

Development of a Nurse Practitioner Fellowship Program in Cardiometabolic Health

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Cardiometabolic syndrome, recently renamed cardiovascular-kidney-metabolic (CKM) syndrome (Ndumele, Rangaswami, et al., 2023), is characterized as a systemic disorder resulting from the pathophysiological interactions among metabolic risk factors such as obesity and diabetes, chronic kidney disease, and cardiovascular conditions (including heart failure, atrial fibrillation, coronary heart disease, stroke, and peripheral artery disease). This syndrome leads to multi-organ dysfunction and an increased risk of adverse cardiovascular outcomes (Ndumele, Neeland, et al., 2023; Ndumele, Rangaswami, et al., 2023). Global prevalence data indicate a rising trend worldwide, largely due to an increase in underlying conditions, particularly obesity and behaviours related to diet and physical activity (Anto et al., 2022 Khan et al., 2023). In the United States, data from the National Health and Nutrition Examination Survey covering 2-year cycles from 1999 to 2018 reveal a prevalence of 14.4% for cardiometabolic multimorbidity (excluding chronic kidney disease), with higher rates among men, older individuals, and non-Hispanic Black people (Cheng et al., 2022). The prevalence increased significantly during that period, with an average 2-year cycle percentage change of 3.6 (95% CI: 2.1 to 5.3) (Cheng et al., 2022). In Canada, although data are limited, the 2016 Canadian Community Health Survey reported an overall prevalence of 3.5% for the syndrome among adults aged 50 years and older, based on self-reported data (Sakakibara et al., 2019). Prevalence is unevenly distributed across racial and ethnic groups, with significant disparities (Koyama et al., 2024), and its incidence begins early. Data from the Canadian Health Measures Survey cycles 1 (2007–2009) and 2 (2009–2011), involving respondents aged 10 to 18 years, indicate a prevalence of 2.5% in this population (MacPherson et al., 2016).

CKM syndrome imposes a significant financial burden on society (Cardiometabolic Risk Working Group Executive Committee et al., 2011; Chatterjee et al., 2012; Khan et al., 2023; Neeland et al., 2018; Powell-Wiley et al., 2021; Rao et al., 2014). With the increasing prevalence of obesity, an aging population, and rising medical costs, this economic challenge is expected to become even more severe (Reiter-Brennan et al., 2021).

Within the current health care system, the optimal care of patients contending with various concomitant conditions associated with CKM syndrome is falling short. The prevailing model of care—medical-centred and siloed—lacks professionals equipped with the requisite knowledge, skills, and competencies to orchestrate a comprehensive therapeutic approach for these patients. Furthermore, this classical approach neglects a holistic perspective, overlooking the importance of non-pharmacological interventions in this context. Lifestyle interventions, health adaptation, and psychosocial guidance are inadequately addressed in this model (Reiter-Brennan et al., 2021). Consequently, patients with CKM syndrome receive fragmented and incomplete care for their condition, leading to redundant diagnostic tests, increased costs, and a greater risk of CKM syndrome-related adverse events (Khan et al., 2023; Ndumele, Rangaswami, et al., 2023).

Therefore, it is crucial to implement early and sustained interventions to optimize cardiometabolic health at both individual and population levels and across all stages of life and tiers of health care, from community and primary care to specialized care settings. Such efforts are essential for reducing morbidity and mortality and enhancing health-related quality of life (Nanayakkara et al., 2021). This goal can be achieved through an integrated, person-centred approach that considers the complexity of morbidities associated with this clinical condition, along with a thorough understanding of social determinants (Ndumele, Rangaswami, et al., 2023). Consequently, there is a pressing need to develop a cardiometabolic specialty tailored to the unique needs of these patients.

Nurse practitioners (NPs) are exceptionally well suited to providing timely, comprehensive, and integrative care for the complex clinical needs of these patients. According to Calkin's (1984) model for advanced nursing practice, advanced practice nurses are at the forefront of knowledge, which enables them to identify and address a more diverse and complex range of health-related human responses. This minimizes the gap between the nurse's skills and knowledge and the patient's responses, in contrast to the gaps observed between novice and expert nurses. Through their formal education, NPs are equipped to apply conceptual and analytical tools in clinical practice.

NPs are recognized for their comprehensive understanding of patients' multiple dimensions—physical, functional, sensory/adaptive, and cognitive (related to health decision-making). They are also known for their ability to provide coordinated care across the health care system, which is particularly beneficial for managing complex clinical needs (Arslanian-Engoren, 2019; Frazee et al., 2020; Tracy, 2019). The integration of specific medical activities into their practice grants NPs significant autonomy in managing the multiple comorbidities associated with CKM. This autonomy enables NPs to support patients in adapting to their condition while simultaneously managing the disease itself. NPs care for patients with complex needs at rates comparable to, or even exceeding, those of their physician colleagues (Frazee et al., 2020).

Specialized education in cardiometabolic health will enhance NPs' skills and competencies in managing the complex interactions of comorbidities in CKM syndrome. This education will equip them to integrate various treatment modalities, address essential lifestyle adaptations, and implement targeted strategies to support health-related behaviours, optimize access to care, and address disparities in under-served populations. By preparing NPs to understand and address the diverse health needs shaped by social determinants, this education will ultimately lead to high-quality, integrated care that is both efficient and cost-effective, while remaining responsive to individual and population health needs.

In the province of Quebec, NPs are advanced practice nurses whose scope of practice is regulated by the nursing practice framework (Ordre des infirmières et infirmiers du Québec [OIIQ], 2021). In addition to the professional activities reserved for nurses under the *Nursing Act*, NPs are authorized to perform eight additional activities:

- diagnose diseases based on specialty area;
- order diagnostic tests;
- use invasive or potentially harmful diagnostic procedures;
- determine appropriate medical treatments;
- prescribe medications and other substances;
- administer medical treatments;
- perform or apply invasive medical techniques that may carry risks of harm; and
- monitor and manage pregnancies.

NPs complete a graduate-level program comprising 75 credits, leading to the issuance of a specialist certificate in one of five clinical areas: primary care, adult care, paediatrics, neonatology, and mental health. Additionally, they must pass a provincial examination to obtain a specialist certificate in their chosen advanced practice nursing (APN) specialty.

NP education involves both theoretical and practical components, including internships. While the education is tailored to each of the five specialty domains, it remains generalist within each domain. Currently, there is no post-entry-level NP education program specifically designed for further specialization. The development of specialized knowledge, skills, and competencies—crucial for NPs to fully adopt their role—still depends on the strategies and resources of the employing organization. CKM syndrome represents a significant population-level health issue, and its complex management cannot be fully addressed within the time constraints of entry-level NP education programs.

Therefore, a 6-month fellowship in cardiometabolic health was developed by the faculty of nursing at Université Laval, in collaboration with the Institut universitaire de cardiologie et de pneumologie de Québec – Université Laval (IUCPQ–UL), in Québec City. This is the first French-language NP fellowship program in North America. The initiative aims to enhance the expertise of NPs already engaged in advanced practice by empowering them to effectively address the complex and maladaptive range of human responses observed in patients with CKM syndrome. The education is designed to bridge the gap between theoretical knowledge, practical skills, and the intricate human responses encountered in this specific clinical context. As a result, NPs are better equipped to respond more effectively, efficiently, and holistically to the diverse health issues faced by these patients. With a comprehensive and integrated approach, which includes both diagnostic and treatment skills, NPs are positioned to play a key role within the interdisciplinary team. Their expertise will enable them to contribute to the development of more effective and efficient care pathways for these patients within the health care system.

This article outlines the development process of a new NP fellowship program in cardiometabolic health, created by the faculty of nursing at Université Laval. It discusses the context surrounding the program's creation and its theoretical foundations, structure, pedagogical framework, and anticipated outcomes.

Background Literature

Literature Review on the Development of an NP Fellowship Program

To bolster the development, operationalization, and evaluation of the fellowship program, we produced a narrative review. According to Greenhalgh et al. (2018), a narrative review is a method that provides a summary, interpretation, and critique of existing literature. It allows for flexibility in defining the body of studies to be reviewed, with the option to use systematic search methods and inclusion or exclusion criteria as needed. A narrative review enhances understanding by critically reflecting on individual studies within a broader context.

The concepts investigated included fellowship, APN, and advanced practice. We conducted searches using both free and controlled vocabularies across four databases: PubMed, Ovid, EBSCO, and Web of Science. This process led to identifying 44 articles, to which we added four articles from alternative sources. Following the initial removal of duplicates, we applied a second screening to the remaining 32 articles. The inclusion criteria were scientific articles published in peer-reviewed journals in French, English, Portuguese, Spanish, or Italian and with a focus on fellowship programs for APN or NPs. We chose to incorporate articles on fellowship programs for advanced practice registered nurses because our interest was centred on studying the program structures, aiming to draw inspiration for the establishment of our initiative. Grey literature sources were excluded.

We examined the 26 articles retained for this second phase using a qualitative analysis software (MAXQDA). The analysis aimed to evaluate the objectives and impact of fellowship programs, identify the primary fields of specialization, scrutinize the program characteristics (admission criteria, cohort profiles, and duration), and explore the pedagogical strategies and tools employed (supervision methods, pedagogical activities, and assessments).

Fellowship programs, as depicted in the revised papers, were often launched from university initiatives in collaboration with health care facilities or, alternatively, were initiated by teaching and research hospitals to specifically address training and workforce retention.

While the structures of fellowship programs varied, their overarching objectives consistently included acquiring specialized knowledge in a targeted field, developing clinical skills, and providing support for the transition from nurse to NP. Typically lasting between 6 months and 2 years, these programs catered to various specializations, with paediatrics ($n = 5$) and oncology ($n = 8$) most frequently represented. Cohorts ranged from one to 20 trainees, who were nurses or NPs. For nurses, the goal of the programs was to enhance advanced practice skills, whereas for NPs, the aim was to support role integration or to develop new skills and competencies. Programs designed to advance NP professional skills typically required candidates to have at least 2 years of professional experience.

The trainees' learning was facilitated through diverse educational activities that differed from one program to another, encompassing readings, online and in-person seminars, and clinical immersions across different settings. Most fellowship programs incorporated clinical immersion, and trainees underwent rotations through internships and were typically supervised by physicians, NPs, and nurses in a mentoring capacity. These supervisors could also act as evaluators, although this responsibility could alternatively be assumed by program directors. The formal assessment tools of trainees reported in the revised papers included written exams, logbooks, portfolios, and internship and research projects.

The main outcomes identified or anticipated for the fellowship NPs in the reviewed articles indicated the significance of this form of education. Participants not only gained a comprehensive knowledge base but also fostered their advanced skills, essential for enhanced patient care. Additionally, the education played a role in advancing the competency of leadership and fostering interprofessional practices. Lastly, care environments that either established or contributed to the development of these programs were shown to decrease the onboarding period for trained staff and enhance their retention rates.

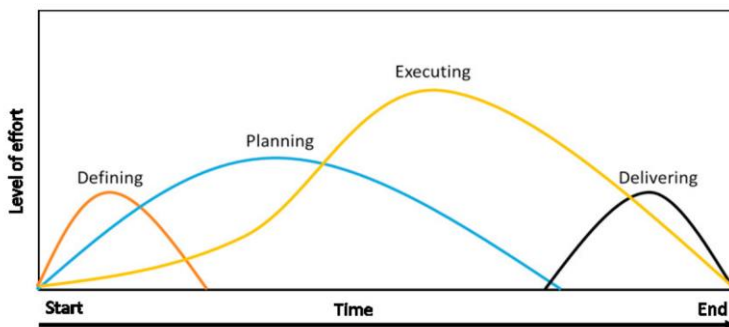
Methodological Framework

The strategic plan for developing the fellowship was guided by the methodological framework of the project life cycle, which acknowledges that projects have a finite lifespan and anticipates foreseeable changes in the level of effort and attention required throughout their lifetime (Larson & Gray, 2010). The life cycle of a project is typically delineated into four stages: defining, planning, executing, and closing. The first step is the approval of the project. Project intensity gradually increases and reaches a peak before gradually diminishing. Given the iterative nature of projects, these stages may overlap. The planning and executing stages—constituting the core and often the lengthiest phases—are intertwined with all other stages (see Figure 1). Larson and Gray (2010) define the four stages of a project as follows:

1. **Defining stage:** Specifications of the project are defined; project objectives are established; teams are formed; major responsibilities are assigned.
2. **Planning stage:** The level of effort increases, and plans are developed to determine what the project will entail, when it will be scheduled, whom it will benefit, what quality level should be maintained, and what the budget will be.
3. **Executing stage:** A major portion of the project work takes place—both physical and mental. The physical product is produced (a bridge, a report, a software program). Time, cost, and specification measures are used for control. Is the project on schedule, on budget, and meeting specifications? What are the forecasts of each of these measures? What revisions/changes are necessary?
4. **Closing stage:** Closing includes three activities: delivering the project product to the customer, redeploying project resources, and post-project review. Delivery of the project might include customer training and transferring documents. Redeployment usually involves releasing project equipment/materials to other projects and finding new assignments for team members. Post-project reviews include not only assessing performance but also capturing lessons learned. (pp. 7–9)

Figure 1

Project Life Cycle (Åsgård & Jørgensen, 2019; based on Larson & Gray, 2010)



Source: Reprinted with permission. From “Health and Safety in Early Phases of Project Management in Construction,” by T. Åsgård and L. Jørgensen, 2019, *Procedia Computer Science*, 164, p. 344 (<https://doi.org/10.1016/j.procs.2019.12.192>). Copyright Elsevier. Licence Number: 5752581473592.

The Creation of a Cardiometabolic Health Fellowship Program

Defining Stage: Design and Objectives of an NPs Fellowship Program in Cardiometabolic Health

The objectives of implementing a fellowship program were to:

- immerse the trainee in a diverse range of clinical environments, providing exposure to the myriad clinical conditions associated with cardiometabolic diseases;
- facilitate the trainee’s attainment of integrated knowledge of the most effective care across all relevant clinical specialties implicated in the caring for individuals living with cardiometabolic diseases;
- foster advanced and comprehensive care of individuals living with the potentially multiple clinical conditions intricately linked to cardiometabolic diseases;

- provide opportunities for trainees to implement interventions tailored to the complex needs of the target population;
- support the fellowship in proposing and structuring the new NP role in cardiometabolic health, based on Bryant-Lukosius and DiCenso's (2004) participatory, evidence-informed, patient-centred process for APN role (PEPPA) framework.

Planning Stage: Partnerships and Admission Criteria for Trainees

Partnership

The fellowship program involved establishing partnerships with key partners in the health care network, including specialized clinics related to conditions intricately linked to CKM syndrome, as well as in the academic environment. Initially, several meetings took place between the vice-dean of graduate studies of the faculty of nursing and key clinical partners, including the chief nursing officer, the head of the NP team, and physicians specializing in CKM-related domains, all from IUCPQ–UL.

Once academic and clinical interest was confirmed, the vice-dean conducted further consultations with the OIIQ and the Ministry of Health and Social Services of Quebec (Ministère de la Santé et des Services sociaux) to assess the potential interest in and relevance of the education. She also held discussions with the faculty of medicine to understand the faculty's approach to developing fellowship programs. The program decision-making group (PDMG) later determined that the fellowship would be affiliated with the NP programs within the faculty of nursing, resulting in the inclusion of the director of NP programs in the PDMG.

Subsequently, several meetings were held between the PDMG and clinicians responsible for each targeted internship area, including sectors such as cardiovascular disease prevention, lipid disorder outpatient clinics, peripheral vascular disease, obesity, diabetes, kidney disease, and refractory hypertension. The internship duration, objectives, and evaluation process were established during these discussions. All leaders in the targeted areas were highly supportive of the NP fellowship program.

Finally, the academic operational aspects were addressed with the program quality office at Université Laval to ensure the formal registration of the education program. Additionally, a philanthropic donation secured the trainees' participation in activities such as workshops, conferences, symposia, online training modules, and videoconferences. The two fellows in this pilot project were already employed at the main hospital. As part of their internship, they provided care to the hospital's designated population, and their salaries were maintained. The first fellow had 4 years of experience as an NP, and the second had 13 years. The entire education process is overseen by two professors from the faculty of nursing at the academic level and, in clinical settings, by the head of NPs at IUCPQ–UL (NP mentor) and physicians from the targeted specialties.

Admission Criteria

Admission criterion was having a minimum of 2 years of experience as a NP specializing in adult care. Registrants are required to be proficient in both written and spoken French and possess an advanced understanding of English. For the inaugural cohort, registrations were limited to NPs in the greater Québec City area.

The admission process entails a thorough review by an expert committee of academic transcripts, a cover letter outlining training expectations and long-term career goals, a curriculum vitae, three references, and a proof of NP certification from the OIIQ.

Executing Stage

Pedagogical Approach

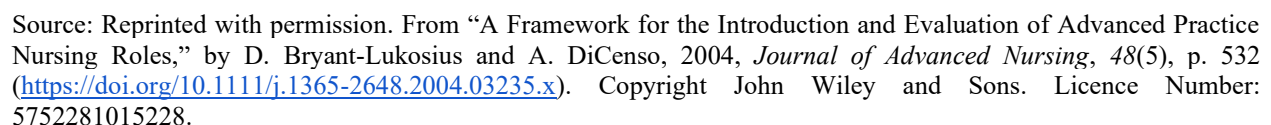
A competency framework was developed to enhance pedagogical support for trainees. Building upon the four competencies of the Université Laval NPs program repository, it introduced a more advanced level of learning focused on cardiometabolic health. The four competencies were as follows:

- **Leadership competency:** Exercise clinical leadership in cardiometabolic health.
- **Health promotion competency:** Promote personal health and well-being in cardiometabolic health.
- **Coordination competency:** Coordinate care and services in cardiometabolic health.
- **Communication competency:** Communicate professionally in cardiometabolic health.

These competencies were further divided into a set of specific components, providing a higher level of precision. Additionally, the components were broken down into performance indicators, defining the expected behaviours of the trainee during fellowship activities. The reference framework served as the basis for developing the trainee evaluation grid. During the evaluation process, the supervisor, in collaboration with the mentor NP, assesses the trainee's performance in different clinical settings for each performance indicator. Performance is classified into four levels—demonstrated, progressing, emerging, or poorly demonstrated—with a qualitative justification required in the comments section. Detailed feedback accompanies each assessment, and an action plan is devised based on the recommendations.

In addition to the evaluation grids, the trainee engages in reflective practice by documenting their experience with patients living with cardiometabolic diseases in a workbook. The workbook was grounded in the program's competency framework and the PEPPA model, supporting trainees in their proposal of a new NP role in cardiometabolic health. The PEPPA model outlines a series of steps for developing and evaluating a new APN role, fostering the design of patient-centred care models. It incorporates the principles of effective health human resources planning, considering the roles of NPs and other partners in the delivery of care and patient support (Bryant-Lukosius & DiCenso, 2004). The framework suggests nine steps.

The PEPPA Framework (Bryant-Lukosius & DiCenso, 2004)



The trainee's workbook is divided into three sections, each designed to evaluate the trainee's capacity to formulate a new model of care and NP role tailored to a population dealing with cardiometabolic diseases. The initial section of the workbook, completed at the beginning of the fellowship, involves analyzing a typical case of a patient with a cardiometabolic disease and proposing a new care model. It explores how patient management could be enhanced through the involvement of a specialized NP. The trainee thoroughly documents the case, detailing the nature of the problem, the implemented interventions, observed gaps in follow-ups, the involved stakeholders (family, community, other health professionals, etc.), and other relevant aspects. Subsequently, the trainee outlines the requirements for implementing a new care model and new NP role in cardiometabolic health. This process facilitates the creation of strategies and intervention pathways meant to support role implementation.

The second section of the workbook, to be progressively completed throughout the fellowship, entails the development of a logbook. Twice a week, the trainee records and documents their experiences, learnings, and challenges. This process provides the trainee with the opportunity to reflect on how the knowledge they acquired in each internship contributes to the evolution of their NP role in cardiometabolic health anchored in a new care model.

In the third section of the workbook, completed towards the end of the fellowship, the trainee presents their new NP role and how it aligns with the new care model in cardiometabolic health. Drawing on the experiences documented in the logbooks throughout the internship, they identify the resources and expertise essential for adopting the new role, along with the activities to be conducted within the new care model. In addition, the trainee reflects on the potential short-term, medium-term, and long-term results of their new model.

The trainee workbook facilitates a reflective process for trainees, from defining the patient population to long-term monitoring of the role and care model. It serves as a comprehensive record of the trainee's learning and progress, providing main academic and clinical supervisors with valuable insights for pedagogical support. When used in conjunction with the internship grids, it streamlines the assessment of the development of targeted competencies.

Structure

Throughout the 6-month fellowship, the NP fellows are immersed in six distinct clinical environments. These settings provide exposure to a wide range of clinical conditions associated with cardiometabolic diseases. The entire process is overseen by the coordinating team, consisting of two professors from the faculty of nursing at the academic level and, in the clinical environment, the NP mentor from IUCPQ-UL. There are several meetings with this team, including a welcome and fellowship presentation meeting, a mid-program supervision meeting, and a correction and feedback session on the workbook.

Additionally, the NP fellows have multiple meetings with the two professors to discuss the assigned readings and the PEPPA framework. Finally, throughout the fellowship, the NP fellows are expected to participate in various scientific communication activities, such as the faculty's Scientific Day, conferences, and seminars.

Table 1 summarizes the overall structure of the program, including the various evaluation activities.

Table 1*NP Fellowship Program in Cardiometabolic Health Structure*

	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6
Coordinating team	Welcome and fellowship presentation meeting		Mid-program supervision meeting			Correction and feedback on the workbook
Clinical specialties*	Clinical environment 1	Clinical environment 2	Clinical environment 3	Clinical environment 4	Clinical environment 5	Clinical environment 6
Evaluation	1.1 Mid-course skills development assessment (evaluation grid)	2.1 Mid-course skills development assessment (evaluation grid)	3.1 Mid-course skills development assessment (evaluation grid)	4.1 Mid-course skills development assessment (evaluation grid)	5.1 Mid-course skills development assessment (evaluation grid)	6.1 Mid-course skills development assessment (evaluation grid)
	1.2 End-of-course skills development assessment (evaluation grid)	2.2 End-of-course skills development assessment (evaluation grid)	3.2 End-of-course skills development assessment (evaluation grid)	4.2 End-of-course skills development assessment (evaluation grid)	5.2 End-of-course skills development assessment (evaluation grid)	6.2 End-of-course skills development assessment (evaluation grid)
	Completing the workbook	Completing the workbook	Completing the workbook	Completing the workbook	Completing the workbook	Completing the workbook
Individual meetings with the academic mentor	Discussions on the readings and the PEPPA framework	Discussions on the readings and the PEPPA framework	Discussions on the readings and the PEPPA framework	Discussions on the readings and the PEPPA framework	Discussions on the readings and the PEPPA framework	Discussions on the readings and the PEPPA framework
Events (communications, symposiums, etc.)	Throughout the fellowship, the fellow is expected to take part in a variety of scientific communication activities, including the faculty scientific day, conferences, and seminars.					

*Clinical specialties are obesity, diabetes, CKD, dyslipidemia, vascular health, cardiovascular primary and secondary prevention. The duration and order of internship vary according to the fellow profile.

Conclusion

The development of an innovative NP fellowship program in cardiometabolic health represents a significant advancement in addressing the growing prevalence of cardiometabolic diseases and the need for specialized health care professionals in this field. The theoretical foundations of the program are firmly rooted in disciplinary basis as well as in evidence-based practice, patient-centred care, and interprofessional collaboration. These principles underpin the development of a new NP role encompassing the competencies necessary to effectively deliver high-quality care that meets the complex needs of patients with cardiometabolic diseases. The format of the fellowship program is designed to provide a comprehensive, reflexive, and immersive learning experience for fellows. Through a combination of clinical rotations, reflective practice, case studies, and participation to targeted scientific activities, NPs will acquire the requisite knowledge and skills to assess, diagnose, and manage various cardiometabolic conditions, all while taking a holistic approach in caring for the patient. The program's pedagogical guidance emphasizes active learning, critical thinking, and reflection to promote the development

of clinical expertise and decision-making abilities. The anticipated long-term impact on the practice of the NP fellows on cardiometabolic health is substantial. It is expected to result in increased self-efficacy, enhanced care coordination capacity through greater interprofessional collaboration, a clearer professional identity as an NP specializing in cardiometabolic health, and the establishment of a new, well-equipped resource for educating the next generation of NPs in this domain. This initial fellowship program was specifically designed for adult care NPs. However, in alignment with recent recommendations for the care of patients with CKM syndrome (Ndumele, Neeland, et al., 2023; Ndumele, Rangaswami, et al., 2023)—which highlight the importance of delivering optimal care across life stages and health care settings—the program will be expanded to include primary care NPs in future iterations. This initiative not only addresses the immediate needs of the population but also establishes a strong foundation for advancing cardiometabolic health care delivery.

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