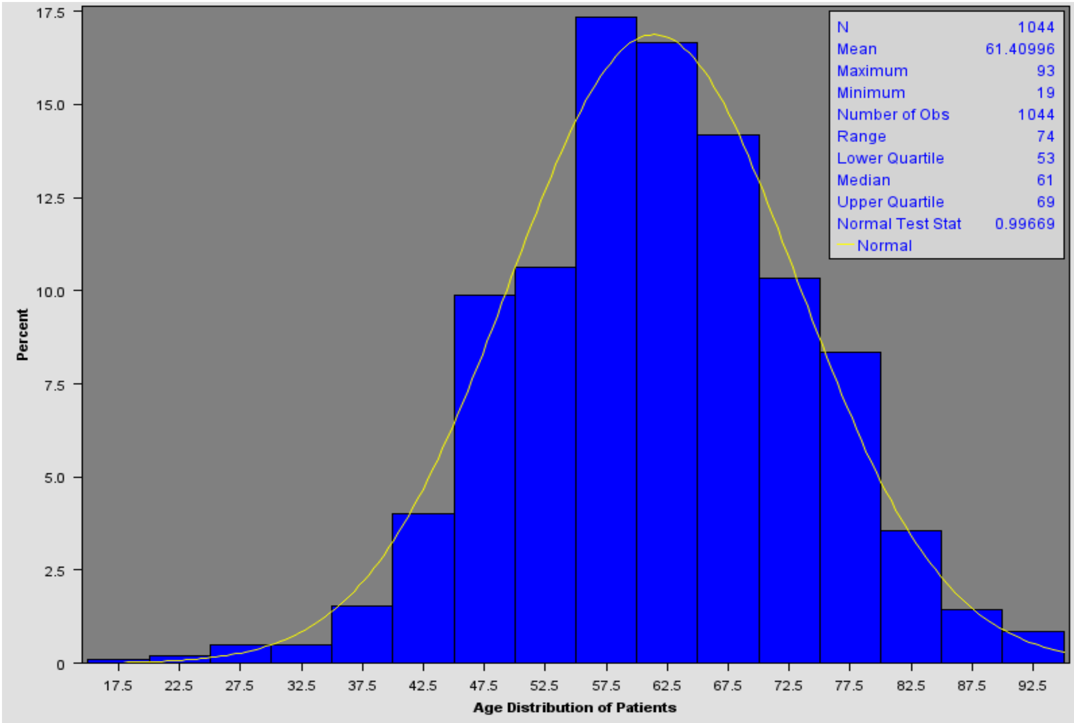


Figure 57: Gender Distribution of Patients screened for appropriate treatment of hyperlipidemia (Academic year 2016-17)

ranged from 19 to 93. The distribution of ages, was approximately normal with the



Basic Statistical Measures			
Location		Variability	
Mean	61.40996	Std Deviation	11.81847914
Median	61.00000	Variance	139.6764491
Mode	64.00000	Range	74
		Interquartile Range	16

Modes	
Mode	Count
64	51

Figure 58: Distribution of ages of patients screened for appropriate treatment of hyperlipidemia (Academic year 2016-17)

average age being about 61.4, median age being 61, and mode about 64 (see Figure 58).

Of the patients screened, 59.58% of the population was Caucasian, 14.75% were black, 6.32% were Hispanic, and 19.25% were of other descent (See Figure 59).

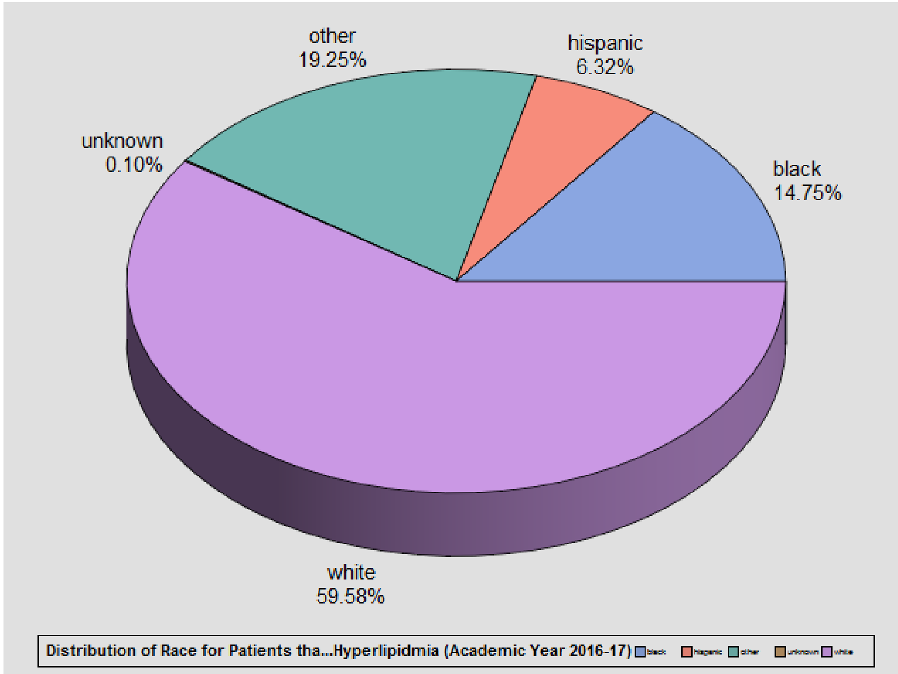


Figure 59: Racial Distribution of patients screened for appropriate treatment of hyperlipidemia in academic year 2016-17)

In addition, the population consisted of 354 diabetic patients, which accounts for about 33.9% (SD 0.474) of the entire sample population. Constructing a 95% confidence interval, at worst 36.8% of the population is diabetic and at best 31.0% (See Figure 60).

Proportion of patients that were diabetic in sample population screened for appropriate treatment of hyperlipidemia (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.33908	0.31032	0.36784
Std Deviation	0.47362	0.45414	0.49486
Variance	0.22432	0.20625	0.24489

Figure 60: Descriptive statistics describing the proportion of patients in the sample population that were diabetic in Academic year 2016-17

There were a total 181 smokers in the sample population. This corresponds to about 17.3% (SD 0.379) of the sample population. Constructing a 95% confidence interval, at worst 19.6% of the population are smokers and at best only 15.0% (see Figure 61).

Proportion of patients that were smokers in sample population screened for appropriate treatment of hyperlipidemia (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.17337	0.15037	0.19637
Std Deviation	0.37875	0.36317	0.39573
Variance	0.14345	0.13189	0.15661

Figure 61: Descriptive statistics describing the proportion of patients in the sample population that are smokers (Academic year 2016-17)

Last but not least, there were a total of 115 patients that were documented to have a history of heart disease and stroke. This accounted for 11.0% (SD 0.314) of the sample population. Constructing a 95% confidence interval, at worst 13.0% of patients have a history of heart disease and at best only 9.1% (see Figure 62).

Proportion of patients that had a history of heart disease or stroke in sample population screened for appropriate treatment of hyperlipidemia (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.11047	0.09140	0.12954
Std Deviation	0.31363	0.30071	0.32771
Variance	0.09836	0.09043	0.10739

Figure 62: Proportion of patients in sample population that had a history of heart disease or stroke (Academic year 2016-17)

The distribution of systolic blood pressures for the patients included in the sample were also analyzed. After a statistical analysis was conducted, it was found that the average systolic blood pressure was 127.25 (SD 14.92, 95% CI [126.66,126.99]) (see Figure 64). The distribution of systolic pressures (see Figure 63) was approximately normal, with a median of 126.00 and mode of 130.00.

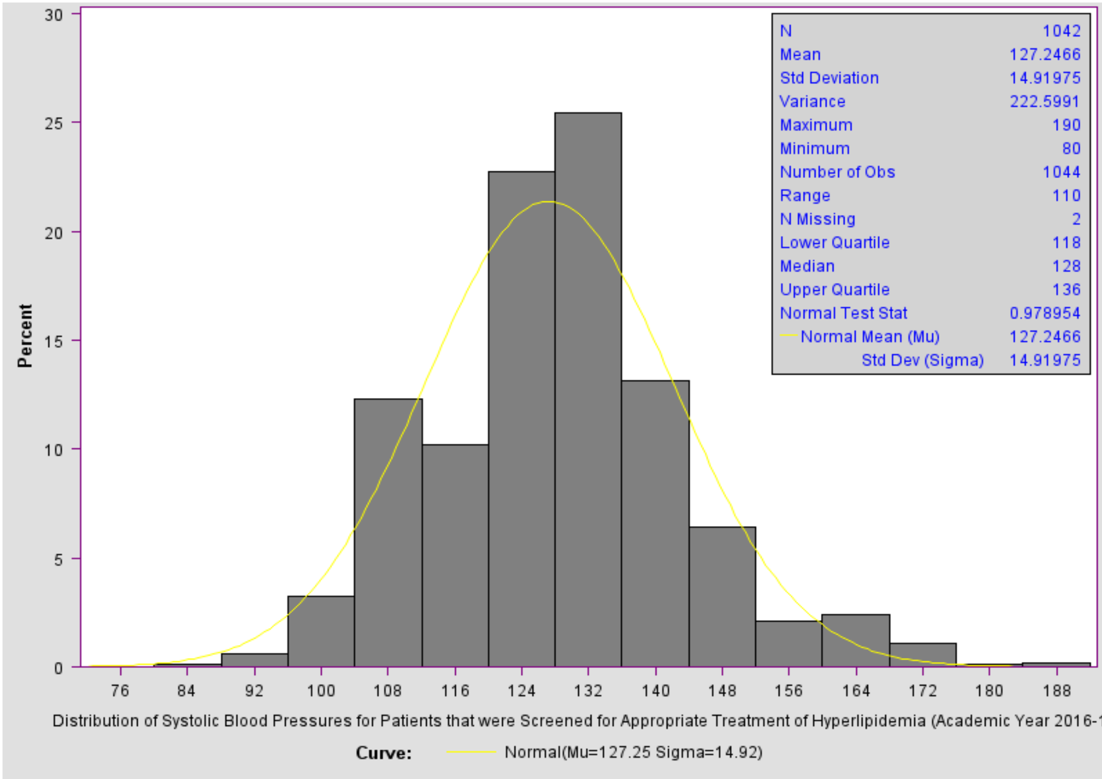


Figure 63: Distribution of Systolic Blood pressures for patients in sample population screened for appropriate treatment of Hyperlipidemia (Academic year 2016-17)

Distribution of Systolic Blood Pressures for Patients screened for appropriate treatment of hyperlipidemia (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: systolic

Moments

N	231	**Sum Weights**	231
Mean	128.688312	**Sum Observations**	29727
Std Deviation	17.607997	**Variance**	310.041558
Skewness	0.49673861	**Kurtosis**	-0.0774115
Uncorrected SS	3896827	**Corrected SS**	71309.5584
Coeff Variation	13.68267	**Std Error Mean**	1.15852115

Basic Statistical Measures

Location		**Variability**	
Mean	128.6883	**Std Deviation**	17.60800
Median	128.0000	**Variance**	310.04156

Basic Statistical Measures

Location		Variability	
Mode	110.0000	**Range**	100.00000
		Interquartile Range	26.00000

Basic Confidence Limits Assuming Normality

Parameter	Estimate	95% Confidence Limits	
Mean	128.68831	126.40564	130.97098
Std Deviation	17.60800	16.13540	19.37869
Variance	310.04156	260.35112	375.53367

Tests for Location: Mu0=0

Test	Statistic		p Value	
Student's t	**t**	111.0798	**Pr > |t|**	<.0001
Sign	**M**	115.5	**Pr >= |M|**	<.0001
Signed Rank	**S**	13398	**Pr >= |S|**	<.0001

Quantiles (Definition 5)

Level	Quantile
100% Max	190
99%	168
95%	160
90%	154
75% Q3	140
50% Median	128
25% Q1	114
10%	110
5%	102
1%	98
0% Min	90

Extreme Observations

Lowest		Highest	
Value	**Obs**	**Value**	**Obs**
90	66	168	47
96	138	168	194
98	160	168	207
100	108	170	156
100	90	190	154

Figure 64: Summary of Descriptive statistics of systolic blood pressures for sample of patients screened for appropriate treatment of hyperlipidemia (Academic Year 2016-17)

4.3.1.2 Analysis of patients that were screened for appropriate treatment of hyperlipidemia (Academic year 2016-17)

4.3.1.2.1 Did patients fast>12 hours before lipid panel?

There were a total of 854 of 988 patients documented to have fasted >12 hours before a lipid panel in Academic year 2016-17. This accounted for about 86.4% (SD 0.343) of the sample population. Constructing a 95% confidence interval, this meant at worst 84.3% of patients in the population fasted for the lipid panel and at best 88.6% (see Figure 65).

Proportion of patients that fasted >12 hours before their lipid panel (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality

Parameter	Estimate	95% Confidence Limits	
Mean	0.86437	0.84299	0.88576
Std Deviation	0.34257	0.32810	0.35838
Variance	0.11735	0.10765	0.12843

Figure 65: Proportion of patients that fasted >12 hours for lipid panel (Academic year 2016-17)

4.3.1.2.2 Were patients currently receiving treatment for hypertension?

There were a total of 695 out of 1044 (86.4% SD 0.343) patients that were receiving treatment for hypertension in the sample population. Upon constructing a 95% confidence interval, at worst 84.3% patients were receiving treatment for hypertension and at best 88.6% (see Figure 66).

Proportion of patients that were documented to have currently received appropriate treatment for hypertension (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.66571	0.63705	0.69437
Std Deviation	0.47197	0.45256	0.49313
Variance	0.22275	0.20481	0.24318

Figure 66: Proportion of patients that were documented to have currently received treatment for Hypertension (Academic year 2016-17)

4.3.1.2.3 Analysis of proper treatment of patients within stratified 4 treatment categories based on diagnosis of clinical arteriosclerotic cardiovascular disease (ASCVD), cholesterol levels, diabetes, and estimated 10-year ASCVD risk

4.3.1.2.3.1 How often are category A patients treated appropriately?

In the sample population, there were a total of 234 Category A patients. Of these patients, 77 patients or, 32.9% [SD 0.471] were documented to have been treated appropriately. Constructing a 95% confidence interval, it is found that at worst 26.8% and at best 39.0% of patients are being treated appropriately (see Figure 67).

Proportion of Category A patients that were treated appropriately (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.32906	0.26841	0.38971
Std Deviation	0.47088	0.43173	0.51790
Variance	0.22173	0.18639	0.26822

Figure 67: Descriptive statistics generated by SAS 9.4 describing proportion of category A patients that are being treated appropriately (Academic year 2016-17)

4.3.1.2.3.2 How often are category B patients treated appropriately?

There were a total of 347 patients that fell under category B in academic year 2016-17. Of these 347 patients, 228 (0.657 SD 0.475) were treated appropriately. A 95% confidence interval indicates that at worst 60.7% and at best 70.7% of patients are being treated appropriately (see Figure 68).

Proportion of Category B patients that were treated appropriately (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.65706	0.60687	0.70725
Std Deviation	0.47538	0.44244	0.51365
Variance	0.22598	0.19576	0.26383

Figure 68: Descriptive statistics generated by SAS 9.4 describing proportion of category B patients that are being treated appropriately (Academic year 2016-17)

4.3.1.2.3.3 How often are category C patients treated appropriately?

There were a total of 384 patients that were stratified as being in Category C in academic year 2016-17. Of these patients, 231 [0.601 (SD 0.490)] were documented to have been treated appropriately. A 95% confidence interval reports that at worst 55.2% and at best 65.1% of the time patients are being treated appropriately (See figure 69).

Proportion of Category C patients that were treated appropriately (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.60156	0.55238	0.65075
Std Deviation	0.49022	0.45782	0.52758
Variance	0.24031	0.20960	0.27834

Figure 69: Descriptive statistics generated by SAS 9.4 describing proportion of category C patients that are being treated appropriately (Academic year 2016-17)

4.2.1.2.3.4 How often are category D patients being treated appropriately?

There were a total of 386 Category D patients in the sample population. Of the 386, 282 [0.731 SD (0.444)] were documented to have been treated appropriately. A 95% confidence interval indicates that at worst 68.6% and at best 77.5% of the time category D patients are being treated appropriately (see Figure 70).

Proportion of Category D patients that were treated appropriately (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.73057	0.68611	0.77503
Std Deviation	0.44424	0.41496	0.47800
Variance	0.19735	0.17219	0.22849

Figure 70: Descriptive statistics generated by SAS 9.4 describing proportion of category D patients that are being treated appropriately (Academic year 2016-17)

4.3.2 Men's Preventative Health

4.3.2.1 Sample Characteristics for Population of Patients selected for study of Appropriate Screening of Men's Preventative Health—Academic year 2016-17

There were a total of 195 male patients that were screened for appropriate preventative measures in Academic year 2016-17. Of these 195, 60 or 30.8% (SD 0.462) were at high risk for prostate cancer (see Figure 71). Using a 95% confidence interval, at worst 37.3% of the population and at best 24.2% were at risk. Additionally, there was a total of 13 (7.4% SD 0.263) patients that were at risk for AAA (see Figure 72). Predicted by a 95% confidence interval, at least 3.50% of the population is at risk and at most 11.4%. 34 patients or 18.7% (SD 0.391) were at risk for GI bleeding, with a 95% confidence interval of [0.130,0.244] (Figure 73). Last but not least, 24 or 12.3% of patients were at risk for I, and upon constructing a 95% confidence interval, it is found that at worst 17.0% of population is at risk and at best 7.7% of the population is at risk (Figure 74).

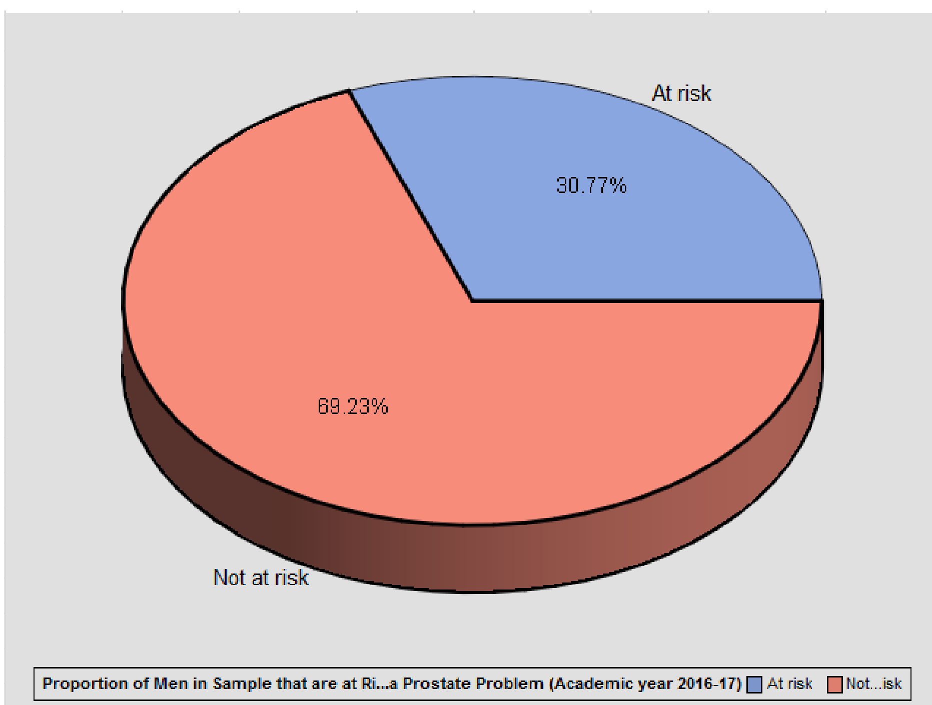


Figure 71: Proportion of male patients that were at high risk for prostate cancer (Academic year 2016-17)

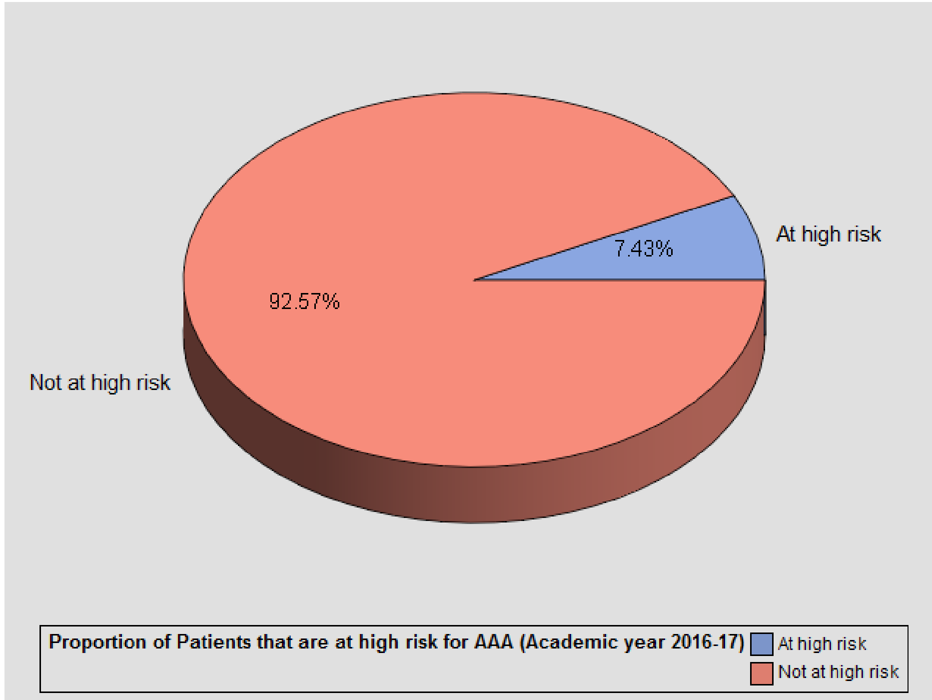


Figure 72: Proportion of male patients at high risk for AAA (Academic year 2016-17)

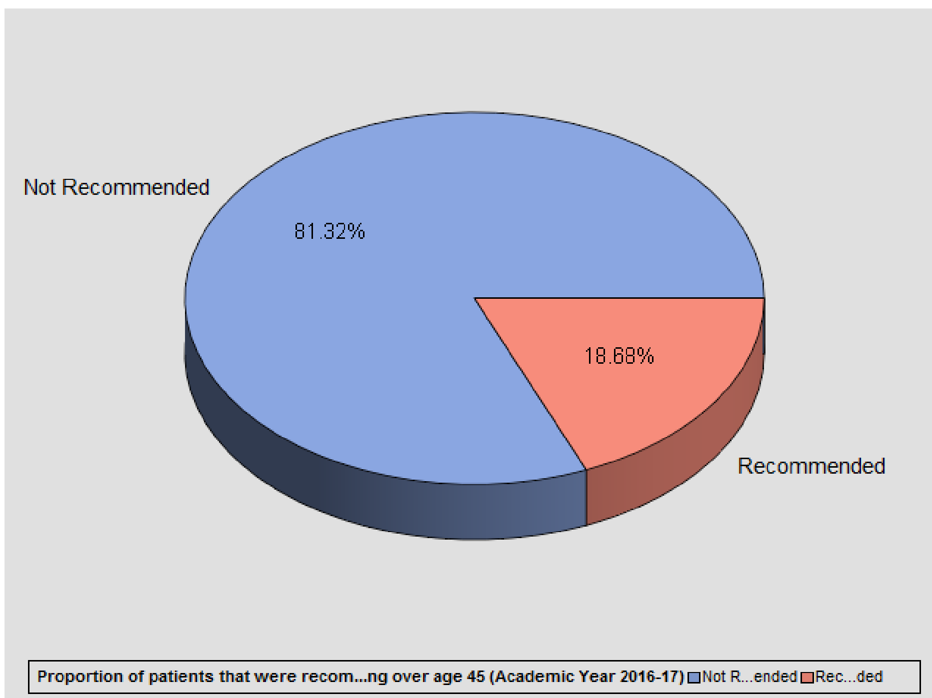


Figure 73: Proportion of male patients that were at risk for GI bleeding (Academic year 2016-17)

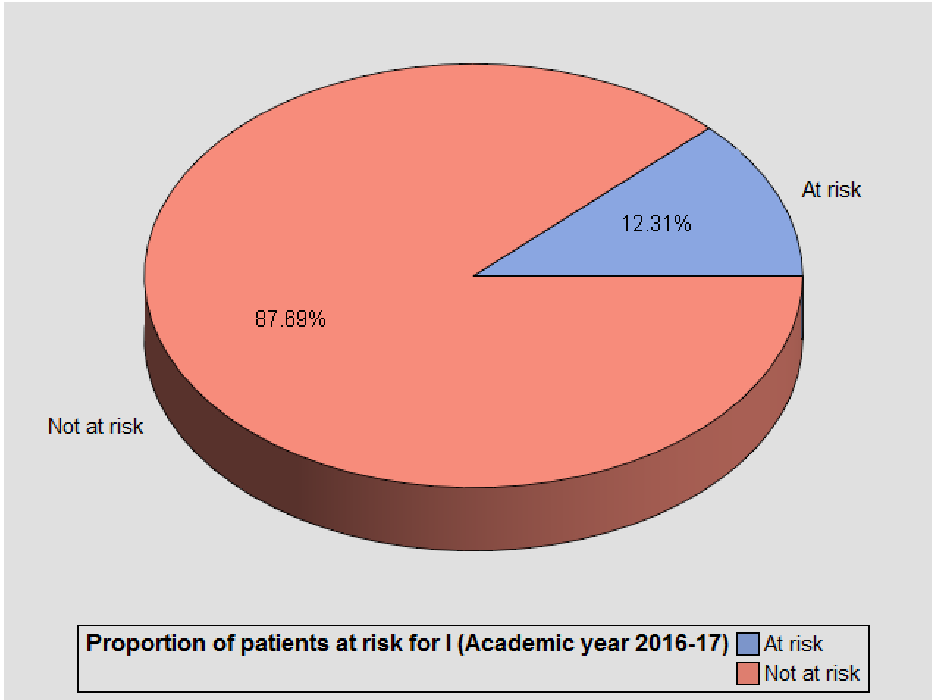


Figure 74: Proportion of male patients at risk for I (Academic year 2016-17)

4.3.2.2 Analysis of patients that were screened for appropriate Male Preventative Screening (Academic year 2016-17)

4.3.2.2.1 How often were men appropriately screened for colorectal cancer?

There were 141 (77.9%) patients that had a colonoscopy done within 10 years. At worst, 71.8% of the patient population had a colonoscopy done and at best 84.0%. There were a total of 11 patients (8.94%) of patients that had a sigmoidoscopy done within 5 years (95% CI [3.8,14.1]). Additionally, there were 60 (45.8%) patients that occult blood testing in Academic year 2015-16 (95% CI [37.2,54.4]).

4.3.2.2.2 How often were men screened for depression when staff assisted depression care supports are in place?

During Academic year 2016-17, 146 or 88.5% (SD 0.320), of male patients were appropriately screened for depression with at worst 83.6% and at best 93.4% being screened. Please see Figures 75 and 76 below for summary statistics and visual distribution.

Proportion of patients that were screened for depression (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.88485	0.83563	0.93407
Std Deviation	0.32018	0.28896	0.35902
Variance	0.10251	0.08350	0.12889

Figure 75: Summary statistics for number of males that were appropriately screened for Depression (Academic year 2016-17)

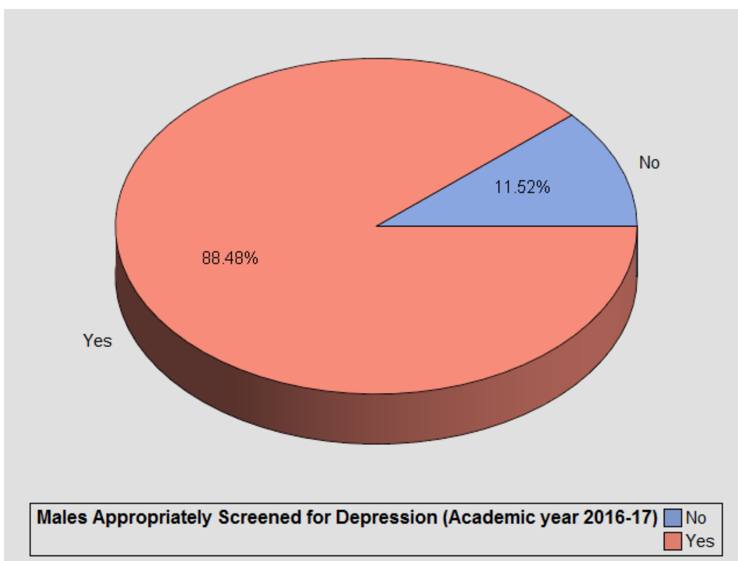


Figure 76: Proportion of Males that were Appropriately Screened for Depression (Academic year 2016-17)

4.3.2.2.3 Have male patients been given TDAP vaccine after age of 19?

Of the sample population, 78, 40.0% (SD 0.491) of eligible male patients in the sample population were documented to have received the TDAP vaccine in Academic year 2016-17 (see Figure 77). Upon constructing a 95% confidence interval, at worst 33.1% and at best 46.9% of the eligible males received the vaccine (see Figure 78).

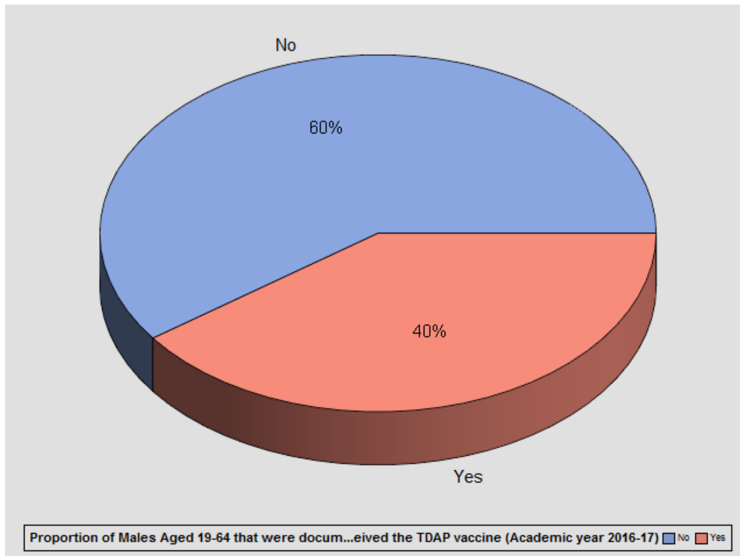


Figure 77: Proportion of males patients that were documented to have received the TDAP vaccine Academic year 2016-17)

Proportion of patients that were given the TDAP vaccine after age 19 (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.40000	0.33063	0.46937
Std Deviation	0.49116	0.44677	0.54542
Variance	0.24124	0.19960	0.29748

Figure 78: Summary statistics for proportion of males that were appropriately documented to have received the TDAP vaccine (Academic year 2016-17)

4.3.2.2.4 Have male patients between ages 21 to 26 received 3 doses of the HPV vaccine?

None of the of male patients screened in Academic year 2016-17 were documented to have received the shots as appropriate.

4.3.2.2.5 Have eligible male patients been counseled on smoking cessation?

In Academic year 2016-17, there were a total of 195 smokers in the sample population. Of the 191, 189 (96.9% SD 0.173) were appropriately counseled (see Figure 79). Using a 95% confidence interval, at worst 94.5% are being appropriately counseled and at best 99.4% (See Figure 80).

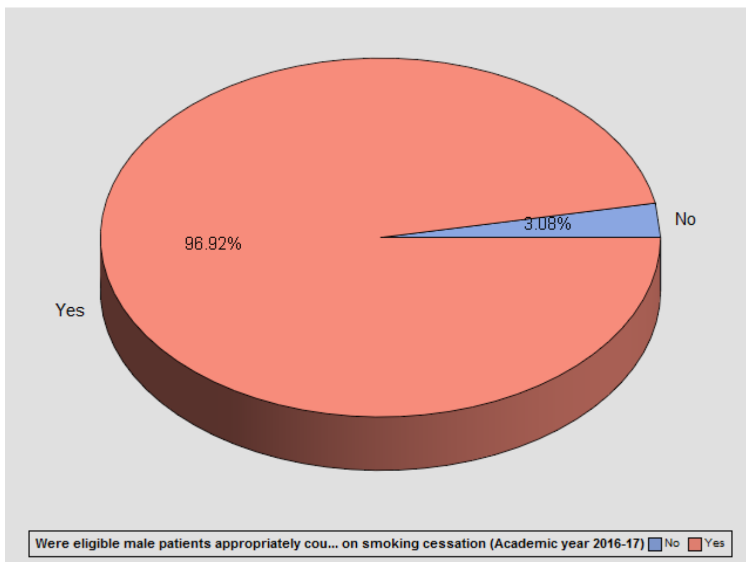


Figure 79: Proportion of eligible males that were being appropriately counseled for smoking cessation (Academic year 2016-17)

Proportion of patients that were appropriately counseled on smoking cessation (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.96923	0.94478	0.99368
Std Deviation	0.17314	0.15749	0.19226
Variance	0.02998	0.02480	0.03697

Figure 80: Summary statistics for proportion of male patients that were appropriately counseled on smoking cessation (Academic year 2016-17)

4.3.2.2.6 Have male patients been screened appropriately for AAA?

There were a total of 0 patients that were documented to have received screening for AAA in Academic year 2016-17.

4.3.2.2.7 Are male patients on aspirin being appropriately screened for GI bleeding?

In academic year 2016-17, there were a total of 70 (38.5% SD 0.488) patients that were appropriately screened for GI bleeding (Figure 81). Using a 95% confidence interval, at worst 31.3% and at best 45.6% of patients are being screened appropriately. (Figure 82).

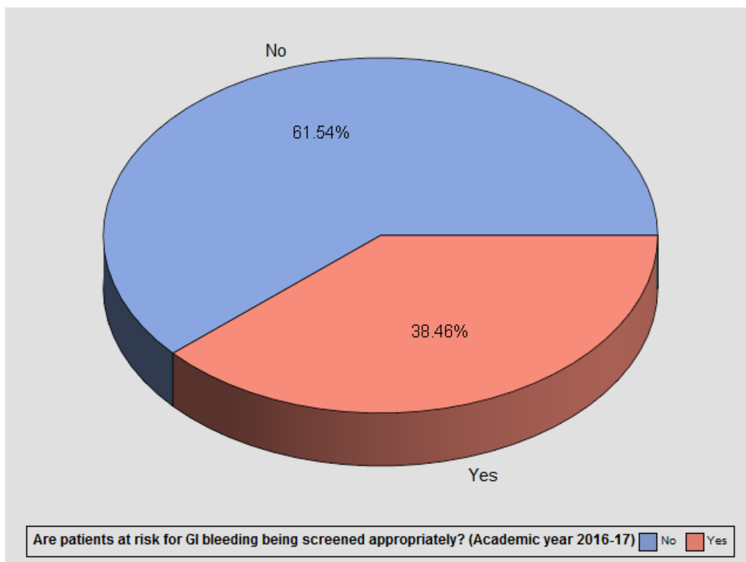


Figure 81: Proportion of patients that are being appropriately screened for GI bleeding (Academic year 2016-17)

Proportion of patients that were screened for GI bleeding (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.38462	0.31326	0.45597
Std Deviation	0.48785	0.44235	0.54386
Variance	0.23799	0.19567	0.29578

Figure 82: Summary statistics of patients that are being appropriately screened for GI bleeding (Academic year 2015-16)

4.1.3.2.8 Are male patients being appropriately screened for high blood pressure?

In academic year 2016-17, there were a total of 164 (84.1% SD 0.367) patients that were appropriately screened for high blood pressure (see Figure 83). Upon constructing a 95% confidence interval it is shown that at worst 78.9% and at best 89.3% of patients are being screened for hypertension (see Figure 84).

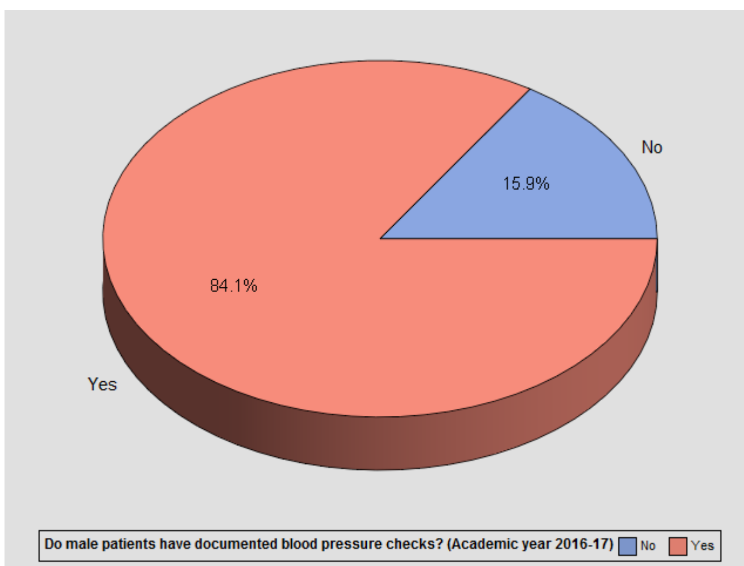


Figure 83: Proportion of males that had their blood pressure checked (Academic year 2016-17)

Proportion of patients that had their blood pressure checked (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.84103	0.78925	0.89280
Std Deviation	0.36659	0.33346	0.40709
Variance	0.13439	0.11120	0.16572

Figure 84: Summary Statistics describing proportion of patients appropriately screened for high blood pressure (Academic year 2016-17)

4.1.3.2.9 How often are male patients being screened appropriately for carotid artery stenosis?

There were a total of 76 (39.0% SD 0.489) males in the sample population that were correctly screened for carotid artery stenosis in academic year 2016-17 (Figure 85). Using a 95% confidence interval, at worst 32.1% and at best 45.9% of male patients are being screened correctly for carotid artery stenosis (Figure 86).

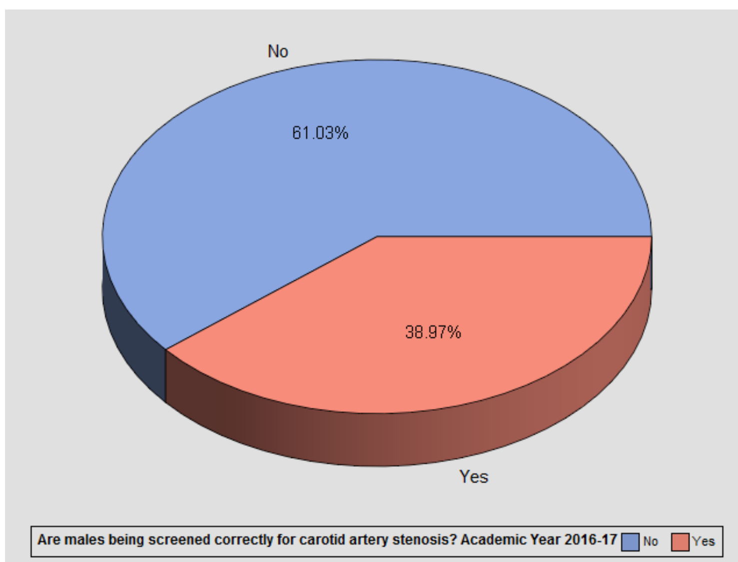


Figure 85: Proportion of males being correctly screened for carotid artery stenosis (Academic year 2016-17)

Proportion of patients that were screened for carotid artery stenosis (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.38974	0.32069	0.45880
Std Deviation	0.48895	0.44476	0.54296
Variance	0.23907	0.19781	0.29481

Figure 86: Summary statistics describing how often males are being screened appropriately for carotid artery stenosis? (Academic year 2016-17)

4.3.3 Prevention of Stroke/Heart Disease

4.3.3.1 Sample Characteristics for Population of Patients selected for study of Appropriate Stroke/Heart Disease Prevention Measures—Academic year 2016-17

There were a total of 488 patients screened in Academic year 2016-17 for appropriate prevention of stroke/heart disease. After a statistical analysis was conducted, it was found that the average systolic blood pressure was 134.35 (SD 17.65, 95% CI [132.78,135.92]) (see Figure 87). The distribution of systolic pressures (see Figure 88) was approximately normal, with a median of 132.00 and mode of 130.00.

Distribution of Systolic Blood Pressures for Patients screened for stroke/heart disease preventative measures (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: systolic

Moments

N	488	**Sum Weights**	488
Mean	134.352459	**Sum Observations**	65564
Std Deviation	17.651275	**Variance**	311.567509
Skewness	0.50906372	**Kurtosis**	0.92686021
Uncorrected SS	8960418	**Corrected SS**	151733.377
Coeff Variation	13.1380364	**Std Error Mean**	0.79903568

Basic Statistical Measures

Location		Variability	
Mean	134.3525	**Std Deviation**	17.65128
Median	132.0000	**Variance**	311.56751
Mode	130.0000	**Range**	120.00000
		Interquartile Range	22.00000

Basic Confidence Limits Assuming Normality

Parameter	Estimate	95% Confidence Limits	
Mean	134.35246	132.78248	135.92244
Std Deviation	17.65128	16.60899	18.83419
Variance	311.56751	275.85871	354.72667

Tests for Location: Mu0=0

Test	Statistic		p Value	
Student's t	**t**	168.1433	**Pr > |t|**	<.0001
Sign	**M**	244	**Pr >= |M|**	<.0001
Signed Rank	**S**	59658	**Pr >= |S|**	<.0001

Quantiles (Definition 5)

Level	Quantile
100% Max	200
99%	186
95%	162
90%	156
75% Q3	144
50% Median	132
25% Q1	122
10%	112
5%	110
1%	100
0% Min	80

Extreme Observations

Lowest		Highest	
Value	**Obs**	**Value**	**Obs**
80	8	186	389
90	58	188	113
92	317	194	255
94	143	196	482
100	451	200	257

Figure 87: Summary of Descriptive statistics of systolic blood pressures for sample of patients screened for appropriate preventative measures for stroke/heart disease prevention (Academic Year 2016-17)

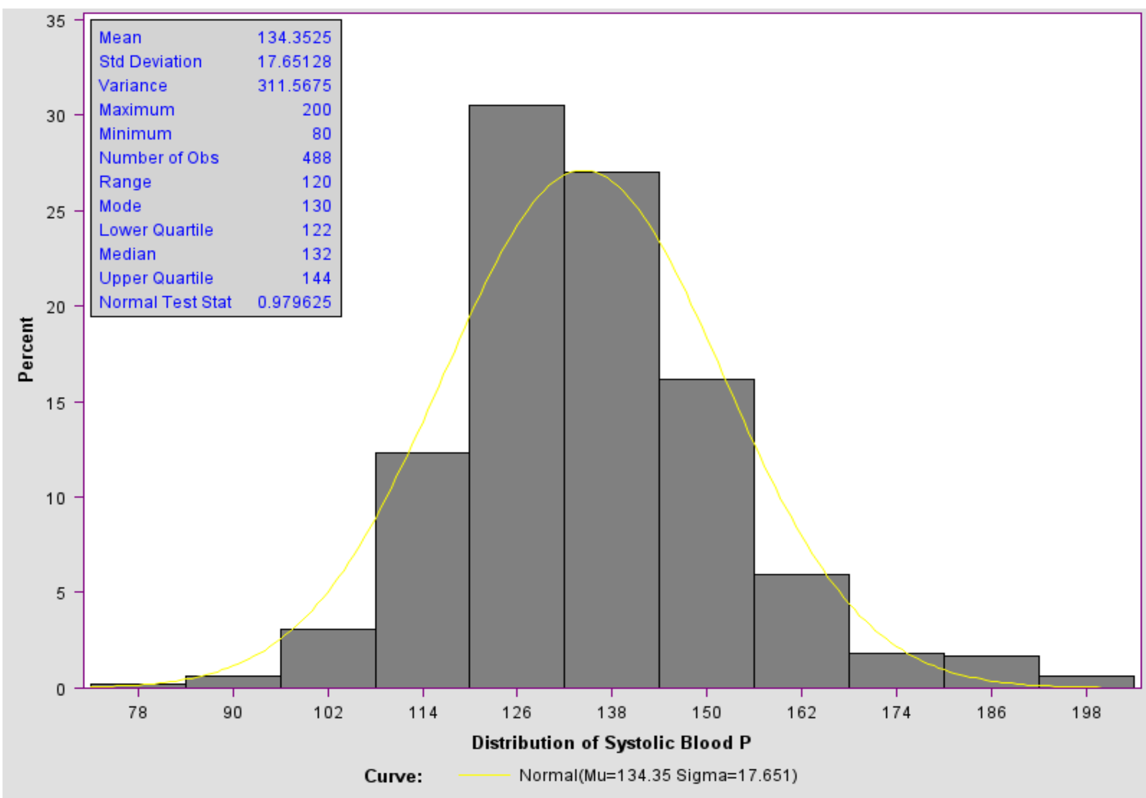


Figure 88: Distribution of Systolic Blood pressures for patients in sample population screened for appropriate measures for Stroke/Heart Disease Prevention (Academic year 2016-17)

The average diastolic blood pressure for the patients in the sample was 80.49 (SD 10.80, 95% CI [77.14,78.97] (see Figure 90 for complete summary of statistics). The distribution was approximately normal and symmetrical with a median and mode of 80 (see Figure 89).

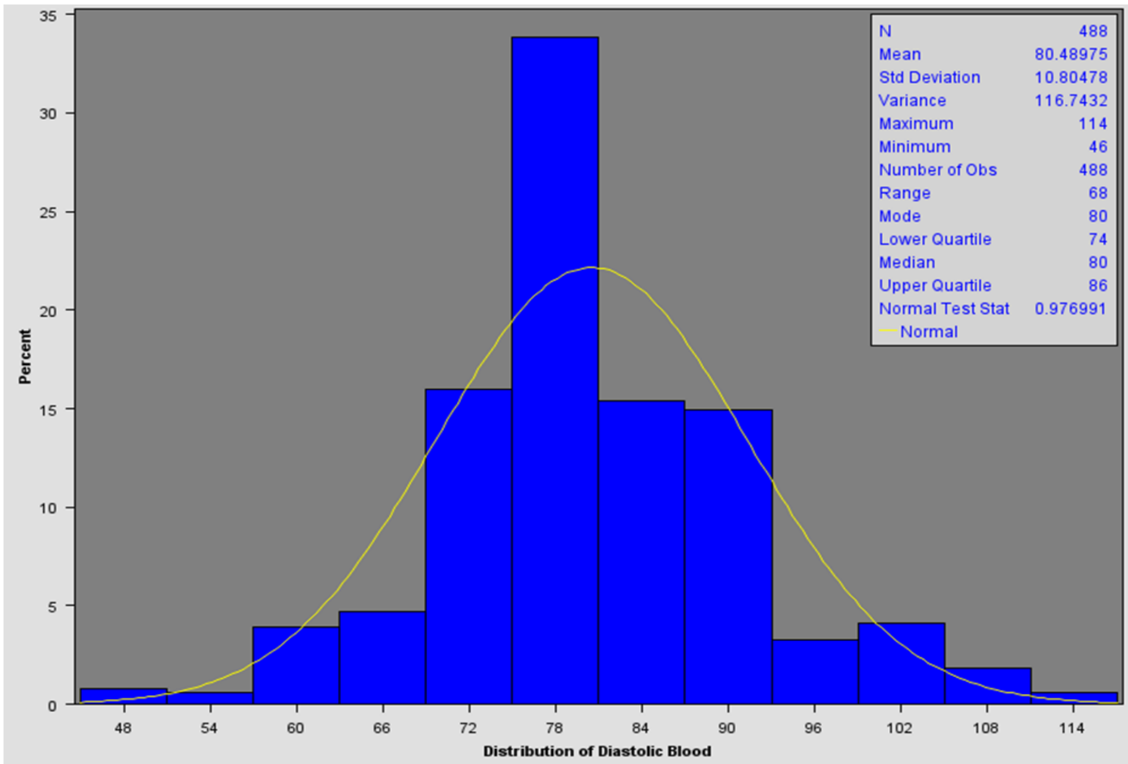


Figure 89: Distribution of diastolic blood pressures of sample population for appropriate preventative measures for stroke/heart disease (Academic year 2016-17)

Distribution of Diastolic Blood Pressures for Patients screened for stroke/heart disease preventative measures (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: diastolic

Moments

N	488	**Sum Weights**	488
Mean	80.4897541	**Sum Observations**	39279
Std Deviation	10.8047777	**Variance**	116.743221

Moments

Skewness	0.18203752	**Kurtosis**	0.75697597
Uncorrected SS	3218411	**Corrected SS**	56853.9488
Coeff Variation	13.4237927	**Std Error Mean**	0.48910931

Basic Statistical Measures

Location		Variability	
Mean	80.48975	**Std Deviation**	10.80478
Median	80.00000	**Variance**	116.74322
Mode	80.00000	**Range**	68.00000
		Interquartile Range	12.00000

Basic Confidence Limits Assuming Normality

Parameter	Estimate	95% Confidence Limits	
Mean	80.48975	79.52873	81.45078
Std Deviation	10.80478	10.16677	11.52887
Variance	116.74322	103.36326	132.91480

Tests for Location: Mu0=0

Test	Statistic		p Value	
Student's t	**t**	164.5639	**Pr > |t|**	<.0001
Sign	**M**	244	**Pr >= |M|**	<.0001
Signed Rank	**S**	59658	**Pr >= |S|**	<.0001

Quantiles (Definition 5)

Level	Quantile
100% Max	114
99%	110
95%	100
90%	92
75% Q3	86
50% Median	80
25% Q1	74
10%	68

Quantiles (Definition 5)

Level	Quantile
5%	62
1%	54
0% Min	46

Extreme Observations

Lowest		Highest	
Value	**Obs**	**Value**	**Obs**
46	58	110	360
48	437	110	483
50	143	111	415
50	34	111	418
54	167	114	410

Figure 90: Summary of Descriptive statistics for distribution of diastolic blood pressures for sample population patients that were screened for appropriate preventative measures of stroke/heart disease prevention (Academic year 2016-

Of the sample population, 66 (13.0% SD 0.353) patients were documented smokers (see Figure 91). Constructing a 95% confidence interval, at worst 17.8% and at best 11.3% are smokers.

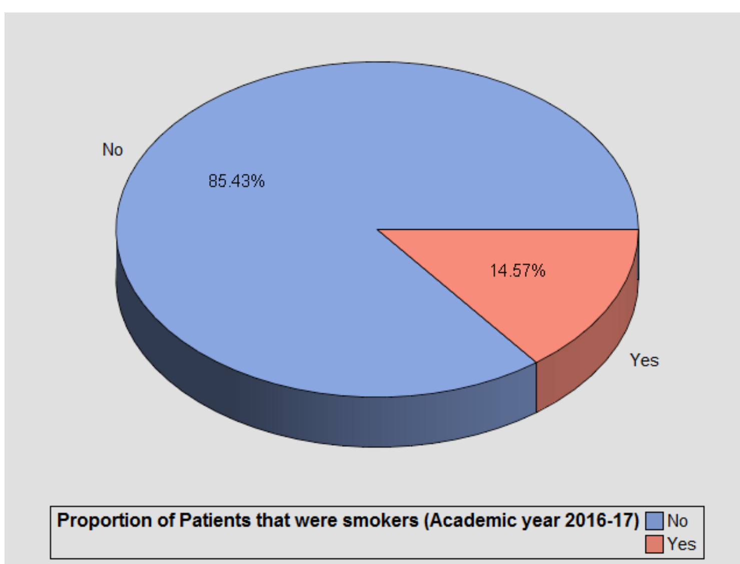


Figure 91: Proportion of patients that were smokers in sample population that were screened for appropriate prevention of stroke/heart disease (Academic year 2016-17)

In addition, a total of 146 (30.0% SD 0.459) patients in the sample population were documented to be diabetic (see Figure 92). Using a 95% confidence interval, at worst 34.0% and at best 25.9% of the population is diabetic.

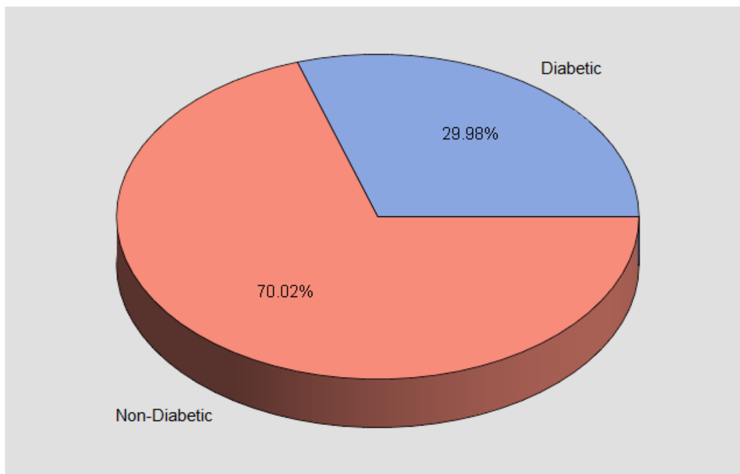


Figure 92: Proportion of patients that were diabetic in sample population that were screened for appropriate prevention of stroke/heart disease in Academic year 2016-17

Last but not least, a total of 16 patients (3.44% SD 0.182) were newly diagnosed with hypertension (see Figure 93). Using a 95% confidence interval, at worst 1.78% and at best only 5.10% were newly diagnosed.

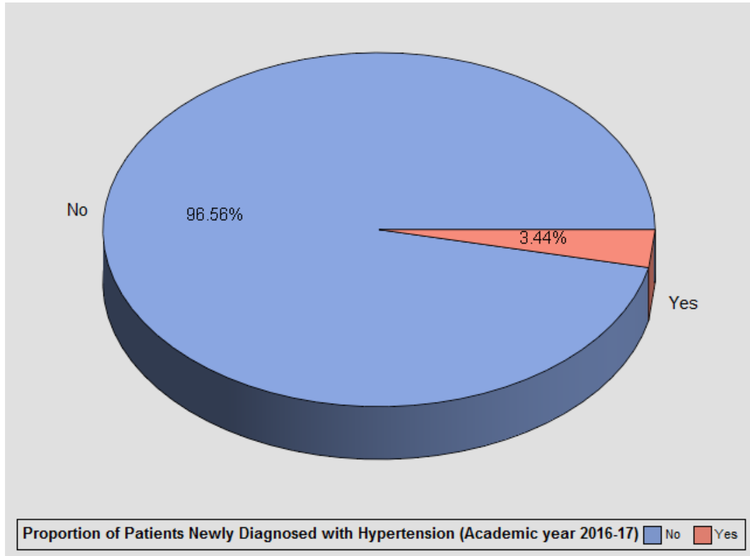


Figure 93: Proportion of patients that were newly diagnosed with hypertension (Academic year 2016-17)

4.3.3.2 Analysis of patients that were screened for appropriate measures for prevention of Heart disease/stroke (Academic year 2016-17)

4.3.1.3.1 Is the patient on aspirin or any other antithrombotic?

In academic year 2015-16, there were a total of 179 (39.4% SD 0.489) out of a total of 453 eligible patients were documented to have been on aspirin or another antithrombotic (see Figure 94). Upon constructing a 95% confidence interval, this means at worst 34.9% and at best 43.9% of the population are on aspirin/another antithrombotic (see Figure 95).

Proportion of patients that were on aspirin or other antithrombotic (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.39514	0.34995	0.44033
Std Deviation	0.48942	0.45949	0.52355
Variance	0.23953	0.21113	0.27411

Figure 94: Summary Statistics estimating proportion of patients on aspirin or other antithrombotic (Academic year 2016-17)

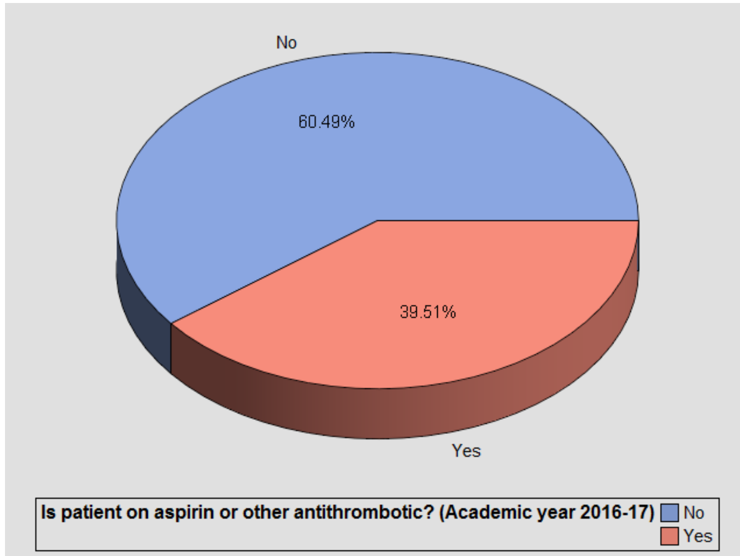


Figure 95: Proportion of patients that are on aspirin or other antithrombotic (Academic year 2016-17)

4.3.1.3.2 Has the patient's smoking status been updated within the last year?

In academic year 2016-17, it was found that there was a total of 324 (85.9% SD 0.348) patients that had their smoking status updated within the last year (see Figure 96). A 95% confidence interval predicts that at worst 82.4% of patients had their smoking status updated within the last year and at best, 89.5% (See Figure 97).

Proportion of patients that had their smoking status updated within a year (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality

Parameter	Estimate	95% Confidence Limits	
Mean	0.85942	0.82417	0.89466
Std Deviation	0.34805	0.32486	0.37485
Variance	0.12114	0.10553	0.14051

Figure 96: Descriptive statistics summarizing proportion of patients that had their smoking status updated within a year (Academic year 2016-17)

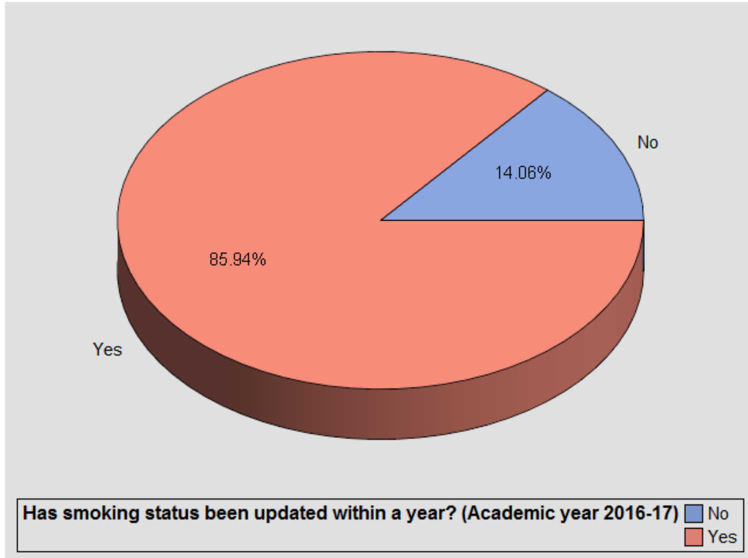


Figure 97: Proportion of patients that had their smoking status updated within the last year (Academic year 2016-17)

4.3.1.3.3 Has the patient been counseled about smoking cessation if appropriate?

In academic year 2016-17 there were 66 documented smokers. Of those 66 smokers, 45 (68.2% SD 0.469) were documented to have been appropriately counseled on cessation (Figure 98). Using a 95% confidence interval, it is found that at worst 56.6% of patients are being counseled and at best 79.9% (see Figure 99).

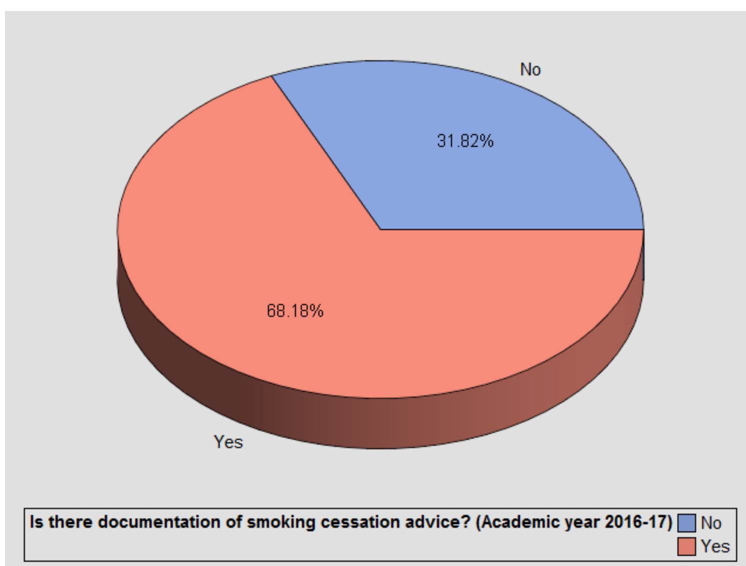


Figure 98: Proportion of patients that were counseled on smoking cessation (Academic year 2015-16)

Proportion of patients were appropriately counseled on smoking cessation (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.68182	0.56644	0.79720
Std Deviation	0.46934	0.40070	0.56658
Variance	0.22028	0.16056	0.32101

Figure 99: Descriptive Statistics estimating proportion of patients that were appropriately given smoking cessation advice (Academic year 2015-16)

4.3.1.3.4 Were patients appropriately screened for diabetes?

In academic year 2016-17, there were a total of 432 patients (89.6% SD 0.305) appropriately screened for diabetes (see Figure 100). Upon conducting a 95% confidence interval, it is found that at worst 86.9% of patients are being screened and at best 92.4% percent patients are being screened (see Figure 101).

Proportion of patients were screened for diabetes (Academic year 2016-17)

The UNIVARIATE Procedure
Variable: compliance

Basic Confidence Limits Assuming Normality			
Parameter	Estimate	95% Confidence Limits	
Mean	0.89627	0.86895	0.92358
Std Deviation	0.30523	0.28710	0.32582
Variance	0.09317	0.08243	0.10616

Figure 100: Descriptive statistics for patients that were screened for diabetes (Academic year 2015-16)

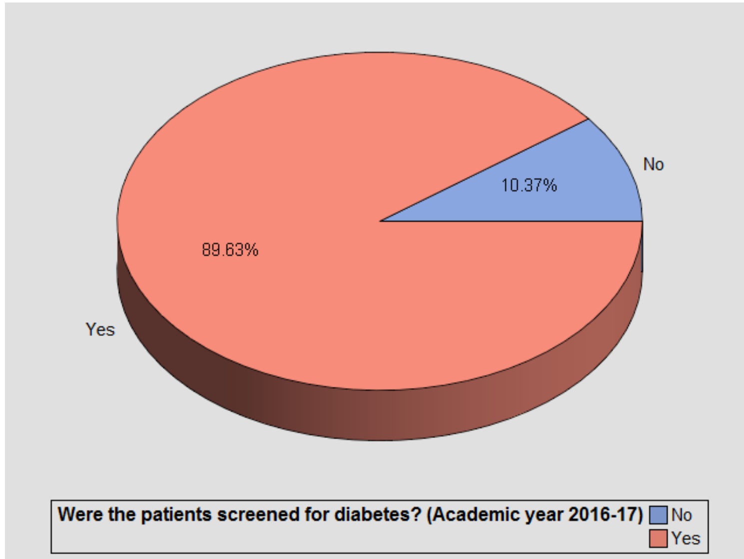


Figure 101: Proportion of patients that were screened for diabetes (Academic year 2015-16)

4.4 On Change in Compliance Post-Intervention

In order to check whether or not there was there was an improvement to compliance post raising awareness to performance, several chi-squared difference of proportions tests were performed against several categories, for each topic.

4.4.1 Hyperlipidemia

4.4.1.1 Comparison of sample characteristics

In academic year 2015-16 there were less documented diabetic patients and smokers. However, there were a greater amount of patients that were documented to have a history of heart disease and stroke. Upon conducting a two-tailed difference of proportions analysis to test whether or not the proportions were equal for academic year 2015-16 and academic year 2016-17, it was found that the proportion of diabetics as well as smokers for between academic years were not equal with p-values of 0.0252 and <0.0002 respectively. However, with a p-value of 0.1209, the null hypothesis that the proportions for the number of patients diagnosed with a history of heart disease/stroke both academic years were equal cannot be rejected.

Table 7: Comparison of Sample characteristics for sample population of patient screened for appropriate management of hyperlipidemia academic year 2015-16 and academic year 2016-17

Characteristic	Proportion, Confidence Interval	
	Academic Year 2015-16	Academic Year 2016-17
Diabetic	0.298, [0.299,0.318]	0.339, [0.310,0.368]
Smoker	0.093, [0.084,0.106]	0.173, [0.150,0.196]
History of Heart Disease/Stroke	0.128, [0.114,0.143]	0.110, [0.091,0.1295]

4.4.1.2 Comparison of compliance to guidelines

Upon conducting a difference of proportions analysis for every category, it was found that there were statistically significant increases to guideline compliance in 2/6 categories. The proportion of patients that received appropriate treatment for hypertension went up from 0.57 to 0.67. Additionally, the proportion of patients that were documented to have fasted >12 hours before having a lipid panel drawn increased from 0.76 to 0.86. Upon conducting a difference of proportions analysis to determine how often category A, B, and D patients were receiving appropriate treatment for hyperlipidemia it was determined that the null hypothesis had to be rejected due to the low p-value: The proportion of patients that were treated appropriately in academic year 2015-16 was greater than the proportion of patients that were treated appropriately in academic year 2016-17.

Table 8: Significance of Change of Compliance to Hyperlipidemia Guidelines Across Several Categories between Academic Year 2015-16 and Academic Year 2016-17 (Significance Level 0.05)

	Proportion Patients Appropriately Managed, 95% CI		
Category	Academic Year 2015-16	Academic Year 2016-17	p-value
Did patient receive appropriate treatment for hypertension?	0.57, [0.55, 0.60]	0.67, [0.64,0.69]	<0.0001
Did patient fast before lipid panel was drawn?	0.76, [0.74,0.78]	0.86, [0.84,0.89]	<0.0001
Were Category A patients treated appropriately?	0.46, [0.40,0.51]	0.33, [0.27,0.39]	0.0011
Were Category B patients treated appropriately?	0.71, [0.68,0.78]	0.66, [0.61,0.71]	0.0429
Were Category C patients treated appropriately?	0.64, [0.60,0.68]	0.60, [0.55,0.65]	0.1224
Were Category D patients treated appropriately?	0.86, [0.84,0.89]	0.73, [0.69,0.78]	<0.0001

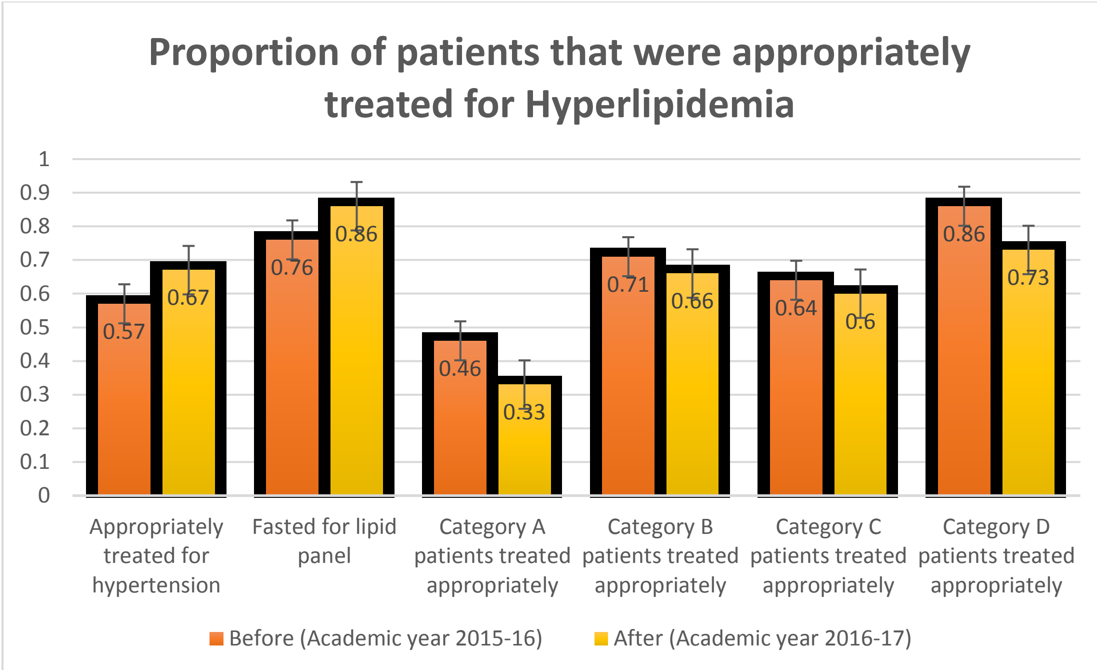


Figure 102: Comparison of proportion of patients that were appropriately treated for hyperlipidemia Academic year 2015-16 and Academic year 2016-17

4.4.2 Men's Preventative Health

4.4.2.1 Comparison of sample characteristics

Upon conducting a difference on proportions analysis to determine whether or not there was a difference in characteristics for the sample population selected to screen for appropriate measures of men's preventative health between academic years 2015-16 and 2016-17, it was found that there were statistically significant differences between the proportion of patients that were at risk for prostate issues as well as for AAA at a significance level of 0.05. However, since the p-value for comparison of proportion of patients that were at risk for GI bleeding is >0.05, the null hypothesis that the proportion of patients that were at risk in both academic years 2015-16 and 2016-17 were the same cannot be rejected.

Table 9: Characteristics of Male Population Screened for Appropriate Preventative Measures

Category	Proportion, Confidence Interval		P-value
	Academic Year 2015-16	Academic Year 2016-17	
Risk of Prostate Issues	0.209, [0.155,0.262]	0.308, [0.242,0.373]	0.0204
Risk of AAA	0.313, [0.251,0.374]	0.074, [0.035,0.114]	<0.0002
Risk of GI bleeding	0.269, [0.205,0.333]	0.187, [0.130,0.244]	0.061

4.4.2.2 Comparison of compliance to guidelines

In order to get a holistic idea of change in compliance to guidelines, an analysis of 12 different categories was conducted. Of these 12 categories, at a significance level of p=0.05, it was found that there were statistically significant differences in the proportion of patients that were screened/treated appropriately or given the appropriate intervention in 6/12 categories, namely, colorectal cancer screening, colonoscopy screening, occult blood screening, occult blood screening, depression screening, smoking cessation counseling, and screening for carotid artery stenosis. In addition, there was not a statistically significant difference in the change of proportion of patients that had their BP-check from one year to another.

A conclusion about change of compliance in the following categories could not be formed because they did not meet the criteria required to conduct a difference of proportions analysis: sigmoidoscopy screening, HPV vaccination administration, and AAA screening.

Table 10: Proportion of Men Screened Appropriately for Different Preventative Measures Academic year 2015-16 and 2016-17

Category	Proportion, Confidence Interval		P-value
	Academic Year 2015-16	Academic Year 2016-17	
Colorectal Cancer	0.675, [0.609,0.742]	0.779, [0.718,0.840]	<0.0001
Colonoscopy	0.527, [0.461,0.593]	0.636, [0.563,0.708]	0.015
Sigmoidoscopy	0.014, [-0.001,0.030]	0.089, [0.038,0.141]	Requirements not met
Occult Blood	0.085, [0.047,0.123]	0.458, [0.372,0.544]	<0.0001
Depression	0.556, [0.490,0.622]	0.885, [0.836,0.934]	<0.0001
TDAP	0.648, [0.585,0.712]	0.4, [0.331,0.469]	<0.0001
HPV	0.047, [0.013,0.081]	0, [-,-]	-
Smoking Cessation Advice	0.880, [0.833,0.926]	0.969, [0.945, 0.994]	<0.0001
AAA Screening	0.161, [0.098,0.222]	0, [-,-]	-
GI Bleeding	0.529, [0.472,0.605]	0.385, [0.313,0.456]	0.001
BP Checks	0.819, [0.767,0.871]	0.841, [0.789,0.893]	0.2733
Carotid Artery Stenosis	0.222, [0.167,0.277]	0.389, [0.321,0.459]	0.0001

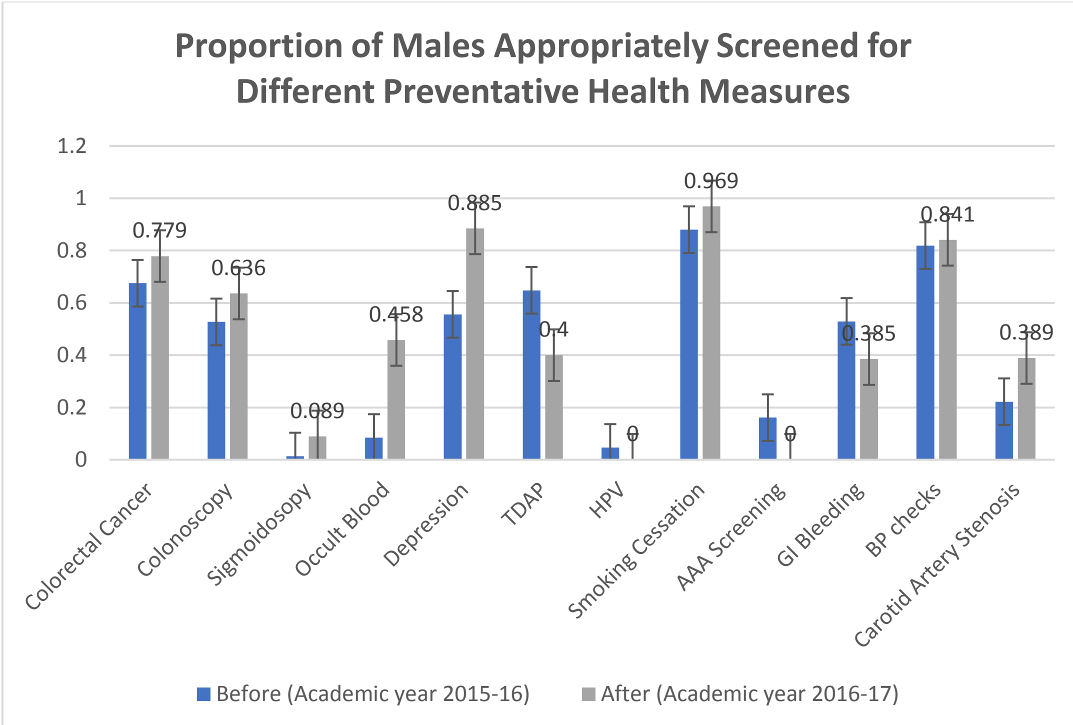


Figure 103: Comparison of proportion of male patients appropriately screened for different preventative health measures Academic year 2015-16 and 2016-17

4.4.3 Stroke/Heart Disease Prevention

4.4.3.1 Comparison of sample characteristics

Upon conducting a difference of proportions analysis it was demonstrated that there was no significant change in the proportion of smokers or in the proportion of patients diagnosed with hypertension between academic years at a significance level p=0.05. However, there is a statistically significance change in the proportion of patients that were diabetic in the sample population between academic year 2016-17.

Table 11: Characteristics of Sample of Patients that were Screened for appropriate treatment for prevention of Stroke/Heart Disease

Category	Proportion, Confidence Interval		p-value
	Academic year 2015-16	Academic year 2016-17	
Smoker	0.130, [0.098,0.161]	0.146, [0.113,0.178]	0.4876
Diabetic	0.226, [0.187,0.265]	0.300, [0.259,0.341]	0.0112
Diagnosed with hypertension	0.016, [0.004,0.027]	0.034, [0.018,0.051]	0.0702

4.4.3.2 Comparison of compliance to guidelines

At a significance level of 0.05, it was found that there was a change in compliance in 4/6 categories, namely, appropriately prescribing new blood pressure medications, appropriately describing aspirin or other antithrombotic, updating smoking status, and providing smoking cessation advise. Criteria to conduct a difference of proportions analysis to determine whether or not there was a difference in obtaining lipid profile between academic years was not met—therefore the change in compliance is inconclusive. It was also found that the change in the difference between of the proportion of patients that were screened for diabetes between both academic years was not significant.

Table 12: Proportion of Patients that Were Treated Appropriately for Prevention of Stroke/Heart Disease in Sample Population

Category	Proportion, Confidence Interval		P-value
	Academic Year 2015-16	Academic year 2016-17	
New Blood Pressure Medication Prescribed	0.116, [0.086,0.146]	0.195, [0.158,0.232]	0.0006
Lipid Profile within last 13 months	1, [-,-]	0.793, [0.757,0.829]	-

Aspirin or Antithrombotic prescribed	0.275, [0.232,0.317]	0.394, [0.349,0.439]	<0.0001
Smoking status updated	0.916, [0.890,0.943]	0.859, [0.824, 0.895]	0.0054
Smoking Cessation advice	0.517, [0.385,0.650]	0.682, [0.566,0.797]	0.0307
Screened for diabetes	0.877, [0.846,0.908]	0.896, [0.869,0.924]	0.1764

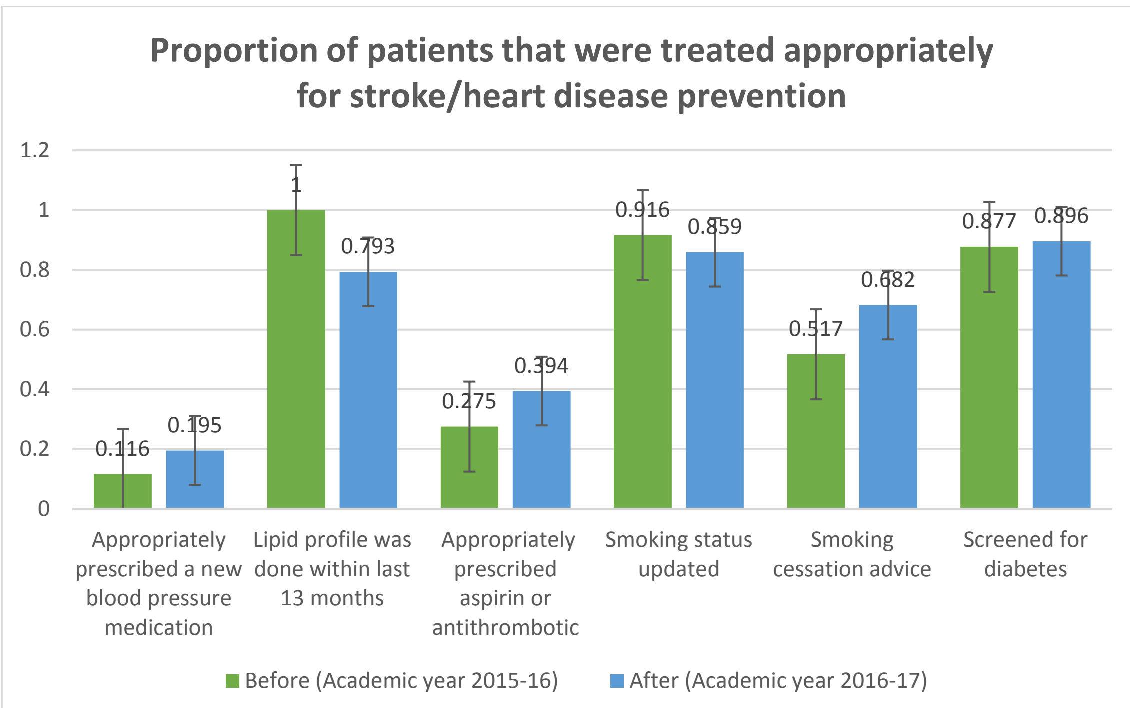


Figure 104: Comparison of proportion of patients that were treated appropriately for stroke/heart disease prevention Academic year 2015-16 and 2016-17

4.5 On change in patient outcomes

As shown above, there was improved compliance in several different categories in screening for appropriate treatment of hyperlipidemia, men's preventative health, and stroke/heart disease prevention. The ultimate goal of complying to evidence based practice is to improve patient outcomes. In order to determine whether or not there was an improvement in patient outcomes in academic year 2016-17, a right tailed t-test was used to test for significance at a significance level of 0.05. For all tests, the following hypotheses were used:

Null hypothesis (H_0): The population mean in academic year 2015-16 is greater than or equal to the population mean in academic year 2016-17

Alternative hypothesis (H_a): The population mean in academic year 2016-17 is greater than the population mean in academic year 2015-16.

4.5.1 Hyperlipidemia

4.5.1.1 Total cholesterol

Upon conducting a t test to determine whether or not the average total cholesterol in the population of patients screened for appropriate treatment of hyperlipidemia in academic year 2015-16 was greater than it was in academic year 2016-17, it was found that the p-value is 0.6751. Consequently, we fail to reject the null hypothesis that that average cholesterol total level in patients in academic year 2015-16 was greater than or equal to the population mean in academic year 2016-17.

Total Cholesterol Difference Analysis Between Academic Year 2015-16 and 2016-17 for patients screened for appropriate treatment of Hyperlipidemia

The TTEST Procedure

Variable: reading

year	N	Mean	Std Dev	Std Err	Minimum	Maximum
y1	1918	198.0	44.7573	1.0220	79.0000	478.0

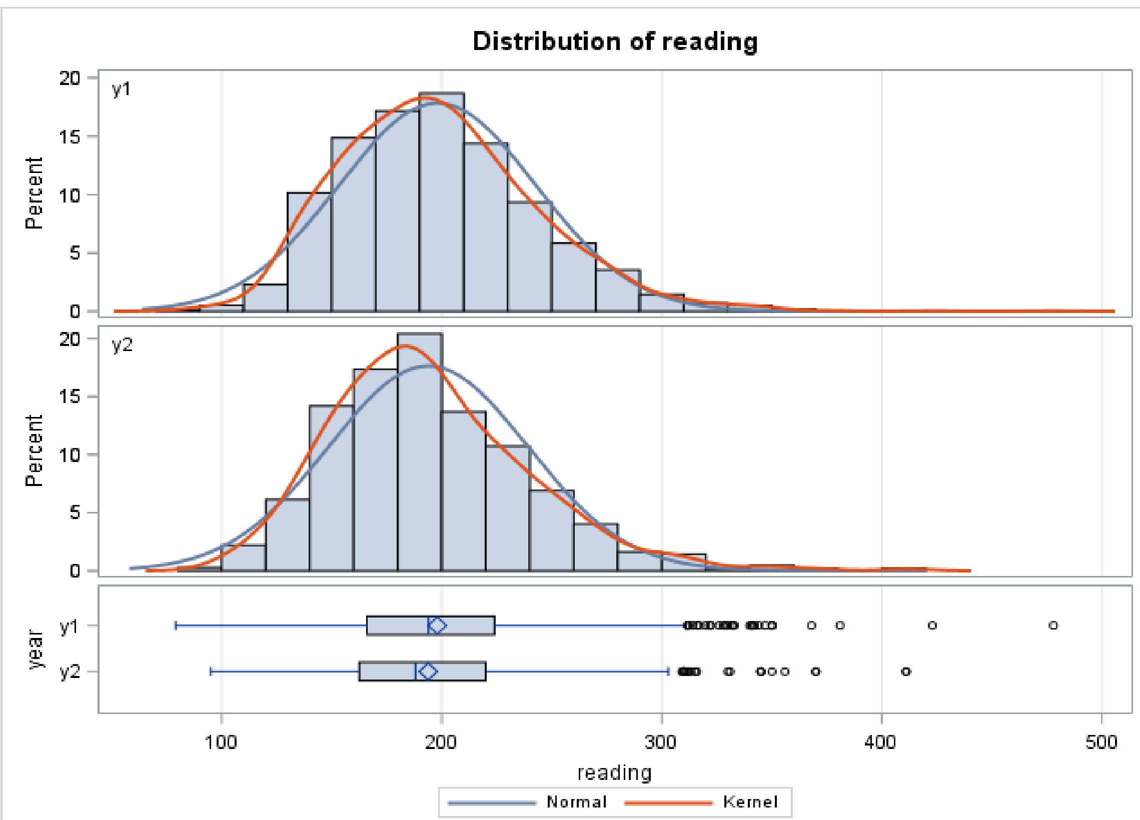
year	N	Mean	Std Dev	Std Err	Minimum	Maximum
y2	1044	193.8	45.2637	1.4009	95.0000	411.0
Diff (1-2)		4.1600	44.9364	1.7283		

year	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
y1		198.0	196.0	200.0	44.7573	43.3845	46.2206
y2		193.8	191.1	196.5	45.2637	43.4020	47.2935
Diff (1-2)	**Pooled**	4.1600	0.7713	7.5488	44.9364	43.8204	46.1111
Diff (1-2)	**Satterthwaite**	4.1600	0.7595	7.5606			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	2960	2.41	0.0161
Satterthwaite	Unequal	2121.6	2.40	0.0165

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	1043	1917	1.02	0.6751



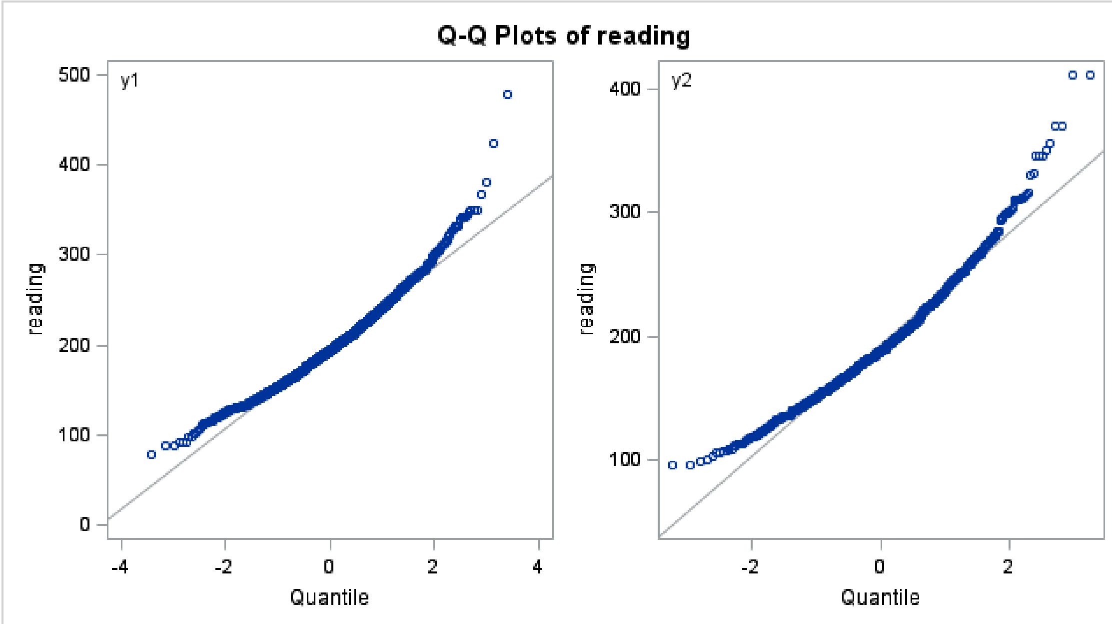


Figure 105: T-Test comparing Distribution of Cholesterol Readings for Patients in Sample. Academic Year 2015-16 and Academic Year 2016-17

4.5.1.2 High Density Lipoprotein (HDL)

Upon conducting a t test to determine whether or not the average HDL level for patients that were screened for appropriate treatment of hyperlipidemia in academic year 2015-16 was greater than the HDL level for patients in academic year 2016-17, it was found that the p-value is less than 0.0001. Consequently, we reject the null hypothesis that the average HDL level in patients in Academic year 2015-16 is greater than or equal to the average HDL level in patients in Academic year 2016-17.

HDL Difference Analysis Between Academic Year 2015-16 and 2016-17 for patients screened for appropriate treatment of Hyperlipidemia

The TTEST Procedure

Variable: reading

year	N	Mean	Std Dev	Std Err	Minimum	Maximum
y1	1914	82.7144	42.6369	0.9746	16.0000	285.0

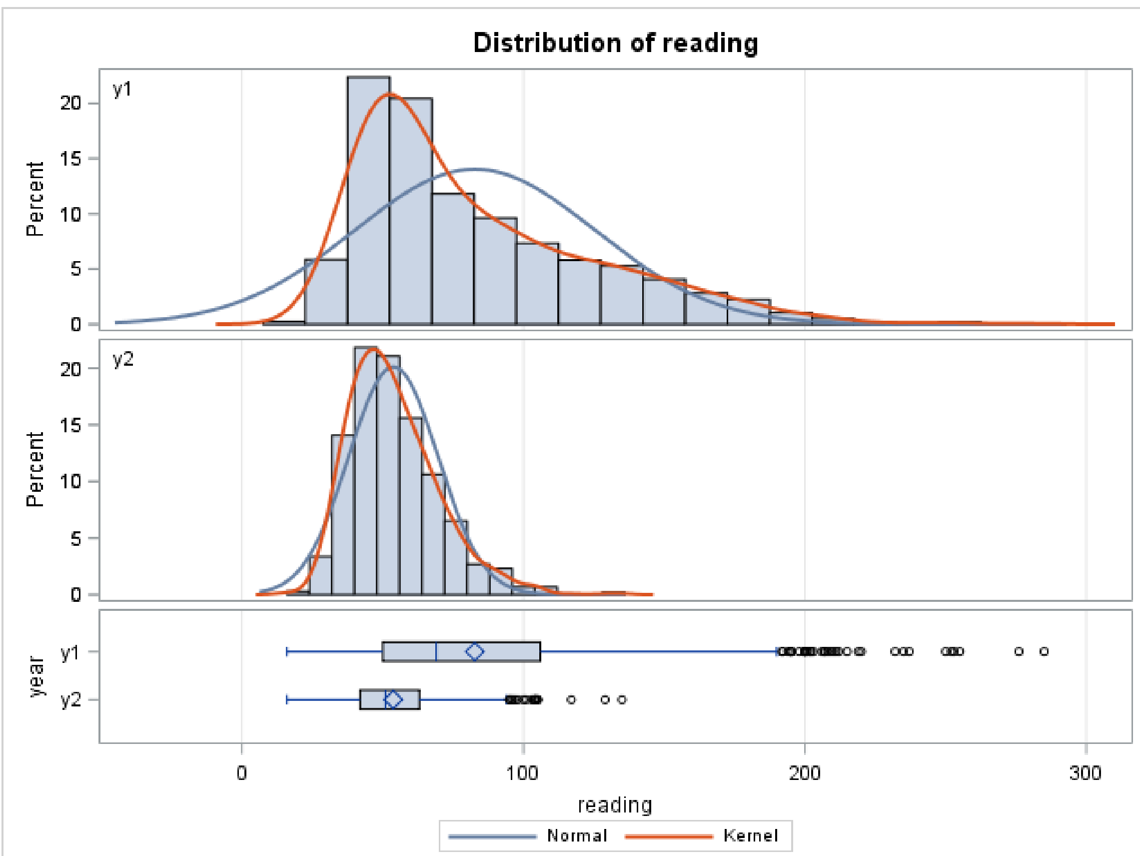
year	N	Mean	Std Dev	Std Err	Minimum	Maximum
y2	1044	53.7725	15.8584	0.4908	16.0000	135.0
Diff (1-2)		28.9419	35.5697	1.3685		

year	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
y1		82.7144	80.8031	84.6258	42.6369	41.3277	44.0323
y2		53.7725	52.8094	54.7356	15.8584	15.2062	16.5696
Diff (1-2)	**Pooled**	28.9419	26.2585	31.6253	35.5697	34.6858	36.5003
Diff (1-2)	**Satterthwaite**	28.9419	26.8023	31.0816			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	2956	21.15	<.0001
Satterthwaite	Unequal	2689.2	26.52	<.0001

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	1913	1043	7.23	<.0001



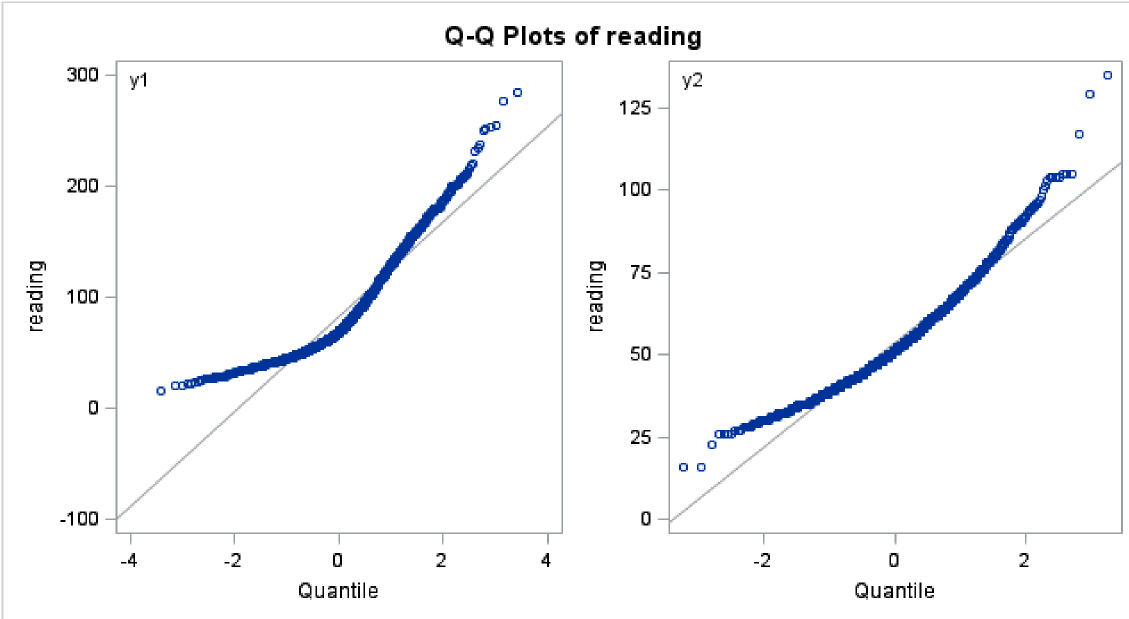


Figure 106: T-test Comparing Distribution of HDL Readings for Patients in Sample. Academic Year 2015-16 and Academic Year 2016-17

4.5.1.3 Low Density Lipoprotein (LDL)

Upon conducting a t test to determine whether or not the average LDL level for patients that were screened for appropriate treatment for hyperlipidemia in academic year 2015-16 was greater than the LDL level for patients in academic year 2016-17, it was found that the p-value is 0.0025. Consequently, we reject the null hypothesis that the average LDL level for patients in academic year 2015-16 is greater than or equal to the average LDL level for patients in academic year 2016-17.

LDL Difference Analysis Between Academic Year 2015-16 and 2016-17 for patients screened for appropriate treatment of Hyperlipidemia

The TTEST Procedure

Variable: reading

year	N	Mean	Std Dev	Std Err	Minimum	Maximum
y1	1911	86.9519	41.9126	0.9588	20.0000	334.0

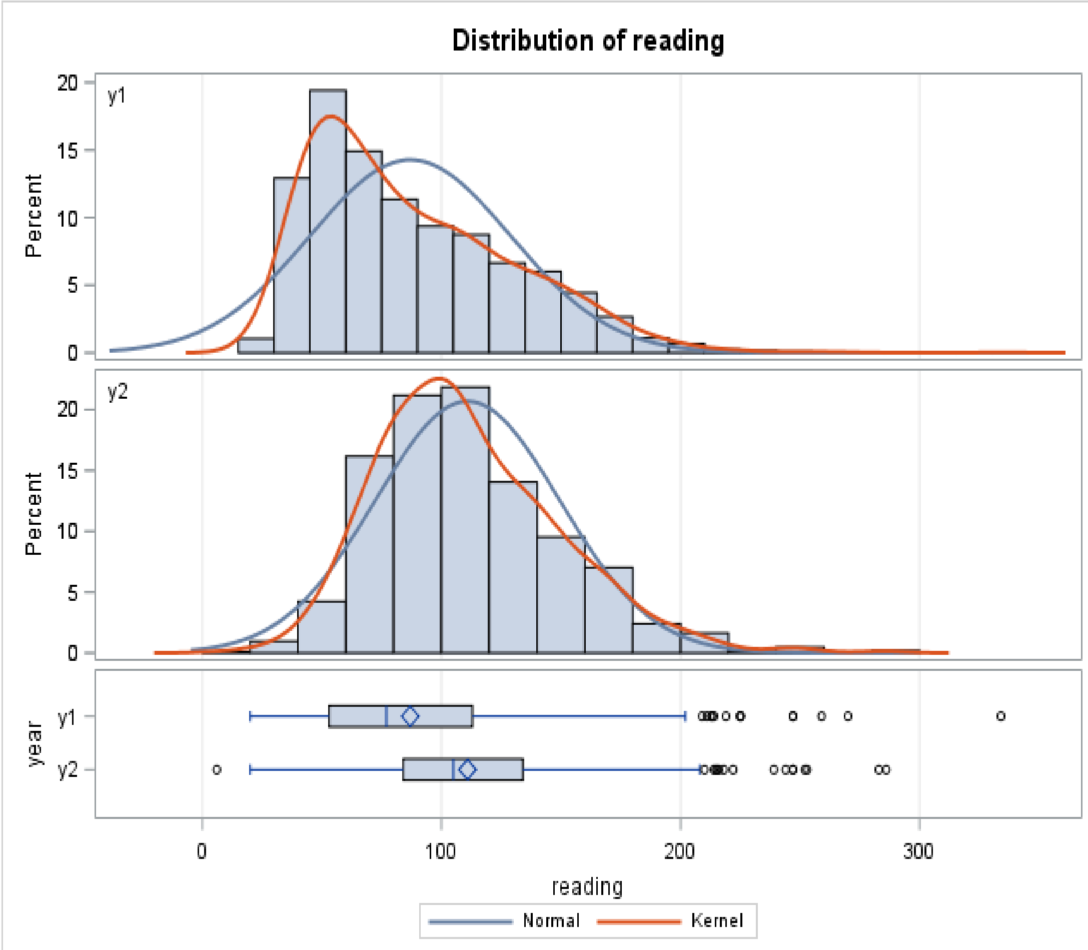
year	N	Mean	Std Dev	Std Err	Minimum	Maximum
y2	1039	110.9	38.5658	1.1964	6.0000	286.0
Diff (1-2)		-23.9298	40.7655	1.5713		

year	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
y1		86.9519	85.0715	88.8322	41.9126	40.6247	43.2854
y2		110.9	108.5	113.2	38.5658	36.9759	40.2995
Diff (1-2)	**Pooled**	-23.9298	-27.0108	-20.8488	40.7655	39.7511	41.8335
Diff (1-2)	**Satterthwaite**	-23.9298	-26.9364	-20.9231			

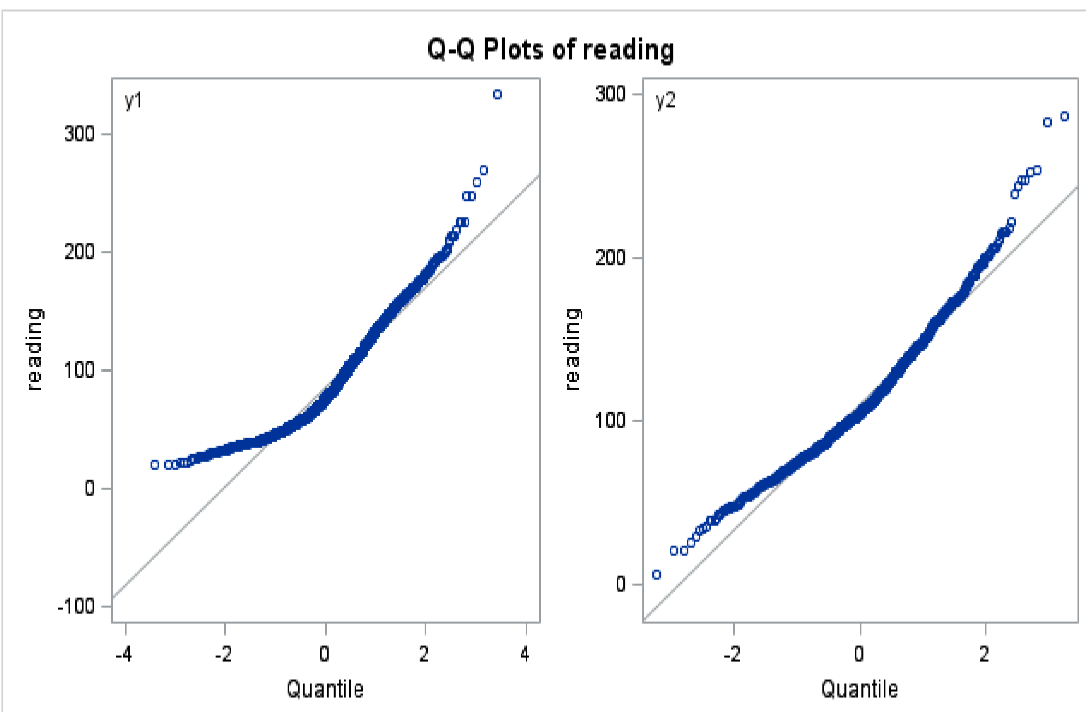
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	2948	-15.23	<.0001
Satterthwaite	Unequal	2286.7	-15.61	<.0001

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	1910	1038	1.18	0.0025



Distribution of reading
y1
y2
Percent
year
reading
Normal
Kernel



Q-Q Plots of reading
y1
y2
reading
Quantile

Figure 107: T-test Comparing Distribution of LDL Readings for Patients in Sample. Academic Year 2015-16 and Academic Year 2016-17

4.5.1.4 Systolic Blood Pressure

Upon conducting a t test to determine whether or not the average systolic blood pressure for patients screened for appropriate treatment of hyperlipidemia in academic year 2015-16 was greater than the average systolic blood pressure for patients in academic year 2016-17, it was found that the p-value is 0.9159. Consequently, we fail to reject the null hypothesis that the average systolic blood pressure for patients in academic year 2015-16 is greater than or equal to the average systolic blood pressure for patients in academic year 2016-17.

Systolic Blood Pressure Difference Analysis Between Academic Year 2015-16 and 2016-17 for patients screened for appropriate treatment of Hyperlipidemia

The TTEST Procedure

Variable: reading

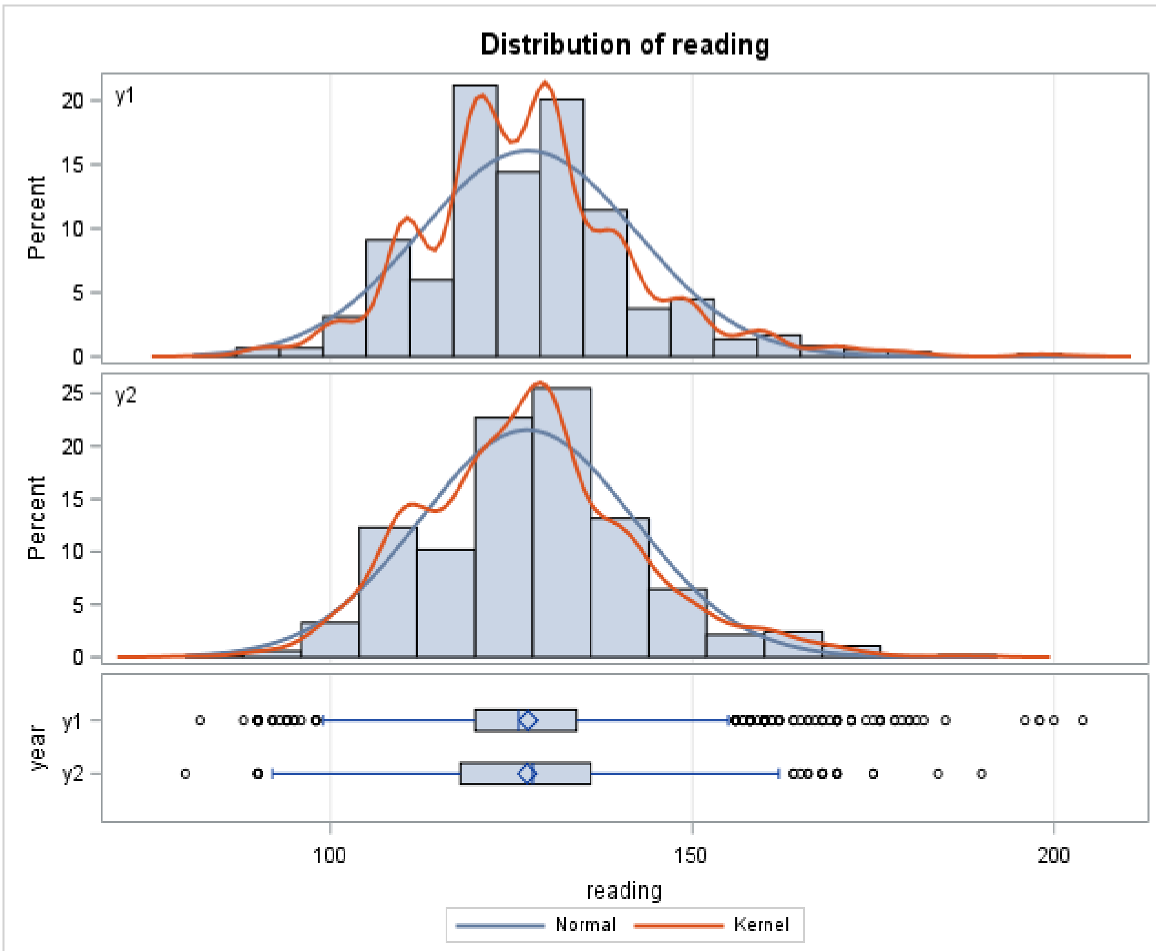
year	N	Mean	Std Dev	Std Err	Minimum	Maximum
y1	1922	127.3	14.8803	0.3394	82.0000	204.0
y2	1040	127.2	14.8354	0.4600	80.0000	190.0
Diff (1-2)		0.1216	14.8646	0.5722		

year	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
y1		127.3	126.7	128.0	14.8803	14.4244	15.3663
y2		127.2	126.3	128.1	14.8354	14.2241	15.5020
Diff (1-2)	Pooled	0.1216	-1.0003	1.2436	14.8646	14.4954	15.2532
Diff (1-2)	Satterthwaite	0.1216	-0.9995	1.2427			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	2960	0.21	0.8317
Satterthwaite	Unequal	2135.8	0.21	0.8316

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	1921	1039	1.01	0.9159



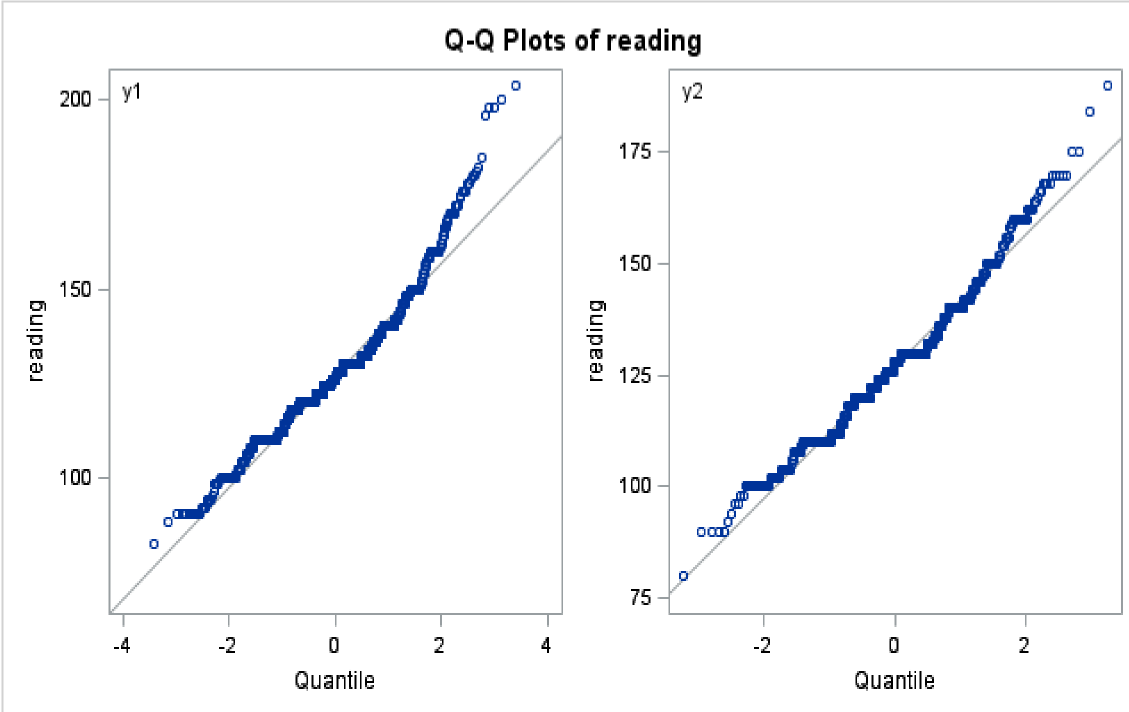


Figure 108: T-test Comparing Distribution of Systolic Blood Pressure Readings for Patients in Sample. Academic Year 2015-16 and Academic Year 2016-17

4.5.1.5 LDL>190

Upon conducting a Chi-squared test to compare the difference in the proportion of patients whose LDL was greater than 190 in Academic year 2015-16 and in Academic year 2016-17 was 0.0003. Consequently, we reject the null hypothesis that the proportion of patients whose LDL was greater than 190 in Academic year 2015-16 is greater than the proportion of patients whose LDL was greater than 190 in Academic year 2016-17.

Significance of Difference Between Proportion of Patients that had an LDL reading greater than 190 in Academic year 2015-16 than in Academic year 2016-17

The FREQ Procedure

Frequency Percent Row Pct Col Pct	Table of Year by Response			
	Year	Response		
		Yes	No	Total
	Year1	129	1802	1931

	4.34	60.59	64.93
	6.68	93.32	
	77.25	64.20	
Year2	38	1005	1043
	1.28	33.79	35.07
	3.64	96.36	
	22.75	35.80	
Total	167	2807	2974
	5.62	94.38	100.00

Statistics for Table of Year by Response

Statistic	DF	Value	Prob
Chi-Square	1	11.7863	0.0006
Likelihood Ratio Chi-Square	1	12.5937	0.0004
Continuity Adj. Chi-Square	1	11.2202	0.0008
Mantel-Haenszel Chi-Square	1	11.7824	0.0006
Phi Coefficient		0.0630	
Contingency Coefficient		0.0628	
Cramer's V		0.0630	

Fisher's Exact Test

Cell (1,1) Frequency (F)	129
Left-sided Pr <= F	0.9999
Right-sided Pr >= F	0.0003
Table Probability (P)	0.0001
Two-sided Pr <= P	0.0006

Column 1 Risk Estimates

	Risk	ASE	(Asymptotic) 95% Confidence Limits		(Exact) 95% Confidence Limits	
Row 1	0.0668	0.0057	0.0557	0.0779	0.0561	0.0789

Column 1 Risk Estimates

	Risk	ASE	(Asymptotic) 95% Confidence Limits		(Exact) 95% Confidence Limits	
Row 2	0.0364	0.0058	0.0251	0.0478	0.0259	0.0497
Total	0.0562	0.0042	0.0479	0.0644	0.0482	0.0650
Difference	0.0304	0.0081	0.0145	0.0463		

Difference is (Row 1 - Row 2)

Column 2 Risk Estimates

	Risk	ASE	(Asymptotic) 95% Confidence Limits		(Exact) 95% Confidence Limits	
Row 1	0.9332	0.0057	0.9221	0.9443	0.9211	0.9439
Row 2	0.9636	0.0058	0.9522	0.9749	0.9503	0.9741
Total	0.9438	0.0042	0.9356	0.9521	0.9350	0.9518
Difference	-0.0304	0.0081	-0.0463	-0.0145		

Difference is (Row 1 - Row 2)

Sample Size = 2974

Figure 109: Chi-Squared test comparing proportion of LDL readings greater than 190 for patients in sample. Academic Year 2015-16 and Academic Year 2016-17

4.5.1.6 Summary for comparison of outcomes for patients screened for appropriate treatment of hyperlipidemia (Academic year 2015-16 and 2016-17)

Table 13: On Significance of Change in Patient outcomes between Academic Year 2015-16 and Academic year 2016-17 with a 0.05 Significance Level

	Average Value, 95% CI		
Category	Academic Year 2015-16	Academic Year 2016-17	P-value
Total Cholesterol	197.96, [195.96-199.96]	193. 80, [191.05-196.55]	0.9919
HDL	82.71, [80.80,84.63]	53.80, [52.80,54.73]	1
LDL	86.95, [85.07,88.83]	110.88, [108.53,113.23]	8.9972e^-51
Systolic Blood Pressure	127.32, [126.66,127.99]	127.25, [126.34,128.15]	0.7072

4.5.2 Stroke/Heart Disease Prevention

4.5.2.1 Systolic Blood Pressure

Upon conducting a t test to determine whether or the average systolic blood pressure for patients screened to determine whether or not they were appropriately treated to prevent heart disease and/or stroke in academic year 2015-16 was greater than or equal to the average systolic blood pressure in academic year 2016-17, the p-value was determined to be less than 0.0001. Consequently, we reject the null hypothesis that the average systolic blood pressure of patients in academic year 2015-16 is greater than or equal to the average systolic blood pressure of patients in academic year 2016-17.

Systolic Blood Pressure Difference Analysis Between Academic Year 2015-16 and 2016-17 for patients screened for appropriate preventative measures of stroke/heart disease

The TTEST Procedure

Variable: reading

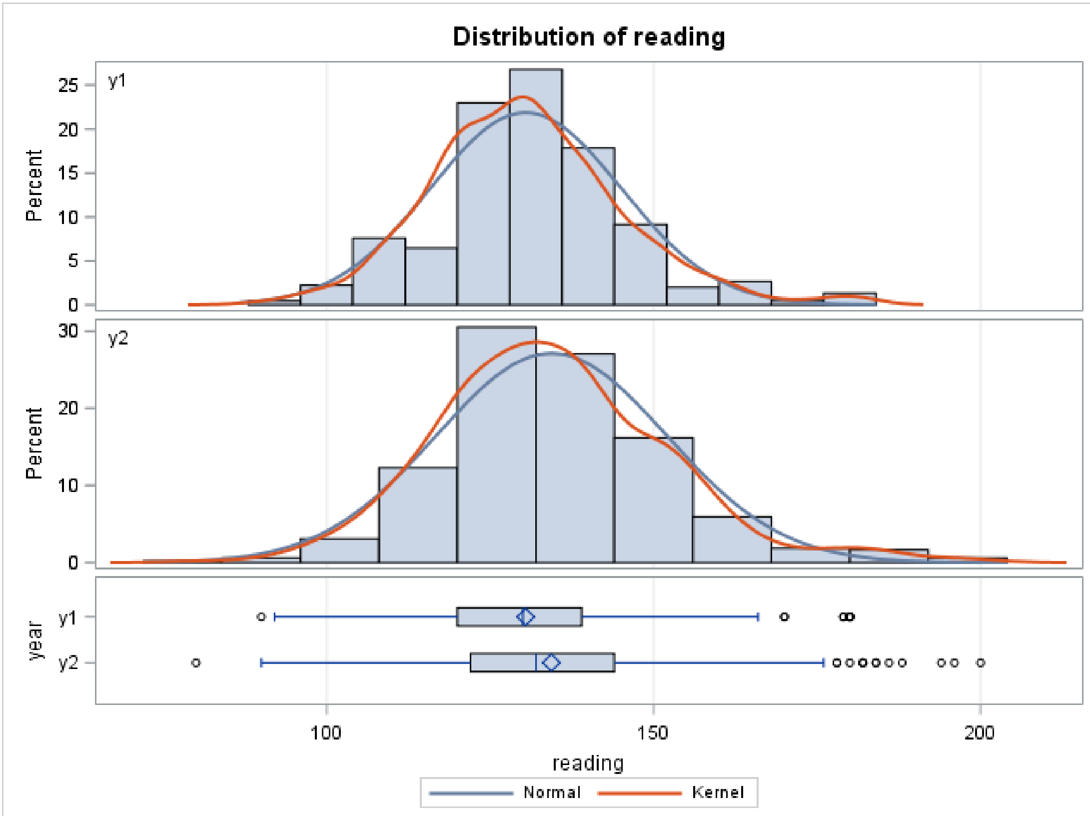
year	N	Mean	Std Dev	Std Err	Minimum	Maximum
y1	448	130.4	14.5959	0.6896	90.0000	180.0
y2	488	134.4	17.6513	0.7990	80.0000	200.0
Diff (1-2)		-3.9395	16.2608	1.0640		

year	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
y1		130.4	129.1	131.8	14.5959	13.6986	15.6198
y2		134.4	132.8	135.9	17.6513	16.6090	18.8342
Diff (1-2)	**Pooled**	-3.9395	-6.0276	-1.8515	16.2608	15.5557	17.0333
Diff (1-2)	**Satterthwaite**	-3.9395	-6.0109	-1.8681			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	934	-3.70	0.0002
Satterthwaite	Unequal	924.1	-3.73	0.0002

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	487	447	1.46	<.0001



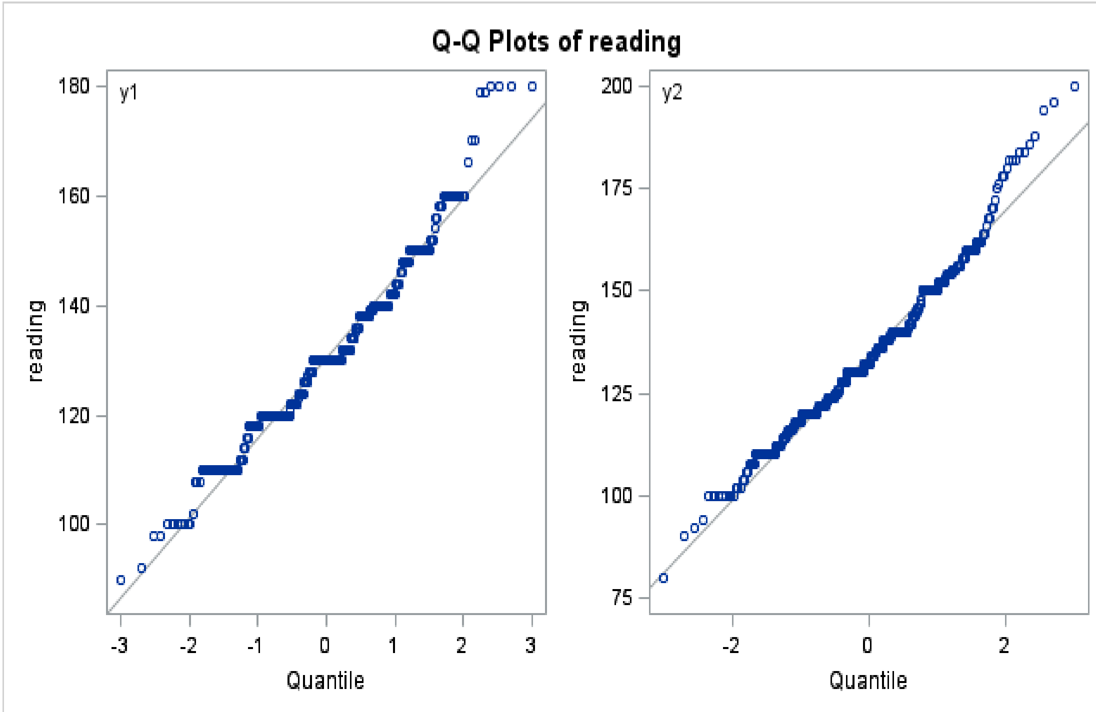


Figure 110: T-test comparing Distribution of Systolic Blood Pressure Readings for Patients in Sample Screened for appropriate preventative treatments for stroke/heart disease prevention. Academic Year 2015-16 and Academic Year 2016-17

4.5.2.2 Diastolic Blood Pressure

Upon conducting a t test to determine whether or not the average diastolic blood pressure for patients screened to determine whether or not they were appropriately treated to prevent occurrence of heart disease and/or stroke in academic year 2015-16 was greater than or equal to the average diastolic blood pressure in academic year 2016-17, the p-value was determined to be 0.0397. Consequently, we reject the null hypothesis that the average diastolic blood pressure in patients in academic year 2015-16 was greater than or equal to the average diastolic blood pressure for patients in academic year 2016-17.

Diastolic Blood Pressure Difference Analysis Between Academic Year 2015-16 and 2016-17 for patients screened for appropriate preventative measures of stroke/heart disease

The TTEST Procedure

Variable: reading

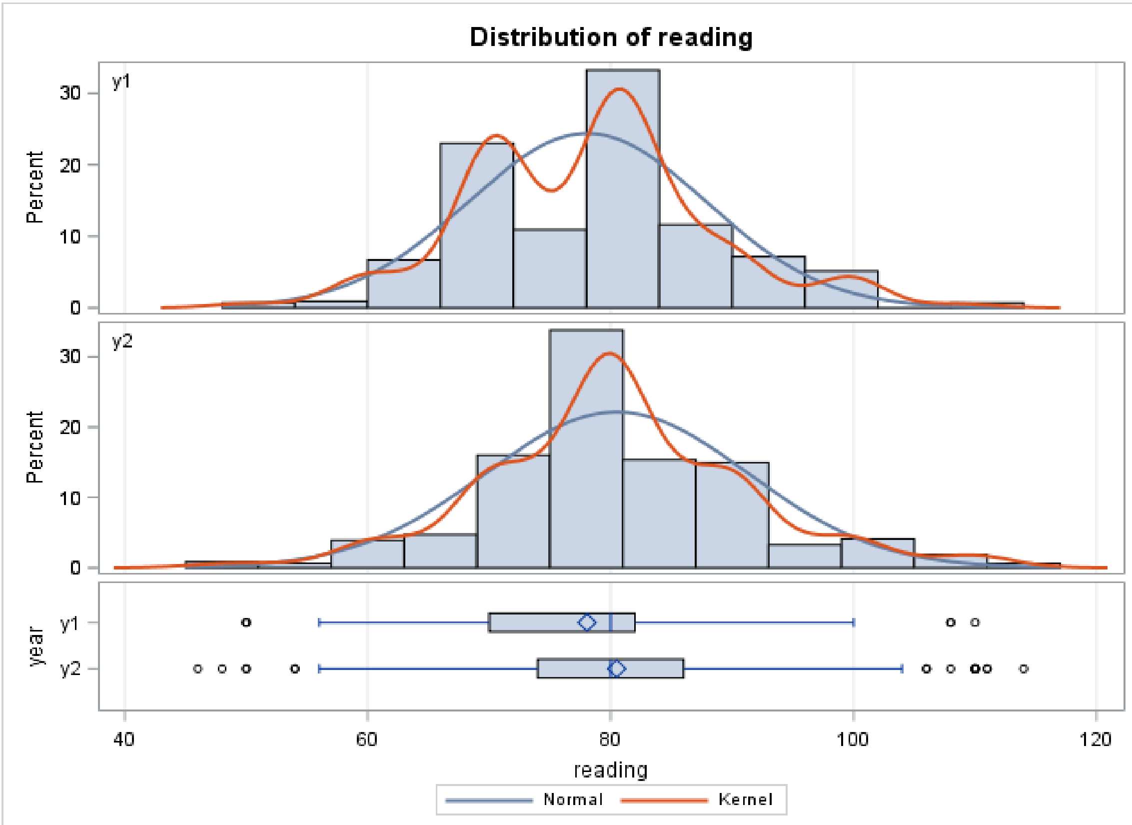
year	N	Mean	Std Dev	Std Err	Minimum	Maximum
y1	448	78.0536	9.8199	0.4639	50.0000	110.0
y2	488	80.4898	10.8048	0.4891	46.0000	114.0
Diff (1-2)		-2.4362	10.3451	0.6769		

year	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
y1		78.0536	77.1418	78.9654	9.8199	9.2163	10.5089
y2		80.4898	79.5287	81.4508	10.8048	10.1668	11.5289
Diff (1-2)	**Pooled**	-2.4362	-3.7646	-1.1078	10.3451	9.8966	10.8366
Diff (1-2)	**Satterthwaite**	-2.4362	-3.7592	-1.1132			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	934	-3.60	0.0003
Satterthwaite	Unequal	933.91	-3.61	0.0003

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	487	447	1.21	0.0397



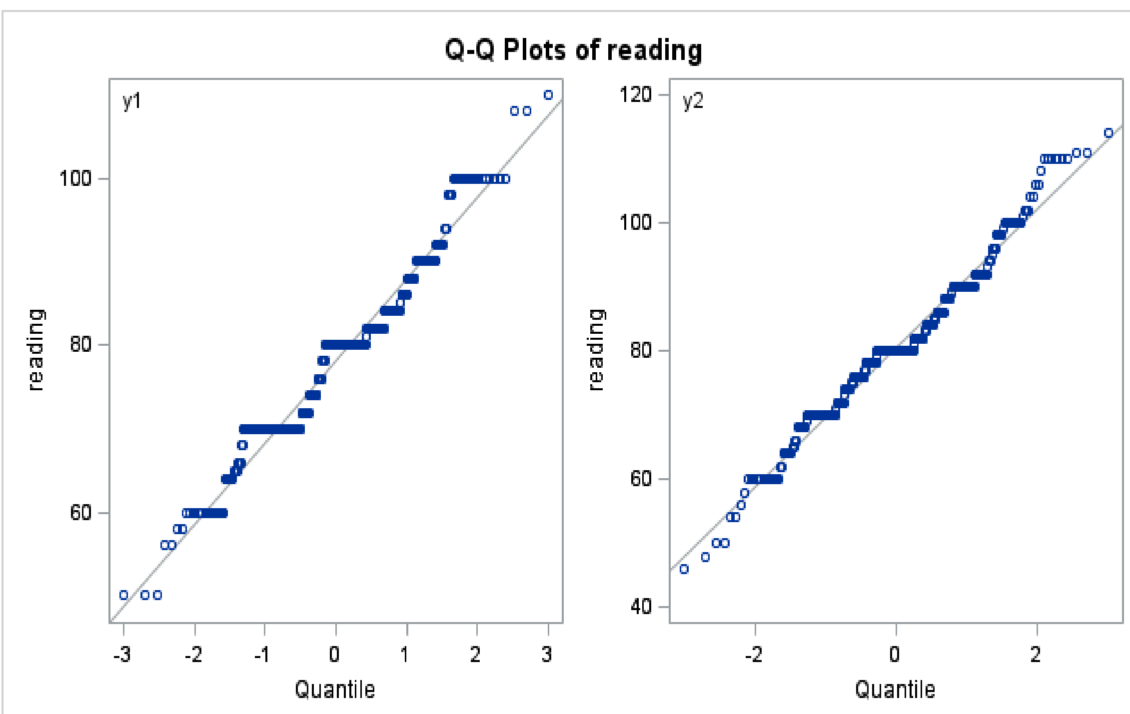


Figure 111: T-test Comparing Distribution of Diastolic Blood Pressure Readings for Patients in Sample Screened for appropriate preventative treatments for stroke/heart disease prevention. Academic Year 2015-16 and Academic Year 2016-17

CHAPTER 5

DISCUSSION

5.1 A Reflection on the Results

In the first part of my report, I discuss the impact of raising awareness to guidelines compliance in practice. It was demonstrated that post intervention, there was improvement to guideline compliance across several categories in screening for appropriate treatment of hyperlipidemia, stroke/heart disease prevention, as well as men's preventative health screening. Overall, most of these improvements were statistically significant and surprisingly, within a short intervention period of about 2 years, it was found that there were statistically significant improvements in systolic blood pressures, diastolic blood pressures, as well as cholesterol levels, in patients screened for appropriate treatment of hyperlipidemia. The lack of improvement in patient outcomes in the other two categories in patients screened for appropriate intervention for stroke/heart disease preventions may not be clearly demonstrated due to a significantly smaller sample size. Additionally, studies have demonstrated that usually post intervention, it may take up to 10 years to see any significant patient outcomes improvements. Therefore, the fact that such drastic improvements were demonstrated in hyperlipidemia patients, particularly in systolic and diastolic blood pressures was truly remarkable. A similar study conducted by Ellsworth Medical Clinic with the objective of achieving desirable blood pressures for their patients also demonstrated a vast improvement in patient outcomes after a year. This indicates the importance of guideline compliance in practice.

5.2 Possible Explanations for Non-Statistically Significant Changes/Improvements/Lack of Improvements

In the results section of this paper it was indicated that in various instances there were statistically significant increases to compliance to guidelines for hyperlipidemia, men's preventative health, and stroke/heart disease prevention. However, there were instances that there were not statistically significant increases: in fact there were even some cases that there were statistically significant decreases in compliance in academic year 2016-17. This section of this discussion aims to explain some of these non-significant changes and statistically significant decreases (where applicable):

5.2.1 Hyperlipidemia

There were statistically significant decreases in the proportion of category A and category B patients that were treated appropriately. This could be possibly attributed to several factors. It is noticeable that there were large increases in the proportion of patients that were appropriately treated for hypertension as well proportion of patients that were documented to have had a fasting lipid panel. It is possible that since these were areas that were easier to improve compliance, providers decided to focus their attention to specifically improving compliance in those areas. In addition, there was a recent update to the guidelines in 2013 for treatment of blood cholesterol. In several of the papers, many providers stated that they were still struggling to recall the guideline changes in treating different categories of patients.

The proportion of category C patients that were appropriately treated decreased from 64% to 60% in academic year 2016-17. This decrease, however, was not statistically significant.

Last but not least, the proportion of Category D patients that were treated appropriately reduced from 86% to 73% between academic years 2015-16 and 2016-17. The decrease was statistically significant. This decrease could be attributed to the fact that preceptors were spending more time learning how to treat Category A and B patients with the appropriate pharmacological therapy , thus spent less time counseling Category D patients, an area they were already arguably doing very well in.

5.2.2 Stroke/Heart Disease Prevention

There were only 2 areas where there were not statistically significant improvements to compliance to guidelines for patients that were treated for stroke/heart disease prevention, namely: 1) whether or not smoking status was updated and 2) whether or not patients were screened for diabetes.

The proportion of patients that had their smoking status updated decreased from 91.6% to 85.9%. Since providers were already performing very well in that area, it is possible they consequently shifted their attention to improving compliance in other areas.

In addition, the proportion of patients that were appropriately screened for diabetes increase from 87.7% to 89.6%. While this increase was not statistically significant, the ceiling effect may be responsible for the modest improvement.

5.2.3 Men's Preventative Health

There were 4 categories where there were not statistically significant improvements to compliance to guidelines for patients that were screened for improved compliance to men's preventative health guidelines over the span of 2 academic years. These 4 categories were administration of TDAP vaccinations, prostate cancer screening, GI bleeding screening, and blood pressure checks.

The percentage of patients that were documented to have received a TDAP vaccine decreased from 64.8% to 40%. This can be attributed to the fact that many providers were pleasantly surprised that they were doing as well as 64% in the area. Upon reflecting on their discussions with the students, many providers stated that they were shocked that they were doing so well in documenting TDAP vaccines, as it usually is not one of the focuses of the patient visit. Consequently, they chose to focus their attention to other areas that they were performing very poorly in—this is evident in the statistically significant improvements in various of the other men's preventative health screening areas. In addition, there was a recent change of guidelines for TDAP administration in adults in 2013. Consequently, raising awareness to these guideline changes may have caused a fluctuation in provider compliance.

While the proportion of patients that were appropriately screened for prostate cancer decreased from 77.5% to 72.3%. This decrease was not statistically significant, and can be attributed to the small sample size. With about 200 patients in the sample size for both academic years, there is room for fluctuation—especially in comparison to the other two topics analyzed where the sample sizes where significantly larger.

In addition, it is notable that the proportion of patients that were correctly screened for GI bleeding decreased from 52.9% to 38.5%. This decrease is statistically significant, and can be attributed to the fact that there was a statistically significant increase in the proportion of patients that were appropriately screened for colorectal cancer. A study by Rahman shows that there is a correlation between GI bleeding and colorectal cancer. Consequently, if providers improve compliance to screen for colorectal cancer, they may have purposely neglected screening for GI bleeding due to that relationship. **[78]**

Last but not least, the proportion of patients that had their blood pressure checked increased from 81.9% to 84.1%. Although this increase was not statistically significant, the providers were already doing very well with compliance in this area. Consequently, this finding may be consistent with the ceiling effect or require larger sample sizes.

5.3 Discussion on factors that influence compliance to guidelines: patient compliance vs. physician compliance

As shown by the results, post-discussion of results, there were statistically significant increases in compliance to guidelines across several categories. The primary question then becomes how, in fact, were these outcomes achieved? Were these due to physician increases in compliance, patient increases in compliance, or both? Upon analyzing many of the discussions, it was noted by the students that often times physicians fail to document everything they do religiously, consequently, they get marked down when it is time for analyses such as these to be conducted. As everyone knows in healthcare, “if it was not documented, it was not done.” Therefore, raising awareness to this simple fact may have simply trigged providers to be extra attentive when documenting their charts. Additionally, many providers stated they were simply unaware of changes and updates in guidelines. Consequently, educating providers about these updates may have played a large role in increasing compliance to guidelines in multiple of these categories. It was also notable that during many of the discussions students suggested many simple changes in process that could assist provider compliance such as putting a poster on a provider's desk, adding a checklist to the patient's chart so the providers remember to screen the patients for certain measures, adding/editing templates in the practice's current EMR system to reflect any necessary changes in guidelines or to assist providers in improving compliance in certain areas, and also implementing reminders for patients to come in for necessary vaccinations/exams, etc. It must be noted that many of the times providers implemented these suggestions immediately, or they were enthusiastic about implementing these suggestions sometime in the future—as confirmed by large proportion of providers that were in the stages of preparation or action post-discussion. The increase in compliance could be attributed to some or many of these factors. Undoubtedly, raising awareness to practice/process deficiencies overall, played a big role in triggering a such a big change.

5.4 Discussion on Change in Physician Behavior—Prochaska's Hierarchy of Behavioral Change

There were three particularly striking findings that resulted from this analysis. The first was that there was a statistically significant decrease ($p=0.0519$) in the proportion of providers that were in a stage of preparation from academic year 2015-16 to 2016-17: 58% to 46% (see Figure 112). The next was that there was a statistically significant improvement in the proportion of providers that were in a stage of action in academic year 2016-17—there was a jump from 10% to 19%--almost double! The decrease in the proportion of providers that were in a state of preparation can be attributed to the increase of providers that were in a state of action the following academic year, since generally the same providers that participated in the study in academic year 2015-16 participated in the study in academic year 2016-17. Additionally, it is also notable that there was a statistically significant increase in the proportion of providers that were in a stage of maintenance between academic year 2015-16 and 2016-17. The proportion tripled!

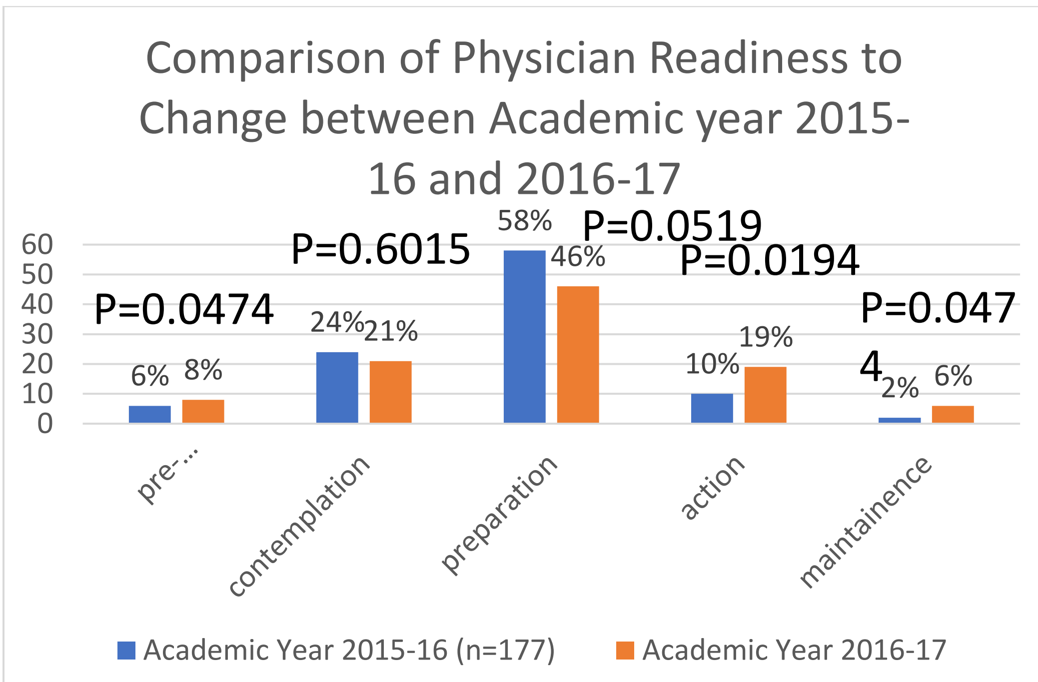


Figure 212: Significance of difference of change in different behavioral categories between Academic year 2015-16 and Academic year 2016-17

These findings could be attributed to several factors. Many providers may have been unaware of guideline changes (many have stated so). Upon raising awareness to these guideline changes as well as lack of compliance, many providers were triggered to action. As aforementioned, very few providers have QA/QI initiatives implemented into practice and are often unware of their performance. They are data-driven individual patients and genuinely care about the care they provide for their patient as well as the well-being of their patients, so they welcome the knowledge. In fact, many providers stated that this initiative was wonderful for their practice and they welcome it (as clearly demonstrated in their survey results). These findings point towards the initiative introducing a culture of continuous quality improvement in practice.

5.5 Discussion on how providers and students felt about QA/QI initiative

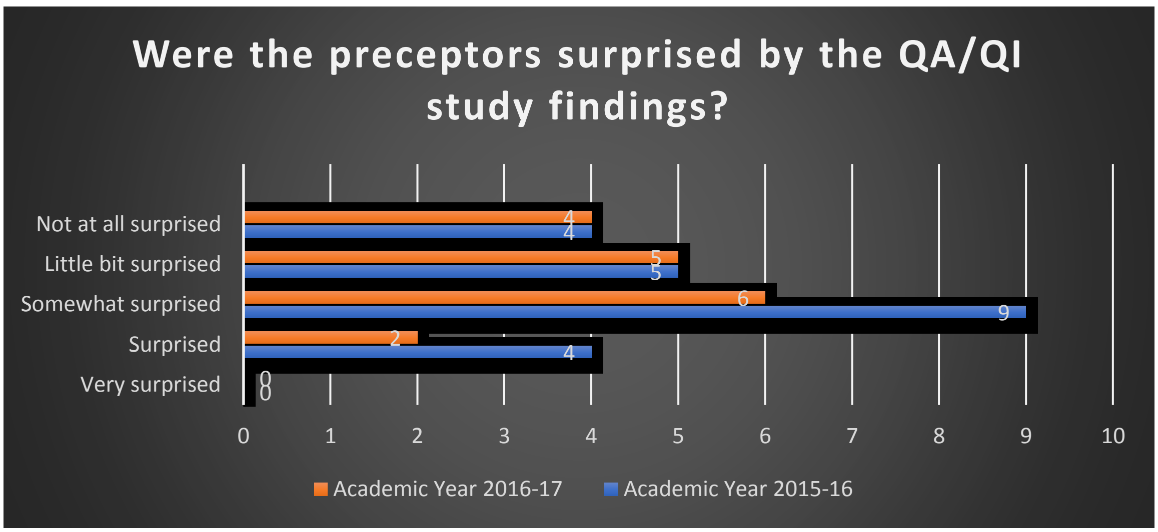


Figure 113: Were the preceptors surprised by the QA/QI study findings?

After raising awareness to guidelines non-compliance in practice, it was found that many of the providers were surprised about how poorly they were doing (please see Figure 113). Of a total of 39 preceptors that responded to the survey in Academic year 2015-16 and Academic year 2016-17, there were only 8 that indicated that they were not at all surprised about the results of the study. This finding undoubtedly stresses the importance of increasing awareness to compliance to evidence based guidelines in practice. A study conducted by the Commonwealth fund demonstrated that not only do only 1/3 of all practitioners are aware of their practice performance but also that only 1/3 of all practices have access to such performance data, which include, but are not limited to patient survey results and reports generated by their respective electronic medical record (EMR) systems. The lack of awareness as demonstrated by both literature as well as this study is clearly a problem and this study is unique in that it demonstrates the direct correlation between increased awareness and increased compliance, which obviously has large implications for how healthcare quality is currently measured and how we can improve it.

Currently systems that are already in place that are geared towards improving quality as well as awareness to performance in practice include EHR apps such as quality measurement, etc. **[76]** However, we find that many of these EHR capabilities have been disabled and/or not used as they should be used to demonstrate problems in practice.**[76]** Further studies should evaluate how we can maximize and optimize the usage of EMR to provide a more quality friendly practice. It may not be necessary to utilize time and efforts to hire a practice facilitator to conduct such QA/QI studies. In fact, the medical student/preceptor effort conducted in this study demonstrated that such a residency teaching initiative effort may be effective in improving practice compliance. Common perceptions include that there are interaction barriers between the preceptor and student. An analysis conducted in this study dispels that myth. Upon conducting an analysis, it was demonstrated that both students and preceptors were comfortable discussing the results of practice (see Figures 114 & 115) and that both students and preceptors felt the interaction provided a useful interaction about the clinical care in their practice (See

Figures 116 & 117), stressing the importance and still current acceptance of evidence based medicine into practice.

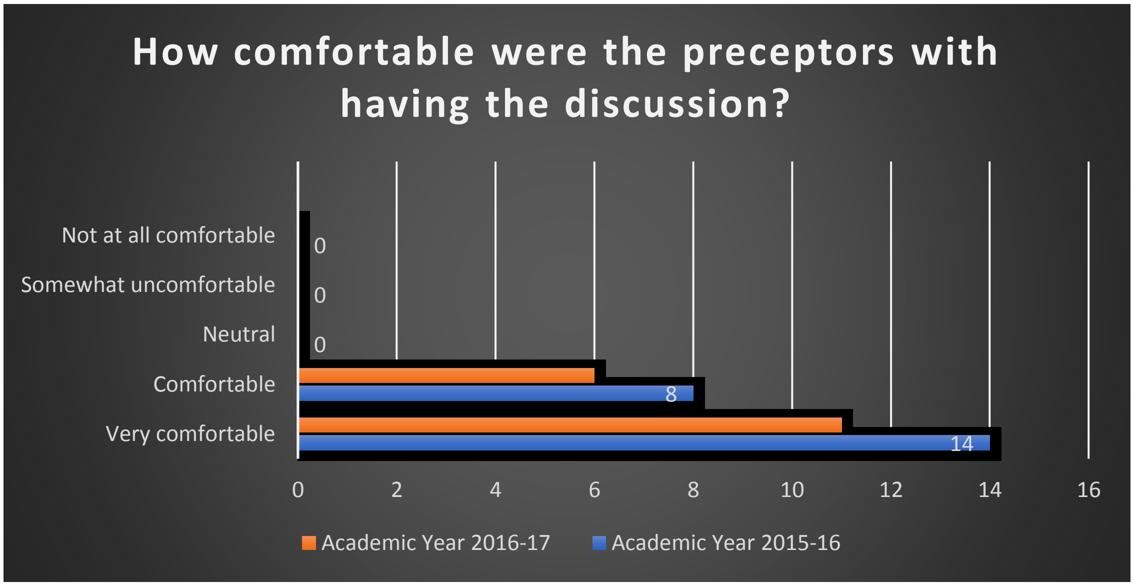


Figure 114: Survey Results describing the proportion of preceptors that were comfortable having the discussion with their students (Academic years 2015-16 and 2016-17)

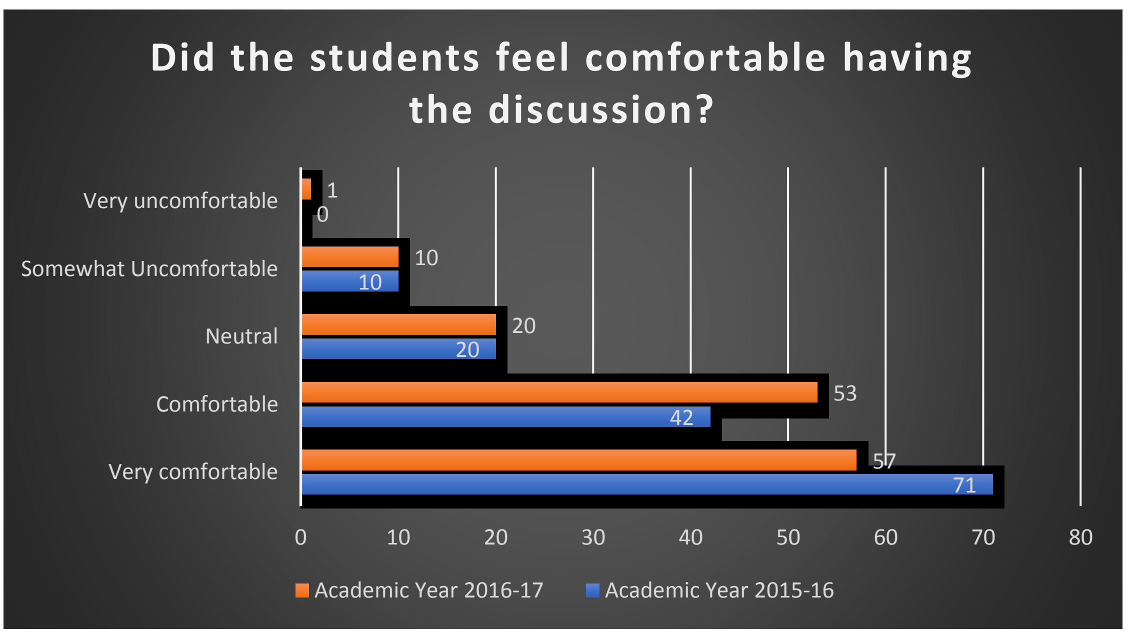


Figure 115: Survey Results describing the proportion of students that were comfortable having the discussion with their preceptors (Academic years 2015-16 and 2016-17)

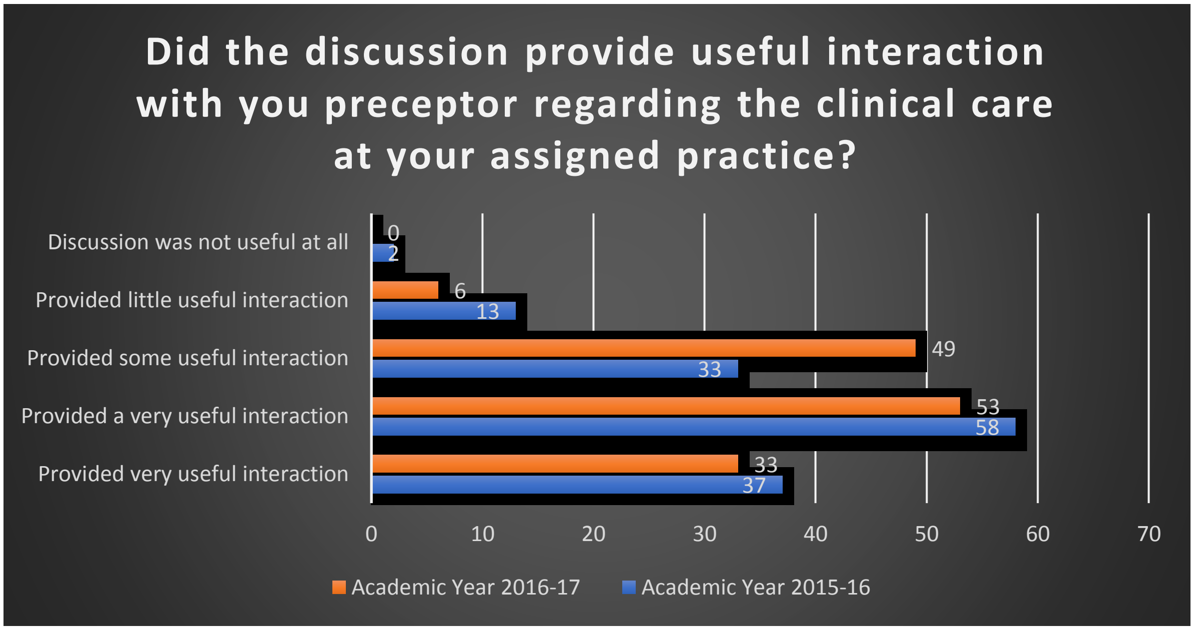


Figure 116: Survey Results describing the proportion of students that were felt that the discussion provided a useful interaction with their preceptor regarding the clinical at their assigned practice (Academic years 2015-16 and 2016-17)

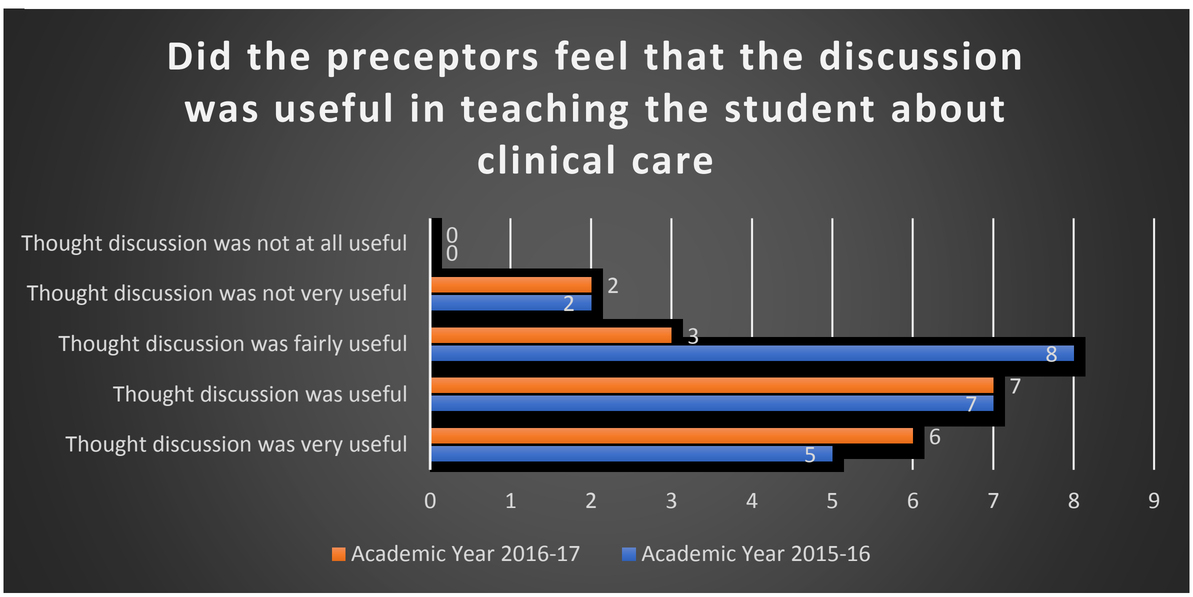


Figure 117: Survey Results describing the proportion of preceptors that felt that the discussion provided a useful interaction with their student regarding the clinical at their assigned practice (Academic years 2015-16 and 2016-17)

The above survey results and findings undoubtedly demonstrate that students discussing QA/QI with their preceptors helps build a collegial relationship between the student and the preceptor. This is contrary to what one would believe—that a discussion involving a student speaking about the performance of an older experienced physician's practice would trigger defensive, unwelcome interaction. This finding was confirmed through the above survey findings as well as discussions as summarized by the students. A further analysis was conducted to see how exactly well received the findings were by the preceptor. The preceptor's reaction towards each part of the discussion (i.e. how the preceptor approached the discussion, how the preceptor reacted to the results, and how the discussion concluded) was graded on a scale from 1-3, with 1 being the least receptive and 3 being the most receptive. Table 14 summarizes the results of the 175 discussions analyzed in academic year 2015-16 and the results of 166 discussions analyzed in academic year 2016-17.

Table 14: How receptive were the providers to different parts of the discussion?

	Score Approaching Topic		Score Upon Hearing Feedback		Score Upon Termination of Discussion	
Year	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17
Number of 1's	3	12	27	22	10	10
Number of 2's	63	90	55	79	33	28
Number of 3's	109	64	92	64	131	127

As shown in Table 14, many preceptors scored 2's and 3's in all three categories. Most of preceptors were scored 3's approaching the conversation of discussion of the results however, particularly striking is that there were very few instances where preceptors reacted defensive upon hearing feedback—27 instances in academic year 2015-16 and 22 instances in academic year 2016-17. This clearly demonstrates that providers were very receptive to the project as well as the conversation of the project. Not only that, the results demonstrated that most of the time discussion ended on a positive note: 131 instances in academic year 2015-16 and 127 instances in academic year 2016-17. In addition to be noted, as previously mentioned, the student survey results demonstrated that they were comfortable having the discussion with their providers as well as felt that the discussion provided a useful interaction. Not only that, a majority of the times the students and preceptors both indicated that the results will make a difference in the future of the practice. All of these results are indicative of this non-threatening collegial relationship, which has many implications for future similar QA/QI initiatives in the future.

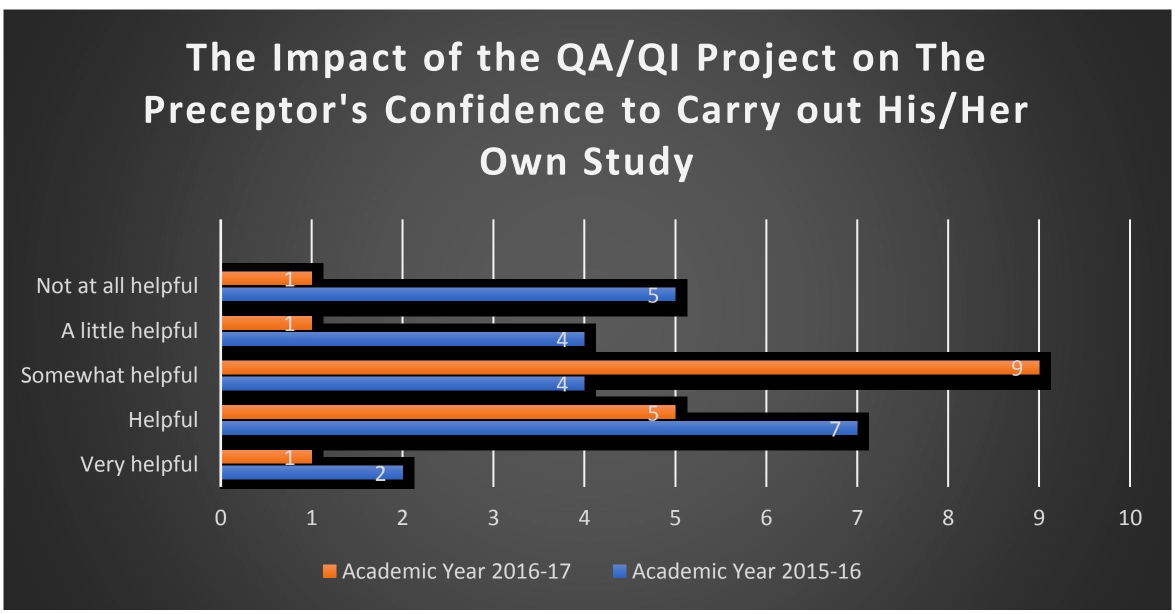


Figure 118: Survey Results describing the number of preceptors that felt the initiative would impact his/her confidence to carry out his/her own initiative in the future (Academic years 2015-16 and 2016-17)

The survey results also demonstrated that in addition to many current preceptors, many students felt prepared to conduct a QA/QI initiative in their own practice in the future, speaking to the future of evidence based practice in healthcare delivery (see Figures 118 and 119). Undoubtedly the results demonstrate that this type of initiative educates both the students as well as preceptors and is well received by both—a win-win situation.

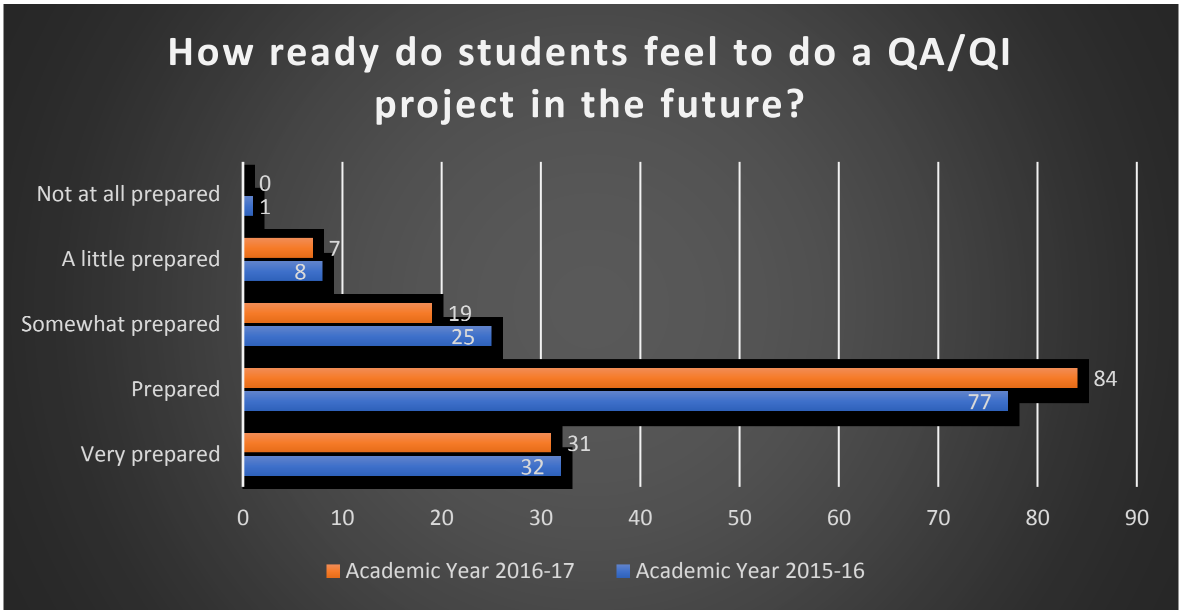


Figure 119: Survey Results describing the proportion of students that felt ready to do their own QA/QI project in the future (Academic years 2015-16 and 2016-17)

5.6 On Barriers to complying to Evidence Based Practice

Upon conducting a deeper analysis to determine what preceptors felt were barriers to complying with evidence based practice, it was found that there were very few instances where preceptors felt that following evidence based practice was a barrier to providing effective clinical care (see Figure 120).

Occurrences in which an attending stated that there were Barriers to Implementing Quality Improvement Measures in Family Practices		
Barrier	Academic Year 2015-16	Academic Year 2016-17
Instances attendings spoke negatively about the guidelines	7/173	2/166
Instances attendings demonstrated apathy towards QA/QI	2/173	2/166
Instances attendings questioned accuracy of data	8/173	4/166
Instances attendings believed that the project was ineffective	2/173	1/166
Instances attendings believed guidelines were detrimental to care	0/173	0/166
Instances attendings believed that there were scenarios where the guidelines will not work	6/173	5/166
Instances attendings thought time, resources, and workload were a barrier to improving care	8/173	5/166
Instances attendings believed lack of knowledge, skills, or conceptual aspects of quality improvement will be a barrier	2/173	4/166
Instances attendings believed that there were cultural/contextual barriers	1/173	1/166
Instances attendings thought insurance was a barrier	1/173	4/166

Figure 120: A summary of the issues that would prevent providers from being compliant with evidence based practice and the frequencies at which they were mentioned to the students (Academic year 2015-16 and Academic year 2016-17)

From Figure 120, it is shown that in academic year 2016-17, there was a decrease in the proportion of times the preceptor identified a barrier to complying with evidence based practice. The most common barriers preceptors identified in academic year 2015-16 ranked from highest to lowest included: 1) believing in the accuracy of the QA/QI data, 2) time, workload, and resources, and 3) negative perceptions about guidelines. In academic year 2016-17, the most common barriers were identified as follows as 1) time, workload, and resources, and 2) the belief that there were instances guidelines would not work. These findings are of particular interest because they demonstrate that in general, providers do not feel that QA/QI initiatives are not applicable to real practice or cannot be realistically implemented.

These findings are also a “mythbuster.” In this day and age, there is much talk about the importance of personalized medicine since “one size does not fit all.” Yet, this study shows that many providers strongly believe in evidence based practice. Evidence based medicine and personalized medicine are actually not mutually exclusive ideas—personalized medicine becomes evidence based once those “personalized” exceptions are confirmed, well-researched and then added to the current knowledge base for all providers to refer to.

CHAPTER 6

SUMMARY AND CONCLUSIONS

6.1 Final Statement

As shown, raising awareness to compliance/lack of compliance to guidelines through the means of QA/QI can lead to improved compliance to guidelines as well as improved patient outcomes in primary care. Furthermore, a teaching learning collaborative in medical school education/residency can assist in providing a consistent means of raising awareness as well as pave a way for future physicians to incorporate evidence based medicine into their own practice.

6.2 Limitations

One of the weaknesses of this study is that it pulls data from only Family Medicine practices in New Jersey. Primary care consists of family medicine, geriatrics, pediatrics, as well as internal medicine. The results of this study, therefore may not be generalizable: conclusions may be only applicable to family practices. Geriatric, pediatric, and internal medicine practices deal with patients with specific age groups so the outcomes of the study may be different due to issues such as patient compliance and other factors specific to these types of practices.

6.3 Future Research

Undoubtedly, this initiative has very large implications to increasing compliance to evidence based practice in this type of setting as well as other types of clinical types of settings in the future. There should most definitely be follow up on this study to determine what the changes in compliance are over the long term, and if there is a point where the changes will plateau. In addition, it would be interesting to analyze the change in patient outcomes over the long term, say 10 years. This type of study will definitely speak loud in terms of the importance of evidence based practice if looked at in the long term. In addition, it is notable that this type of study can be implemented in any type of clinical setting. The QA/QI initiative can be repeated in residency programs, or even repeated as a teaching/learning collaborative for medical students at other medical schools. It can be repeated across bigger specialties such as surgery, oncology, nephrology, where the details of how a patient is treated can be extremely crucial. This can be a life changing initiative, for many patients, across the world.

Additionally, further studies should investigate methods on how the EMR and CDSS can effectively be used to consistently and conveniently generate performance data to assist providers in gaining in idea as to how they are performing against the guidelines and how they compare to national performance. Currently, there is an application on the CDSS that allows providers to generate reports per their wish, but the goal is to provide a means through which they are constantly and consistently aware of what their shortcomings are, which can, as shown above, have implications in the long term.

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APPENDIX A

Preceptor Survey

Confidential

Preceptor Survey

We thank you for being a preceptor for our Family Medicine's clerkship. In order to help us improve the QA/QI experience we ask that you please complete the following 5-minute survey by clicking on the link below. You as well as the staff members of your practice play a great part in exposing the students to primary clinical care and the challenges practices face while maintaining standards. We are very grateful to you as a preceptor andall of your office members for giving our students a rewarding experience.

If you have any questions, please feel free to contact Dr. Steven Keller, Research Director for Family Medicine (sek1949@gmail.com) or Dr. Chantal Brazeau, Interim Chairman and Clerkship Director for Family Medicine (chantal.brazeau@rutgers.edu), Rutgers New Jersey Medical School.

1 What is your name? __________________________________

2 Approximately how many end of clerkship QA/QI discussions with students have you had at the end of each rotation during this past academic year?

- ○ 0
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7
- ○ 8

(If your answer is 0, you do not need to proceed any further with the survey. Thank you for your participation.)

The following four questions pertain to the discussion between you and your student at the end of the rotation:

3 In general, how do you like having the discussion with the students about the project at the end of the rotation?

- ○ I liked the discussion very much.
- ○ I liked the discussion.
- ○ I am neutral.
- ○ I did not like some parts of the discussion.
- ○ I did not like the discussion at all.

4 In general, did you find that the discussion was useful in teaching the student about clinical care?

- ○ I found the discussion very useful in terms of teaching the student about clinical care.
- ○ I found the discussion useful in terms of teaching the student about clinical care.
- ○ I found the discussion fairly useful in terms of teaching the student about clinical care.
- ○ I found the discussion not very useful in terms of teaching the student about clinical care.
- ○ I found the discussion not at all useful in terms of teaching the student about clinical.

5 Did you find the discussion of the findings of the QA/QI study useful to your practice?

- ○ The discussion was very useful to my practice
- ○ The discussion was useful to my practice.
- ○ The discussion was moderately useful to my practice.
- ○ The discussion was not very useful to my practice.
- ○ The discussion was not at all useful to my practice.

6 How comfortable were you during the discussion?

- ○ Very comfortable
- ○ Comfortable
- ○ Neutral
- ○ Somewhat uncomfortable
- ○ Not comfortable at all.

The following three questions pertain to the findings of the QA/QI study:

7 How will the results of the QA study impact your future practice?

- ◯ The results will make a very big difference in my future practice.
- ◯ The results will make a difference in my future practice.
- ◯ The results will make some difference in my future practice.
- ◯ The results will make little difference in my future practice.
- ◯ The results will not make any impact on my future practice.

8 Were you surprised by any of the QA/QI study findings?

- ◯ Very surprised.
- ◯ Surprised.
- ◯ Somewhat surprised.
- ◯ I was a little bit surprised.
- ◯ Not at all surprised

9 Will you use any of the activities (data, findings, results) for the ABFM certification?

- ◯ Yes
- ◯ No

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10 How have the QA/QI projects impacted your confidence/ability to carry out your own QA/QI study?

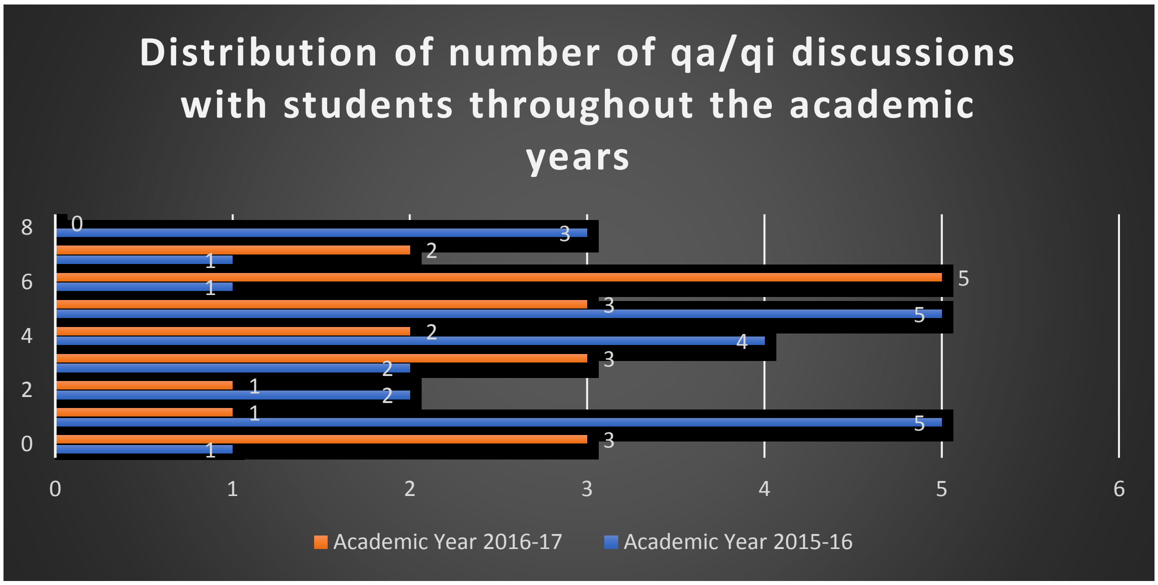
- ◯ Very helpful
- ◯ Helpful
- ◯ Somewhat helpful
- ◯ A little helpful
- ◯ Not at all helpful

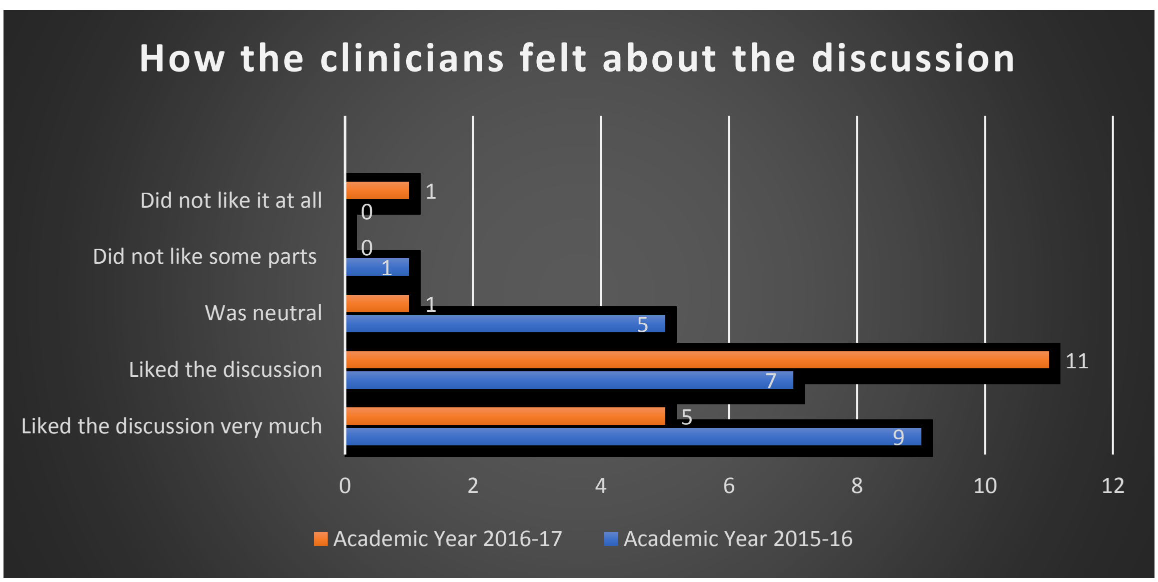
Please feel free to share any of your thoughts, comments, or opinions concerning the QA project in the text box to the right.

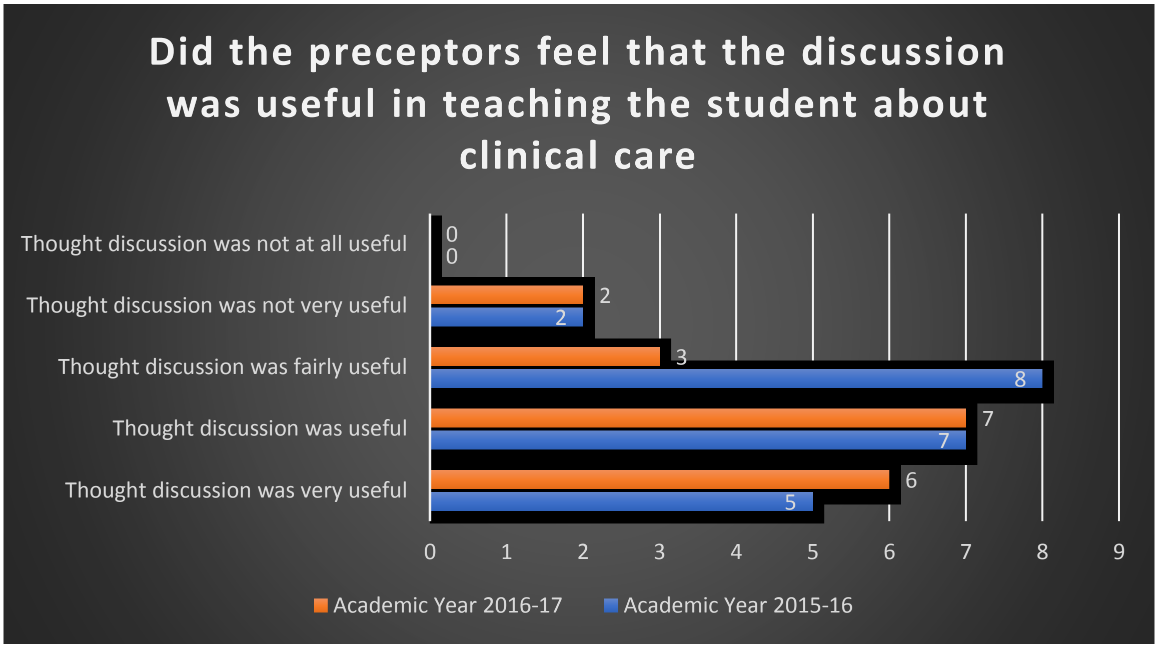
____

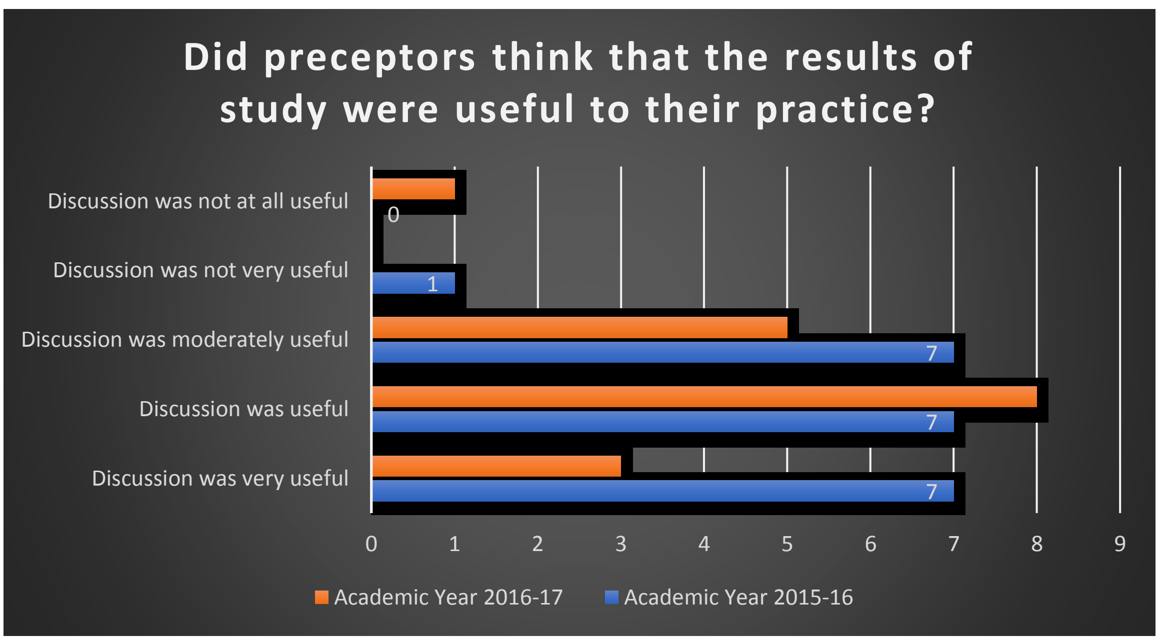
APPENDIX B

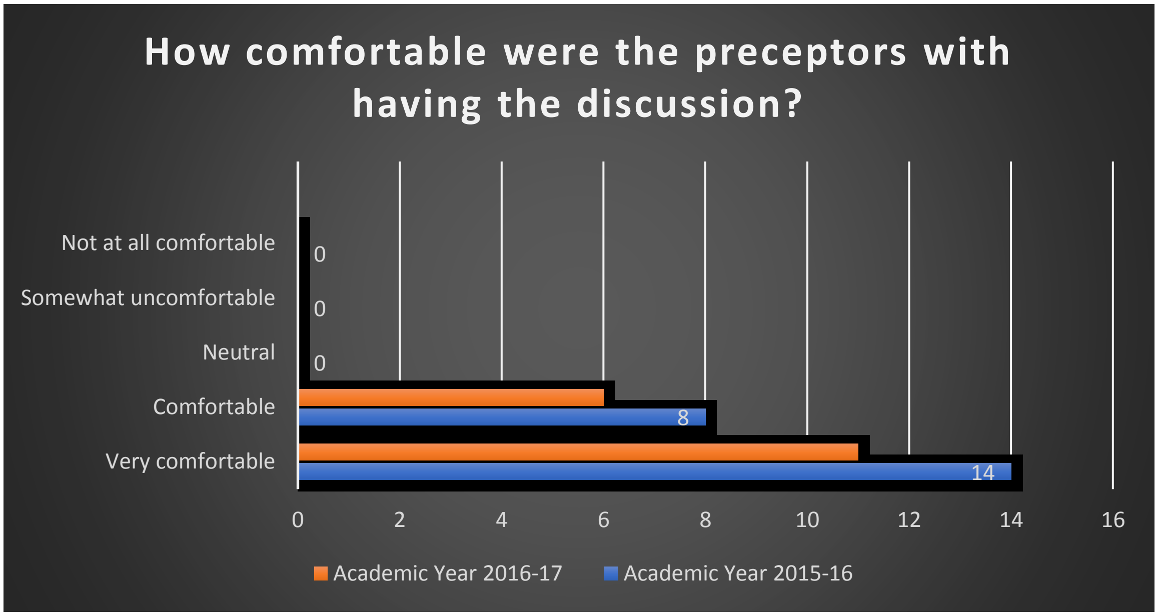
Preceptor Survey Results

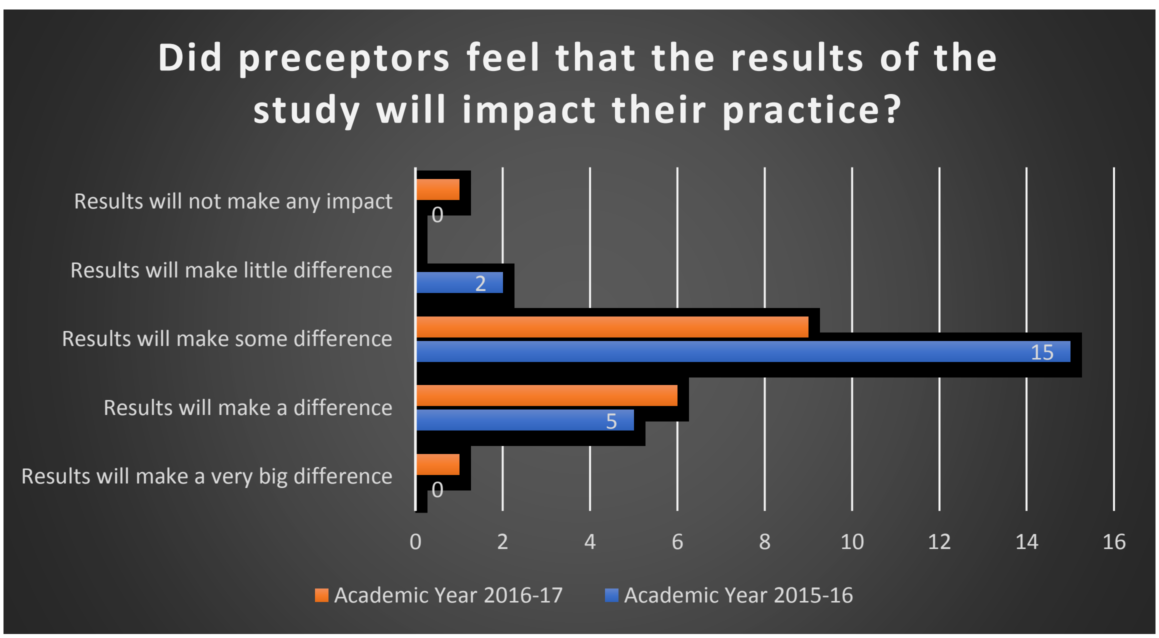


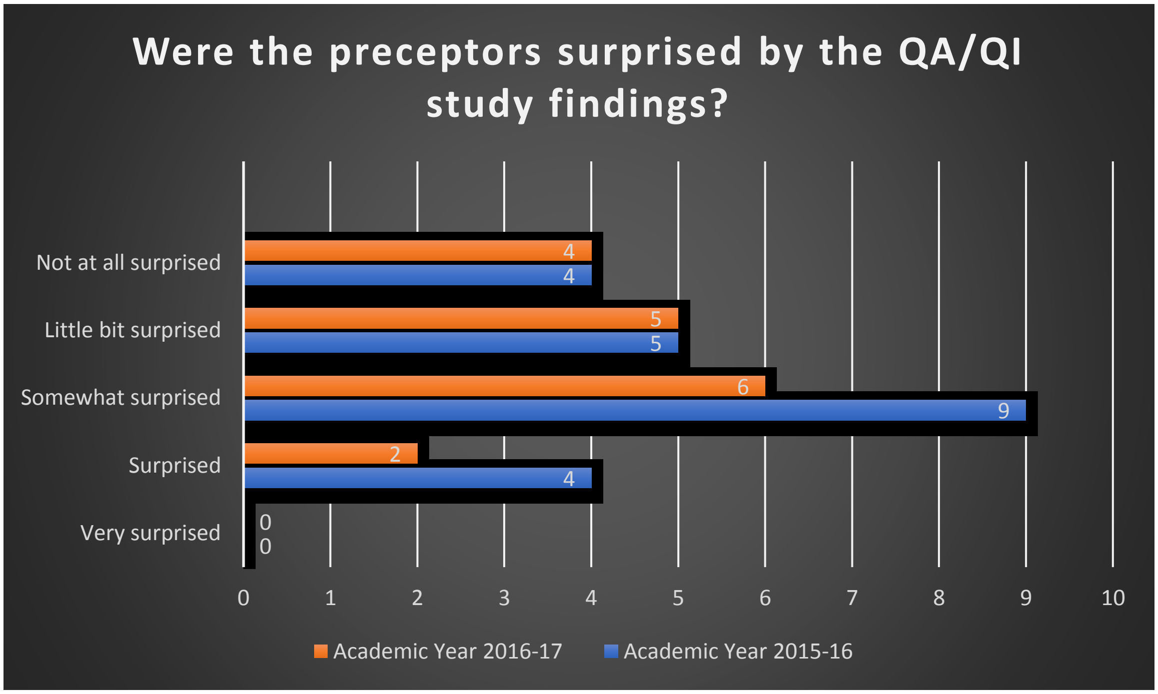


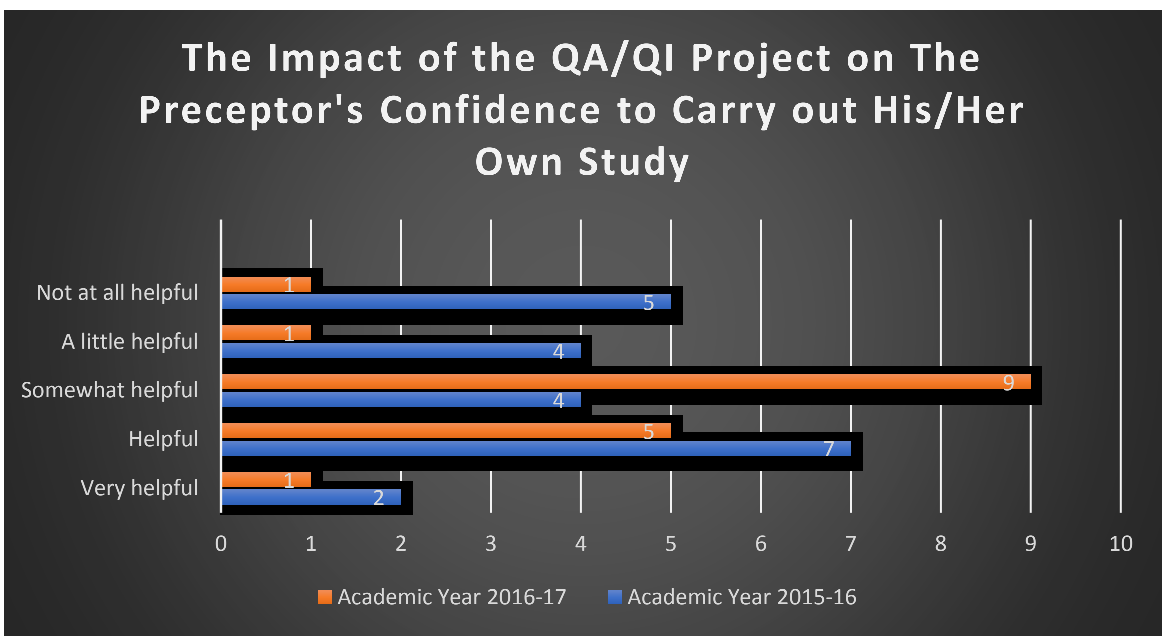

Did the preceptors feel that the discussion was useful in teaching the student about clinical care
Thought discussion was not at all useful
Thought discussion was not very useful
Thought discussion was fairly useful
Thought discussion was useful
Thought discussion was very useful
0
0
2
2
3
8
7
7
6
5
0 1 2 3 4 5 6 7 8 9
Academic Year 2016-17
Academic Year 2015-16


Did preceptors think that the results of study were useful to their practice?
Discussion was not at all useful
Discussion was not very useful
Discussion was moderately useful
Discussion was useful
Discussion was very useful
0
1
7
7
7
0 1 2 3 4 5 6 7 8 9
Academic Year 2016-17
Academic Year 2015-16


How comfortable were the preceptors with having the discussion?
Not at all comfortable
Somewhat uncomfortable
Neutral
Comfortable
Very comfortable
0
0
0
8
14
0
2
4
6
8
10
12
14
16
Academic Year 2016-17
Academic Year 2015-16


Did preceptors feel that the results of the study will impact their practice?
Results will not make any impact
Results will make little difference
Results will make some difference
Results will make a difference
Results will make a very big difference
0
2
15
5
0
0
2
4
6
8
10
12
14
16
Academic Year 2016-17
Academic Year 2015-16


Were the preceptors surprised by the QA/QI study findings?
Not at all surprised
Little bit surprised
Somewhat surprised
Surprised
Very surprised
4
4
5
5
6
9
2
4
0
0
0 1 2 3 4 5 6 7 8 9 10
Academic Year 2016-17
Academic Year 2015-16


The Impact of the QA/QI Project on The Preceptor's Confidence to Carry out His/Her Own Study
Not at all helpful
A little helpful
Somewhat helpful
Helpful
Very helpful
1
5
1
4
9
4
5
7
1
2
0 1 2 3 4 5 6 7 8 9 10
Academic Year 2016-17
Academic Year 2015-16

APPENDIX C

Student Survey

Student Survey

Rutgers New Jersey Medical School sends its medical students to over 40 different family medicine offices across New Jersey during the academic school year for a total of 8 rotations. Each rotation, students conduct a quality assurance/quality improvement (QA/QI) study for their assigned office to evaluate its performance against national standards.

According to our records, you have participated in the QA/QI study this rotation. As part of your evaluation of the clerkship you will need to complete the following short survey (~5 minutes). While your responses, positive or negative will not your affect grade, you must complete this survey with thoughtful responses before you receive your Family Medicine clerkship grade. Your thoughtful feedback is greatly appreciated and valued.

If you have any questions, please feel free to contact Dr. Steven Keller, Research Director for Family Medicine (sek1949@gmail.com) or Dr. Chantal Brazeau, Interim Chairman and Clerkship Director Family Medicine (brazeacm@njms.rutgers.edu), Rutgers NJMS.

1 What is your name? ______________________________

2 Did you have the post clerkship QA/QI discussion with your preceptor at the end of the rotation?
- ◯ Yes
- ◯ No

The following four questions pertain to the QA/QI discussion between you and your preceptor at the end of each rotation. If you did not have the discussion, please skip to the next section of the survey.

3 In general, how did you like having the discussion with your preceptor about the QA/QI project?
- ◯ I liked the discussion very much.
- ◯ I liked the discussion.
- ◯ I am neutral about the discussion
- ◯ The discussion was fair.
- ◯ I did not like the discussion at all.

4 In general, did you find that the discussion was useful in terms of learning about clinical care?
- ◯ The discussion taught me very much about clinical care.
- ◯ The discussion taught me much about clinical care.
- ◯ The discussion provided some useful knowledge.
- ◯ The discussion was fair.
- ◯ The discussion was not useful at all.

5 Did you find that the discussion provided a useful interaction with your preceptor regarding the clinical care at your assigned practice?
- ◯ The discussion provided very useful interaction.
- ◯ The discussion provided a useful interaction.
- ◯ The discussion provided some useful interaction.
- ◯ The discussion provided little useful interaction.
- ◯ The discussion was not useful at all.

6 How comfortable were you having the discussion?
- ◯ Very comfortable
- ◯ Comfortable
- ◯ Neutral
- ◯ Somewhat uncomfortable
- ◯ Very uncomfortable.

The following two questions pertain to the findings of the QA/QI study:

7 Do you believe that the results of the QA study will impact your preceptor's future practice?

- ◯ The results will make a very big difference in my preceptor's future practice.
- ◯ The results will make a big difference in my preceptor's future practice.
- ◯ The results will make some difference in my preceptor's future practice.
- ◯ The results will make little difference in my preceptor's future practice.
- ◯ The results will make no difference in my preceptor's future practice.

8 Were you surprised by any of the QA/QI study findings?

- ◯ Very surprised.
- ◯ Surprised.
- ◯ Somewhat surprised.
- ◯ I was a little bit surprised.
- ◯ Not at all surprised

9 How prepared do you feel to do a QA/QI project in the future?

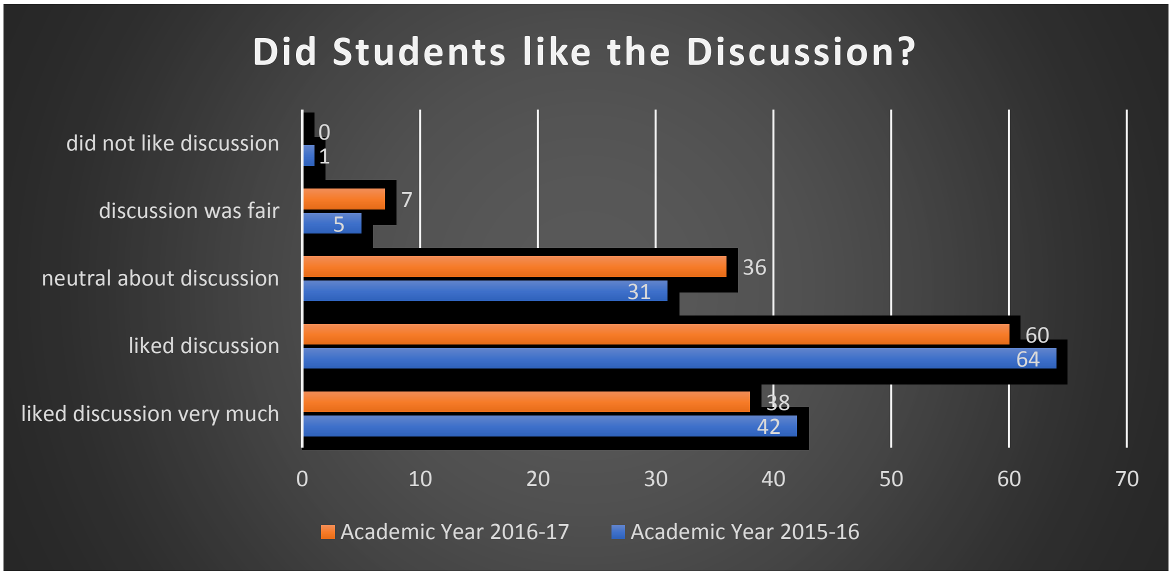
- ◯ Very prepared
- ◯ Prepared
- ◯ Somewhat prepared
- ◯ A little prepared
- ◯ Not at all prepared

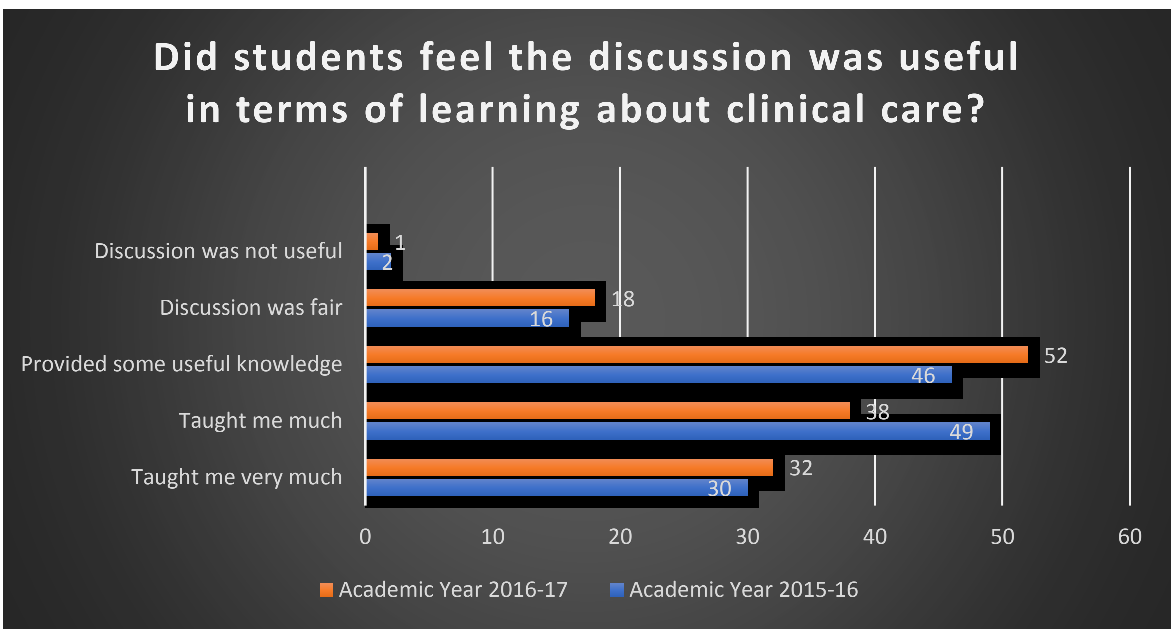
10 Please feel free to share any of your thoughts, comments, or opinions in the text box below. If you would like to meet with Dr. Keller our QA/QI research director please indicate this below.

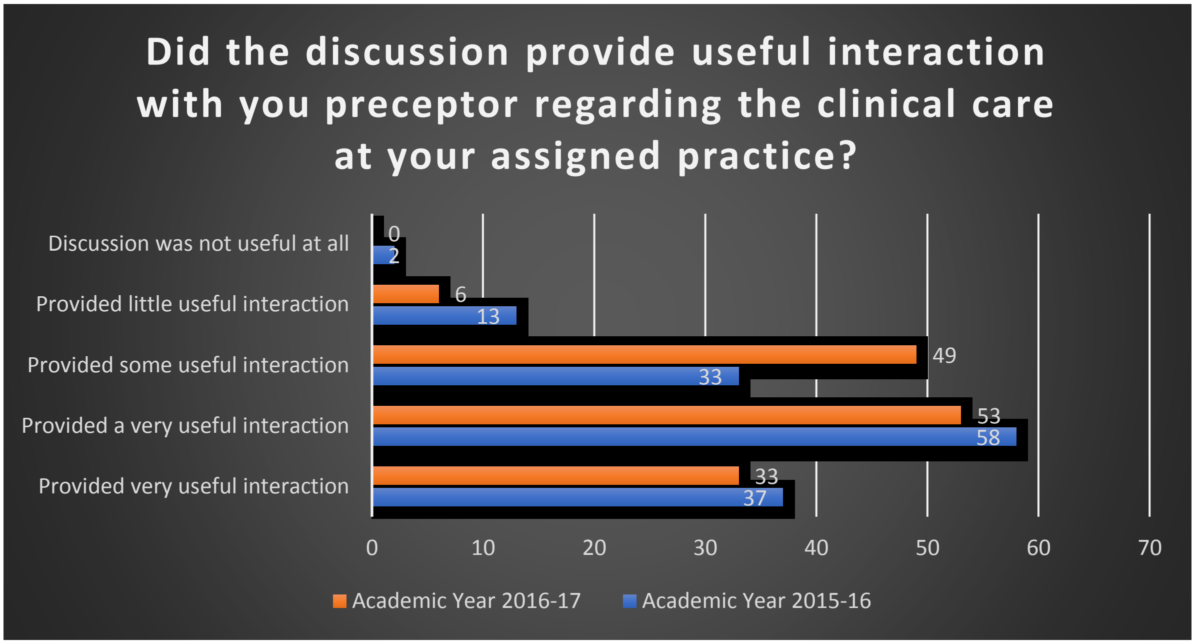
____

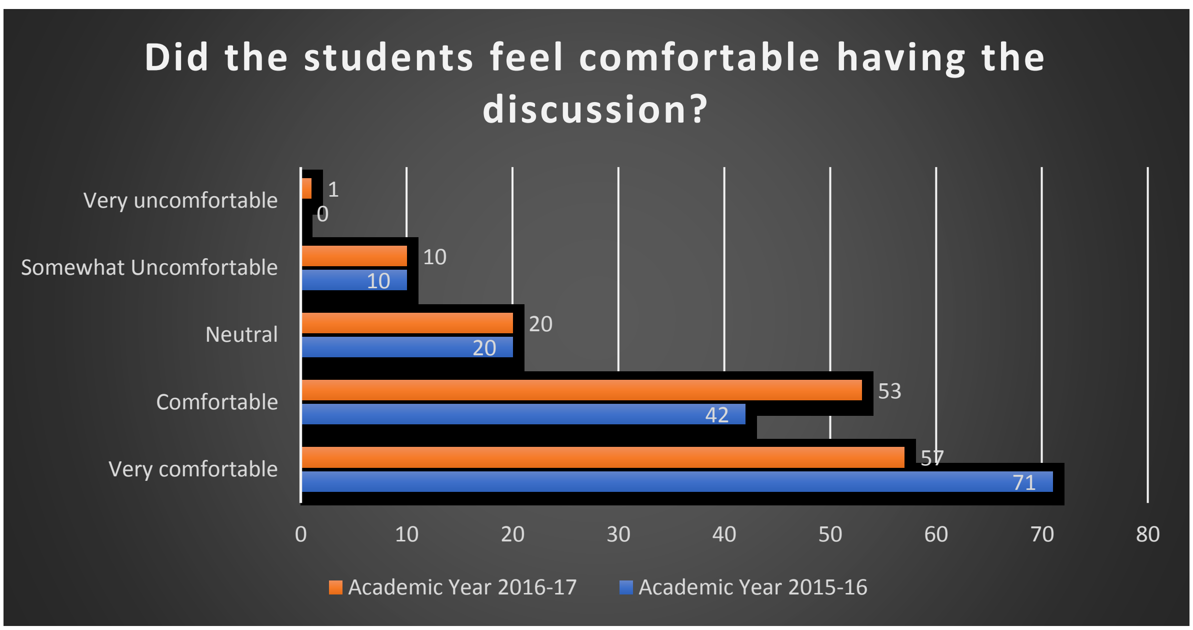
APPENDIX D

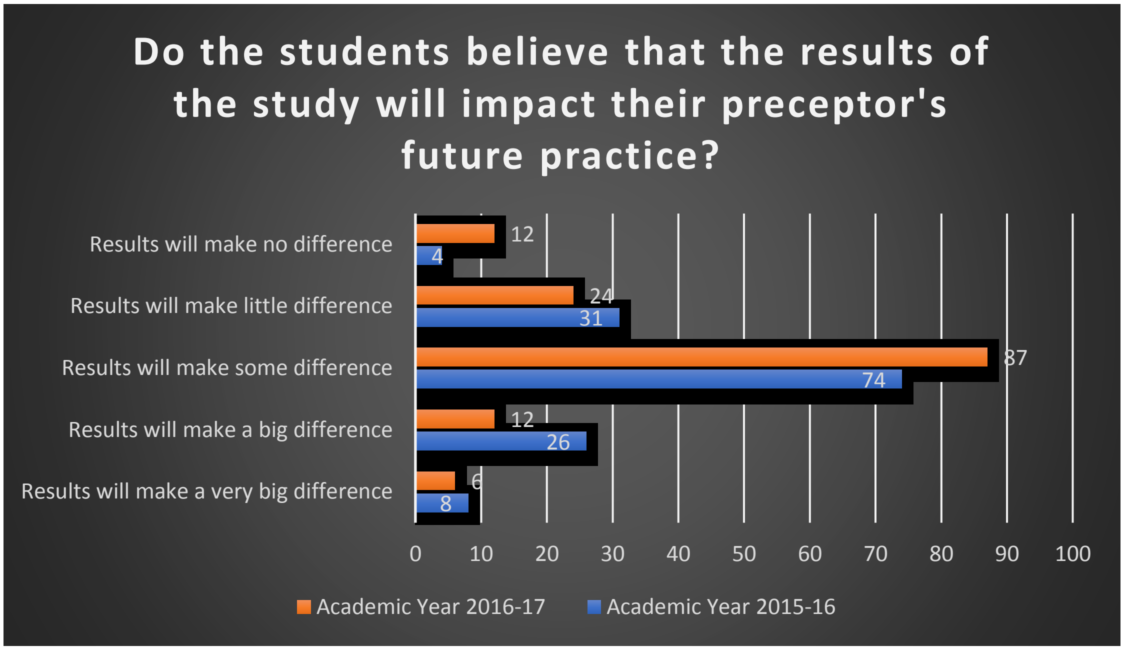
Student Survey Results

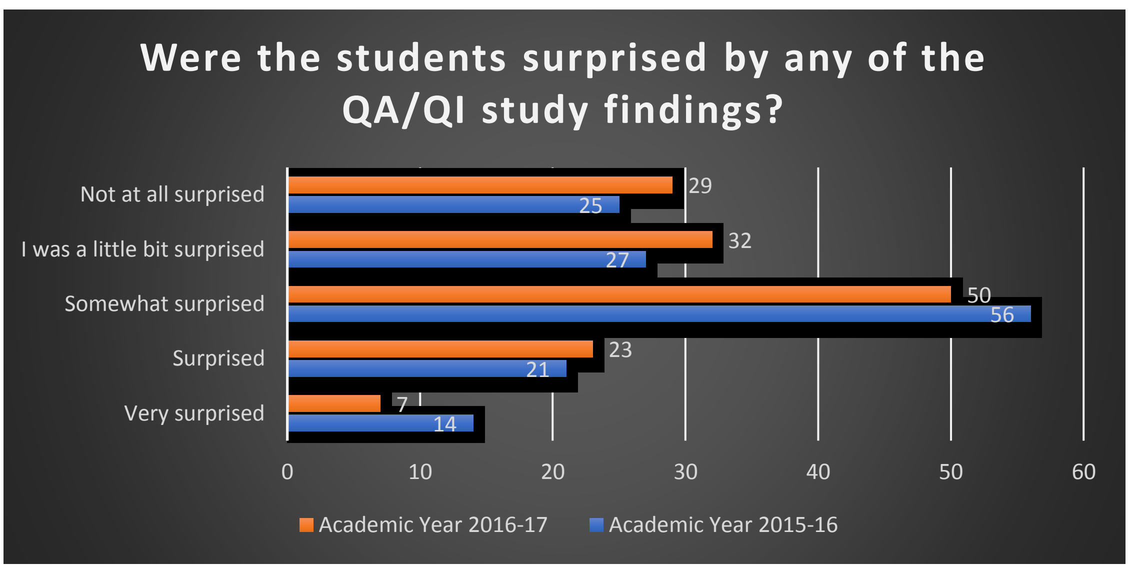


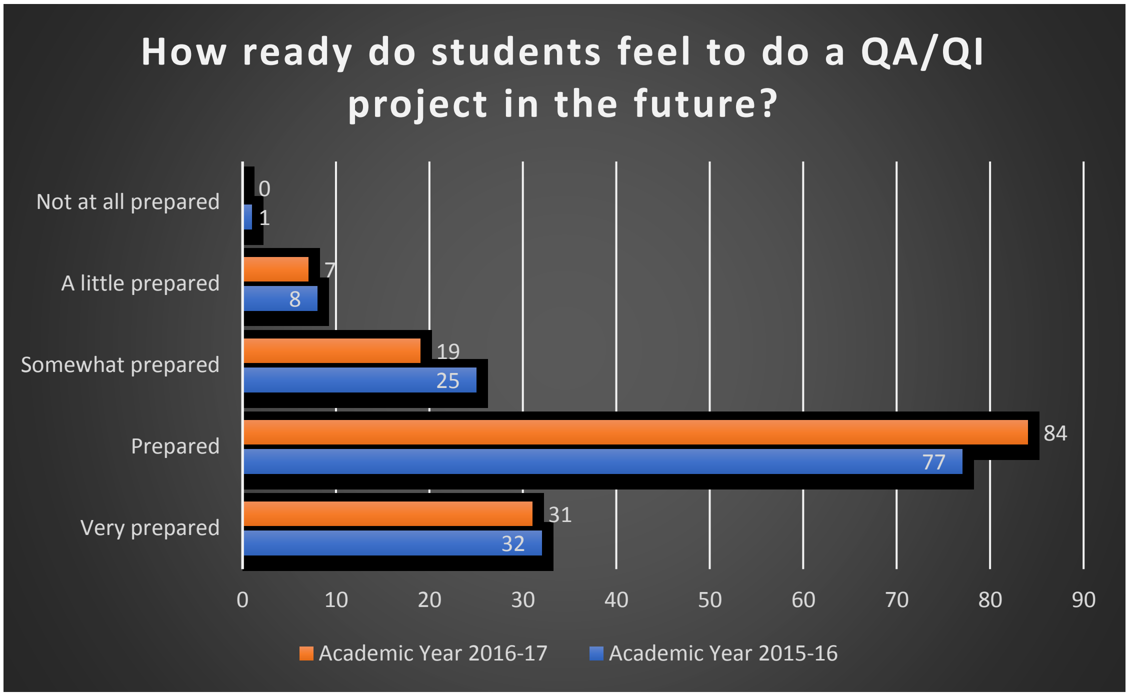



Did the discussion provide useful interaction with you preceptor regarding the clinical care at your assigned practice?
Discussion was not useful at all
Provided little useful interaction
Provided some useful interaction
Provided a very useful interaction
Provided very useful interaction
0
2
6
13
49
33
53
58
33
37
0
10
20
30
40
50
60
70
Academic Year 2016-17
Academic Year 2015-16


Did the students feel comfortable having the discussion?
Very uncomfortable
Somewhat Uncomfortable
Neutral
Comfortable
Very comfortable
1
0
10
10
20
20
53
42
57
71
0
10
20
30
40
50
60
70
80
Academic Year 2016-17
Academic Year 2015-16


Do the students believe that the results of the study will impact their preceptor's future practice?
Results will make no difference
Results will make little difference
Results will make some difference
Results will make a big difference
Results will make a very big difference
12
4
24
31
87
74
12
26
6
8
0 10 20 30 40 50 60 70 80 90 100
Academic Year 2016-17
Academic Year 2015-16


Were the students surprised by any of the QA/QI study findings?
Not at all surprised
I was a little bit surprised
Somewhat surprised
Surprised
Very surprised
29
25
32
27
50
56
23
21
7
14
0 10 20 30 40 50 60
Academic Year 2016-17
Academic Year 2015-16


How ready do students feel to do a QA/QI project in the future?
Not at all prepared
A little prepared
Somewhat prepared
Prepared
Very prepared
0
1
7
8
19
25
84
77
31
32
0
10
20
30
40
50
60
70
80
90
Academic Year 2016-17
Academic Year 2015-16

APPENDIX E

IRB Approval Form

Arts & Sciences IRB - New Brunswick 335 George Street Suite 3100, 3rd Floor New Brunswick, NJ 08901 Phone: 732-235-2866	**Health Sciences IRB - New Brunswick/Piscataway** 335 George Street Suite 3100, 3rd Floor New Brunswick, NJ 08901 Phone: 732-235-9806	**Health Sciences IRB - Newark** 65 Bergen Street Suite 511, 5th Floor Newark, NJ 07107 Phone: 973-972-3608

DHHS Federal Wide Assurance Identifier: FWA00003913

IRB Chair Person: Cheryl Kennedy

IRB Director: Carlotta Rodriguez

Effective Date: 6/29/2017

Approval Date: 6/28/2017

Expiration Date: 6/27/2018

eIRB Notice of Approval for Initial Submission # Pro20170000623

STUDY PROFILE

Study ID:	Pro20170000623
Title:	Are medical students and preceptors satisfied with the QA/QI learning projects the students carry out during their Family Medicine Clerkship?

Principal Investigator:	Steven Keller		
Co-Investigator(s):	Chantal Brazeau Norma Hernandez Christine Ramdin		
Approval Cycle:	Twelve Months		
Risk Determination:	Minimal Risk		
Review Type:	Expedited	**Expedited Category:**	

CURRENT SUBMISSION STATUS

Submission Type:	Research Protocol/Study	**Submission Status:**	Approved
Approval Date:	6/28/2017	**Expiration Date:**	6/27/2018

Pregnancy Code:	No Pregnant Women as Subjects	**Pediatric Code:**	No Children As Subjects	**Prisoner Code:** No Prisoners As Subjects

Protocol:	IRB required Template june 8 2017.docx data collection and surveys revised june 8 2017.docx	**Consent:**	data collection and surveys revised june 8 2017.docx.pdf IRB required Template june 8 2017.docx.pdf

*** Study Performance Sites:**

Other PIs office BHSB E 1536

ALL APPROVED INVESTIGATOR(S) MUST COMPLY WITH THE FOLLOWING:

1. Conduct the research in accordance with the protocol, applicable laws and regulations, and the principles of research ethics as set forth in the Belmont Report.

2. **Continuing Review:** Approval is valid until the protocol expiration date shown above. To avoid lapses in approval, submit a continuation application at least eight weeks before the study expiration date.

3. **Expiration of IRB Approval:** If IRB approval expires, effective the date of expiration and until the continuing review approval is issued: **All research activities must stop unless the IRB finds that it is in the best interest of individual subjects to continue. (This determination shall be based on a separate written request from the PI to the IRB.) No new subjects may be enrolled and no samples/charts/surveys may be collected, reviewed, and/or analyzed.**

4. **Amendments/Modifications/Revisions**: If you wish to change any aspect of this study, including but not limited to, study procedures, consent form(s), investigators, advertisements, the protocol document, investigator drug brochure, or accrual goals, you are required to obtain IRB review and approval prior to implementation of these changes unless necessary to eliminate apparent immediate hazards to subjects.

5. **Unanticipated Problems**: Unanticipated problems involving risk to subjects or others must be reported to the IRB Office (45 CFR 46, 21 CFR 312, 812) as required, in the appropriate time as specified in the attachment online at: https://orra.rutgers.edu/hspp

6. **Protocol Deviations and Violations**: Deviations from/violations of the approved study protocol must be reported to the IRB Office (45 CFR 46, 21 CFR 312, 812) as required, in the appropriate time as specified in the attachment online at: https://orra.rutgers.edu/hspp

7. **Consent/Assent**: The IRB has reviewed and approved the consent and/or assent process, waiver and/or alteration described in this protocol as required by 45 CFR 46 and 21 CFR 50, 56, (if FDA regulated research). Only the versions of the documents included in the approved process may be used to document informed consent and/or assent of study subjects; each subject must receive a copy of the approved form(s); and a copy of each signed form must be filed in a secure place in the subject's medical/patient/research record.

8. **Completion of Study:** Notify the IRB when your study has been stopped for any reason. Neither study closure by the sponsor or the investigator removes the obligation for submission of timely continuing review application or final report.

9. The Investigator(s) did not participate in the review, discussion, or vote of this protocol.