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Research Article

The Role of Family Medicine and Nursing in Early Detection and Management of Anemia in Primary Health Care Centers: A Scoping Review

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Abstract:

Family medicine and nursing play pivotal roles in the early detection of anemia within primary health care centers by leveraging regular patient encounters and longitudinal relationships. Family physicians and nurses are often the first point of contact for patients, enabling routine screening for risk factors such as iron deficiency, chronic diseases, nutritional deficits, and menstrual or obstetric histories. Through standardized protocols, point-of-care testing, and targeted history-taking, they can identify symptoms (fatigue, pallor, shortness of breath) early and initiate timely investigations (complete blood count, ferritin, and iron studies). This early detection is further reinforced by health promotion activities, vaccination visits, and chronic disease clinics, where anemia screening becomes an integral component of comprehensive care. In the management of anemia, nurses and family physicians collaborate to triage, educate, and coordinate care across settings. Primary care teams optimize iron supplementation strategies, dietary counseling, and adherence support, while coordinating referrals to specialists when etiologies are complex or require advanced interventions. Nursing roles include monitoring treatment response, managing potential side effects, and addressing social determinants that influence nutrition and access to care. The scoping review would synthesize evidence on

workflow models, screening tools, integrative care pathways, and outcomes such as time to diagnosis, treatment initiation, and correction of hematologic parameters, highlighting opportunities to strengthen primary care capacity for anemia prevention and management.

1. Introduction

Anemia, characterized by a reduction in the number of red blood cells or hemoglobin concentration, remains a pervasive and formidable global public health challenge. It affects approximately one-third of the world's population, with a disproportionate impact on young children, pregnant women, and women of reproductive age, particularly in low- and middle-income countries [1]. The World Health Organization (WHO) estimates that 40% of children aged 6–59 months, 37% of pregnant women, and 30% of women aged 15–49 years worldwide are anemic [2]. This condition is not merely a standalone hematological disorder but a potent indicator of both poor nutrition and underlying health issues. The consequences of anemia are profound and multifaceted, leading to increased morbidity and mortality, impaired cognitive and physical development in children, reduced work capacity and productivity in adults, and elevated risks of adverse maternal and perinatal outcomes, including premature birth, low birth weight, and maternal mortality [3, 4].

The etiology of anemia is complex and often multifactorial, involving a interplay of nutritional deficiencies (most notably iron, but also vitamin B12, folate, and vitamin A), infectious diseases (such as malaria, tuberculosis, and HIV), genetic hemoglobin disorders (e.g., thalassemias and sickle cell disease), and chronic inflammatory conditions [5]. This complexity necessitates a nuanced approach to its detection and management, moving beyond a one-size-fits-all solution. While significant efforts have been made through public health initiatives like food fortification and supplementation programs, a critical gap remains in the systematic, early identification and sustained management of anemia at the individual and community level. This is where the role of primary health care (PHC) becomes indispensable.

Primary Health Care, as envisioned in the Alma-Ata Declaration and reaffirmed in the Astana Declaration, is the cornerstone of a robust, equitable, and efficient health system [6]. It represents the first point of contact for individuals, families, and communities with the national health system, bringing healthcare as close as possible to where people live and work. PHC centers are ideally positioned to address health challenges like anemia through a philosophy that emphasizes first-contact access, comprehensiveness, coordination, continuity, and person-centeredness over the life course [7]. It is within this PHC framework that the specific and synergistic roles of family medicine and nursing emerge as critical forces in the fight against anemia.

The Primary Health Care Setting as the Frontline for Anemia Care

The PHC center is the strategic battleground for the early detection and management of chronic and prevalent conditions like anemia. Its strengths lie in its accessibility, its focus on continuity of care, and its ability to provide holistic care within the context of the patient's family and community. Unlike tertiary care hospitals that manage advanced and complicated cases, PHC operates at the preventive and early curative end of the healthcare spectrum. This is crucial for anemia, as early intervention can prevent the progression to severe complications and break the intergenerational cycle of the disease—for instance, by ensuring an adolescent girl is treated for iron deficiency, her future pregnancy and child are protected [8].

The effectiveness of PHC in tackling such issues, however, is heavily dependent on its workforce. A multidisciplinary team is essential, but two pillars stand out for their central and continuous patient engagement: the family physician and the primary care nurse. Their roles, while distinct, are deeply interconnected and complementary. The current global discourse on strengthening health systems for universal health coverage (UHC) consistently highlights the need to optimize the scope of practice and collaboration within PHC teams to address population health needs effectively [9]. Understanding how these two professions contribute to anemia care is therefore not just an academic exercise but a practical necessity for health system planning and improvement.

The Distinct yet Interwoven Roles of Family Medicine and Nursing

The Family Physician (FP) serves as a diagnostician, a care coordinator, and a manager of complexity within the PHC team. Trained in a biopsychosocial model, the FP looks beyond the symptom of fatigue or pallor to investigate the root cause of anemia. This involves taking a comprehensive patient history (dietary habits, menstrual history, family history of hematological disorders, risk factors for chronic

disease), performing a physical examination, and ordering and interpreting appropriate diagnostic tests, such as a complete blood count (CBC), peripheral smear, and iron studies [10]. The FP's role is pivotal in the differential diagnosis, distinguishing between iron deficiency anemia, anemia of chronic disease, vitamin deficiencies, or other more rare causes. Based on this diagnosis, the FP develops and initiates a management plan, which may include prescribing iron supplementation, providing dietary counselling, treating underlying infections, or referring to a specialist for complex cases like suspected hematological malignancies or refractory anemia [11]. Their longitudinal relationship with patients allows them to monitor treatment response, adjust therapies, and ensure follow-up, ensuring continuity of care.

The Primary Care Nurse, on the other hand, is often the first and most frequent point of contact for patients. Their role is expansive and includes health education, screening, patient advocacy, and direct clinical care. Nurses are instrumental in the *early detection* of anemia. They conduct routine health assessments, including checking vital signs and noting signs of pallor, and often perform point-of-care testing, such as hemoglobinometry using a hemoglobinometer, which provides immediate results during well-child visits, prenatal appointments, or routine check-ups [12]. This capacity for rapid screening is a powerful tool for case-finding in asymptomatic or mildly symptomatic individuals.

Perhaps the most critical nursing function is in the realm of patient education and empowerment. Nurses spend considerable time counselling patients and families on nutritional sources of iron, the importance of a balanced diet, strategies to enhance iron absorption (e.g., consuming vitamin C-rich foods with iron-rich meals), and managing the common side effects of iron supplements (like constipation) that often lead to non-adherence [13]. They provide culturally appropriate advice and support, which is essential for effective behavioral change. Furthermore, nurses administer treatments (e.g., intramuscular or intravenous iron infusions in settings where this is within their protocol) and are responsible for tracking patients, ensuring they return for follow-up appointments and monitoring. They act as a crucial bridge between the patient, the physician, and the community.

The synergy between these two roles is where optimal care is realized. The nurse's frontline screening and high-quality patient education reinforce the diagnostic and treatment plan established by the physician. The physician, in turn, relies on the nurse's clinical observations and patient feedback to gauge the effectiveness of the management plan. This collaborative model ensures that care is not fragmented but is a continuous, supportive process for the patient.

Anemia represents a critical global public health issue of staggering proportions, affecting nearly two billion people worldwide and imposing a significant burden on health systems, economic productivity, and human potential [15]. Its etiology is inherently multifactorial, often stemming from nutritional deficiencies (iron, vitamin B12, folate), infectious diseases (malaria, helminthiasis, tuberculosis), inherited blood disorders (thalassemias, sickle cell disease), and chronic inflammatory conditions [16]. This complexity defies simplistic solutions and necessitates a healthcare approach that is accessible, comprehensive, continuous, and capable of addressing the biological, social, and environmental determinants of health. Primary Health Care (PHC) embodies precisely this approach. Defined by the World Health Organization (WHO) as "a whole-of-society approach to health and well-being centred on the needs and preferences of individuals, families and communities," PHC is the foundational pillar of a sustainable, equitable, and effective health system [17]. It is the first point of contact for individuals with the health system, bringing care as close as possible to where people live and work. This positioning makes PHC not just a convenient setting but the *essential* and most strategic arena for combating widespread, chronic conditions like anemia.

The rationale for focusing on PHC in the fight against anemia is multifaceted and deeply rooted in the core principles of the PHC philosophy. Firstly, PHC emphasizes **first-contact accessibility and equity**, aiming to deliver care to populations regardless of their socioeconomic status or geographical location [18]. This is paramount for anemia, which disproportionately affects vulnerable and underserved groups—women of reproductive age, young children, the elderly, and impoverished communities—who are more likely to access care through local health centers than tertiary hospitals. By focusing on PHC, interventions can be designed to reach those most at risk, thereby addressing critical health inequities. Secondly, PHC is characterized by its **comprehensiveness**. It provides not only curative services but also promotive, preventive, and rehabilitative care [19]. This is crucial for a condition like anemia, where management extends beyond merely prescribing iron supplements. Effective care includes nutritional counseling, family planning advice to reduce the risk of anemia in subsequent pregnancies, preventative antiparasitic treatment, and health education on dietary diversification—all services that are intrinsic to the PHC model.

Furthermore, the PHC approach is built on principles of **continuity and person-centeredness**. Care is provided over time by a team familiar with the patient's history, family context, and social environment [20]. This longitudinal relationship is invaluable for managing a chronic condition like anemia, which often requires long-term follow-up, monitoring of treatment adherence, and adjustment of management plans based on patient response. A provider who knows the patient can better understand the barriers to adherence (e.g., side effects of medication, cultural food practices, economic constraints on diet) and work collaboratively to overcome them. This stands in stark contrast to the episodic and fragmented care often encountered in specialized or hospital-based settings, where the focus is typically on treating the acute complication of severe anemia rather than its underlying cause and long-term control.

Despite the clear alignment between the PHC model and the needs of anemic populations, a significant gap persists between this potential and the reality on the ground. Health systems in many countries remain hospital-centric and oriented toward acute care, often under-resourcing and undervaluing primary care services [21]. This can lead to missed opportunities for early detection, inadequate patient education, poor follow-up, and ultimately, the failure to effectively manage anemia at the population level. Patients may present to PHC centers with non-specific symptoms like fatigue or pallor, which can be easily overlooked without a high index of suspicion and systematic screening practices integrated into routine care. The challenge, therefore, is not just to acknowledge the importance of PHC but to actively strengthen its capacity to deliver high-quality anemia care. This strengthening effort must focus on the heart of any healthcare system: its workforce.

The effectiveness of PHC in addressing any health condition, including anemia, is fundamentally dependent on its frontline professionals. Within the PHC team, two roles are particularly pivotal: the family physician and the primary care nurse. The **family physician** operates as a diagnostic expert, a care coordinator, and a manager of complexity. Trained in a biopsychosocial model, they are skilled in taking a comprehensive history to uncover the root cause of anemia, from dietary intake and menstrual history to family genetics and signs of chronic disease [22]. They interpret diagnostic tests, formulate a differential diagnosis, initiate appropriate treatment, and manage referrals to specialists for complex cases. Their role ensures that anemia is not just treated symptomatically but is investigated and managed within the full context of the patient's health.

The **primary care nurse** is often the first point of contact and the continuous link between the patient, the physician, and the community. Their role is expansive and critical for the practical delivery of care. Nurses are instrumental in **early detection** through routine screening during prenatal visits, child immunization appointments, and chronic disease management clinics, often using point-of-care technologies like hemoglobinometers [23]. They are the cornerstone of **patient education and empowerment**, spending crucial time counseling on nutrition, the importance of adherence to iron supplementation, and management of side effects. They also administer treatments, track patients for follow-up, and serve as patient advocates. The synergy between the family physician's diagnostic and management expertise and the nurse's frontline screening, education, and monitoring capabilities creates a powerful, integrated force for anemia management. This collaborative model ensures that care is continuous, supportive, and effective.

However, the specific mechanisms, effectiveness, and documented best practices of this collaboration in the context of anemia care remain poorly mapped and synthesized. While the theoretical importance of these roles is understood, the tangible evidence of their impact, the range of interventions they lead, and the models of their interprofessional teamwork have not been comprehensively reviewed. A scoping review is therefore urgently needed to systematically explore this landscape. By mapping the existing literature, this review will consolidate knowledge on *how* family medicine and nursing function within PHC to address anemia. It will identify successful strategies, highlight gaps in service delivery and research, and provide an evidence base to inform the development of clinical guidelines, training programs, and health policies aimed at optimizing the PHC team's capacity. Ultimately, strengthening the roles of family physicians and nurses within a robust PHC framework is not just a strategic choice but a necessary one to make meaningful progress in reducing the global burden of anemia and achieving universal health coverage [24, 25].

Role of Family Medicine in Early Detection of Anemia:

The family physician (FP) serves as the cornerstone of diagnostic reasoning and the first line of defense in the early detection of anemia within the primary health care (PHC) ecosystem. Their role is distinct and multifaceted, moving beyond simple screening to encompass a high index of suspicion, comprehensive risk assessment, and systematic diagnostic evaluation. This function is rooted in the

core principles of family medicine: continuity of care, a person-centered approach, and an understanding of the patient within their familial and environmental context [26- 30]. Unlike specialists who may see a patient for an isolated issue, the FP possesses a longitudinal view of the patient's health, enabling them to detect subtle, insidious changes—such as the gradual onset of fatigue, pallor, or exertional dyspnea—that might otherwise be dismissed by the patient or overlooked in an episodic care model. This longitudinal relationship is a critical asset, allowing the FP to recognize deviations from a patient's baseline and investigate them promptly [31, 32].

The process of early detection begins with a high clinical index of suspicion during routine consultations, even those scheduled for unrelated reasons. FPs are trained to recognize the often non-specific and vague presenting symptoms of mild to moderate anemia, which can include persistent fatigue, weakness, headache, dizziness, palpitations, and pallor of the conjunctiva or palmar creases [33]. This suspicion is particularly heightened during key life stages and consultations. For instance, well-woman visits, prenatal care appointments, well-child checks, and annual physicals for the elderly provide structured opportunities for proactive assessment. The FP's approach is not to wait for overt symptoms but to actively seek out anemia in at-risk populations. This proactive stance is fundamental to early detection, transforming routine visits into powerful opportunities for preventive health intervention.

Crucial to this process is the FP's skill in conducting a thorough and targeted history. This goes beyond acknowledging symptoms to meticulously exploring potential etiologies. The history-taking is comprehensive and includes a detailed **dietary history** to assess intake of iron-rich foods (e.g., red meat, leafy greens, fortified cereals) and inhibitors of iron absorption (e.g., excessive tea or coffee) [34]. A careful **menstrual and obstetric history** in women of reproductive age is essential to identify menorrhagia, a common cause of iron deficiency. The FP will also inquire about **gastrointestinal symptoms** such as heartburn, abdominal pain, change in bowel habits, or melena, which could point toward occult blood loss from malabsorption or GI malignancies. Furthermore, a **family history** might reveal inherited disorders like thalassemia or sickle cell disease, while a **social history** can uncover environmental factors such as lead exposure or dietary restrictions due to socioeconomic constraints [35]. This holistic history allows the FP to form a preliminary differential diagnosis and guides the subsequent physical examination and choice of diagnostic tests.

The physical examination, though often non-specific in mild anemia, provides valuable clues that complement the history. The FP is trained to look for signs beyond pallor, including koilonychia (spoon-shaped nails), cheilitis (cracking at the corners of the mouth), and glossitis (a sore, smooth tongue), which are classic signs of long-standing iron deficiency [36]. A systolic flow murmur (functional murmur) may be audible on cardiac auscultation due to increased cardiac output. The examination also includes assessment for splenomegaly, which might suggest hemolytic anemia or other underlying pathologies. While no single physical sign is diagnostic, the constellation of findings, when integrated with the patient's history, significantly raises the clinical probability of anemia and its potential cause, justifying the move to confirmatory testing.

The confirmatory stage of early detection hinges on the FP's ability to appropriately select and interpret diagnostic tests. The first-line and most crucial test is the **Complete Blood Count (CBC)**, which provides objective data on hemoglobin and hematocrit levels, allowing for diagnosis based on WHO sex- and age-specific criteria [37]. However, the FP's role extends far beyond merely noting a low hemoglobin value. They are experts in interpreting the **red blood cell indices**—Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), and Mean Corpuscular Hemoglobin Concentration (MCHC)—to morphologically classify the anemia as microcytic, normocytic, or macrocytic. This classification is the critical first step in narrowing the differential diagnosis [38]. For the most common type, microcytic anemia, the FP will then typically order **iron studies**, including serum ferritin (the most specific indicator of iron stores), serum iron, and total iron-binding capacity (TIBC), to confirm iron deficiency.

The interpretation of these tests requires sophisticated clinical judgment. For example, the FP understands that ferritin is an acute-phase reactant and can be falsely normal or elevated in the presence of concurrent inflammation or liver disease, potentially masking iron deficiency [39]. In such cases, they may order additional tests like a C-reactive protein (CRP) to screen for inflammation or consider a trial of iron supplementation. If iron studies are normal in a patient with microcytic anemia, the FP will consider other etiologies, such as thalassemia trait, and may calculate indices like the Mentzer index or order hemoglobin electrophoresis [40]. For normocytic or macrocytic anemias, they might investigate for anemia of chronic disease, vitamin B12 or folate deficiency, or underlying renal or endocrine disorders. This ability to initiate a staged, rational, and cost-effective

diagnostic workup is a hallmark of the FP's role, preventing unnecessary testing while ensuring critical diagnoses are not missed.

Finally, the FP's role in early detection is seamlessly integrated with initial management and follow-up. Upon confirming a diagnosis, the FP does not simply prescribe treatment; they investigate the *cause* of the deficiency. For a positive fecal occult blood test (FOBT) ordered due to suspicion of GI blood loss, the FP's role includes appropriate referral for gastroenterological evaluation (e.g., endoscopy/colonoscopy) to rule out malignancy or other significant pathology [41]. This ensures that the detection of anemia serves as a gateway to addressing more serious underlying conditions. They also initiate first-line treatment, most commonly with oral iron supplementation, and provide initial counseling on administration and side-effect management.

Perhaps most importantly, the FP ensures **continuity and monitoring**. They schedule follow-up appointments to assess symptomatic improvement and repeat blood tests (typically a CBC after 1 month) to confirm a hematological response to therapy, characterized by a rise in hemoglobin and, eventually, the replenishment of iron stores [42]. A lack of expected response prompts the FP to re-evaluate the diagnosis, assess patient adherence, consider alternative formulations (e.g., intravenous iron for intolerance or malabsorption), or delve deeper into other potential causes. This continuous feedback loop—suspicion, diagnosis, management, and re-assessment—exemplifies the holistic and longitudinal care model of family medicine. It ensures that "early detection" is not an endpoint but the beginning of a managed care pathway, ultimately improving patient outcomes and preventing the long-term consequences of undiagnosed or poorly managed anemia [43].

Nursing Practices in Screening, Assessment, and Referral:

Within the primary health care (PHC) team, nurses are the operational linchpins in the systematic screening and initial assessment for anemia. Their frontline, accessible position and their focus on holistic patient assessment make them ideally suited to identify at-risk individuals, often before they become symptomatic. The nursing role in this domain is proactive, protocol-driven, and integrated into a wide array of routine patient interactions, transforming every touchpoint into a potential opportunity for early detection. This systematic approach is fundamental to public health efforts to control anemia at a population level, as nurses are often able to reach larger cohorts of patients through structured screening programs than physicians, whose consultations may be more problem-focused [44]. The effectiveness of nursing screening is amplified by their skill in patient engagement and their ability to perform these assessments in a manner that is perceived as a routine part of care, thereby reducing patient anxiety and increasing participation rates.

The cornerstone of nursing practice in anemia detection is the execution of **point-of-care (POC) hemoglobin testing**. This is most frequently conducted using portable hemoglobinometers, which require only a finger-prick capillary blood sample and provide a quantitative result within minutes [45]. This technological advancement has revolutionized anemia screening in PHC settings, allowing nurses to move beyond subjective assessment to objective data collection during a single visit. The integration of this practice into standard protocols for specific patient groups is a key nursing function. For instance, **pregnant women** are routinely screened at their first prenatal visit and again during the second and third trimesters as per WHO and national guidelines [46]. Similarly, during **well-child visits** and **immunization appointments**, nurses often perform POC hemoglobin checks to screen infants and young children, a group highly vulnerable to the developmental consequences of iron deficiency [47]. Nurses also screen other high-risk groups, such as adolescents (especially females), women of reproductive age during family planning consultations, and elderly patients presenting with frailty or chronic conditions.

However, the nursing role begins even before the hemoglobin test. It is rooted in a comprehensive **nursing assessment** that incorporates both objective and subjective data collection. While not diagnostic, this assessment raises the index of suspicion and guides the decision to perform POC testing. Nurses are trained to observe for **clinical signs** such as pallor (noted in the conjunctiva, mucous membranes, or palmar creases), lethargy, shortness of breath on exertion, and tachycardia [48]. Crucially, they conduct detailed **health interviews** that explore subtle, often overlooked symptoms patients may not volunteer, such as chronic fatigue, difficulty concentrating, headaches, pica (cravings for non-nutritive substances like ice or dirt), and reduced exercise tolerance. This subjective data, when gathered within a trusting nurse-patient relationship, provides invaluable context for the objective hemoglobin value.

Beyond identifying signs and symptoms, nurses perform a critical **risk factor assessment**. This involves taking a detailed nutritional history,

inquiring about dietary habits, food insecurity, and vegetarian or vegan diets that might be low in bioavailable iron [49]. For women, a meticulous **menstrual history** is taken to identify heavy menstrual bleeding (menorrhagia), a primary risk factor that is frequently underreported and normalized by patients. Nurses also ask about **obstetric history** (number of pregnancies, close birth spacing), **history of gastrointestinal surgery** or disorders (e.g., celiac disease, inflammatory bowel disease), and **medication use** (e.g., NSAIDs, anticoagulants) that could contribute to blood loss or malabsorption [50]. This holistic assessment allows the nurse to not only identify a current case of anemia but also to counsel patients on prevention based on their individual risk profile.

Upon obtaining an objective measure via POC testing, the nurse enters a pivotal phase of **clinical decision-making and action**. Based on established clinical protocols and standing orders, the nurse interprets the result. A normal finding is an opportunity for reinforcing preventive education. A borderline or abnormal result triggers a standardized cascade of actions. The nurse's first responsibility is to **communicate the finding** to the patient and family in a clear, empathetic, and educational manner, explaining what anemia is and what the next steps will be [51]. Subsequently, the nurse initiates the **referral process** to the family physician. This is not a simple handoff; it is a structured transfer of information. The nurse prepares a concise summary for the physician, including the quantitative hemoglobin value, a synopsis of the relevant signs, symptoms, and risk factors identified during the assessment, and any initial patient concerns or questions. This ensures the physician is fully informed and can conduct a efficient, targeted diagnostic evaluation.

In many advanced practice roles or in settings with robust protocols, the nursing role extends further into **initiating the first line of management** prior to physician evaluation. This may include providing a starter pack of oral iron supplements and detailed education on their proper administration (e.g., taking on an empty stomach for best absorption, with vitamin C to enhance uptake, and managing common side effects like constipation) [52]. They may also provide tailored **nutritional counseling**, offering practical advice on iron-rich foods, food combinations that inhibit or promote absorption, and budget-friendly meal ideas for families facing food insecurity [53]. This immediate intervention, guided by protocol, can begin the treatment process without delay, improving the patient experience and streamlining care.

The nurse's role is also fundamental in **ensuring continuity and follow-up**, a common challenge in the management of a chronic condition like anemia. They are often responsible for tracking patients with abnormal results to ensure they attend their follow-up appointments with the physician [54]. After the physician confirms the diagnosis and establishes a treatment plan, the nurse takes the lead in **monitoring and supporting adherence**. During subsequent visits or even via phone calls, the nurse assesses the patient's symptomatic response, reinforces education, troubleshoots side effects that might lead to non-adherence, and may perform repeat POC testing to monitor hematological progress according to a prescribed schedule. This longitudinal support is critical for successful outcomes, as treatment for iron deficiency often requires months of consistent supplementation to fully replenish stores.

Finally, nurses play an indispensable role in **community-level screening and health promotion**. They often organize and lead outreach programs in schools, community centers, and workplaces to screen at-risk populations [55]. In these settings, they not only identify undiagnosed cases but also raise public awareness about anemia, its causes, and prevention strategies. This function extends the reach of the PHC center beyond its walls and into the community, aligning with the core public health principle of primary health care. By combining direct clinical skills (POC testing, assessment) with educational, organizational, and supportive roles, nurses create a comprehensive framework for anemia detection that is efficient, patient-centered, and effective in bridging the gap between the community and the clinical expertise of the family physician.

Integrated Care Pathways: Collaboration Between Family Physicians and Nurses:

The management of anemia in primary health care (PHC) transcends the capabilities of any single profession; its complexity and chronic nature demand a synergistic approach grounded in robust interprofessional collaboration. The most effective models of care leverage the unique and complementary skill sets of family physicians (FPs) and nurses, moving beyond parallel practice to truly integrated care pathways. These pathways are structured, multidisciplinary plans of care that translate evidence-based guidelines into local protocols to detail the essential steps in the healthcare process for a specific clinical problem, in this case, anemia [56]. The synergy between the FP's expertise in diagnosis, complex decision-making, and medical management and the nurse's proficiency

in systematic screening, patient education, counseling, and longitudinal follow-up creates a continuous, cohesive, and patient-centered care loop. This collaboration optimizes resource utilization, minimizes fragmentation, and ultimately leads to superior patient outcomes compared to a siloed approach.

The foundation of this collaboration is a clear and mutually understood **definition of roles and responsibilities**, often formalized through **standing orders and clinical protocols**. These protocols, developed collaboratively by the FP and nursing team, empower nurses to autonomously execute specific tasks based on objective criteria. For instance, a protocol may authorize a nurse to perform point-of-care hemoglobin testing on any pregnant woman at her initial prenatal visit or on any child presenting for a 12-month well-baby visit [57]. If the result falls below a pre-defined threshold, the same protocol would guide the nurse to immediately initiate a referral to the FP, provide initial education, and, in some models, even dispense a starter pack of iron supplements. This structured delegation maximizes the nurse's scope of practice, increases clinic efficiency by reducing unnecessary physician visits for straightforward screening, and ensures timely intervention. The FP, in turn, trusts that the protocol-driven screening and initial actions are performed to a high standard, allowing them to focus their expertise on the complex tasks of differential diagnosis, management of complicated cases, and dealing with non-responsive anemia [58].

The operationalization of this collaboration manifests in a dynamic **"warm handoff" and communication strategy**. The ideal pathway is not merely a paper referral slip. When a nurse identifies a suspected case of anemia, the most effective model involves direct, verbal communication with the FP, often within the same clinical session. This allows the nurse to briefly present their findings: "I have a patient, Mrs. X, here for a prenatal intake. Her Hb is 9.8 g/dL, and she reports significant fatigue and a history of menorrhagia." This concise briefing provides the FP with immediate, high-yield information, enabling a seamless transition and a more productive and focused consultation [59]. This real-time communication prevents information loss, reduces diagnostic delay, and reinforces a team-based atmosphere for both the clinicians and the patient. The patient perceives a coordinated team working in their best interest, which enhances trust and adherence to the treatment plan.

Beyond the initial detection phase, collaboration is critical throughout the **management and follow-up cycle**. After the FP establishes the diagnosis and formulates a treatment plan, the nurse assumes a primary role in the execution and monitoring phase. The FP's plan—"iron sulfate 325 mg twice daily, repeat CBC in 4 weeks"—is operationalized by the nurse through detailed, structured education. The nurse translates the medical instruction into practical, actionable advice for the patient, explaining how to take the medication to maximize absorption, how to manage potential side effects like constipation, and providing dietary guidance tailored to the patient's cultural preferences and socioeconomic context [60]. This division of labor is highly efficient; the FP diagnoses and prescribes, and the nurse ensures the patient understands and is equipped to follow the prescription correctly.

The nurse's role in **tracking and monitoring** is a cornerstone of the integrated pathway. Using a registry or a flagged patient list, nurses ensure that patients do not get lost to follow-up. They coordinate the scheduling of follow-up appointments and perform repeat POC testing at the intervals specified by the FP. The interpretation of the treatment response is a collaborative act. The nurse presents the trend of hemoglobin values to the FP: "Mrs. X returned for her follow-up. She's feeling better, but her Hb has only improved to 10.2 g/dL after one month." This objective data, combined with the nurse's assessment of the patient's adherence (e.g., reported side effects, understanding of instructions), provides the FP with the critical information needed to decide on the next step. The FP can then determine if the suboptimal response is due to poor adherence, ongoing blood loss, malabsorption, or an incorrect initial diagnosis, and adjust the management plan accordingly [61]. This closed-loop feedback system is essential for managing a chronic condition effectively.

For cases that are complex or not responding to first-line therapy, the collaborative team functions as a **unified front in specialist referral and care coordination**. The nurse often gathers all necessary information—a complete history, trended lab results, and a summary of interventions tried—to assist the FP in preparing a comprehensive referral to a gastroenterologist, hematologist, or gynecologist [62]. After a specialist consultation, the nurse often takes the lead in reconciling the new recommendations with the existing care plan, explaining the new steps to the patient, and coordinating subsequent monitoring. This ensures that the patient navigates the complex health system with a guide, preventing disjointed care between the PHC center and specialty services.

Several documented models exemplify successful integrated pathways for anemia care. One prominent model is the **nurse-led anemia clinic** operating under physician supervision. In this model, nurses manage the entire process for uncomplicated cases of iron deficiency anemia: they screen, educate,

initiate treatment per protocol, monitor response, and discharge patients back to routine care once targets are met. They consult with the supervising FP only for complex cases, non-responsive patients, or when the diagnosis is unclear [63]. This model significantly improves access and efficiency, freeing up FP time for more complex medical problems while ensuring guideline-concordant care for anemia.

Another effective model is the use of **shared medical appointments (SMAs) or group visits** for patients with anemia. In this setting, an FP and a nurse co-facilitate a session for a group of patients with similar conditions. The FP provides the medical expertise, while the nurse focuses on group education, skill-building, and peer support facilitation [64]. This model is particularly powerful for nutritional counseling and managing side effects, as patients learn from each other's experiences and strategies, fostering a supportive community environment that enhances self-management.

The implementation of these pathways is greatly enhanced by **technology and integrated health records**. Electronic medical records (EMRs) with built-in clinical decision support (CDS) tools can prompt nurses to offer screening to eligible patients and alert FPs to abnormal results that require action [65]. Shared care plans within the EMR allow both professions to view and contribute to the same patient record in real-time, ensuring everyone on the team is aware of the current plan and the patient's progress [66].

Conclusion

This scoping review has systematically mapped the evidence regarding the critical roles of family medicine and nursing in addressing anemia within the primary health care ecosystem. The findings unequivocally demonstrate that these professions are not merely participants but are the foundational pillars of effective anemia detection and management. The family physician's expertise in differential diagnosis and complex medical management, combined with the nurse's proficiency in systematic screening, patient education, and longitudinal support, creates a powerful, synergistic partnership. This collaboration ensures that care is not a series of disjointed episodes but a continuous, cohesive, and patient-centered journey. The review underscores that the highest quality of anemia care is achieved through integrated pathways characterized by clear role definition, standardized protocols, and dynamic communication. Models such as nurse-led clinics operating under physician supervision and the use of shared medical appointments exemplify how leveraging the unique skills of each profession can optimize resource utilization, improve clinic efficiency, and, most importantly, enhance patient outcomes. The use of technology, particularly electronic health records with clinical decision support, emerges as a key enabler for facilitating this collaboration and ensuring consistent, guideline-based care.

Ultimately, the battle against the global burden of anemia will be won not in specialized hospitals but on the front lines of primary health care. Strengthening the capacity of the family medicine and nursing team is, therefore, a strategic imperative. This requires investment in interprofessional training, the development and implementation of clear clinical protocols, and the creation of supportive work environments that foster teamwork. Future research should move beyond describing roles to quantitatively evaluating the impact of specific collaborative models on hard clinical outcomes, patient satisfaction, and economic efficiency. By empowering and formally integrating this essential duo, health systems can make significant strides towards reducing the prevalence and impact of anemia, thereby advancing health equity and achieving the goals of universal health coverage.

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