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The Importance of Following ACC/AHA Cholesterol Guidelines 2013 by Residents′ Physicians to Reduce Atherosclerotic Cardiovascular Disease in Different Populations

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The 2013 American College of Cardiology (ACC)/American Heart Association (AHA) cholesterol protocols recommend the use of Pooled Cohort Equations to estimate 10-year and life time Atherosclerotic cardio-vascular disease (ASCVD) risk as a guide for primary prevention treatment options. Many providers under-utilize this important tool. To observe resident physicians′ HMG COA inhibitor (statins) prescribing pattern, with particular attention to appropriate dosing as per 2013 ACC/AHA Cholesterol Guidelines, at the University of Toledo Family Medicine Residency Program and to increase Resident Physicians′ awareness of the ASCVD risk calculator as a tool to improve appropriate statin dosing. A retrospective, observational, cross-sectioned chart review was performed to analyze pre-existing data collected from a patient population within a defined time period. The study included 237 patient charts, who received care from among 12 Family Medicine Residents. The success rate for correct statins prescriptions for first year residents was 63%, including 24 correct dose prescriptions out of 38 patients total. Second year residents success rate increased to 73%, representing 58 correct dose prescriptions out of 80 patients total. Third year residents success rate was 63% with 75 correct dose prescriptions out of 119 patients total. Out of 237 chart reviewed, 157 patients received appropriately dosed statin prescriptions, representing a success rate of 66%. This suggests that across all 3 levels of resident training, there is room of improvement in the utilization of the 2013 ACC/AHA lipid lowering guidelines.

ASCVD | statin | residents physicians | success rate | prescriptions |

The secret to prevent chronic disease is to start with primary preventive measures. The 2013 American College of Cardiology (ACC)/American Heart Association (AHA) cholesterol protocols recommend the use of Pooled Cohort Equations to estimate 10-year and lifetime Atherosclerotic cardio-vascular disease (ASCVD) risk as a guide for primary prevention treatment options (1, 8, 10). In 1948, the Framingham Heart Study was commissioned by the United States Congress. The study is an ongoing cohort cardiovascular (CVD) risk assessment developed to identify risk factors for cardiovascular disease. Data obtained via the Framingham Study originally formed the basis for the management of hyperlipidemia. One of the limitations though was Framingham used an ASCVD risk calculator which was only estimating Coronary Heart Disease (CHD) risk. After 2008 other factors were added including, Cerebrovascular Accident (CVA), Peripheral Arterial Disease (PAD), and heart failure as disease outcomes. The 2013 lipid management guidelines expanded upon the directives of the Framingham study by incorporating the use of the previously mentioned equations. An emphasis was made regarding risk reduction while considering cost effectiveness. These recommendations supported the use of a statin prescription for primary CVD prevention when 10-year ASCVD risk of having a heart attack or stroke is more than 7.5%, but not to prescribe statins for general populations with low density lipoprotein-C (LDL-C) levels less than 190 mg per dL (4.92 mmol per L) with risk scores less than 7.5% (2). This recommendation to not treat this particular segment of the population was based on a lack of cost-effectiveness. JAMA, in 2014 reiterated the validity of using the risk equations, indicating they were well calibrated for the general population, and that using them constituted good clinical practice. (10,11).

An important study published in JAMA 2016 described the lack of cost-effectiveness of a novel class of a potent class of lipid lowering medications. The study demonstrated that while Proprotein convertase subtilisin/kexin type 9 (PCSK9) Inhibitor therapy in patients with ASCVD or heterozygous familial hypercholesterolemia clearly had a profound impact on LDL levels, routine implementation was estimated to increase US health care costs substantially (3). Conversely, a significant number of studies published in 2012, 2013, and 2015 consecutively demonstrated that as a class, statins had a beneficial impact on cardiac risk reduction, were cost-effective, had a consistent safety profile, and thus, justified different recommendations. (4-6, 9, 12). The American Diabetes Association (ADA) expanded on its recommendations for cardiac risk reduction when it focused in 2015 on treating risk factors associated with diabetes including dyslipidemia and hypertension. They stated that aggressively managing lipids would significantly improve the 10-year (CHD) risk among U.S. adults with diabetes (7). The American Journal of Medicine in 2015 clarified guidelines that statin intensity dosing based on ASCVD risk, as opposed to dosing based on LDL levels could significantly improve CVD outcomes (12). In developing this study it was apparent that, in an academic setting, adoption of these guidelines, and understanding the role of cardiac risk calculators could enhance learners' clinical practice skills and their adoption of evidence-based primary prevention strategies. A MESH-based literature search failed to identify any prior studies addressing Family Medicine residents' knowledge or attitudes regarding correct statin dosing according to ACC/AHA guidelines using an estimated ASCVD risk calculator. Thus, our study focused on our residents' awareness of guidelines for primary prevention of

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CVD risk in general population, and in particular their statin prescribing habits.

Methods

A retrospective, observational, cross-sectioned chart review was done to analyze pre-existing data collected from a patient population within a defined time period. The charts reviewed were selected from among patients cared for by Family Medicine residents at the University of Toledo Family Medicine Center, Glendale Medical East Clinic (GME).

Study population. The pooled cohort equations incorporated in 2013 ACC/AHA guidelines utilize a patient population between the ages of 40 and 75 years old. Hence our study focused on Health Center patients within the same age range. While the ACC/AHA calculator is primarily intended to guide treatment for primary prevention, we opted to include patients with pre-existing cardiovascular disease within the same age range. This was done to assess compliance with treatment guidelines for the residents′ patients at highest risk. This included patients with clinical ASCVD or equivalents including: diabetes, acute coronary syndrome, myocardial infarction, stable or unstable angina, coronary or other arterial revascularization, stroke, transient ischemic attack, and peripheral artery disease. We excluded pregnant women, patients no longer under our care, patients who had not been prescribed statins, and those patients who had not had a lipid profile performed during the timeframe of the study.

Study Design. From a patient stand point, this study was a de-identified, retrospective chart review. Thus individual patient consent was not required. However, each resident was required to provide consent for the purpose of chart review their patients. Once the target patient population was identified, records were filtered to identify those patients with a diagnosis of hyperlipidemia, who were currently being prescribed a statin. This was subsequently limited to those patients under resident care who had a documented lipid profile. A total of 237 charts were reviewed. Once the study population was established, the patients were de-identified so as to maintain patient confidentiality. The following data points were pooled for study purposes: physician name, patient age, gender, LDL, HDL, total cholesterol, systolic blood pressure, diabetes diagnosis, comorbidities other than diabetes and hypertension (related to hyperlipidemia), smoking status, race, presence of statin usage, specific statin prescribed and dosage, calculated 10 year ASCVD risk, optimal 10 year ASCVD risk, lifetime ASCVD risk, optimal lifetime ASCVD risk, and recommended statin intensity. Of the 273 total chart reviewed the approximate breakdown was as follows: 50.2% were from third year residents, 33.7% from second year residents, and 16.1% from first year residents. A total of twelve residents′ (including the author′s) charts were studied.

Methodology. The ACA/AHA calculator available online at (http://clincalc.com/Cardiology/ASCVD/PooledCohort.aspx) was used to determine each patient′s predicted cardiac risk. This peer-reviewed online calculator uses the Pooled Cohort Equations to estimate the 10 year risk of ASCVD among patients without pre-existing cardiovascular disease who are between 40 and 75 years of age. However we also included those patients with pre-existing ASCVD to monitor if they were already using appropriate statin doses. Patients are considered to be at "elevated" risk if the Pooled Cohort Equations predicted risk is $>$7.5%. The ACC/AHA Pooled Cohort Equations have been proposed to replace the Framingham Risk 10-year Cardio-Vascular Disease (CVD) calculation, which was originally recommended for use by the National Cholesterol Education Program (NCEP) - Adult Treatment Panel (ATP III) guidelines for high blood cholesterol in adults.

Guidelines. This study utilized the 2013 ACC/AHA guidelines on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults, please refer to 2013 ACC/AHA cholesterol guidelines. This algorithm identifies treatment options with either moderate or high intensity statins. Table 1 identifies those statins currently available in the US with respective doses equivalent to tiered treatment intensity.

Table 1. Statins of different intensity and dosage.

High intensity statins	Moderate intensity statins	Low intensity statins
Atorvastatin 40-80 mg	Atorvastatin 10-20 mg	Simvastatin 10 mg
Rosuvastatin 20-40 mg	Rosuvastatin 5-10 mg	Pravastatin 10-20 mg
	Simvastatin 20-40 mg	Lovastatin 20 mg
	Pravastatin 40-80 mg	Fluvastatin 20-40 mg
	Lovastatin 40 mg	Pitavastatin 1 mg
	Fluvastatin XL 80 mg	
	Fluvastatin 40 mg bid	
	Pitavastatin 2-4 mg	

Results

The entire resident contingent of 12 residents were included in the study, four residents per PGY (post-graduate year). The original goal was to identify 10 charts per PGY-1 resident, 20 per PGY-2 resident, and 30 per PGY-3 resident. This would have resulted in 240 total patients′ charts studied. Three patient records were unable to be used due to a lack of recent lipid results. Of the 237 total charts reviewed the breakdown was as follows: 119 were from third year residents, 80 from second year residents, and 38 from first year residents. This is represented by Fig. 1.

Patient demographics are indicated in Fig. 2. Caucasian patients outnumbered African-American ones at a rate of 2.08/1; more men were studied than women at a rate of 1.2/1.

Additional cardiac risk criteria were assayed for the patient population. These include the presence or absence of diabetes or pre-diabetes, hypertension, and smoking status. This is represented by Fig. 3.

The method of analysis used to calculate the success rate of appropriate statin prescribing was via the following formula (Correct dose/Patients Number * 100). Results were calculated for the pro-

gram overall as well as per year of residency. This is represented in Fig. 4.

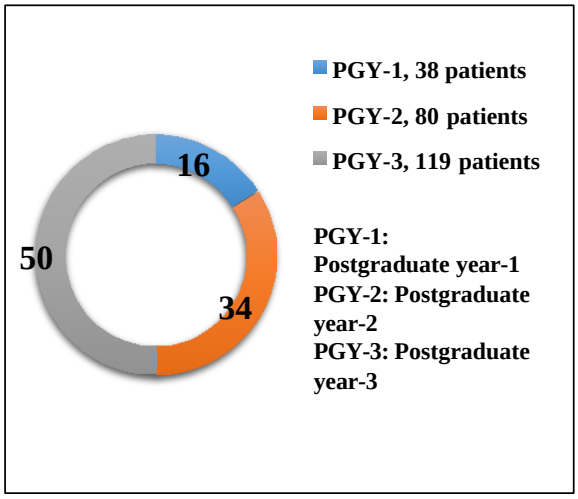

Fig 1. Number of patients per residents 237 patients were studied, representing 9.5 per PGY-1 (total 38); 20 per PGY-2 (total 95); 29.75 per PGY-3 (total 119).

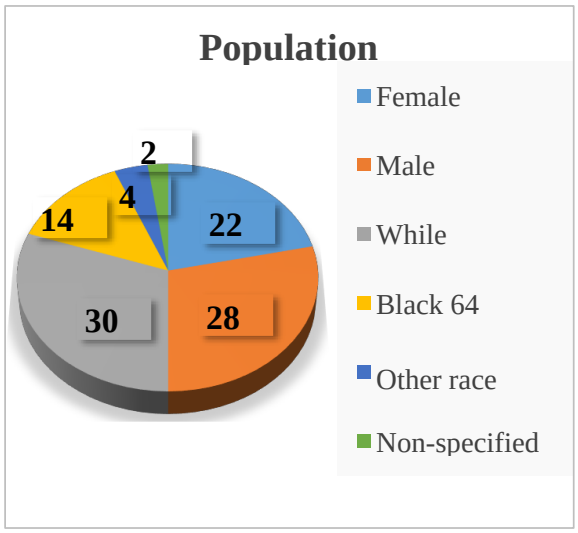

Fig 2. Study population 102 patients (22%) females, and 135 patients (28%) were males; 144 patients (30%) were white, 64 patients (14%) were black, 18 patients (4%) were other races, and 11 patients (2%) didn't specify their races.

Discussion

To best utilize the ACC/AHA algorithm total cholesterol levels should range from 130-320 mg/dl. For that reason, patients whose cholesterol was < 130 mg/dl were rounded to 130 mg/dl. Patients whose total cholesterol was > 320 mg/dl were rounded to 320 mg/dl. These corrections represented less than 1% of the total patient population in our study. A similar approach was taken with patients whose systolic blood pressure was either less than 90 mm/hg or greater than 200 mm/hg who also represented less than 1% of total patient population.

This study was developed as a tool to improve our family medicine residents' knowledge of current guidelines for ASCVD risk reduction. Presence of statin use and dosage intensity was reviewed for each patient individually. After completion of the study, each resident received feedback regarding his/her management. Suggestions were made regarding appropriate statin selection and treatment intensity, both individually and as a group when this project was presented as a scholarly activity to our Residency program by the author. The residents had a highly favorable response to the study, and found the results to be highly informative. All residents downloaded the ASCVD risk Calculator Application immediately after we recommended it during the presentation. They indicated their intent to use this beneficial tool for both previously established patients and new patients coming to the practice having ASCVD risk.

While this study focused primarily on lipid management, it was also provided an opportunity to revisit approaching those patients with modifiable risk factors. This was a good reminder for both residents and faculty at GME to address this risk and adhering with current guidelines.

The 10 year and life time ASCVD risk for patients with clinically significant atherosclerotic disease was highly elevated. The success rate prescribing correct statin doses by our residents who took care of those patients was 75%. This means that our residents are diligent when prescribing statins for high risk patients, but still there is room for improvement. The initial focus of this study however, was to focus on patients being treated with statins for primary prevention. The 10 year and lifetime ASCVD risk for patients with clinical ASCVD equivalents was lower than those with pre-existing cardiovascular disease. We found out that 70% of prescriptions provided for these patients conformed to current guidelines. We suspect the decline in this percentage could be related to this slightly lower risk versus those with pre-existing cardiovascular disease, and residents' perception of risk.

Unfortunately there was insufficient data for those patients whose LDL level was less than 90 mg/dl, and had either a prior history of ASCVD, or an equivalent cardiac risk factor. Those patients calculated 10 year and life time ASCVD risk was elevated based on ACC/AHA 2013 guideline. They were eight patients total to whom this applied. Seven out of eight received prescribed statin doses that were correct. Previously our decision to initiate statin therapy was just based on the patient's LDL calculation. Via the use of the ACC/AHA guidelines and on-line calculator we are better able to identify those patients that may have increased ASCVD risk despite having LDL levels less than 90. In particular, we can capture those patients with prior ASCVD or cardiac equivalents diagnoses, and treat them appropriately. The 10 year and life time ASCVD risk for our general population greater than or equal to 7.5% was lower than above mentioned patient categories. The success rate prescribing statins for this patient population was about 55%. Again this suggests a lack of familiarity with current guidelines and/or the availability of the online ASCVD calculator among our residents.

Conclusion

We are optimistic that this study will enhance our resident's awareness of current statin prescribing guidelines, and improve our statin prescribing patterns. We strongly believe that after this study and our subsequent recommendations to our residents the percentage of correct statins prescriptions will increase.

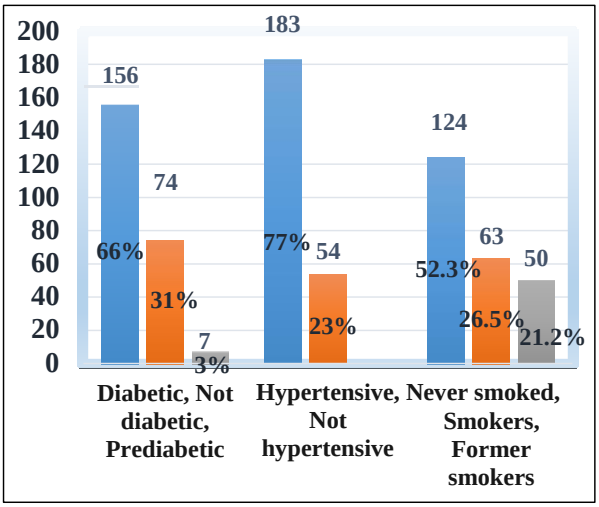

Fig 3. Additional cardiac risk factors 156 patients (66%) were diabetics, 74 patients (31%) were not diabetics, and 7 patients (3%) were pre-diabetics; 183 patients (77%) were hypertensive, and 54 patients (23%) were not hypertensive; 124 patients (52.3%) were never smoked, 63 patients (26.5%) were currently smokers, and 50 patients (21.2%) were former smokers.

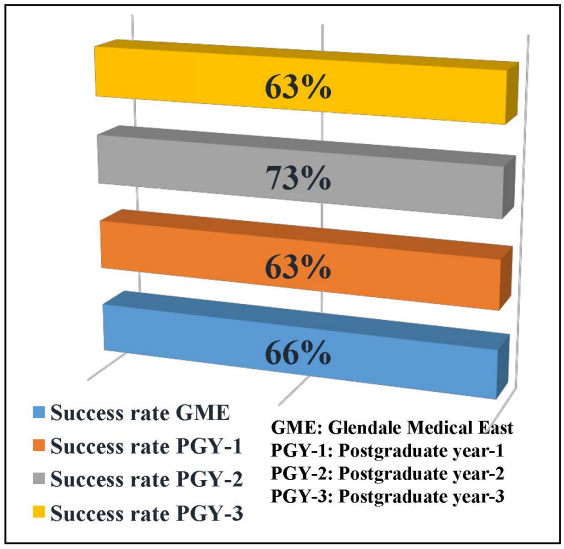

Fig 4. Success rate of prescribing statins per PGY teams. Success rate for PGY-3 was 63%, PGY-2 was 73%, PGY-1 was 63%, and overall GME performance for the residents was 66%.

We also believe this study has, and will continue to impact the residents′ use of this and similar online clinical decision tools. Ultimately we hope this study will improve the quality of care we are providing our patients for both primary and secondary prevention of ASCVD. Ideally this study will increase residents′ awareness of the need to be more diligent when addressing cardiovascular risk.

Disclosure

As a residents in an accredited residency program at University of Toledo, Ohio, we disclose that we have no financial interest or other relationship with a commercial interest producing healthcare goods or services that have a direct bearing on the subject matter of this project or the outcome. Also we have no other relationship with other organizations outside UTMC. All patients and residents information kept confidential and saved at the University of Toledo, Family Medicine Center department for the next five years.

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