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Role and impact of a specialized cardiometabolic clinic in managing high-risk patients with type 2 diabetes and atherosclerotic cardiovascular disease

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ABSTRACT

Background: Lipid-related risk and residual cardiovascular risk remain high in patients with type 2 diabetes (T2D) and atherosclerotic cardiovascular disease (ASCVD). Significant treatment gaps exist in implementation of pluripotent and effective therapies that reduce these risks.
Objective: This study evaluates the efficacy and impact of a dedicated, standalone cardiometabolic clinic designed to address treatment gaps through streamlined management and optimization of treatment strategies.
Methods: We retrospectively collected data from the first 400 patients with T2D and ASCVD who underwent treatment at the clinic and presented for at least one follow-up visit. These patients were primarily managed for their cardiometabolic risks and received intensified lipid-lowering therapies, including adjunct non-statin therapies.
Results: Significant findings included increased use of glucagon-like peptide-1 receptor agonists (GLP1RA) and sodium-glucose cotransporter 2 inhibitors (SGLT2i) to 84 % and 65 %, respectively, with 94 % of patients eventually on one therapy and 55 % on dual therapy. Increases in lipid-lowering therapies led to 89 % of patients achieving low-density lipoprotein cholesterol levels below patient-specific thresholds for intensification.
Conclusion: This care model effectively manages high-risk patient needs, achieving significant intensification of lipid-lowering therapies and broad use of cardiometabolic drugs, and highlights the clinic's potential to serve as a model for similar high-risk populations.

1. Introduction

Despite the significant impact of lipid-lowering therapy with statins, patients with atherosclerotic cardiovascular disease (ASCVD) continue to face substantial residual cardiovascular risk [1]. These risks are particularly prominent in patients with type 2 diabetes (T2D) [2], a high-risk population where historical therapeutic approaches and "wait-to-failure" models have been inadequate. Many patients remain at elevated lipid-related risk, exceeding low-density lipoprotein cholesterol (LDL-C) thresholds for intensification [3]. This issue is compounded by the slow adoption of guideline-recommended anti-diabetes agents that reduce residual cardiovascular risk such as glucagon-like peptide-1 receptor agonists (GLP1RA) and sodium-glucose cotransporter 2 inhibitors (SGLT2i). Consequently, there are considerable treatment gaps and suboptimal implementation of these pluripotent therapies [4,5]. New care models are needed to address these gaps and improve patient outcomes [6].

We established a dedicated, standalone cardiometabolic clinic using a lean model, staffed by an endocrinologist and one office assistant, and leveraged technology to minimize operational burdens. This included primarily web-based scheduling and extensive use of patient portals. We excluded care for non-cardiometabolic endocrine disorders, and we managed patients with type 1 diabetes or insulin-requiring type 2 diabetes in collaboration with local diabetes centers of excellence. Patients were primarily referred from local cardiology practices, with a smaller referral base from primary care practices. We formed a referral pathway to an external dietitian for nutritional counseling to augment and personalize the dietary advice patients received during their visits at the clinic.

Herein, we examine the effectiveness and impact of the clinic in addressing implementation gaps.

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2. Methods

We conducted a retrospective, observational study to examine the first 400 patients with T2D and ASCVD who sought care in our clinic and attended at least one follow-up appointment. Data on sex, race and ethnicity were self-reported. The primary outcome, which was pre-specified, was the rates of use of GLP1RA, SGLT2i, statins, ezetimibe, proprotein convertase subtilisin/kexin type 9-directed therapies (PCSK9i, including both monoclonal antibody and small interfering RNA) and bempedoic acid. The secondary outcome was the percentage of patients achieving LDL-C levels below thresholds for intensification as per the 2022 American College of Cardiology Expert Consensus Decision Pathway on the Role of Nonstatin Therapies for LDL-Cholesterol Lowering in the Management of Atherosclerotic Cardiovascular Disease Risk [7].

The study was conducted through chart review and manual tabulation of demographic data, interventions and laboratory results. Baseline laboratory results before establishing care in our clinic and follow-up results were ascertained from the electronic health record and national laboratory physician portals. Tabulation and calculations were performed using Microsoft Excel.

We defined T2D according to American Diabetes Association criteria, primarily as hemoglobin A1c level of 6.5 % or higher, or fasting hyperglycemia of 126 mg/dL or higher. ASCVD was defined as coronary artery disease (CAD), cerebrovascular disease, and peripheral artery disease, with CAD including prior myocardial infarction, percutaneous coronary revascularization, coronary artery bypass grafting, an absolute coronary artery calcium score over 300, or above the 90th percentile for age. We calculated percentiles using the Multi-Ethnic Study of Atherosclerosis coronary artery calcium calculator [8-9] for patients aged 45–84 (available at https://www.mesa-nhlbi.org/Calcium/input.aspx) and the CAC-Tools calculator [10] for those aged 30–45 (available at https://www.cac-tools.com/).

In determining thresholds for intensification of lipid-lowering therapy, we used the definitions found in the 2022 ACC Expert Consensus Decision Pathway recommendations. Therefore, “very high risk” was defined as patients with a history of multiple major ASCVD events or one major ASCVD event and the presence of multiple high-risk conditions.

Ethics approval was not required as the study was limited to deidentified secondary data analyses, and all patients participating in the clinic consented to use of deidentified data for research purposes.

3. Results

The baseline demographic information and clinical characteristics of the cohort are shown in Table 1. Mean age was 61 ± 11.6 years, and 48 % were female. Obesity, defined as a BMI ≥ 30 kg/m^2, was present in 87 % of the cohort. Other common comorbidities included hypertension, hyperlipidemia and chronic kidney disease (CKD). CKD was defined by an estimated glomerular filtration rate less than 60 mL/min/1.73m^2 or urine albumin-to-creatinine ratio (UACR) ≥ 30 mg/g.

Table 1
Demographic and baseline characteristics of the cohort.

Variable	Total (n = 400)
Age, mean, years (SD)	61.0 (11.6)
Sex, n (%)	
Male	207 (51.8)
Female	193 (48.2)
Race, n (%)	
White	287 (71.8)
Black or African American	81 (20.2)
Asian	32 (8.0)
Ethnicity, n (%)	
Not Hispanic or Latino	352 (88.0)
Hispanic or Latino	48 (12.0)
BMI, mean, kg/m^2	38.3
Comorbidity, n (%)	
Obesity	348 (87.0)
Hypertension	339 (84.7)
Hyperlipidemia	377 (94.2)
Chronic Kidney Disease	85 (21.2)

The baseline and follow-up usage rates of cardiometabolic therapies are shown in Fig. 1. After an average of 2.8 clinic visits per patient, the usage rate of GLP1RA increased from 28 % to 84 %, and the usage rate of SGLT2i increased from 38 % to 65 %, resulting in 94 % of patients on either class and 55 % of patients on both classes. Addition of adjunct non-statin lipid-lowering therapy occurred in 42 % of patients, with 21 % initiating PCSK9i. By proportion, PCSK9i represented the most common non-statin intensification strategy from baseline. These interventions led to 89 % of patients achieving LDL-C levels below the thresholds for intensification as per the 2022 ACC Expert Consensus Decision Pathway recommendations.

Baseline and follow-up laboratory test means are shown in Table 2. There were significant numerical decreases in mean LDL-C, hemoglobin A1c and triglycerides.

4. Discussion

Our findings demonstrate the viability and efficacy of a lean, standalone cardiometabolic clinic in delivering high-volume, effective cardiometabolic therapies, particularly for patients with T2D and ASCVD who have unique treatment needs.

The structure of cardiometabolic care delivery remains a critical topic in clinical discussions. Previous work in this field has suggested development of a distinct cardiometabolic subspeciality and an integrated and interdisciplinary care model [11] as well as creation of centers of excellence [12]. These care models, which are increasingly prevalent and successful, feature a multidisciplinary approach either internally or in conjunction with external partnerships that streamline patient management and optimize treatment efficacy through targeted strategies. The approaches have demonstrated deep impact, such as significant increase in utilization of PCSK9i in patients with dyslipidemia [13], and both in-person and virtual care delivery of lipid-lowering therapies in patients post-myocardial infarction [14,15]. Similarly impactful data has been demonstrated for GLP1RA and SGLT2i in patients with T2D and ASCVD or other cardiac conditions [16,17].

A notable finding of our study is the successful broad intensification of lipid-lowering therapies, aligning with the latest recommendations in clinical lipidology and preventive cardiology guidelines. Given that the impact of intensification strategies across cohorts depends on the absolute baseline risk, and patients with T2D and ASCVD are at high absolute baseline risk, these interventions are likely to be profoundly impactful. Further, considering the expanding pluripotent benefits of GLP1RA and SGLT2i throughout the spectrum of cardiovascular-kidney-metabolic health, the implementation of these specific therapies will have a multiplied clinical impact on this patient profile. The potential of such clinics and approaches to overcome barriers typically associated with complex patient management, such as payer restrictions and the high cost of novel therapies, is notable.

The model’s success in integrating care with external cardiology and primary care partners prompts consideration of its potential for broader applicability. Expanding the reach of such clinics could address similar gaps in care across diverse demographic and geographic settings. Research into the scalability and adaptability of this model to other healthcare ecosystems could provide valuable insights into its broader applicability.

A key element of the care model was the physician-led prior authorization (PA) process. Traditionally handled by medical staff, the completion of PAs by the physician allowed for a high rate of approvals and follow-through due to several factors: (1) identification of insurance requirements for formulary preferences and criteria for approval, which therefore were known at the time of the patient visit and could be

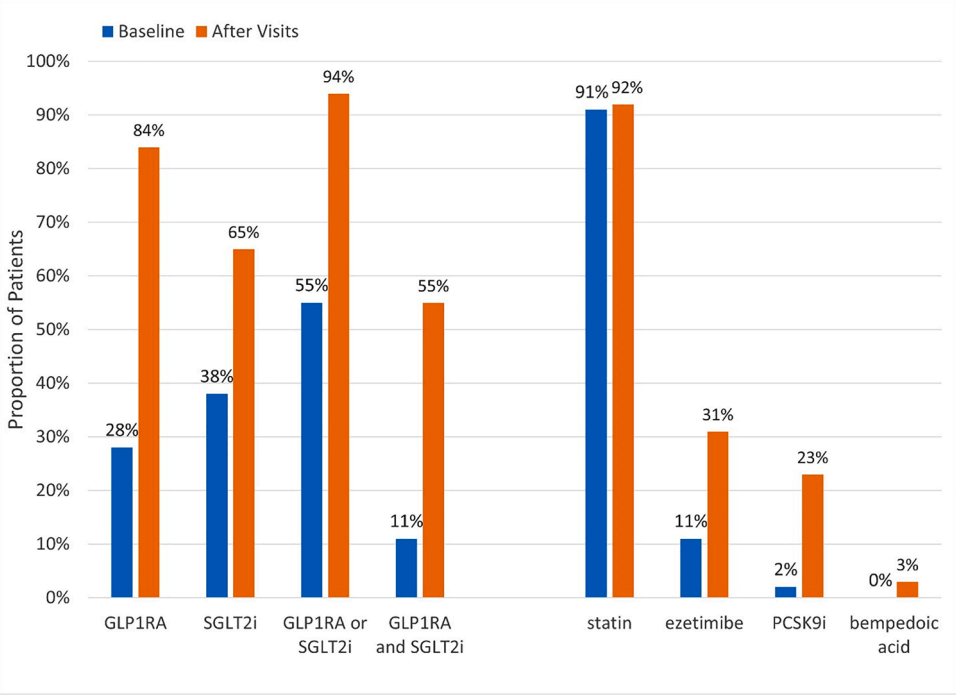

Fig. 1. Utilization trends of cardiometabolic therapies.

Table 2
Laboratory results before and after establishment of care.

Variable	Before establishing care	After follow-up
LDL-C, mean, mg/dL (SD) [$N = 391$]	88.3 (26.5)	53.9 (19.2)
Hemoglobin A1c, mean,% (SD) [$N = 358$]	8.1 (1.3)	6.4 (0.9)
Triglycerides, mean, mg/dL (SD) [$N = 391$]	228.2 (72.7)	146.4 (55.4)

discussed during the visit, (2) the completion of PA prior to electronic prescribing, often simultaneously during the clinical encounter, allowing for a smoother process for prescription dispensing and (3) the ability to track PA approvals, denials and appeals via the online platform used for completion and submission.

Limitations of this study include its retrospective design and single-center setting, which may limit the generalizability of the findings. Certain aspects of our patient demographics may have been skewed by the origin of presentation to care at referral sources. Our definition of ASCVD was broader than current clinical guidelines, including patients with high calcium scores by absolute value or percentile. By nature of our early follow-up timeline, long-term adherence to medical therapy, which is crucial for longitudinal cardiometabolic health, remains unclear. Several elements were not tabulated, including subtype of ASCVD and rates of statin dose intensification. There is selection bias in the cohort, as the patients who followed through their physicians' recommendation to establish care at our practice were likely more motivated and dedicated to follow-up and adhering to our treatment recommendations. The impact of socioeconomic factors on patient access to the clinic and adherence to prescribed therapies was not extensively explored and warrants further investigation.

Despite our positive outcomes, challenges remain. Cost remains a challenge despite a multi-prong approach to mitigate, including use of copay cards for commercially-insured patients, patient assistance programs for patients on Medicare, and grants from foundations for underinsured patients. Financial toxicity from pharmaceutical treatments continues to threaten long-term adherence to therapies. Insurance coverage also poses challenges: although the clinician often deemed PCSK9i as the appropriate choice for many patients, particularly for those with high lipoprotein(a), regional payer restrictions in requiring "step-therapy" influenced the high use of ezetimibe. Finally, the expanding arsenal targeting residual risk – including residual thrombotic and inflammatory risks and potential emerging approaches in residual lipoprotein(a) and triglyceride-rich lipoprotein risks – will inevitably face challenges related to pill and injection burden. Development of long-acting, RNA-targeting agents that require administration every 1–6 months could benefit many patients.

Lastly, it is important to highlight that preventive work, which consolidates medical care around the most potent and impactful therapies, is generally heavily undervalued and undercompensated in the current healthcare ecosystem, reflecting a broader trend in healthcare that deprioritizes prevention.

5. Conclusion

The standalone cardiometabolic clinic model offers a promising approach to managing the needs of a high-risk patient population. By integrating specialized care with advanced therapeutic strategies, we can significantly improve patient outcomes and potentially reduce the overall burden of cardiovascular disease in patients with T2D and ASCVD. This model serves as an additional resource to consider within broader healthcare strategies to ensure that these benefits can be realized on a larger scale.

CRediT authorship contribution statement

Taher Modarressi: Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence

the work reported in this paper. Taher Modarressi reports a relationship with Novo Nordisk Inc that includes: board membership and consulting or advisory. Taher Modarressi reports a relationship with Eli Lilly and Company that includes: speaking and lecture fees. Taher Modarressi reports a relationship with AstraZeneca Pharmaceuticals LP that includes: speaking and lecture fees. Taher Modarressi reports a relationship with Novartis Pharmaceuticals Corporation that includes: board membership. Taher Modarressi reports a relationship with Abbott Laboratories that includes: speaking and lecture fees. Taher Modarressi reports a relationship with CRISPR Therapeutics that includes: consulting or advisory. Taher Modarressi reports a relationship with Amgen Inc that includes: speaking and lecture fees. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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