

Public Health And Oral Health As Gateways To Cardiovascular Risk Prevention: Why Should Nurses And Pharmacists Be Educated To Bridge Oral Screening, Medication Review, ECG-Based Assessment, And Cardiac Technology?

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Abstract

Cardiovascular diseases remain a major global public health challenge, requiring preventive strategies that extend beyond traditional diagnosis and treatment. Early cardiovascular risk recognition depends not only on identifying established risk factors such as hypertension, diabetes mellitus, dyslipidemia, smoking, obesity, and physical inactivity, but also on recognizing broader clinical, behavioral, oral, and medication-related indicators that may appear during routine patient encounters. Oral health, particularly periodontal health, provides an accessible and often underused gateway for identifying patients with shared cardiometabolic, inflammatory, behavioral, and social risk factors. At the same time, medication review offers a practical pathway for identifying poor adherence, uncontrolled risk factors, bleeding concerns, adverse drug effects, drug interactions, and gaps in patient understanding. This narrative interprofessional review examines the need to educate nurses and pharmacists for early cardiovascular risk recognition through oral health screening and medication review. The review is grounded in the shared-risk-factor approach, recognizing that oral diseases and cardiovascular diseases share several modifiable determinants, including tobacco use, diabetes, unhealthy diet, obesity, low health literacy, and limited access to preventive care. Evidence supports an association between severe periodontitis and cardiovascular disease, although this relationship should be interpreted carefully and not overstated as direct causation.

Nurses are strategically positioned to identify oral health indicators, assess symptoms, measure vital signs, provide patient education, reinforce lifestyle modification, and coordinate referrals. Pharmacists complement this role by reviewing cardiovascular and metabolic medications, identifying poor adherence, detecting medication-related risks, educating patients about antihypertensive, antidiabetic, lipid-lowering, antiplatelet, and anticoagulant therapies, and supporting safe medication use in patients who may also require oral or dental care.

The review proposes an integrated nurse-pharmacist preventive model in which oral health screening and medication review serve as practical entry points for early cardiovascular risk recognition. In this model, nurses identify oral and clinical warning indicators, pharmacists assess medication-related risks and adherence patterns, and both professionals coordinate referral to dental, primary care, or cardiac services when indicated. ECG-based assessment and cardiac technology may support further evaluation in patients with symptoms or clinically relevant risk profiles, but they should not be used indiscriminately based on oral findings alone. This interprofessional approach may reduce fragmented care, improve patient education, strengthen medication safety, and support more holistic cardiovascular prevention.

Keywords: cardiovascular risk prevention, oral health, periodontal disease, nursing education, pharmacy practice, medication review, medication adherence, interprofessional care, cardiovascular screening.

1. Introduction

Cardiovascular diseases remain among the leading public health challenges worldwide, contributing substantially to premature mortality, chronic disability, healthcare utilization, and economic burden. Although major advances have been achieved in diagnosis, pharmacological treatment, cardiac technology, interventional cardiology, and rehabilitation, cardiovascular prevention continues to require earlier, broader, and more integrated approaches. Modern prevention is no longer limited to treating established disease; it increasingly emphasizes early risk recognition, patient education, lifestyle modification, medication adherence, shared decision-making, and interprofessional teamwork. Within this preventive framework, oral health has gained increasing relevance. The mouth is not isolated from the rest of the body; rather, oral conditions may reflect broader patterns of systemic inflammation, self-care behavior, metabolic disease, tobacco exposure, health literacy, and access to preventive services. Oral diseases share several modifiable risk factors with other noncommunicable diseases, including cardiovascular disease and diabetes. These shared determinants make oral health a meaningful entry point for identifying patients who may require broader cardiovascular risk education, referral, and follow-up.

The oral–cardiovascular relationship should be presented with scientific caution. Severe periodontitis has been associated with cardiovascular disease, and consensus literature supports independent associations between severe periodontitis and cardiovascular outcomes. However, this does not mean that periodontal disease directly causes cardiovascular events in every patient. Therefore, oral health should be positioned as a gateway to risk recognition rather than as a replacement for established cardiovascular risk assessment.

The focus of this review is the combined role of nurses and pharmacists. Nurses are often the first professionals to assess patients, ask screening questions, measure vital signs, observe symptoms, provide education, and coordinate referral. Pharmacists add a complementary and essential perspective through medication review. Many patients at cardiovascular risk use antihypertensive, antidiabetic, lipid-lowering, antiplatelet, or anticoagulant medications. These therapies are central to prevention, but their benefits depend on adherence, correct use, safety monitoring, and patient understanding.

Medication review provides a direct bridge between oral health and cardiovascular prevention. Gum bleeding may be related to local periodontal inflammation, but it may also require careful consideration in patients using antiplatelet or anticoagulant therapy. Poor oral health in a patient with diabetes may suggest a need to reinforce glycemic control and adherence to antidiabetic therapy. Xerostomia, oral discomfort, poor diet, smoking, and irregular dental attendance may also reveal barriers to self-care and preventive health behavior. In this sense, the pharmacist’s role is not limited to dispensing medication; it includes identifying medication-related risks, supporting adherence, educating patients, and collaborating with nurses and other professionals.

Accordingly, this review argues that educating nurses and pharmacists together can strengthen early cardiovascular risk recognition by integrating oral health screening with medication review. Oral findings may reveal shared risk factors and self-care gaps, while medication review can identify poor adherence, uncontrolled cardiometabolic risk, bleeding concerns, adverse drug effects, and drug-related barriers to prevention. Combining these roles creates a practical interprofessional pathway for patient-centered cardiovascular risk reduction.

2. Rationale and Problem Statement

Despite increasing awareness of the relationship between oral health and cardiovascular risk, oral health is still often separated from cardiovascular prevention in routine healthcare practice. Many cardiac and primary care patients receive education about diet, smoking, blood pressure, diabetes, cholesterol, and physical activity, but oral hygiene, gum bleeding, periodontal inflammation, tooth loss, and dental referral may be omitted. Similarly, medication counseling may focus on instructions for use without fully connecting medication adherence, oral symptoms, bleeding risk, diabetes control, and cardiovascular prevention.

This separation creates missed opportunities. A patient with gum bleeding, smoking history, uncontrolled diabetes, hypertension, and poor adherence to medication may be at increased risk for both periodontal disease and cardiovascular disease. If oral findings, medication use, and cardiovascular risk factors are treated separately, the patient may receive fragmented advice. However, if nurses and pharmacists are educated to recognize the overlap, the same patient can receive integrated oral health education, medication review, adherence support, cardiovascular risk assessment, and referral when clinically indicated.

The problem is not simply a lack of evidence; it is also a gap in interprofessional translation. Scientific literature may describe the association between periodontal disease and cardiovascular disease, but frontline healthcare professionals need practical training to apply this knowledge safely and appropriately. Nurses need to know what oral and cardiovascular warning indicators to ask about, observe, document, and refer. Pharmacists need to know how medication history, adherence patterns, bleeding risk, drug interactions, and side effects may intersect with oral health and cardiovascular prevention.

Therefore, the central problem addressed in this review is:

Although oral health and medication use provide practical opportunities for early cardiovascular risk recognition, routine healthcare practice often lacks a structured interprofessional approach that educates nurses and pharmacists to connect oral health indicators, medication review, adherence patterns, and cardiovascular prevention.

3. Aim and Objectives

Aim

The aim of this review is to examine the need to educate nurses and pharmacists for early cardiovascular risk recognition through oral health screening and medication review.

Objectives

This review seeks to:

1. Explain how oral health can serve as an accessible gateway for early cardiovascular risk recognition.
2. Summarize the shared risk factors linking poor oral health, periodontal disease, and cardiovascular disease.
3. Clarify the role of nurses in oral health screening, symptom recognition, patient education, documentation, and referral.
4. Clarify the role of pharmacists in medication review, adherence support, drug-related risk identification, and cardiovascular prevention counseling.
5. Explain how medication classes such as antihypertensives, antidiabetics, lipid-lowering agents, antiplatelets, and anticoagulants connect pharmacy practice with oral and cardiovascular risk.
6. Propose an interprofessional nurse–pharmacist model for integrating oral health questions and medication review into cardiovascular prevention.
7. Highlight implications for clinical practice, education, medication safety, referral pathways, and future research.

4. Research Question

How can educating nurses and pharmacists in oral health screening and medication review improve early recognition of cardiovascular risk and strengthen interprofessional preventive care?

5. Methodological Approach

This article is designed as a narrative interprofessional review. This design is appropriate because the topic integrates several connected but distinct areas: cardiovascular prevention, oral health, periodontal disease, nursing education, pharmacy practice, medication review, medication adherence, patient education, and interprofessional care. A narrative review allows synthesis of clinical guidelines, consensus reports, public health literature, periodontal–cardiovascular evidence, and medication safety literature into a practice-oriented framework.

The review focuses on literature related to oral health and cardiovascular disease, common risk factors, nursing roles in prevention, pharmacy-led medication review, medication adherence, and

interprofessional cardiovascular risk reduction. Priority is given to international guidelines, consensus statements, peer-reviewed reviews, public health reports, and cardiovascular prevention recommendations from recognized organizations such as the World Health Organization, the American Heart Association, the American College of Cardiology, the European Society of Cardiology, and periodontal–cardiovascular consensus groups.

6. Proposed Interprofessional Framework

The proposed framework is based on the idea that early cardiovascular risk recognition can be strengthened when oral health screening and medication review are integrated into routine patient encounters. Oral health screening may reveal signs of shared risk factors, inflammation, poor self-care, or limited access to preventive care. Medication review may reveal poor adherence, uncontrolled hypertension or diabetes, drug-related oral effects, bleeding risk, or medication-related barriers to prevention. Nurses and pharmacists therefore contribute complementary forms of risk recognition.

Component	Nurse's Role	Pharmacist's Role	Cardiovascular Prevention Value
Oral health screening	Ask about gum bleeding, tooth loss, oral pain, dental visits, smoking, diabetes, and oral hygiene habits	Identify drug-related oral symptoms, bleeding concerns, xerostomia, and adherence barriers	Supports early recognition of shared oral–cardiac risk indicators
Medication review	Reinforce medication instructions and report concerns to the care team	Review antihypertensive, antidiabetic, lipid-lowering, antiplatelet, and anticoagulant therapy	Improves adherence, medication safety, and risk-factor control
Risk-factor recognition	Measure blood pressure, identify symptoms, assess lifestyle risks, and document findings	Identify uncontrolled risk factors from medication history, refill patterns, and patient counseling	Supports earlier intervention and referral
Patient education	Explain the oral–cardiac relationship in simple and balanced terms	Counsel on adherence, side effects, drug interactions, and safe medication use	Improves patient understanding and self-care
Referral pathway	Refer to dental, primary care, or cardiac services when indicated	Recommend medication follow-up or physician review when needed	Reduces fragmented care and improves continuity
ECG and cardiac assessment	Escalate symptoms such as chest pain, palpitations, dyspnea, dizziness, or syncope	Identify medication-related symptoms that may require clinical review	Supports clinically indicated cardiac evaluation

This framework does not require nurses to diagnose periodontal disease or pharmacists to provide dental treatment. It also does not suggest that every patient with poor oral health should undergo ECG screening. Instead, it offers a realistic interprofessional pathway in which oral health indicators and medication-related findings are used to identify patients who may benefit from education, medication optimization, dental referral, primary care follow-up, or cardiac evaluation when clinically indicated. Medication review is a critical bridge between oral health and cardiovascular risk recognition. Patients at risk of cardiovascular disease commonly use antihypertensive, antidiabetic, lipid-lowering, antiplatelet, and anticoagulant medications. These medications are essential for prevention, yet poor adherence, inappropriate use, side effects, bleeding risk, drug interactions, and limited patient understanding can reduce their protective value.

Oral health screening may reveal indicators that are clinically relevant to medication review, such as gum bleeding in patients using antithrombotic therapy, oral inflammation in patients with diabetes,

xerostomia or oral discomfort affecting diet and adherence, and poor oral hygiene reflecting broader self-care challenges. Educating nurses and pharmacists together can therefore support earlier recognition of cardiovascular risk by combining clinical observation, oral health questions, medication review, adherence counseling, and referral pathways.

In this model, nurses identify oral and cardiovascular warning signs, while pharmacists evaluate medication-related risks and reinforce safe, effective use of preventive therapies. Together, they create a practical bridge between oral health, medication safety, chronic disease control, and cardiovascular prevention.

8. Educational and Clinical Implementation Implications

The proposed nurse–pharmacist model requires more than theoretical awareness; it needs practical educational and clinical implementation. For this model to be useful in real healthcare settings, nurses and pharmacists should receive structured training that helps them recognize the overlap between oral health indicators, medication-related risks, and early cardiovascular risk factors. The goal is not to expand professional responsibilities beyond scope of practice, but to improve early recognition, patient education, referral, and continuity of preventive care.

Educational programs should include core content on the shared risk factors between oral disease and cardiovascular disease, including smoking, diabetes mellitus, obesity, unhealthy diet, hypertension, low health literacy, and limited access to preventive care. Nurses should be trained to ask brief oral health screening questions, identify warning symptoms, measure and document vital signs, and refer patients appropriately. Pharmacists should be trained to review medication histories, identify poor adherence, detect drug-related oral manifestations, counsel patients on cardiovascular medications, and recognize when medication-related concerns require referral to physicians, dentists, or cardiac services.

Clinical implementation can begin with simple tools rather than complex infrastructure. Healthcare institutions may add a short oral health and medication review section to routine nursing and pharmacy assessments. This section may include questions about gum bleeding, tooth loss, oral pain, dental visits, smoking, diabetes control, blood pressure control, medication adherence, antiplatelet or anticoagulant use, and symptoms such as chest pain, palpitations, dyspnea, dizziness, or syncope. Positive findings should be linked to clear referral pathways, such as dental referral, medication counseling, primary care follow-up, or cardiac evaluation when clinically indicated.

A key implementation priority is communication between nurses and pharmacists. Nurses may identify oral or cardiovascular warning signs during assessment, while pharmacists may identify poor adherence, uncontrolled risk factors, side effects, drug interactions, or bleeding concerns during medication review. When these findings are shared effectively, the care team can provide more coordinated and patient-centered prevention. This collaboration may be especially valuable for patients with diabetes, hypertension, cardiovascular disease, polypharmacy, or use of antiplatelet and anticoagulant therapy.

Patient education should also be standardized. Nurses and pharmacists should provide balanced messages that explain the oral–cardiovascular relationship without overstating causality. Patients should understand that poor oral health does not automatically mean they have heart disease, but oral inflammation, smoking, diabetes, poor self-care, and medication nonadherence may indicate a need for broader preventive attention. This approach protects scientific accuracy while still using oral health as a practical gateway to cardiovascular risk recognition.

The implementation of this model may also support quality improvement. Institutions can monitor the number of patients screened for oral health risk, the number receiving medication review, the number referred to dental or medical services, the number receiving adherence counseling, and the number escalated for cardiac evaluation when clinically indicated. These indicators can help evaluate whether the model improves early risk recognition, referral completion, medication safety, and preventive care delivery.

Overall, the educational and clinical implementation of this model can help transform oral health screening and medication review from isolated tasks into coordinated preventive strategies. By preparing nurses and pharmacists to work together, healthcare systems may strengthen early cardiovascular risk recognition, reduce fragmented care, and promote safer, more holistic patient management.

Saudi Healthcare Context and Justification for Local Application

Before examining the potential application of this model in the Saudi healthcare market, it is important to clarify why Saudi Arabia represents a relevant context for nurse–pharmacist education in early cardiovascular risk recognition. The Kingdom is undergoing a major health system transformation under Vision 2030, with increasing emphasis on prevention, early detection, primary healthcare strengthening, digital health, quality improvement, and patient-centered care. The Health Sector Transformation Program specifically aims to improve access and quality of healthcare services while strengthening prevention and overall public health.

This national direction makes the proposed model highly relevant. Early cardiovascular risk recognition through oral health screening and medication review aligns with the shift from reactive disease treatment toward proactive prevention. Saudi health initiatives increasingly emphasize regular screening, early detection of chronic diseases, and helping individuals monitor health indicators before complications develop. The Ministry of Health’s “Taakad” initiative, for example, reflects this preventive shift by promoting periodic screening and early detection of chronic disease risk factors.

Cardiovascular prevention is particularly important in Saudi Arabia because modifiable risk factors such as obesity, hypertension, type 2 diabetes, dyslipidemia, and sedentary lifestyle contribute to the national cardiovascular burden. A Saudi cardiovascular review highlights that these determinants have been rising in the Kingdom and that Vision 2030 includes reducing the clinical and economic burden of cardiovascular disease as part of improving vitality and longevity. In addition, noncommunicable diseases, including cardiovascular diseases and diabetes, remain a major public health concern in Saudi Arabia, creating a strong need for integrated preventive approaches.

Oral health is also relevant within the Saudi prevention agenda. The Saudi Ministry of Health emphasizes oral health as part of comprehensive healthcare transformation, including integration of dental services within primary healthcare centers, national early screening programs, and public awareness campaigns aligned with Vision 2030. This supports the argument that oral health should not be treated as an isolated dental issue, but as part of broader prevention, health literacy, and chronic disease risk reduction.

Within this context, nurses and pharmacists are well positioned to support practical implementation. Nurses can incorporate brief oral health questions and cardiovascular warning signs into routine assessment, while pharmacists can identify medication nonadherence, drug-related risks, uncontrolled cardiometabolic conditions, and concerns related to antiplatelet or anticoagulant therapy. Because many Saudi healthcare settings already include multidisciplinary teams across primary care, cardiac centers, hospitals, military hospitals, and community pharmacy services, a nurse–pharmacist model can be adapted without requiring major structural redesign.

Therefore, the Saudi context provides a strong justification for applying this interprofessional model. It aligns with national priorities in prevention, early screening, chronic disease control, digital transformation, medication safety, oral health promotion, and quality improvement. Positioning oral health screening and medication review as gateways to early cardiovascular risk recognition may help Saudi healthcare institutions reduce fragmented care, strengthen preventive counseling, and improve referral pathways between nursing, pharmacy, dental, primary care, and cardiac services.

Potential Educational Pathways for Implementation in Saudi Arabia

The proposed nurse–pharmacist model can be implemented in Saudi Arabia through several educational pathways rather than through a single route. These pathways may include undergraduate curricula in public and private universities, postgraduate and professional training programs, continuing professional development courses, and hospital-based competency training. This flexibility is important because cardiovascular risk prevention, oral health awareness, and medication review are relevant to both students and practicing healthcare professionals.

One potential pathway is integration into undergraduate nursing and pharmacy curricula. Public and private universities that offer health sciences programs can introduce the topic within existing courses such as public health, health promotion, cardiovascular nursing, clinical pharmacy, pharmacotherapy, oral health promotion, patient safety, and interprofessional education. The topic does not necessarily require a separate course. Instead, it can be embedded as a focused module on early cardiovascular risk recognition through oral health screening and medication review. This approach would help students understand the shared-risk-factor model, the relationship between periodontal health and cardiovascular

risk, the importance of medication adherence, and the complementary roles of nurses and pharmacists in preventive care.

A second pathway is interprofessional education across health colleges. Interprofessional education is particularly suitable for this topic because the proposed model depends on collaboration between nursing, pharmacy, dentistry, public health, and cardiac services. Saudi literature has discussed the importance and feasibility of introducing interprofessional education into health profession curricula in the Kingdom, particularly to strengthen collaboration and support health system transformation. The Saudi Commission for Health Specialties has also published work on the integration and roll-out of interprofessional education and collaborative practice in health professions education curricula in Saudi Arabia, emphasizing the need for teamwork, patient safety, communication, professionalism, ethics, and collaborative practice.

A third pathway is continuing professional development for licensed healthcare practitioners. This pathway may be especially important for nurses and pharmacists who are already practicing in hospitals, primary healthcare centers, cardiac centers, dental clinics, and community pharmacies. The Saudi Commission for Health Specialties provides systems for CPD activity accreditation and allows health practitioners to view their CPD hours during their valid registration period. Therefore, the proposed model can be developed as a CPD-accredited workshop or short course focusing on oral–cardiovascular risk recognition, medication review, adherence counseling, antiplatelet and anticoagulant considerations, referral pathways, and patient education.

A fourth pathway is hospital-based training. Healthcare institutions can introduce the model through internal education programs, competency checklists, quality improvement projects, or clinical orientation sessions. This may be particularly suitable for cardiac centers, military hospitals, tertiary hospitals, primary care networks, and institutions with integrated pharmacy and nursing services. Hospital-based training can be highly practical because it can use real clinical workflows, existing assessment forms, local referral pathways, and institutional protocols. For example, nurses can be trained to add brief oral health questions to cardiovascular risk assessment, while pharmacists can be trained to flag medication-related oral and cardiovascular concerns during medication reconciliation or counseling.

A fifth pathway is short certificate programs or micro-credentials. These may be offered by universities, professional societies, hospitals, training centers, or accredited CPD providers. A short certificate could target practicing nurses, pharmacists, dental hygienists, and public health professionals. It may include modules on shared oral–cardiovascular risk factors, medication adherence, antithrombotic therapy and oral bleeding, diabetes and periodontal health, patient communication, ECG referral awareness, and interprofessional case management. This route is useful because it is more flexible than full curriculum reform and can reach professionals from both government and private healthcare sectors.

The following table summarizes the possible implementation pathways.

Pathway	Target Group	Possible Format	Main Value
Public university curricula	Undergraduate nursing and pharmacy students	Embedded module within existing courses	Builds early professional awareness before graduation
Private university curricula	Undergraduate nursing, pharmacy, and allied health students	Interprofessional module or elective course	Supports flexible curriculum innovation
Interprofessional education programs	Nursing, pharmacy, dentistry, public health, and allied health students	Joint case-based learning sessions	Strengthens teamwork and referral understanding
CPD-accredited courses	Licensed nurses, pharmacists, and allied health practitioners	Workshop, seminar, online course, or blended training	Updates practicing professionals and supports lifelong learning

Pathway	Target Group	Possible Format	Main Value
Hospital-based training	Clinical nurses, pharmacists, and cardiac teams	Competency training, orientation, or quality improvement project	Connects the model directly to clinical workflow
Short certificate or micro-credential	Practicing healthcare professionals	Structured short program with assessment	Provides focused specialization without requiring a degree program
Community pharmacy training	Community pharmacists and pharmacy interns	Counseling-focused short course	Enhances medication adherence and early risk recognition in community settings
Primary healthcare training	Nurses, pharmacists, family medicine teams	Screening and referral pathway training	Supports prevention and chronic disease management

This multi-pathway approach is important because the Saudi healthcare system includes both government and private providers, university-based education, hospital-based training, and regulated professional development. A model limited only to undergraduate education would not reach current practitioners, while a model limited only to CPD would miss the opportunity to prepare future nurses and pharmacists before they enter practice. Therefore, the most appropriate approach is a combined strategy: integrate the topic into university curricula while also offering CPD courses and institutional training for practicing professionals.

In practical terms, the educational content can be organized into four core modules. The first module would cover oral health and cardiovascular risk, including shared risk factors and the balanced interpretation of periodontal–cardiovascular associations. The second module would focus on medication review, including antihypertensive, antidiabetic, lipid-lowering, antiplatelet, and anticoagulant therapies. The third module would address nurse–pharmacist collaboration, including communication, documentation, referral, and patient education. The fourth module would focus on clinical scenarios, such as a diabetic patient with gum bleeding and poor medication adherence, a hypertensive smoker with poor oral hygiene, or a patient on anticoagulant therapy requiring dental referral.

Overall, implementation in Saudi Arabia can be achieved through public and private university curricula, CPD-accredited courses, hospital-based training, and short professional certificates. This flexibility increases the feasibility of the proposed model and allows it to reach both future graduates and current healthcare practitioners. By using multiple educational pathways, Saudi healthcare institutions can strengthen early cardiovascular risk recognition, improve medication safety, and promote more integrated preventive care.

Early cardiovascular risk recognition requires a broader preventive approach that goes beyond traditional clinical assessment alone. Cardiovascular risk is shaped by multiple overlapping factors, including hypertension, diabetes mellitus, dyslipidemia, smoking, obesity, unhealthy diet, poor medication adherence, limited health literacy, and reduced access to preventive care. Oral health and medication use provide two practical entry points for recognizing these risks earlier, especially when they are integrated into routine nursing and pharmacy practice.

This review has argued that oral health screening can serve as an accessible gateway to cardiovascular risk recognition because oral conditions may reflect shared behavioral, metabolic, inflammatory, and social determinants. Gum bleeding, periodontal inflammation, tooth loss, poor oral hygiene, smoking-related oral findings, irregular dental attendance, and oral symptoms affecting nutrition or medication use may indicate the need for broader preventive assessment. However, the oral–cardiovascular relationship should be interpreted carefully. Oral health findings should not be presented as direct proof of cardiovascular disease, but as warning indicators that may support education, referral, and risk-factor review.

Medication review strengthens this model by adding a practical and clinically relevant pharmacy component. Many patients at cardiovascular risk use antihypertensive, antidiabetic, lipid-lowering,

antiplatelet, or anticoagulant medications. These therapies are essential for prevention, but their effectiveness depends on adherence, correct use, safety monitoring, and patient understanding. Pharmacists can identify poor adherence, side effects, drug interactions, bleeding concerns, inappropriate medication use, and medication-related barriers to prevention. When combined with oral health screening, medication review becomes a powerful tool for identifying patients who may need counseling, medication optimization, dental referral, primary care follow-up, or cardiac assessment when clinically indicated.

Nurses and pharmacists are therefore complementary partners in early cardiovascular risk recognition. Nurses contribute through patient assessment, oral health screening questions, symptom recognition, vital-sign monitoring, education, documentation, and referral coordination. Pharmacists contribute through medication review, adherence counseling, drug safety evaluation, patient education, and identification of medication-related risks. Together, they can reduce fragmented care and create a more coordinated preventive pathway.

The proposed model is particularly relevant for healthcare systems seeking to strengthen prevention, chronic disease management, interprofessional education, medication safety, and patient-centered care. It can be introduced through undergraduate nursing and pharmacy curricula, interprofessional education programs, continuing professional development courses, hospital-based training, and short certificate programs. In the Saudi context, this model is especially appropriate because it aligns with national priorities related to prevention, early detection, chronic disease control, quality improvement, and health system transformation.

Overall, educating nurses and pharmacists for early cardiovascular risk recognition through oral health screening and medication review may improve preventive care by connecting oral symptoms, medication use, chronic disease control, lifestyle risk factors, and referral pathways. This approach does not require complex infrastructure; rather, it requires structured education, brief screening tools, effective communication, clear referral pathways, and practical collaboration between nursing, pharmacy, dental, primary care, and cardiac services. By integrating these elements, healthcare institutions can support earlier risk recognition, safer medication use, better patient education, and more holistic cardiovascular prevention.

12. Recommendations

Based on the findings and proposed interprofessional model, the following recommendations are suggested:

1. Integrate oral health awareness into cardiovascular prevention education for nurses and pharmacists.

Nursing and pharmacy education should include the shared risk factors linking oral health and cardiovascular disease, such as smoking, diabetes mellitus, obesity, unhealthy diet, hypertension, low health literacy, and limited access to preventive care.

2. Include medication review as a core component of cardiovascular risk recognition.

Pharmacy education and clinical training should emphasize the role of antihypertensive, antidiabetic, lipid-lowering, antiplatelet, and anticoagulant therapies in cardiovascular prevention, with specific attention to adherence, side effects, drug interactions, bleeding concerns, and patient understanding.

3. Develop brief oral health screening tools for use in nursing and pharmacy practice.

Healthcare institutions should consider adding short screening questions about gum bleeding, tooth loss, oral pain, oral hygiene habits, dental visits, smoking, diabetes, and oral symptoms that may affect nutrition or medication use.

4. Establish clear referral pathways between nursing, pharmacy, dental, primary care, and cardiac services.

Positive oral health findings or medication-related concerns should be linked to practical actions, such as dental referral, pharmacist counseling, physician review, primary care follow-up, or cardiac evaluation when clinically indicated.

5. Use balanced patient education messages.

Nurses and pharmacists should explain that poor oral health does not automatically mean the patient has cardiovascular disease, but oral inflammation, smoking, diabetes, poor self-care, and medication nonadherence may indicate the need for broader preventive attention.

6. Introduce the topic into undergraduate curricula in public and private universities.

Nursing and pharmacy colleges should embed this topic within courses such as public health, health promotion, cardiovascular nursing, clinical pharmacy, pharmacotherapy, patient safety, oral health promotion, and interprofessional education.

7. Offer continuing professional development courses for practicing nurses and pharmacists.

Short CPD-accredited courses can help current practitioners apply the model in hospitals, primary healthcare centers, cardiac centers, dental clinics, military hospitals, and community pharmacy settings.

8. Develop hospital-based competency training.

Healthcare institutions should provide practical workshops on oral health screening, medication review, documentation, referral communication, and case-based cardiovascular risk recognition.

9. Use case-based interprofessional learning.

Training should include realistic cases, such as a diabetic patient with gum bleeding, a hypertensive smoker with poor oral hygiene, a patient on anticoagulant therapy with oral bleeding, or a patient with poor adherence to lipid-lowering therapy.

10. Avoid unnecessary cardiac testing.

Oral health findings should support risk recognition and referral, but they should not automatically lead to ECG or cardiac investigations unless clinically indicated by symptoms, risk profile, or institutional protocol.

11. Strengthen nurse–pharmacist communication.

Nurses and pharmacists should share relevant findings related to oral health indicators, medication adherence, bleeding risk, uncontrolled risk factors, cardiovascular symptoms, and referral needs.

12. Support quality improvement and outcome monitoring.

Institutions should monitor indicators such as the number of patients screened, medication reviews completed, adherence counseling sessions provided, dental referrals made, referral completion rates, and cardiac escalations performed when clinically indicated.

13. Adapt the model to the Saudi healthcare context.

Saudi healthcare institutions can apply this model through university curricula, CPD programs, hospital training, chronic disease clinics, cardiac centers, primary healthcare centers, and community pharmacy services.

14. Encourage future research.

Future studies should evaluate whether nurse–pharmacist education improves oral health screening rates, medication adherence counseling, patient knowledge, referral completion, medication safety, and early cardiovascular risk recognition.

15. Develop culturally appropriate patient education materials.

Educational materials should be simple, clear, and suitable for local healthcare settings. They should explain the relationship between oral health, medication adherence, diabetes, smoking, hypertension, and cardiovascular prevention in a non-alarming and patient-centered manner.

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