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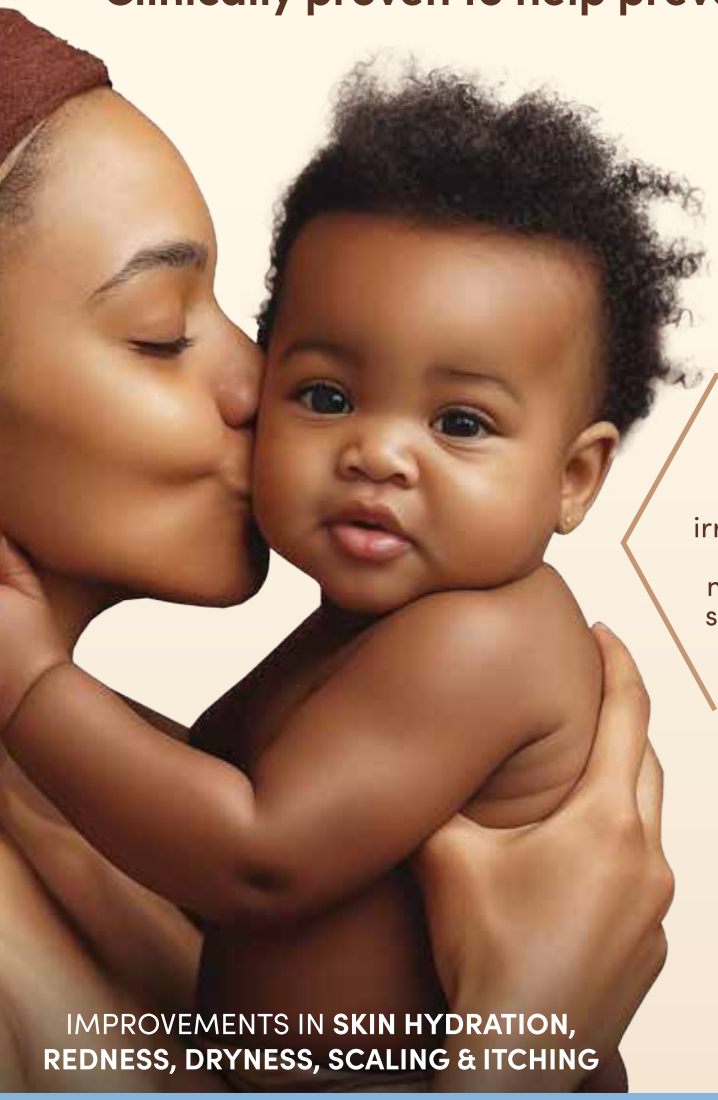

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Aims, scope and review policy

SAPJ is aimed at the continuing professional development of the South African pharmacist in a variety of practice settings, including clinical pharmaceutical care practitioners in a community or hospital pharmacy environment, and pharmacists in academic and industrial practice.

The journal accepts specific clinical reviews on self-medication topics (symptomatic therapy) and information on prescription medication (therapy in clinical context), and provides pharmacists with essential information for referring customers for early medical attention should it be required. SAPJ further recognises that the role of the pharmacist continually evolves to meet the needs of the population. An example of this is the provision of accessible, basic primary health care services in community pharmacies.

Papers dealing with medicines safety issues, including the safe and appropriate prescription, administration and use of medication as well as pharmacovigilance, are strongly advocated in SAPJ. SAPJ further supports pharmacists in transforming the pharmacy into an accessible, basic primary health care facility for preventing and treating primary health care conditions through diagnosis, screening and treatment.

The journal is currently indexed by Google Scholar via www.sapj.co.za and enjoys wide international exposure. An 'electronic long, paper short' policy will be followed for original papers where abstracts of original papers are featured in the printed copy with the full version available online.

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Addressing antimicrobial resistance: insights from the 2024 UN General Assembly High-Level Meeting and the role of pharmacists in South Africa

Natalie Schellack
Editor: SA Pharmaceutical Journal

On the 26th of September 2024 for the second time in history a high-level meeting on antimicrobial resistance (AMR) was held during 79th United Nations General Assembly (UNGA) and has set ambitious targets.[1]

Just over half of surveyed healthcare workers reported successful local implementation of antimicrobial stewardship programmes (AMSPs) across healthcare settings.[2] A recent scoping review of antimicrobial stewardship (AMS) initiatives in South African hospitals revealed ongoing efforts across public and private sectors, a need for greater alignment with the National Antimicrobial Resistance Strategy (AMRS) and improved collaboration between these two sectors.[2,3] AMR is when bacteria, viruses, fungi and parasites no longer respond to the antimicrobial (medicine), leaving the host vulnerable to a once treatable infection.

Key points of the declaration include setting the following specific key objectives and goals for countries:

- Approval of a concise, action-oriented political declaration with a shared vision on addressing AMR, including measurable targets and objectives
- Concrete, specific and bold commitments from member states with aspirational targets and strengthened accountability to combat AMR
- New targets and practical steps to address AMR as a global threat for humans, animals, plants and the environment
- Commitments to accelerate multisectoral global, regional and national actions to address AMR, as reflected in the meeting's theme
- Strengthening the mandates of the Quadripartite organisations (WHO, FAO, UNEP, WOAH) to coordinate multisectoral responses to AMR
- Commitments to implement multisectoral National Action Plans on AMR using a One Health approach
- Increased political and financial commitment to address AMR, including potentially exploring innovative financing models
- Strengthening global governance and accountability mechanisms to drive progress on AMR, including better data collection and monitoring
- Commitments to address AMR through equity, access, awareness-building, and innovation across human, animal, plant, and environmental sectors
- Pledges to tackle AMR through integrated surveillance, capacity-building, sustainable resources, financing, and investment in human health, animal health and welfare, agrifood systems, and environmental protection

The threat of AMR is underscored in the WHO African region, with the magnitude estimated to over 255 000 deaths which were directly attributable to AMR in the region, with seven leading pathogens responsible for over 821 000 deaths associated with resistance.[5] These organisms include *Streptococcus pneumoniae, Klebsiella pneumoniae, Escherichia coli,* and *Staphylococcus aureus* each accounted for over 100 000 deaths. These persistently high and seemingly increasing rates of AMR among these pathogens highlights the urgent need for enhanced stewardship and infection control efforts to support South Africa in meeting the global targets set out by this declaration.[5]

The recent COVID-19 pandemic further exposed vulnerabilities in infection prevention and control (IPC) practices with a recent study reporting a significant increase in hospital-acquired infections during the third wave compared to the first.[6] The vulnerabilities in IPC practices again calls for an urgent need to bridge the gap between policy and implementation, to address shortages in infrastructure and resource constraints. Historically designed facilities do not always account for modern airflow and ventilation needs, running water from working taps and access to soap. The shortage of trained IPC practitioners across provinces severely hampers any efforts to implement and maintain IPC measures that is critical to reduce the rate of AMR in South Africa and thus subsequently meet the goals set out by the 2024 UNGA AMR goals.[6]

The pharmacy profession in South Africa today finds itself at a critical juncture to combat AMR and meet the growing demand for healthcare services by uninsured patients and meet the ambitious goals set forth by the global leaders' group on AMR. Pharmacists play

a critical role in meeting these goals especially in a country that is rich in cultural diversity and languages. As frontline trained healthcare professionals that is in a unique position at the interface of healthcare and the community to provide culturally and linguistically appropriate education on the use of antimicrobials.

With a workforce of 3 971 community pharmacies, 937 private and public institutional pharmacies, 17 581 registered pharmacists, 22 000 pharmacist's assistants and 7 760 learning pharmacist's assistants, interventions such as hand hygiene, vaccination and education may be more tangible interventions to assist in efforts to reduce AMR in South Africa. Pharmacists and pharmacist's assistants are trusted in their communities and thus significantly influence public understanding and behaviour regarding antibiotic use. Patients in low- to middle-income countries seek treatment for their ailments from their community pharmacy especially in underserved areas. Pharmacists can therefore directly contribute to meeting the call to action and play a critical role in ensuring appropriate use of antimicrobials, specifically in providing appropriate and responsible access to antibiotics. The World Health Organization (WHO) has developed the AWaRe (Access, Watch, Reserve) classification of antibiotics to improve access to appropriate antibiotics and reduce AMR.[7]

Lack of access to effective antibiotics may be due to weak regulatory capacity, fragmented supply chains, lack of economic incentives for manufacturers and inadequate health system infrastructure. In South Africa the dual challenge of AMR and inadequate access to essential medicines, highlights the pivotal role of pharmacists in improving access to WHO Access Antibiotics while promoting responsible use. A recent primary care AMS study using peer audit and feedback interventions in Cape Town Community Healthcare centres, have demonstrated that a multidisciplinary team that includes active participation of pharmacists with stewardship interventions can lead to an overall reduction in 19% of antibiotic consumption.[8]

Despite the potential that pharmacists and pharmacist's assistants have they may inadvertently contribute to AMR. The business orientation of some pharmacies may lead to prioritisation of sales over proper antibiotic stewardship. A recognised driver of AMR in low-to middle-income countries is the excessive use of antibiotics in community settings. In a recent pilot study self-purchasing of antibiotics was observed among independent pharmacies in South Africa.[9] Almost all the patients interviewed agreed that AMR occurs when "their body" becomes resistant to antibiotics, and antibiotics no longer work that well. The same number also agreed that taking antibiotics when not needed can lead to antibiotic resistance (ABR). [9]

Almost all (90%) of the participants also agreed that when people take too many antibiotics, germs become resistant to them.[9] More than 80% of those interviewed agreed that ABR is something the community should be concerned with, with the same number feeling that healthcare personnel are the principal personnel responsible for addressing and preventing ABR.[9] However, they all agreed that everyone should take responsibility for using antibiotics appropriately and that the government and regulatory bodies are also responsible for addressing and preventing ABR.[9]

Importantly, while all patients agreed that antibiotics are used for treating bacterial infections, more than half (67%) of those interviewed believed that antibiotics could treat colds and coughs.[9] Language and contextualisation with AMR including certain terms, including "antibiotic" and "AMR", posed challenges regarding their understanding of the purpose of antibiotics. For instance, one patient self-purchased antibiotics for "cleansing" of sexually transmitted infections. The concept of "AMR" was also difficult to grasp among interviewed patients, exacerbated by no specific term existing for AMR in any of the three native languages (Xitsonga, Tshivenda and Sepedi).[9]

Some patients thought antibiotics were meant to "cleanse" the body of unwanted foreign bodies. Highlighting the importance of contextualised education to patients by pharmacists and pharmacist's assistants as the study highlighted that once the patients understood for example, the term "*swidlaya-switsongwatsongwana"* which means "antibiotic" in Xitsonga, it is hardly used. While all participants knew that antibiotics were used to treat bacterial infections, a majority also believed they could treat colds and influenza.[9]

The South African Pharmacy Council (SAPC) published the accreditation criteria for Immunisation and Injection Techniques courses through Board Notice 241 of 2022, following collaboration and consultation with providers of pharmacy education and the profession at large.[10] Subsequently the SAPC has since accredited providers to deliver the Immunisation and Injection Techniques course in line with the relevant accreditation criteria and competency standards. The process for pharmacists to become qualified vaccinators is now clearly delineated: once a pharmacist has completed training the said pharmacist may then apply to the Director-General for a Section 22A(15) permit, and once the Director-General issues the permit, the pharmacist must then record such permit with Council. The role of the pharmacist as a vaccinator in managing AMR cannot be understated as vaccines represent a very powerful tool in mitigating against AMR, working through multiple mechanisms to prevent infections, reduce antibiotic use, and thus slow the emergence and spread of resistant pathogens.[10]

In a notable development, South Africa has recently transitioned from the 13-valent pneumococcal conjugate vaccine (PCV13) to the 10-valent version (PCV10) in its childhood immunisation programme.[11] This strategic shift has created an opportunity to expand the vaccine repertoire, leading to the introduction of a rubella-containing vaccine and additional booster doses of acellular pertussis vaccines for adolescents and pregnant women. These changes reflect a dynamic and responsive approach to public health, balancing resource allocation with maximising protective coverage against a broader range of pathogens.[11]

The suggestion to include immunisation in the next iteration of South Africa's National Action Plan on AMR is a logical step. However, it is essential to recognise that vaccination and AMR mitigation, while related, are distinct public health challenges that may require different

strategies and resources. Simply incorporating immunisation into the AMR plan without a comprehensive, evidence-based approach risks diluting the focus and effectiveness of both initiatives.

It is prudent to establish clear outcome indicators, such as increased vaccination rates and decreased incidence of vaccine-preventable diseases. However, these metrics must be carefully defined, considering South Africa's unique demographic, geographic, and socioeconomic factors. Additionally, it is crucial to establish realistic, achievable targets that consider resource limitations and existing healthcare disparities.

While pharmacists and pharmacist's assistants undoubtedly play a crucial role in promoting immunisation and AMS, a more nuanced, multifaceted approach is necessary. Bottom-up community engagement initiatives that empower local leaders and address cultural barriers to vaccination and appropriate antibiotic use. Integration of health literacy education into school curricula to foster long-term behavioural change, collaborative efforts between pharmacists, pharmacist's assistants, doctors, nurses, and other healthcare professionals to ensure consistent messaging and comprehensive patient education. Utilisation of diverse communication channels, including social media and traditional media, to reach different demographic groups. Addressing systemic issues such as access to healthcare, poverty, clean water, sanitation and education that impact health literacy and medication adherence.

The UNGA recent declaration AMR has once again emphasised the need for political commitment to ensure sustainable access to affordable vaccines. While this call to action is commendable, it is crucial to critically examine its implications and potential implementation, particularly within the South African context. The assertion that AMR mitigation will decrease healthcare costs in the long term by reducing resource use and hospital stays is a simplistic view of a complex issue. While there is evidence to support this claim, it fails to account for the substantial upfront investments required in healthcare infrastructure, education, and surveillance systems necessary to effectively combat AMR. Furthermore, the economic benefits may not be immediately apparent, potentially discouraging policymakers from prioritising AMR initiatives.

The UNGA declaration highlights critical objectives, and calls for implementation in South Africa that is critical, comprehensive, with a context-specific approach. Pharmacists and pharmacist's assistants have a vital role to play in this effort, but their involvement should be part of a broader, multi-stakeholder strategy that addresses the complex interplay of factors influencing public health outcomes in South Africa.

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President's Message

My journey up to now

Tshifhiwa Rabali
PSSA President

In 2023, during the 78th AGM of the PSSA, I was elected as the President of this great Society, following in the footsteps of the first President of the Society, Mr Todd, who was elected in 1946. This marked a milestone that reflects progress for the Society for its remarkable achievements and enduring legacy. Although PSSA was given the opportunity to host the 82nd FIP Congress, I did not envisage having to do much as FIP handles all the conference arrangements. It was only when the discussions about us being the host took place that I realised what I was expected to do.

It was only during the site visit in Cape Town in March where we met up with the President of FIP, Paul Sinclair, the Congress organisers, Sophie, and Carola, that I realised that as the President of the Society there would be much to do. During this meeting, we agreed on some of the venues and artists that would be contracted for the different gatherings and any project that we as PSSA can undertake.

I, Ms Refiloe Mogale (PSSA's Executive Director) and Dr Mariet Eksteen (PSSA Professional Development Officer) were given the opportunity to put forward our ideas for the various conference activities. After my re-election as the President of PSSA, it really sank in what was expected of me to participate in at the FIP congress.

Before the FIP congress, I met with the PSSA head office to discuss the last arrangements and to coordinate which sessions each of us would be attending. I also attended the special AGM of Border and Eastern Districts (B&E) branch on 28 August in East London before flying to Cape Town on 30 August. The AGM started with a webinar on vaccine hesitancy presented by Prof Truter. It provided valuable insights into the factors behind vaccine hesitancy and strategies for improving vaccine acceptance. After the webinar, we shared takeaway messages from the PSSA with the attendees, sparking productive discussions with the members on how the branch can support PSSA in achieving its mission.

The engagement with the B&E Branch members was both refreshing and encouraging. I could see the enthusiasm on their faces and their willingness to serve the profession through the Society. All were very excited about the FIP congress. I would like to thank the Branch Chairperson, Taki Kyriacos, for inviting us.

On the Friday evening before the start of the Congress, I attended the Opening dinner hosted by the FIP President and most of the dignitaries from other countries were also there. It was very encouraging to receive feedback from our international guests in the way they described the beauty, splendour, friendly reception in South Africa. The evening was indeed fun, joyous and memorable for all in attendance. Then on Sunday before the Opening Ceremony, we met with the Director-General of Health, Dr Sandile Buthelezi who was pleased with our presentation and enquired about the role of pharmacy support personnel and our stance as PSSA regarding the ownership of pharmacies. I cannot wait to see the yield of our future engagements with him.

I was motivated when I saw the large number of enthusiastic pharmacists attending the Congress. It gave me the courage to face all the colleagues from around the world and to welcome them to our country. I am grateful to Nitsa at the National Office, who served as my chaperone, as there were many sessions where my presence was required. The seamless coordination of my calendar was excellent.

On Monday, we met with the Minister of Health, Dr Aaron Motsoaledi. It was an honour for me to meet him and it was such big moment for the PSSA and FIP to have the presence of the Minister at our Congress. I took the opportunity to mention the PSSA to him in the hope that should we request a meeting with him, he will remember that we had met in Cape Town. We are grateful for the NDoH's communication team for ensuring that the Congress was broadcasted on their platforms. Engaging with other FIP Member organisations was very fruitful and I'm hopeful that we can learn from each other. The sessions were of a high standard and those who attended couldn't stop talking about what they had heard.

When the Congress ended, I wanted it to continue, but that was not possible as I had other commitments, such as the Southern Gauteng Symposium held on 28 September. The symposium was a great platform for pharmacists to showcase their contributions to the profession. I hope other PSSA branches will try and emulate this event so that we can identify and promote the pockets of excellence in all our branches.

As the PSSA, we successfully hosted the first-ever Congress in sub-Saharan Africa and the second largest Congress in FIP's history. Many delegates told us that we are friendly people, and we should take pride in this. Future congresses will have to compete with us regarding the number of delegates, friendliness, warmth, etc. We have set the bar, not only for South Africa but for the African continent. I feel very proud to be the PSSA President. Thank you to my colleagues for their support. One PSSA, One Pharmacy.

Yours in Pharmacy.

Thank you, FIP 2024!

After seven and a half years of meticulous planning, envisioning, and groundwork, the 2024 FIP World Congress of Pharmacy and Pharmaceutical Sciences was triumphantly held at the Cape Town International Convention Centre (CTICC) in the first week of September. This historic event marked the first-ever hosting of the Congress in sub-Saharan Africa, and it proudly stood as the second largest Congress in FIP's history, drawing 3 365 participants from 97 nations. Notably, 55% of these participants hailed from South Africa, with an additional 10% representing the rest of the African continent.

The PSSA thanks the Health and Welfare Sector Education and Training Authority (HWSETA) for their substantial contribution. Their funding enabled 900 South African pharmacists to participate in the Congress, a commendable initiative managed by the South African Pharmacy Council (SAPC). We would like to specifically acknowledge the unwavering support and efforts of Mr Sikhumbuzo Gqabashe, Executive Manager for Skills Development Planning, and Ms Baakedi Motubatse, Executive Manager for Education and Training Quality Assurance at the HWSETA, and Mr Vincent Tlala, CEO, and Ms Mojo Mokoena, COO, of SAPC, without whom, the 900 pharmacists would not have been able to attend the Congress.

Attendance by the high-ranking officials

Several high-ranking officials attended plenary sessions of the Congress. Dr Sandile Buthelezi, Director-General for Health at the National Department of Health (NDOH) addressed the Congress participants during the Opening Ceremony on Sunday, 1 September, with a welcome remark. Dr Buthelezi said pharmacies are among the most easily accessible healthcare providers. In many cases, they are the public's first point of care, providing the needed services, promoting health and improving public awareness of health priorities. During this ceremony, the participants were entertained by the local choir, Isibane se Africa (*The Light of Africa*), which performed several traditional songs during the ceremony while dancing in traditional attire and concluded with the National Anthem, which evoked the dynamics of our culture. Dr Aaron Motsoaledi, Minister of Health, was a speaker during the first plenary session on Monday, 2 September, whereby he addressed the transformation to equitable and quality healthcare. Minister Motsoaledi said that pharmacists play an essential role in the healthcare sector as they also foresee innovation in medicine, such as vaccines, which are critical in saving people's lives, specifically during outbreaks and pandemics, as was the case during the COVID-19 pandemic. Minister Motsoaledi mentioned five issues for pharmacists to consider during the Congress:

1. The need to address health inequities across the world
2. The urgency to strengthening health systems
3. The need to harness innovation and technology to transform our health systems
4. The need to invest in sustainable and equitable health financing
5. Healthcare as a public good and as part of social justice

Mrs Steve Letsike, Deputy Minister in the Presidency for Women, Children and People with Disabilities, attending as the Vice-President of the SAPC, delivered a closing remark during the closing session on Wednesday, 4 September 2024, encouraging participants to take hand in the realisation of universal health coverage globally.

Other high-ranking officials who attended and participated in the Congress were:

- Dr Nicholas Crisp, Deputy Director-General for National Health Insurance for Health, NDOH
- Mr Mogologolo David Phasha, President, SAPC
- Mr Vincent Tlala, Registrar and CEO, SAPC
- Dr Boitumelo Semete-Makokotlela, Chief Executive Officer of the South African Health Products Regulatory Authority (SAHPRA)
- Dr Katlego Mothudi, Managing Director and Chief Executive Officer of the Board of Healthcare Funders in South Africa (BHF)

Dr Sandile Buthelezi

Dr Aaron Motsoaledi

- Dr Magome Masike, Registrar and Chief Executive Officer of the Health Professions Council of South Africa (HPCSA)
- Prof Ntombifikile Mtshali, Registrar and Chief Executive Officer of the South African Nursing Council (SANC)
- Dr Makhapa Makhafola, Chief Operations Officer of the South African Qualifications Authority (SAQA)

Awards

During the Congress, the following South African participants received awards from FIP:

- Dr Sham Moodley was awarded Fellowship of FIP
- Dr Stavros Nicolaou has been awarded the prestigious Industrial Pharmacy Section Medal for 2024

Steve Letsike

Isibane se Africa

FIP President Mr Paul Sinclair AM, FIP CEO Dr Catherine Duggan, PSSA Executive Director Ms Refiloe Mogale, Minister of Health Dr Aaron Motsoaledi, PSSA President Mr Tshifhiwa Rabali

- Ms Candidah Nephawe was awarded the FIP Young Scientist Award

PSSA legacy projects

Before the Congress, the PSSA adopted three legacy projects which will continue the success of the FIP 2024 Congress.

The first project, CTICC Cares, was launched on 18 July during the CTICC's Mandela Day celebrations. This initiative collected pre-loved items from Congress participants and will be distributed

Dr Sham Moodley with Paul Sinclair

Dr Stavros Nicolaou with Paul Sinclair

Candidah Nephawe with Paul Sinclair

CTICC care programme

to local communities during December. Participants were encouraged to bring books and/or stationary, soft toys, pieces of clothing, shoes, bathroom items and non-perishable food items.

The second project focuses on the implementation of the Basel Statements in Africa. The Basel Statements are a set of hospital pharmacy practice standards developed by the International Pharmaceutical Federation (FIP) Hospital Pharmacy Section (HPS) to reflect the global pharmacy profession's preferred vision of practice in the hospital setting and serve as a resource for pharmacists, departments of pharmacy, and pharmacy organisations to ensure the collective group of hospital pharmacists are working toward a shared vision. The result of the Gap analysis and membership survey results presented during the Basel Statement Review workshop conducted in September 2023 in Brisbane indicated:

- National hospital associations need to recognise the Basel Statements to achieve global coherence.
- The lack of alignment of the statements with activities at the country level suggests the potential need for WHO region-specific statements and validates the need for the Brisbane Updates.
- Implementation guides are needed to help incorporate Basel Statements into practice.

Therefore, South Africa and the African Continent must develop a strategy to align the statements with our context. This will be done through a 4-6 year long legacy project and more information will be shared over time.

Dr Sham Moodley signing the Medicines to Africa initiative

The third legacy project, Medicines to Africa, is an initiative that commenced in 2023 during the FIP Congress in Brisbane when the "Medicines to…" initiative signed an agreement with South Africa to initiate and drive it in the African region. During a dedicated signing ceremony, eight (8) countries signed their support to the initiative. These countries are South Africa, Nigeria, Tanzania, Kenya, Ghana, Egypt, Zimbabwe, and Malawi. In addition to the country representatives who signed, Ms Khadija Jamaloodien, Chief Director: Sector-wide Procurement at the NDOH, also pledged their support to the initiative. Gift of the Givers has been appointed as the charity that will facilitate the process during times of crisis.

Where to next?

At the closing session, PSSA was thanked as the Congress partner and host country and received a Dutch jar as memorabilia. At this session, it was also the privilege for PSSA to hand over the FIP flag to Ms Susie Ekstrand, CEO of Pharmadanmark and Mr Jesper Gulev Larsen, President of the Association of Danish Pharmacies, as they will be the Congress partners for the 83rd FIP World Congress, which will take place from 31 August to 3 September 2025 in Copenhagen.

Members from the PSSA together with the student volunteers from the University of the Western Cape, receiving the Dutch jar as a token of appreciation

The Dutch jar

Representatives from Denmark receive the FIP flag from PSSA President, Tshifhiwa Rabali

The PSSA/Alpha Pharm distance learning programme 2024

The PSSA/Alpha Pharm distance learning programme continues to offer pharmacists useful, practical, up-to-date information that enables them to provide optimal pharmaceutical care to their patients.

Module 4, 2024 – Dyslipidaemia: An update for the pharmacist

Dyslipidaemia refers to abnormal levels of lipids (fats) in the blood, including cholesterol and triglycerides, and is a significant risk factor for cardiovascular disease (CVD). Dyslipidaemia, whether due to genetic or lifestyle factors, can lead to atherosclerosis and other cardiovascular complications and can increase the risk of having a heart attack or stroke.

Dyslipidaemia is an important target for intervention in the prevention and treatment of CVD. The timely implementation of lifestyle changes, early diagnosis and effective management are essential if we are to reduce the burden of CVD in South Africa.

This module describes what the various lipid levels should be and how dyslipidaemia should be treated. The community pharmacist can play an important role in cholesterol screening. Finger-prick testing is appropriate for screening to determine where advice on lifestyle intervention is required or where patients require referral to the doctor.

For more information about this programme, contact Gill or Glynis at Insight Medicine Information on 011 706 6939 or email: cpdalphapharm@insightmed.co.za.

The PSSA/Alpha Pharm clinical education programme 2024 for pharmacy staff

The PSSA/Alpha Pharm pharmacy staff clinical education programme continues to offer front-shop assistants or pharmacists' assistants up-to-date information that enables them to provide optimal pharmaceutical care to their patients. All pharmacy staff need to be familiar with the use of unscheduled medicines and should be reminded of when it is necessary to refer the patient to the pharmacist.

Module 4, 2024 – Stopping smoking

The tobacco epidemic is one of the biggest public health threats facing humans, killing over 8 million people every year globally. Most smoking-related deaths are due to heart disease, chronic obstructive pulmonary disease and lung cancer.

Tobacco smoking is, without doubt, the primary risk factor for chronic obstructive pulmonary disease (COPD). South Africa also has one of the highest burdens of tuberculosis (TB) and HIV, which are both risk factors for COPD and worsen the effects of smoking.

Tobacco smoking increases the risk of TB, cancer, pneumonia, heart disease and stroke.

The benefits of stopping smoking are almost immediate, with longer-term benefits including improved lung function and a reduced risk for lung cancer. Stopping smoking increases life expectancy by as much as a decade, is associated with clear health benefits and improves quality of life. However, many smokers have no desire to quit or have tried to quit before but failed.

The World Health Organization (WHO) recently (2024) released its first-ever clinical treatment guideline for stopping tobacco smoking in adults.

This module discusses smoking, the benefits of stopping smoking, and the interventions recommended by the WHO and the South African smoking cessation guidelines. It also covers the medicines available in the pharmacy to help people stop smoking.

If you would like to participate in the PSSA/Alpha Pharm pharmacy staff clinical education programme, please contact Gill or Glynis for further information on 011 706 6939 or email: cpdalphapharm@insightmed.co.za.

FIP, ECPG, and the 2024 Congress – Wrapped Up

The 82nd FIP World Congress in Cape Town from 1–4 September 2024 wasn't just another pharmacy conference—it was the event of the year offering amazing opportunities to network, volunteer, and have fun, all while levelling up your professional game.

Networking and Leadership Development: Unleash Your Potential!

If you've ever wondered how to sharpen your leadership skills and stand out in the pharmacy world, the Leadership Development Workshop (LDW) was exactly that—and more! Held right before the main event, this workshop gave early-career pharmacists, students, and scientists the tools to take charge and make things happen.

We left feeling inspired, motivated, and ready to conquer new challenges! Thinking about building your career with these kinds of workshops? Keep an eye out for our Mentorship & Beyond Webinars!

Leadership Development Workshop

Social Events and Friends That You'll Never Forget

Who said conferences are all work and no play?

FIP 2024 was packed with social events where we got to relax and connect with young pharmacists from across the globe. As pharmacists, we are passionate about what we do! Having this time to connect outside the conference meant that we got to share what excites us – passions, frustrations, and shared ideas!

ECPG international night

These events ranged from the International Student Night on Sunday, where we shared stories and cultures, to the Sunday South African Night at Mojo Market (hello karaoke!), the atmosphere was electric – our international guests got to taste a bit of South Africa and what we have to offer. Tuesday's Early Career Social Night brought us even closer, with bingo, dancing, and lifelong friendships made over delicious food and great conversation.

Volunteering: Make a Difference, Have an Impact

For those wanting to roll up their sleeves and make a real difference, the humanitarian hackathon was the place to be. We tackled real-world challenges, simulating emergency responses alongside FIP and the Pharmaceutical Society of Nigeria.

Not only did we flex our problem-solving skills, but we also got a firsthand look at how pharmacists can change lives during a crisis. It was truly empowering, humbling, and inspiring!

Ready to Join the Fun? Let's Build the 2025 South African Delegation for FIP Copenhagen!

The fun doesn't stop here. Now is the perfect time to get involved with PSSA YPG and be part of something bigger. The 2025 FIP Congress is set for Copenhagen - imagine being a part of a South African delegation!

Imagine travelling to Denmark, meeting inspiring pharmacists from around the world, and making memories that will shape your career. Whether you're into leadership, volunteering, or just building your network, this is your chance.

So, what are you waiting for? Join PSSA YPG, get involved in our events, and let's make the 2025 Congress the biggest one yet! For more info and to stay updated, follow us on social media or check out our newsletters. Let's do this!

Let's build our YPG – We want you to be involved

PSSA member, you're already part of something incredible—the Young Pharmacists' Group (YPG)!

The best part? If you're under 35 or graduated within the last five years, you're automatically a YPG member. It's time to get involved, make your voice heard, and help us grow our YPG community.

YPG is all about collaboration and giving back. Whether you're passionate about pharmacy-related volunteering or want to help, we want to hear from you! Have you been involved in any pharmacy volunteering activities recently? Share your experiences with us—we'd love to highlight your contributions and inspire others to make a difference.

We also want to connect with you on social media! Tag us in your posts to share your pharmacy journey, volunteering efforts, or event highlights. Let's show the world what young pharmacists are achieving and create a network of support and inspiration.

We'd love to collaborate if you're organising an event or part of a student pharmacy society! Reach out to us to partner on events or projects that can benefit our pharmacy community. Whether it's a local workshop, a national conference, or student-led activities, we're excited to work with you and support your efforts.

Let's keep the momentum going—join in, share your experiences, and help shape the future of pharmacy!

You can always reach us at ypg@pssa.org.za or follow us on social media for updates and opportunities. Together, we can build a stronger, more connected YPG!

Feel free to reach out to us at
Email: ypg@pssa.org.za
Facebook: Young Pharmacists' Group of PSSA
Instagram: @pssaypg
Young pharmacists – connected, engaged, empowered and inspired!

Dry eye disease: a comprehensive overview for pharmacists

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Abstract

The tear film, which provides moisture and protection to the eyes with each blink, can be compromised by various conditions, leading to ocular discomfort such as dry eyes. Individuals presenting with symptoms of dry eyes in a pharmacy setting, are often recommended lubricating eye drops as a first-line treatment. However, incorporating nutritional interventions may offer additional support and complement the effectiveness of standard therapies.

Keywords: dry eye disease, ocular discomfort, nutritional interventions, standard therapies

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Introduction

Dry eye disease is a multifactorial and complex condition, characterised by a disruption in the tear film. This results in ocular discomfort, visual disturbances, and potential damage to the ocular surface. The tear film, comprising lipid, aqueous, and mucin layers, is essential for maintaining eye health and clear vision. Any changes in the production, composition or drainage of tears can lead to the development of dry eye disease. There are glands on the edge of the eyelid, the meibomian glands that secrete the lipid layer of the tear film. Any changes on the meibomian glands, for instance blockage, will result in an unstable tear film and increased tear evaporation.

At local pharmacy level, pharmacists play a crucial role in recognising symptoms, as well as advising individuals with dry eye disease on appropriate treatment. Pharmacists also educate on both pharmacological and non-pharmacological dry eye disease management strategies.

Aetiology of dry eye disease

Dry eye disease arises from either reduced tear production or excessive tear evaporation, or a combination of both, which leads to an unstable tear film. Various factors contribute to the development of dry eyes, including meibomian gland dysfunction. This occurs when the dysfunction of the meibomian glands leads to an insufficient lipid layer, causing increased tear evaporation.

Environmental factors such as low humidity, air pollution, and exposure to cigarette smoke can exacerbate symptoms by accelerating tear evaporation. Age-related decline, can negatively affect tear production, which can compromise the tear film integrity. Hormonal changes and resulting hormonal fluctuations, particularly in women during pregnancy, menopause, and hormone therapy, are known contributors to dry eye disease. Autoimmune disorders such as Sjögren's syndrome and rheumatoid arthritis directly impair tear production. Certain drugs, including antihistamines, antidepressants, decongestants, and some glaucoma treatments, can reduce tear secretion. Eye surgeries may result in nerve disruption, further compromising tear production, leading to eye dryness. Contact lenses, particularly if the lens is poorly fitted or not properly maintained, can lead to dry eye symptoms due to eye surface and altered tear film quality.[1,2]

Clinical presentation

Patients with dry eye disease commonly report a burning, stinging, or scratchy sensation in the eyes, often described as a gritty feeling. Other hallmark symptoms include stringy mucus in or around the eyes, light sensitivity (photophobia), redness, and irritation. The patient may report blurred vision, eye fatigue and excessive tearing as a reflex response to dryness. The sensation of having a foreign body in the eye is a primary concern amongst individuals with dry eyes, contributing to discomfort and visual disturbance.[2] These symptoms can vary in intensity and may fluctuate over time. Dry eye disease is therefore considered a long, lifetime condition. If left untreated, dry eye disease can severely impact an individual's quality of life, interfering with daily activities such as reading, driving, and prolonged screen use.

Treatment options

Pharmaceutical intervention

The management of dry eye disease is focused on improving tear film stability and relieving symptoms. Eye drops, known as artificial tears are the primary treatment for dry eyes and help reduce inflammation and improve lubrication.[4]

The main formulations are described below:

1. **Lubricants** are first-line treatment for most patients with dry eye disease. These formulations contain ingredients such as cellulose derivatives, carbomers, povidone and hyaluronic acid. These ingredients increase the thickness of the tear film and reduce evaporation.
2. **Electrolytes** such as sodium, potassium, and chloride help maintain tear film osmolarity and ocular surface homeostasis.

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Table I: Examples of pharmaceutical agents in dry eye intervention

Brand	Action	Sustained relief	Evaporative status	Nocturnal use
Artelac™	Splash moisture	Intense	Advanced complete	Advanced gel
Blink™	Contacts refresher	Intense +	-	-
Optive™	Original	Fusion	Plus	Gel drops
Systane™	Ultra-fast action	Complete long-lasting hydration	Balanced	Gel drops
Xailin™	Fresh hydrate	HA/Plus gel	-	Gel drops

Osmo-protectants containing betaine and glycerine protect against cellular stress and dehydration.

3. **Lipid-based and surfactant** formulations help replenish the deficient lipid layer and prevent tear evaporation, particularly in cases of meibomian gland dysfunction. Examples include castor oil, paraffins and lanolin.[4]
4. **Preservative-free formulations** are recommended for patients requiring frequent application, those with sensitive eyes and for single application.

Note: Preservatives protect the tear substitute by inhibiting bacterial growth once the bottle has been opened. Some preservatives can irritate the eyes, particularly in severe dry eye cases.[5]

There is growing evidence supporting the use of nutritional supplements to complement pharmacological treatment. Studies have shown that certain nutrients help the eyes stay properly hydrated.[3,6,7]

Key nutrients include:

- Omega-3 Fatty Acids, demonstrated to reduce inflammation and stabilise the tear film.
- Vitamin A (Retinol) – essential for maintaining corneal health and promoting tear production. Improvement of tear quality.
- Vitamins B_2, B_5, and B_{12}, support tear film stability and optic nerve function.
- Vitamin D and E possess anti-inflammatory properties that may enhance tear film quality. Vitamin C protects against oxidative stress, improves blood circulation and assists in collagen synthesis.
- Lutein and Zeaxanthin are antioxidants that protect against oxidative damage, particularly harmful UV rays.
- Zinc facilitates vitamin A transportation to the retina and supports melanin production, which protects the eyes from UV damage.
- Several oral supplements combining these nutrients are available, such as Ocuvite Complete™, Biogen Ocumax Plus™, FitHealth Dry Eye™, Dry Eye Plus™ and Vital Eye Health™.

Pharmacists should counsel individuals on the potential benefits of these supplements, but also advise caution in specific populations. In high doses, some supplements can be unsafe or contraindicated, such as in patients on anticoagulants who may be at risk when taking omega-3 fatty acids.[7]

Additionally, warnings should be issued to smokers against high-dose beta-carotene and Vitamin E consumption.

Non-pharmaceutical intervention

Lifestyle and environmental modifications

In addition to pharmacological interventions, individuals should be educated on lifestyle modifications to minimise symptom exacerbation, such as avoiding dry or windy environments, using humidifiers to maintain air moisture, reducing screen time, and staying hydrated to support tear production.

24-Hour dry eye relief (Day and night time)

Please see Table II

Long-term outlook

It is likely that individuals suffering from dry eye disease may need to take indefinite measures to control dry eye symptoms. People with dry eye disease may experience complications such as eye infection, damage or inflammation of the cornea, vision loss and decreased quality of life.[2]

Pharmacists should refer individuals to a medical doctor or ophthalmologist if they experience the following symptoms:

Table II: Treatment options for dry eye syndrome

Drop	Dosage	Indications	Contraindications and warnings
Xailin® Gel	• 1 drop 2–4 times a day	• Lubricates and protects the eye in certain eye conditions, and provides long-lasting relief of dry eye sensations • Preservative-free (in the eye)	• The safety of use in pregnancy or while breastfeeding has not been established
Xailin® Night (Ointment)	• Can be used as often as required	• Provides strong, soothing night-time relief of dry eye sensations; acts as a barrier against moisture loss; ideal for use at bedtime • Preservative free	Not to be used if allergic to lanolin alcohols

Table II: *Continued*

Drop	Dosage	Indications	Contraindications and warnings
Xailin Plus 0.2 % HA	• 1 drop in conjunctival sac 3–4 times per day	• Maintains and restores the condition of the eye surface for prompt and lasting relief from dry, irritated and tired eyes due to external factors • Preservative free	• Do not touch eye or any surface with the tip of the dropper
Xailin® Hydrate	• 1-2 drops 2–4 times per day	• Lubricates and protects the eyes, and provides immediate relief of dry eye sensations • Preservative-free (in the eye)	• The safety of use in pregnancy or while breastfeeding has not been established
Xailin® Fresh (vials)	• 1 drop 2–4 times a day	• Daily, single-dose solution for soothing and lubricating dry, red and irritated eyes • Preservative free	• Can be used on contact lenses

Note: Always shake the drops before use, and to avoid contamination, never touch the dropper tip of the container to any surface

- Persistent or worsening symptoms despite treatment.
- Severe eye pain, redness or sudden vision changes.
- Frequent infections or corneal ulcers.

Conclusion

Pharmacists are in a unique position to identify dry eye disease and recommend appropriate treatments. Additionally, they can recommend a combination of artificial tears, nutritional supplements, and environmental adjustments that can provide symptomatic relief and improve patients' quality of life. Pharmacists can also be instrumental in identifying agents that may contribute to or exacerbate dry eye disease.[7]

Long-term management strategies are essential, as dry eye disease is often a chronic condition requiring ongoing care. Healthy nutrition and staying hydrated helps to ensure that eyes get the vitamins and minerals needed, but a topical remedy may be required to relieve symptoms and improve tear film quality.[2]

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An update on vitamin and mineral supplementation: is it essential?

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Abstract

Multivitamin/mineral (MVM) supplements are among the most popular dietary supplements worldwide, often marketed as a simple solution to enhance overall health, fill nutritional gaps in the diet and prevent deficiencies. With a staggering variety of options available, one might wonder: Are MVMs really essential for everyone?

Keywords: multivitamin/mineral supplements (MVMs), dietary supplements, micronutrients, health benefits, chronic diseases, memory, cognitive health, vitamins and minerals

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Understanding MVM supplements

Multivitamin/minerals (MVMs) are dietary supplements that combine a variety of vitamins, minerals, and other nutritional components that are essential for various bodily functions. There is no standard definition or regulatory guideline that specifies which nutrients must be included in a MVM or in what quantities. Consequently, MVM formulations can vary significantly between different brands and products. Some MVMs also include additional ingredients such as fatty acids, amino acids, enzymes, probiotics, herbs, and botanical extracts.[1,2]

MVMs are popular due to their perceived safety at low doses, affordability, and convenience, allowing individuals to take a single supplement instead of multiple different pills.[3]

A study published in the American Journal of Clinical Nutrition found that MVM use could improve nutrient status in individuals[3] at risk of, or with confirmed deficiencies, such as those with poor diets, alcoholics, chronic conditions or malabsorption disorders, a history of bariatric surgery and vegans.[1]

Why are vitamins and minerals important?

Vitamins and minerals are essential micronutrients required for numerous critical functions in the body. They play key roles in various enzyme systems, tissue maintenance, bone and teeth formation, and overall health. Additionally, they are crucial for energy production, immune function, and cellular repair. Since our bodies cannot synthesise these essential nutrients, they must be obtained through our diets.[3,4]

The power of a varied diet

A varied and balanced diet rich in nutrient-dense foods—such as fruits, vegetables, whole grains, and dairy products—typically provides the necessary amounts of vitamins and minerals. However, not everyone meets their nutritional needs through diet alone. Several factors, including food choices and availability, socioeconomic status, and lifestyle habits, often prevent people from achieving an optimal diet, leading to nutritional gaps.[1,3] In such cases, MVM supplements may become a means to meet adequate intake requirements.[3]

The limitations of existing research

Observational studies: a double-edged sword

Most studies examining the potential benefits of MVMs in enhancing health and preventing disease are observational. These studies typically compare individuals who choose to take MVM supplements with those who do not. A significant limitation of this approach is that people who use dietary supplements often have healthier diets and lifestyles overall. This makes it challenging to attribute health benefits directly to supplement use, separate from the benefits of healthy behaviours.[3]

Furthermore, MVM users tend to have higher micronutrient intakes from their diet alone compared to non-users. Ironically, those at the highest risk of nutritional inadequacy—such as pregnant and breastfeeding individuals, adult women, people of low socioeconomic status, and individuals who are underweight or overweight—are the least likely to take MVMs.[3]

Randomised controlled trials (RCTs): the gold standard

Randomised controlled trials (RCTs), where participants are randomly assigned to take either a dietary supplement or a placebo, are more reliable than observational studies for determining whether MVMs might affect disease risk. However, only a few RCTs have been conducted due to the lengthy duration required to demonstrate significant effects on disease risk, beyond merely identifying intermediate biomarkers.[3]

Even among the RCTs that have been conducted, results are mixed. Some have suggested potential health benefits from MVM use, while others have found no such benefits. Notably, no two RCTs have used MVMs with the same combinations and amounts of nutrients, further complicating the interpretation of results.[3]

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Predicted modelling used to estimate age-related decline within the study, with observed treatment-related protection against cognitive ageing of 1.8 years in 3 years.

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MVMs and disease prevention: what does the evidence say?

Can MVMs prevent chronic diseases?

The role of MVMs in preventing chronic diseases such as cardiovascular disease (CVD) and cancer is debated. Large-scale studies have produced mixed results regarding their effectiveness. For instance, the Women's Health Initiative and Physicians' Health Study II (PHS II) found no strong evidence that MVMs reduce the risk of major chronic diseases in the general population.[1,5]

Cardiovascular disease (CVD)

A meta-analysis of 16 prospective cohort studies and two RCTs, involving over two million participants, found no significant association between MVM use and improved cardiovascular outcomes, such as reduced mortality from CVD or stroke.[3]

The PHS II conducted between 1997 and 2011 with over 14 000 male physicians aged 50 and older, found that daily MVM (specifically Centrum Silver) use did not significantly reduce the risk of major cardiovascular events.[6]

The COcoa Supplement and Multivitamin Outcomes Study (COSMOS), which involved over 21 000 older adults across the United States, found that neither cocoa extract supplementation nor MVM (specifically Centrum Silver) use significantly lowered the incidence of major cardiovascular events. Although cocoa flavanols might offer cardiovascular benefits, these were not consistent across all participants.[7]

The United States Preventive Services Task Force (USPSTF) concluded that beta-carotene supplementation likely causes more harm than good for CVD prevention, and vitamin E supplementation offers no net benefit. The task force found insufficient evidence to determine whether MVMs or other nutrients provide any net benefit or harm in CVD prevention.[8]

Cancer

The PHS II study did suggest a modest reduction in cancer risk among participants taking daily MVMs, with an 8% reduction in total cancer incidence. However, this was not substantial enough to recommend MVM use solely for cancer prevention.[6]

The COSMOS study found that daily MVM use did not significantly reduce overall cancer risk, though there was a slight trend toward reduced cancer risk in those with a history of cancer. The evidence was not strong enough to make general recommendations for MVM use for cancer prevention.[7]

The USPSTF similarly found insufficient evidence to determine whether MVM supplements provide any net benefit or harm in cancer prevention. Beta-carotene supplementation is likely harmful, and vitamin E supplementation does not provide a net benefit. Evidence is also insufficient to evaluate the benefits and harms of other nutrients for cancer prevention.[8]

Cognitive health

MVMs are critical for brain function and may impact cognitive processes through their role in energy metabolism, DNA synthesis, oxygen transport, and neuronal function.[3] Evidence suggests MVMs might support cognitive health, particularly in older adults. A study in *JAMA Neurology* found that long-term MVM use was associated with a slower rate of cognitive decline, though further research is needed.[3]

The PHS II study found no significant difference in cognitive decline or dementia risk between those taking daily MVMs and those on a placebo.[6]

The COSMOS-Mind study, published in *Alzheimer's & Dementia*, investigated the effects of MVM supplementation on cognitive function in older adults. It suggested that MVMs might enhance cognitive function by reducing oxidative stress, addressing micronutrient deficiencies, or improving vascular health. While MVMs did not significantly reduce mild cognitive impairment (MCI), they showed a modest improvement in global cognitive function, particularly in individuals with CVD. In the COSMOS-Clinic sub-cohort, MVM supplementation showed a statistically significant effect on episodic memory compared to placebo.[9]

A meta-analysis of over 5 000 participants from three COSMOS cognitive sub-studies demonstrated clear benefits of MVMs on global cognition and episodic memory. Daily MVM use over two to three years may reduce cognitive ageing by approximately two years compared to placebo.

The safety of continuous MVM use

Safety and risks

For most people, the continuous use of MVMs is generally considered safe when taken at recommended doses. However, excessive intake of certain vitamins and minerals can lead to adverse effects. High doses of fat-soluble vitamins (A, D, E, and K), for example, can accumulate in the body and potentially cause toxicity.[10]

A review in *Nutrients* highlights the importance of adhering to recommended daily allowances and avoiding excessive supplementation to prevent potential adverse effects. For individuals who take multiple supplements or consume fortified foods and beverages, there is a risk of exceeding the upper limit for certain nutrients, which could increase the possibility of adverse effects.[3]

Specific risks for certain populations

Smokers and, potentially, former smokers should avoid MVM products that provide large amounts of beta-carotene or vitamin A. Studies have linked these nutrients to an increased risk of lung cancer in smokers. For instance, a RCT involving male Finnish smokers found that those who took supplemental beta-carotene had a higher incidence of lung cancer compared to those who took a placebo or vitamin E.[3]

Additionally, taking excess vitamin A during pregnancy can increase the risk of birth defects. Thus, the recommended upper limit for vitamin A during pregnancy is 2 800 mcg/day for adolescents and 3 000 mcg/day for women.[3]

MVMs that provide nutrients in recommended amounts typically do not interact with medications. However, there is a notable exception. Individuals taking blood thinners, such as warfarin, should consult their healthcare providers before using any MVMs or dietary supplements containing vitamin K. Vitamin K plays a role in blood clotting and can reduce the effectiveness of warfarin and similar medications.

The bottom line: are MVMs necessary?

Continuous MVM supplementation may not be necessary for everyone, especially those who maintain a balanced and varied diet. However, for individuals with specific nutritional needs, restricted diets, or certain health conditions, MVMs can be a useful tool to fill gaps in nutrient intake. It is crucial to base supplementation on individual health needs.[5]

MVMs should not be viewed as a catch-all solution for achieving optimal health. Evidence regarding their health benefits for the general population remains inconsistent, and in some cases, they may even cause harm. If you have a specific nutrient deficiency, targeted supplementation with that nutrient is often more effective than taking a MVM.[3]

Unanswered questions

Despite the potential benefits, several questions about MVM supplementation remain unanswered. Why do people start and continue taking MVMs? Can these supplements improve health outcomes throughout life, or are their benefits limited to certain age groups? Most research focuses on older populations, leaving a gap in understanding their effects on younger individuals. Additionally, studies like PSH II and COSMOS used Centrum Silver, making it difficult to apply findings to other MVM products. It's also unclear whether cognitive benefits are due to specific vitamins, minerals, or other compounds within MVMs. Furthermore, these studies didn't compare MVMs to a healthy, balanced diet, raising questions about whether similar benefits could be achieved through dietary improvements alone. The potential for precision dosing tailored to individual needs and whether MVMs could be included in public health guidelines or targeted supplementation strategies remains unexplored. Further research is needed to address these uncertainties and refine our understanding of the role MVMs play in promoting cognitive health and overall well-being.

Conclusion

While MVM supplements may offer some cognitive benefits, particularly for older adults, their role in promoting long-term health remains complex and not fully understood. The modest improvements observed in studies like the COSMOS study suggest that MVMs could be a valuable component of a broader strategy for maintaining cognitive health, especially where dietary intake may be inadequate. However, MVM supplementation should not be viewed as a substitute for a balanced, nutrient-rich diet or healthy lifestyle practices.

The current body of evidence indicates that MVMs are not a universal solution for everyone. Their use should be personalised, considering individual dietary needs, health conditions, and potential interactions with medications. As research continues to evolve, a more nuanced understanding of the specific benefits, risks, and appropriate contexts for MVM use will be essential. Until then, the emphasis should remain on achieving nutritional adequacy through diet, with MVMs considered a complementary option when specific needs arise.

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The GLP-1 receptor agonists: what's all the (cardiovascular) hype about?

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Abstract

Over four million people in South Africa are estimated to have diabetes. People diagnosed with diabetes have an increased risk of developing cardiovascular disease. Safety trials conducted on novel hypoglycaemic agents suggest that glucagon-like peptide-1 receptor agonists may afford cardiovascular benefits in this at-risk population. Selection of an agent from this class, as add-on treatment to metformin, should be individualised and based on accessibility, affordability, convenience of the dosing schedule, and tolerability.

Keywords: GLP-1 receptor agonists, cardiovascular disease, hypoglycaemic agents

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Introduction and epidemiology

Over four million people in South Africa are estimated to have diabetes.[1] People living with diabetes (PLWD) have an increased risk of microvascular and macrovascular disease, with an estimated prevalence of coronary artery disease among PLWD of 8.7% in South Africa.[1] The pathogenesis of increased risk of atherosclerotic cardiovascular disease in diabetes is multifactorial, and related to hyperglycaemia, hyper-insulinaemia, dyslipidaemia, inflammation, increased reactive oxygen species, endothelial dysfunction, hypercoagulability, and vascular calcification.[2] Mitigation of this increased risk requires lifestyle modification, glycaemic control and pharmacological management. Therefore, an understanding of the cardiovascular benefits and risks associated with the classes of anti-diabetic drugs utilised in type 2 diabetes mellitus is essential.[2]

Previously, a statistically significant reduction in HbA1c and short-term safety data was all that was required for approval of a glucose-lowering drug by regulatory authorities such as the US Food and Drug Administration (FDA). Safety signals of increased cardiovascular risk and cardiac failure with thiazolidinediones and sulphonylureas led to a change in policy for drug development.[3] Since 2008, the FDA has mandated that all new drugs developed for glycaemic control be assessed for safety with cardiovascular outcome trials (CVOT), evaluating the risk of major adverse cardiac events (MACE).[3] This composite endpoint includes myocardial infarction (MI), cerebrovascular accident (CVA), and cardiovascular mortality events, while some trials also include unstable angina and revascularisation events.[4] According to the FDA, an investigational hypoglycaemic agent is deemed to have an unacceptable level of risk if the upper bound of the 95% confidence interval (95% CI) for the hazard ratio (HR) of MACE exceeds 1.8 if the study is conducted preregistration, or 1.3 if conducted post-approval.[3,5]

Consequent to FDA requirements, we now have a body of evidence looking at the cardiovascular safety of newer hypoglycaemic agents, including the glucagon-like peptide-1 (GLP-1) receptor agonists.

Mechanism of action

Incretin hormones are released by the gut in response to an oral glucose load. Incretins, specifically GLP-1, reduce glucose levels through three important mechanisms: Firstly, GLP-1 stimulates insulin secretion, and this secretion is more pronounced during hyperglycaemia. During normo- or hypoglycaemia, GLP-1 stimulation of insulin secretion is reduced providing protection from further decreases in blood glucose.[6] Secondly, GLP-1 decreases the secretion of glucagon with a subsequent reduction in hepatic gluconeogenesis.[6] Thirdly, GLP-1 delays gastric emptying, reducing the postprandial increase in glucose and promoting satiety with resultant decrease in food intake.[6]

Endogenous GLP-1 has a short duration of action of 1–2 minutes and is rapidly degraded by dipeptidyl peptidase-4 (DPP-4) enzymes and cleared renally. To increase the duration of effect, GLP-1 analogues with longer half-lives were developed, that are not subject to degradation by DPP-4.

GLP-1 receptor agonists bind to the GLP-1 receptor and stimulate glucose-dependent insulin release to reduce blood glucose levels. As a class, GLP-1 agonists reduce HbA1c by 0.9–1.2% without clinically significant increased risk of hypoglycaemia, unless combined with insulin or sulphonylureas.[7] Furthermore, the effects of GLP-1 agonists on gastric emptying, satiety and resultant weight reduction are exploited in the medical management of obesity. Exenatide, liraglutide, dulaglutide, and semaglutide are GLP-1 receptor agonists registered for use in South Africa by the South African Health Product Registration Authority for the treatment of type 2 diabetes. Lixisenatide is a GLP-1 receptor agonist available in combination with insulin glargine.[8] These agents remain costly with single exit prices ranging from R350 to R2 400 depending on agent and dose, however, evidence from well-resourced settings suggests that these agents may still be cost-effective for patients

that have failed monotherapy with metformin.[9,10] Local data would be required to assess the cost-effectiveness and affordability of these agents in South Africa.

Effects on atherosclerotic cardiovascular disease

In addition to their glucose-lowering effects, the GLP-1 agonists reduce the risk of cardiovascular disease via a reduction in atherosclerotic plaque formation and rupture, inflammation, and vasoconstriction.[11] Matrix metalloproteinase-2 (MMP2), an enzyme produced by vascular cells, promotes arterial remodelling in atherosclerosis. MMP2 concentrations are increased in patients with type 2 diabetes and cardiovascular risk factors. A previous animal study showed that MMP2 expression was reduced in diabetic rats after exenatide or GLP-1 administration using an adenovirus vector.[12] Improved endothelial function may also be related to an increase in nitric oxide production and reduced reactive oxidative species production in response to GLP-1 receptor agonists.[11] Other direct effects of the GLP-1 receptor agonists include the decreased expression of inflammatory cytokines and a reduction in systolic blood pressure, which appear independent of the degree of weight loss.[6] Atherosclerotic cardiovascular disease risk is further attenuated via a reduction in low-density lipoprotein (LDL) and triglycerides, a reduction in body weight, an increase in adiponectin (an adipokine protein known for its anti-inflammatory effects), and a reduction in albuminuria.[11]

Evidence for benefit in atherosclerotic cardiovascular disease

Several meta-analyses ("critically low" quality rating)[13] have reported a beneficial class effect of various GLP-1 agonists on MACE.[14-17] Of these, one meta-analysis examined all GLP-1 receptor agonist CVOTs published before June 2021 and included the results of 60 080 patients followed up from between 1.3 to 5.4 years. In this study, pooled analysis found that the risk of MACE was reduced by 14% (HR 0.86; 95% CI 0.79–0.94; $p = 0.006$) in GLP-1 agonist treatment groups, as compared to placebo. Treatment with GLP-1 agonists was associated with a 16% reduction in risk of MACE (HR 0.84; 95% CI 0.79–0.90; $p < 0.001$) in patients with established cardiovascular disease (secondary prevention population). In comparison, patients without established cardiovascular disease (primary prevention population) had a non-significant 6% reduction in risk of MACE (HR 0.94; 95% CI 0.83–1.06; $p = 0.33$).[17] Another meta-analysis ("critically low" quality rating)[13] which published a similar 14% reduction in risk of MACE (HR 0.86; 95% CI 0.80–0.93; $p < 0{\cdot}0001$), reported a number needed to treat of 65 (95% CI 45–130) patients over three years to prevent one event.[16]

Despite the lack of robust evidence for use in the primary prevention population, the latest guideline from the American Diabetes Association recommends the use of a GLP-1 receptor agonist to reduce the risk of MACE in people living with type 2 diabetes and established atherosclerotic cardiovascular disease, as well as those with multiple risk factors for cardiovascular disease.[18]

For individual components of MACE, GLP-1 receptor agonist treatment was associated with statistically significant reductions in risk of cardiovascular mortality and non-fatal stroke, but not non-fatal MI.[17] In stand-alone trials, exenatide (EXSCEL trial) and lixisenatide (ELIXA trial) failed to demonstrate a cardiovascular benefit, despite no difference to placebo in terms of safety.[19,20] Conversely, liraglutide (LEADER trial), semaglutide (SUSTAIN-6 trial), and dulaglutide (REWIND trial) all demonstrated benefit, but head-to-head trials examining superiority between agents in the class are lacking.[21-23] It is uncertain if this disparity in cardiovascular benefit across agents relates to differences in study design alone or to the inherent pharmacodynamic and pharmacokinetic properties of each agent.[11] For example, exenatide and lixisenatide are based structurally on exendin-4 (a hormone found in the saliva of the Gila monster that mimics GLP-1), whereas albiglutide, dulaglutide, liraglutide, and semaglutide are structurally similar to endogenous GLP-1.[16]

Safety and adverse effects

Common adverse effects associated with GLP-1 receptor agonists are gastrointestinal, including nausea, vomiting, and diarrhoea, which may contribute to reported discontinuation rates of between 4.5 and 13.2% across trials.[6,8] Gastrointestinal adverse events may be the result of direct effect on the central nervous system, in addition to delayed gastric emptying and increased smooth muscle activity and motility in the colon. The frequency appears to be dose-related and more prevalent when combined with metformin.[24] In a meta-analysis examining adverse effects, nausea, vomiting and study withdrawal rates were found to be lower with the longer-acting GLP-1 agonists, such as liraglutide and dulaglutide, as compared to the shorter-acting agents lixisenatide and exenatide. Semaglutide was not included in this meta-analysis as it was not yet registered for use in diabetes at the time the analysis was conducted.[24]

Based on preclinical studies, concerns of increased risk of pancreatitis, pancreatic cancer, cholecystitis, and medullary thyroid cancer associated with GLP-1 receptor agonists, have led to the exclusion of participants with a history of these conditions from subsequent clinical trials. The pathophysiological mechanism of these serious complications is related to the expression of GLP-1 receptors by thyroid C cells and the pancreatic duct.[6,11] Three meta-analyses ("critically low" quality)[13] did not show an increased incidence of pancreatitis, pancreatic cancer, or thyroid cancer associated with GLP-1 receptor agonist use.[14-16] Importantly, most trials for these agents were of limited duration, excluded patients at increased risk for these conditions, and were not powered to detect these rare events.

Overall, these results suggest that GLP-1 receptor agonists are safe to use, however, pharmacovigilance is ongoing.[25] For example, a registry to monitor the incidence of medullary thyroid carcinoma associated with GLP-1 agonist use has been mandated by the FDA as a specific post-marketing requirement.[26] It remains prudent to avoid the use of GLP-1 receptor agonists in patients with a history

of pancreatitis, pancreatic cancer, medullary thyroid cancer, or multiple endocrine neoplasia type 2 (MEN 2).[7,8]

Conclusion

Meta-analyses of pooled data for GLP-1 receptor agonists suggest a class protective effect in PLWD for atherosclerotic cardiovascular disease. In randomised controlled trials, liraglutide, semaglutide, and dulaglutide (all approved for use in South Africa) have demonstrated a reduction in MACE. Extending the use of these agents for the primary prevention of atherosclerotic cardiovascular disease in PLWD currently lacks robust evidence, and the cost-effectiveness of this indication is debatable. GLP-1 receptor agonists may be a useful adjunctive treatment option to metformin in patients with uncontrolled diabetes, established atherosclerotic cardiovascular disease, obesity, and problematic hypoglycaemia. However, the decision to initiate GLP 1 agonist therapy should be individualised and based on affordability.

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Conflict of interest

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Iron deficiency anaemia: Managing symptoms and supporting self-care. 2024 - Part 1

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https://www.fip.org/file/5751

Summary

Anaemia is a global public health concern, affecting individuals of all ages and demographic groups, with implications for health, morbidity and mortality. It stems from many factors, including diet, chronic illnesses, infections, hereditary blood disorders and other conditions related to blood loss and reduced haemoglobin levels. While anaemia manifests as decreased haemoglobin or haematocrit levels, iron deficiency anaemia is the most prevalent type, and iron is a crucial element for growth and development and a component of haemoglobin.

In 2022, the International Pharmaceutical Federation (FIP) explored the role of pharmacists in anaemia management, emphasising the need for an educational guide to support pharmacists, particularly in addressing iron deficiency anaemia (IDA). IDA, which affects 1.2 billion individuals worldwide, is preventable and treatable, highlighting the importance of early detection. Pharmacists, as accessible healthcare providers, bear a critical responsibility to educate patients, tailored to factors like age, sex, underlying conditions and the causes of IDA, encompassing self-care interventions and various management approaches. Pharmacists can promote a holistic approach to self-care and can support mitigation of the impact of this condition on overall health and well-being.

This handbook aims to provide a comprehensive guide for pharmacists to manage iron deficiency anaemia effectively, including for more vulnerable populations. It equips pharmacists with information on treatment options, managing special populations, screening and preventive measures for IDA. Nutrition, emphasising iron-rich diets and physical activity, is also described.

Addressing other types of anaemia is equally important, necessitating the identification and tailored treatment of their underlying causes. This handbook only covers anaemia treatment and management due to iron deficiency; there remains a need to further develop resources and guidelines for the management of other types of anaemia.

Further professional programmes designed to enhance pharmacists' competence in managing IDA, such as in a format of workshops, self-directed learning opportunities, or continuing professional development courses, are recommended. Collaboration with national professional leadership bodies would facilitate the organisation of workshops, self-directed learning initiatives, and the sharing of best practices.

In conclusion, this handbook serves as an invaluable resource for pharmacists in managing IDA, underpinning the importance of pharmacists' role in screening, managing, treating, patient education and holistic self-care practices. It is recommended to accompany this handbook with further CPD and resources for other types of anaemia.

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1. Introduction

The sections in this handbook were developed following a structured scoping review process using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guideline. The steps involved can be seen in Figure 1.

1.1 Background

Anaemia is a major global public health concern, closely tied to socioeconomic status and education,[1,2] and could indicate poor nutrition and health.[3] Anaemia involves a decreased red blood cell count or haemoglobin concentration, which impairs oxygen transport in the body.[3] The World Health Organization (WHO) defines anaemia as haemoglobin levels below 12.0 g/dl in non-pregnant, reproductive-aged women and 13.0 g/dl in males.[4-6] It is estimated that half of the global burden of anaemia[7] is due to iron deficiency.

Globally, anaemia affects around 40% of children (6–59 months), 37% of pregnant women, and 30% of women (15–49 years).[1,2] The WHO African and South-East Asian regions are most affected.[8] In 2019, 1.8 billion people (23% of the world) suffered from anaemia,[1,4] increasing to 1.9 billion in 2021.[9] Males exhibited a lower prevalence than females across all age groups. In 2021, the prevalence for all age groups was 17.5% in males and 31.2% in females.[9] A critical concern is for women of reproductive age, as anaemia contributes to maternal deaths,[10,11] and affects about two in five pregnant women and one in three non-pregnant women in this group.[8,11]

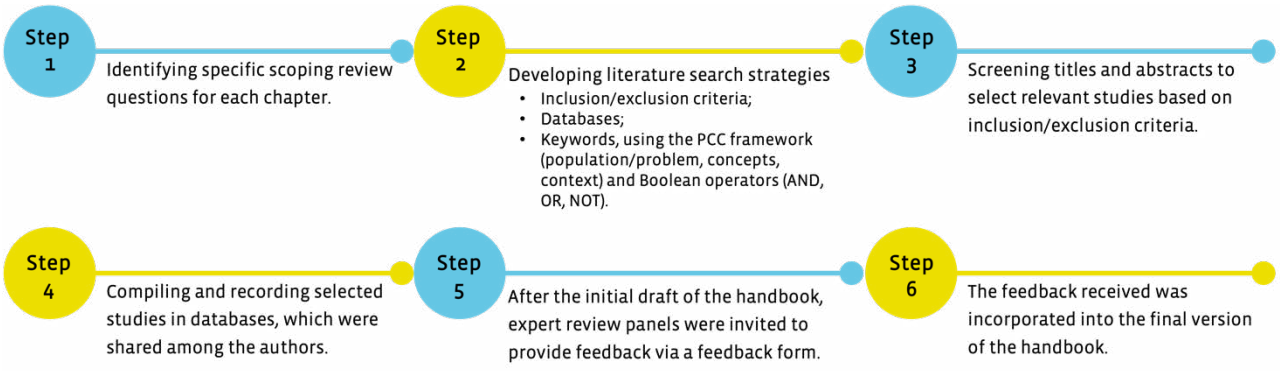

Figure 1: Steps involved in the development process of the handbook

The underlying causes of anaemia are multifactoral,[12] including biological, socioeconomic and ecological influences.[1] The causes may vary by population and age; for example, nutritional deficiencies and chronic diseases are the most common causes in children and older adults, respectively.[2] Causes of anaemia can be nutrition-specific (e.g., insufficient intake or poor absorption of micronutrients), non-nutritional specific (e.g., inherited haemoglobinopathies and infectious diseases), or a combination of these; each of these factors may have a social component.[8] Low socioeconomic status and limited education increase risk through poor living conditions, inadequate diets and restricted healthcare access.[1] There were variations in the distribution of anaemia cases based on gender and country, but dietary iron deficiency, haemoglobinopathies and haemolytic anaemias (13.7%) accounted for most cases worldwide.[4] Looking specifically at low and lower-middle income countries, iron deficiency and malaria are the most common causes of anaemia, particularly in rural and poor households with no formal education.[1] Comprehensive approaches are needed to address this multifaceted problem.[1]

1.2 Global policies and interventions on anaemia

As a health concern affecting maternal, infant and child well-being, anaemia recognition and treatment is significant for global policy and intervention agendas. As long ago as 2012, the World Health Assembly (WHA) approved global targets for maternal, infant and young child nutrition, which encompasses the ambitious objective of halving anaemia prevalence in women aged 15 to 49 by 2025.[1,13] This effort is reinforced by the United Nations 2030 Agenda for Sustainable Development Goals (SDGs), which highlights anaemia in women of the same age group as a key indicator of 2.2.3 of the SDGs.[1,8] This commitment was affirmed at the 2021 Nutrition for Growth Summit, where the WHO pledged to develop an encompassing framework for preventing, diagnosing and managing anaemia through a holistic approach.[1] Additionally, an Anaemia Action Alliance was created to align actions in reducing anaemia. [1]

Progress in reducing anaemia prevalence has been insufficient. While some progress has been made in combating anaemia, the most substantial declines have been seen among males and adults aged 20–74 years.[9] In contrast, young children (under five years) and women of reproductive age have not experienced the same improvement.[9] From 2000 to 2019, global estimates of anaemia prevalence slightly decreased from 31% to 30% among non-pregnant women and 41% to 36% among pregnant women. There is a global prevalence of 40% in 2019 for infants and children, exceeding 70% in specific countries. This status quo mandates comprehensive changes on multiple fronts, necessitating the involvement of policymakers, politicians, pharmacists and clinicians to address the complex factors contributing to anaemia.[12]

1.3 Iron deficiency anaemia

As stated above, it is estimated that half of the global burden of anemia[7] is due to iron deficiency (ID). ID is characterised by a reduction in the body's total iron content and is a global nutritional concern affecting over two billion people.[14,15] It may or may not progress to iron deficiency anaemia (IDA), a common form of chronic anaemia.[15] ID can result from insufficient iron intake or absorption and can also occur due to clinical issues such as chronic gastrointestinal bleeding or iron depletion, like blood donation.[16] As ID progresses, it initially mobilises iron from ferritin, primarily stored in the liver. This redirection of iron resources to support red blood cell production occurs at the expense of other essential bodily functions and precedes the onset of anaemia, leading to IDA.[16] According to International Classification of Diseases (ICD)-10 and Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT), IDA is categorised as nutritional anaemia (disorder) or nutritional deficiency associated condition (disorder) and it is interpreted as haemoglobin or red blood cell count below reference range.[17,18]

Both ID and IDA significantly impact an individual's well-being.[19] ID alone adversely affects quality of life and cognitive function.[16] Chronic conditions like chronic kidney disease, heart failure and inflammatory diseases are often associated with ID and contribute to increased mortality risk.[20] ID, with or without anaemia, is also a common complication of cancer.[20] In mild-to-moderate cases, symptoms such as fatigue, weakness and shortness of breath may occur.[16,20] However, some cases can remain asymptomatic.[21] Untreated ID, particularly IDA, leads to reduced cognitive function,[22] decreased work productivity and diminished overall quality of life.[4,21,23] During pregnancy, untreated ID hampers fetal brain maturation and development,[2,21,24] and contributes to low

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COURSE LAYOUT

Module	Date	Time	Topic	Speaker for event
Module 1	19 March	19:00	**Unveiling the Iron Enigma:** Insights into Epidemiology and Pathophysiology of ID/IDA	**Dr. Claire Barrett**
Module 2	25 April	19:00	**Iron Metabolism Unraveled**: A Journey through the Intricacies	**Prof. Vernon Louw**
Module 3	9 May	19:00	**Cracking the Code:** Diagnosis and clinical features of Iron Deficiency and Iron Deficiency Anaemia	**Prof. Vernon Louw**
Module 4	11 June	19:00	**From Tradition to Innovation:** Practical Approaches to Iron Deficiency Treatment	**Prof. Vernon Louw**
Module 5	16 July	19:00	**Beyond the Norm:** Understanding the Impact of Heavy Menstrual Bleeding on Iron Stores	**Dr. Trudie Smith**
Module 6	20 August	19:00	**Iron Symphony and Forging Minds:** Harmonizing Maternal Wellness and Foetal Intelligence	**Prof. Vernon Louw**
Module 7	3 September	19:00	**The Silent Strength:** Iron's Impact on Cardiovascular Fortitude	**Prof. Vernon Louw**
Module 8	15 October	19:00	**Surgical Synchrony:** Perioperative Considerations for Iron Deficiency/Anaemia	**Dr. Matthew Gibbs**
Module 9	**12 November**	19:00	**Ageless Challenges:** Exploring the Effects of ID/IDA in the Elderly	**Dr. Claire Barrett**
Module 10	**5 December**	19:00	**Iron Reimagined:** A Masterclass in Gastroenterological Wellness	**Dr. Wayne Simmonds**

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birth weight and maternal complications.[19] Untreated ID can also affect child development, causing impaired school performance.[2] Addressing ID and IDA could yield substantial economic returns.[25]

Diagnosing and managing ID and IDA present challenges due to varying diagnostic criteria and tests.[19] Haemoglobin concentration lacks sensitivity and specificity, leading to potential underestimation of ID.[14] ID without anaemia can be elusive, with vague symptoms, necessitating investigation in patients with normal complete blood counts and low ferritin levels.[19,21] Conditions like pregnancy, thalassaemia and inflammatory disorders can complicate diagnosis by impacting ferritin levels.[20] Inconsistent laboratory reference ranges for ferritin in women further hinder accurate diagnosis.[19] Striking a balance between diagnostic thresholds is crucial, as setting it too low risks overlooking iron deficiency cases.[19] Comprehensive guidelines for early detection and management are essential, especially among women of childbearing age.[19] Implementing effective screening practices, including measuring ferritin and haemoglobin levels, can enhance outcomes and alleviate the associated health burdens.[19]

1.4 FIP contribution to support pharmacists' roles in managing anaemia

Historical efforts have often emphasised iron deficiency as the primary cause of anaemia; however, the complexity of anaemia demands a multifaceted approach.[26] A collaborative approach involving various stakeholders, including governments, civil society, healthcare professionals, academia, researchers and the media, is essential to drive meaningful progress. Each plays a specific role in reducing anaemia and promoting good health.[26] Associations and societies of healthcare professionals can promote education and awareness among association and society members, professionals and the general public about the importance of addressing anaemia comprehensively.[1]

The International Pharmaceutical Federation (FIP), a global professional leadership body for pharmacists, pharmaceutical scientists and educators, conducted an exploration study in May 2022 on pharmacists' role in anaemia, specifically IDA. This study underscored the imperative of enhancing the involvement of practising pharmacists, particularly community and hospital pharmacists, in IDA management.[27,28] With a foundation in clinical expertise and a widespread presence, pharmacists possess substantial opportunities to play a pivotal role in reducing IDA. This encompasses diverse aspects, including understanding the causes, participating in treatment strategies, engaging in preventive measures and promoting self-care practices.[27,28]

This explorative study also highlights the necessity to offer educational assistance to pharmacists, achieved through the provision of guidelines or toolkits for anaemia counselling, treatment, management, screening and prevention, complemented by comprehensive training sessions and

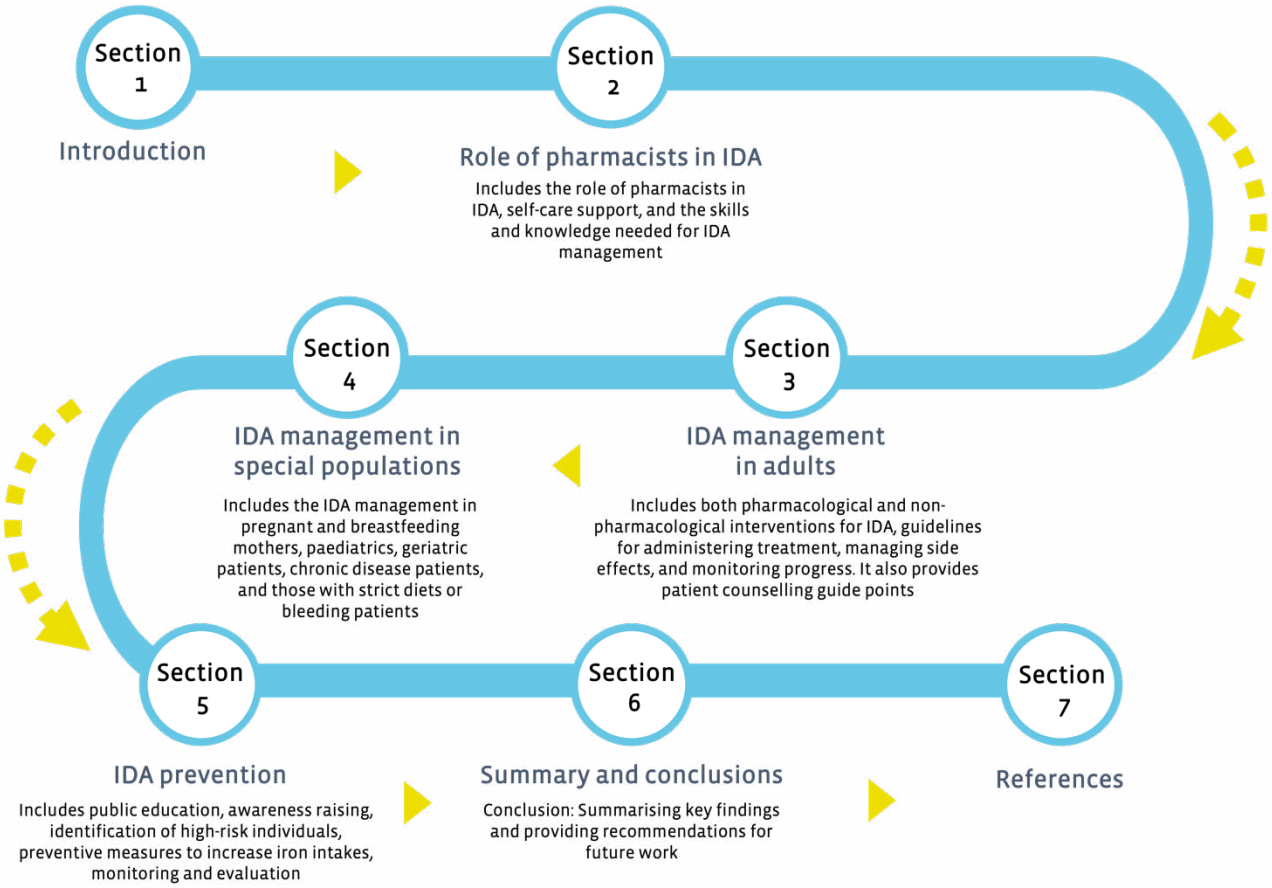

Figure 2: Sections included in this handbook

workshops.[27,28] It is recommended that national professional leadership bodies collaborate in developing practice support materials. These resources would empower pharmacists to excel in their role, ultimately contributing to the advancement of public health through comprehensive anaemia management strategies.[27,28]

1.5 Handbook development to support pharmacists' roles in IDA

This handbook is designed to be a valuable resource for a range of stakeholders:

- **Pharmacists** — This handbook serves as a comprehensive guide for pharmacists, offering guidance on screening, treating, managing, and preventing iron deficiency anaemia. It equips pharmacists with the knowledge and skills necessary for tasks like screening and counselling, enabling them to provide personalised patient care and stay updated on the latest guidelines and treatments.
- **Professional pharmacy leadership bodies** — Professional leadership bodies can share this handbook with their members to enhance their practice and improve patient care.
- **Pharmacy students** — Pharmacy students can use this handbook as a foundational resource to build their understanding of IDA.
- **Researchers and academics** — This handbook can serve as a valuable reference source for researchers and academics studying IDA, helping them identify and address research gaps in this field.

This handbook consists of seven sections (Figure 2).

2. Role of pharmacists in IDA

2.1 Pharmacists' roles in supporting self-care with regard to IDA

Pharmacists play a pivotal role in advancing self-care practices, including addressing IDA.[27-29] Defined by the WHO as individuals' ability to manage their health independently, self-care is vital to improving well-being and achieving universal health coverage.[29-31] Empowering patients to actively participate in their health management enhances patient-centred care and overall healthcare outcomes.[32] Self-care should not be confused with self-medication. Self- medication involves using medication to treat self-diagnosed disorders or symptoms or the intermittent or continued use of prescribed medicines for chronic or recurrent conditions.[33] Self-care empowers individuals to make informed health choices, and pharmacists, easily accessible healthcare professionals, can support individuals in making informed decisions on their health. Pharmacists are crucial in advocating and facilitating self-care, offering various interventions to enhance patient autonomy.[29,34] They act as promoters, supporters and overseers of self-care within their communities and can contribute as programme managers and policymakers.[29] Pharmacists' involvement in self-care helps address health system challenges,[29] such as limited access to healthcare, poor health literacy and financial barriers, ultimately benefiting individuals and communities in managing conditions[35] like IDA.

The Global Self-Care Federation established the Self-Care Readiness Index in 2021 and updated the index in 2022.[36] It serves as a comprehensive framework for implementing self-care and a powerful advocacy tool for elevating self-care's status in local and international contexts. This framework spotlights four critical enablers of self-care: stakeholder support and adoption, consumer and patient empowerment, self-care health policies, and a supportive regulatory environment.[36] Pharmacists play an essential role in advancing the second enabler, consumer and patient empowerment, as they engage with patients directly, empowering them to make well-informed health choices, particularly in managing conditions[29] such as IDA. This aligns with the index's recommendations to enhance the availability of quality self-care information and encourage healthcare providers, including pharmacists, to endorse self- care practices,[36] especially in the context of IDA prevention, screening and management. Furthermore, the call for interprofessional collaboration resonates with the need for a coordinated approach[1] to address IDA through self-care, ensuring the optimal delivery of information and services to patients facing this specific health challenge. The Self-Care Readiness Index,[36] in conjunction with pharmacists' role, underscores their significant contribution to promoting self- care practices in the context of IDA and other health concerns.

The seven pillars framework of self-care is also relevant in addressing IDA, for which it offers a comprehensive structure for individuals to bolster their self-care abilities.[29,37] Firstly, within the "Knowledge and health literacy" pillar, pharmacists empower individuals by providing crucial information about IDA, its underlying causes and the available treatment options, enabling patients to make well-informed decisions tailored to their specific needs.[27-29] They significantly contribute to the "Healthy eating" pillar by offering dietary guidance, emphasising the importance of incorporating iron-rich foods and supplements into the diet, which is especially pertinent for individuals managing IDA.[27-29] Furthermore, in the "Rational use of products and services" pillar, pharmacists play a central role in ensuring the responsible and effective use of iron supplements, offering expert advice on proper dosage and timing, crucial considerations for those dealing with IDA.[27-29] Additionally, they actively support the "Risk avoidance and mitigation" pillar by counselling patients on lifestyle modifications to prevent the recurrence of anaemia, such as addressing dietary deficiencies and advocating behaviours that mitigate risks.[27-29] In essence, by actively engaging with patients and applying their expertise, pharmacists bridge the gap between the seven pillars framework and effective self-care practices, providing invaluable guidance for individuals managing the complexities of IDA and ultimately contributing to improved health and quality of life.[27-29]

The self-care matrix (SCM)[38] is another valuable framework that pharmacists can leverage to enhance their role[29] in addressing IDA. The SCM encompasses the various facets of self-care,

acknowledging the influence of social and health systems, environmental factors and policy-based determinants on individuals' self-care practices.[38] Pharmacists equipped with an understanding of this framework can better support patients in maximising their autonomy and advocating person-centred decision-making when managing conditions like IDA. The SCM offers pharmacists a holistic perspective to comprehend the complex factors influencing self-care.[29,38] Specifically, pharmacists can align their interventions with the SCM's dimensions to empower patients with knowledge about IDA, foster self-awareness regarding its management, promote physical activity and healthy eating, and advise on risk avoidance and mitigation strategies. Furthermore, the SCM highlights the importance of considering external support and resources, making pharmacists pivotal in organising educational sessions or workshops to cater to individual needs. Additionally, in the realm of the self-care environment, pharmacists can advocate policy changes and community engagement initiatives to improve access to resources and healthcare services. By aligning their practices with the SCM's cardinal dimensions, pharmacists can enhance their role in improving individuals' health literacy in IDA, ensuring a comprehensive and effective approach to self-care in this context.[29,38]

2.2 Pharmacists' roles in managing IDA across practice sectors

Pharmacists are well-trained to effectively educate patients and provide evidence-based advice on a broad range of topics, including self-care interventions and the use of non-prescription medicines or supplements in IDA.[29,39] With their expertise, pharmacists can actively engage patients in discussions about IDA, explaining the importance of iron supplements and addressing any concerns or misconceptions. FIP has recently introduced toolkits for medication review and reconciliation to support pharmacists in improving medication adherence and health outcomes.[40] As pharmacists actively contribute to better medication management, they empower individuals to navigate IDA with confidence and competence, promoting a holistic approach to self-care and ultimately mitigating the impact of this condition on overall health and well-being. By fostering health literacy and advocating medication adherence, pharmacists play a pivotal role in supporting individuals on their journey to manage IDA and achieve optimal health outcomes effectively.[41] The increasing role of pharmacists in the healthcare system, coupled with being the most accessible members of the health workforce,[42-44] enable them to contribute significantly to the management of conditions such as IDA.[28]

In a community setting, pharmacists can provide health services and information on preventing and managing IDA.[45] Several studies have documented the role of pharmacists in IDA in community settings. A study carried out in Peru examined the feasibility and acceptability of training the pharmacy workforce to offer point-of-care testing for chronic diseases, including anaemia. It was reported that nearly 100% of 371 clients preferred the pharmacy for point-of-care testing due to better access, faster results, and faster and better attention. This study underscored the unique role of pharmacists in providing point-of-care testing services in the community setting. It also highlighted an opportunity to train the pharmacy workforce to conduct early detection and screening of the disease.[46] In Tanzania, a study revealed that private pharmacies were in closer proximity and offered greater convenience than government clinics, indicating the potential contributions of pharmacists in supporting maternal iron supplementation in rural areas.[47] This study recommended the importance of educating the public about the existing policies and treatments for anaemia, a role in which pharmacists actively participate by providing health education to the public and society.[47,48]

In a hospital setting, pharmacists can optimise patient outcomes by monitoring and adjusting treatment plans.[49] Studies in Jordan[50] and Thailand[51] explored how clinical pharmacist interventions in an outpatient clinic in a hospital improved patients' outcomes through pharmaceutical care programmes, such as providing comprehensive patient counselling for those with IDA.[50,51] Pharmacists' evolving roles include their ability to prescribe,[52,53] initiate or discontinue specific medicines, adjust the dosage[52-54] and order relevant laboratory tests.[52,53,55,56] Additionally, they are also actively involved in developing evidence-based practice guidelines in collaboration with fellow healthcare professionals.[54,56,57] Pharmacists are strategically positioned to influence drug formulary choices and healthcare management, thereby promoting adherence to guidelines and reducing costs tied to specific medicines.[52,57] Their active engagement in providing health advice was proven to yield significant therapeutic impact and garnered approval from fellow healthcare professionals.[56,58]

In addition to the role of community and hospital pharmacists, researchers in the field of pharmacy also play a significant role in addressing IDA alongside researchers from other fields. Their involvement in IDA research aligns with the broader goals of understanding, managing, and raising awareness of this condition. Pharmacy researchers contribute to understanding IDA's pathophysiology and its implications for medication management. Their research often intersects with areas such as pharmacokinetics and pharmacodynamics of different iron formulations, including exploring optimal dosing regimens and evaluating the safety and effectiveness of treatment options for IDA. Furthermore, they actively engage in clinical trials to assess the efficacy and tolerability of oral and intravenous iron supplements, focusing on patient adherence and outcomes. This research directly informs evidence-based guidelines for IDA treatment, ensuring that pharmacists and healthcare providers can offer the best possible care to patients. Their dissemination of research findings through publications, conferences and workshops can contribute to the body of knowledge on IDA, promoting best practices and ensuring access to appropriate iron repletion therapies.

The exploratory study conducted by FIP in May 2022 highlighted various roles of pharmacists in anaemia management, which

include screening and detection, medication management, patient counselling and monitoring patient progress. The conversation specifically underscored the pharmacist's role in taking patients' medical histories and ensuring the appropriate selection of supplements based on dietary habits and over-the-counter medicines. The participants also highlighted the need for guidelines or toolkits, along with subsequent training or workshops, to improve their competence in the management of IDA. A key enabler identified in this study was collaboration with other healthcare professionals, which is particularly pertinent to the development of community-based, point-of-care testing. Based on the findings in this study, it is evident that there is an increasing opportunity for pharmacists to contribute to the attainment of the WHO's global anaemia target, particularly through early detection, medication management and delivering health education to both individual patients and the broader community.[28]

2.3 *Educational needs to support pharmacists' role in IDA*

Roundtable participants of the exploratory study conducted by FIP in May 2022 shared a variety of competencies needed to support pharmacists' role in IDA.[27,28] The insights shared during this discussion are represented in Figure 3.

Specifically, regarding patient education and counselling, participants emphasised two key qualities that pharmacists should possess: confidence in patient management and effective communication skills. Furthermore, a strong foundational knowledge of IDA, as detailed in Figure 4, was identified as crucial to enhance their proficiency in this domain.[27,28]

An important suggestion from this roundtable was the need to develop a comprehensive guideline, toolkits or handbook tailored to individual pharmacists, addressing the topic of IDA. These resources would function as educational manuals, providing guidance on patient screening and counselling and encompassing critical information such as:[27,28]

- Diagnosis and severity assessment of anaemia;
- Appropriate medication selection, including details on iron preparations, their bioavailability, and pharmacokinetics to aid in supplement choice and formulation decisions;
- Common side effects associated with medicines and supplements; and
- Dietary guidelines to complement treatment strategies.

In addition to these resources, participants also recommended the establishment of professional programmes designed to enhance pharmacists' competence in managing IDA. These programmes could include workshops, self-directed learning opportunities, or continuing professional development courses, all centred around anaemia-related knowledge and skills. Collaboration with national professional leadership bodies would facilitate the organisation of workshops and self-directed learning initiatives, and the sharing of best practices.[27,28]

The handbook serves as an invaluable resource, providing pharmacists, specifically in patient-facing roles, with the essential knowledge needed to address the identified gaps above in their understanding of IDA.

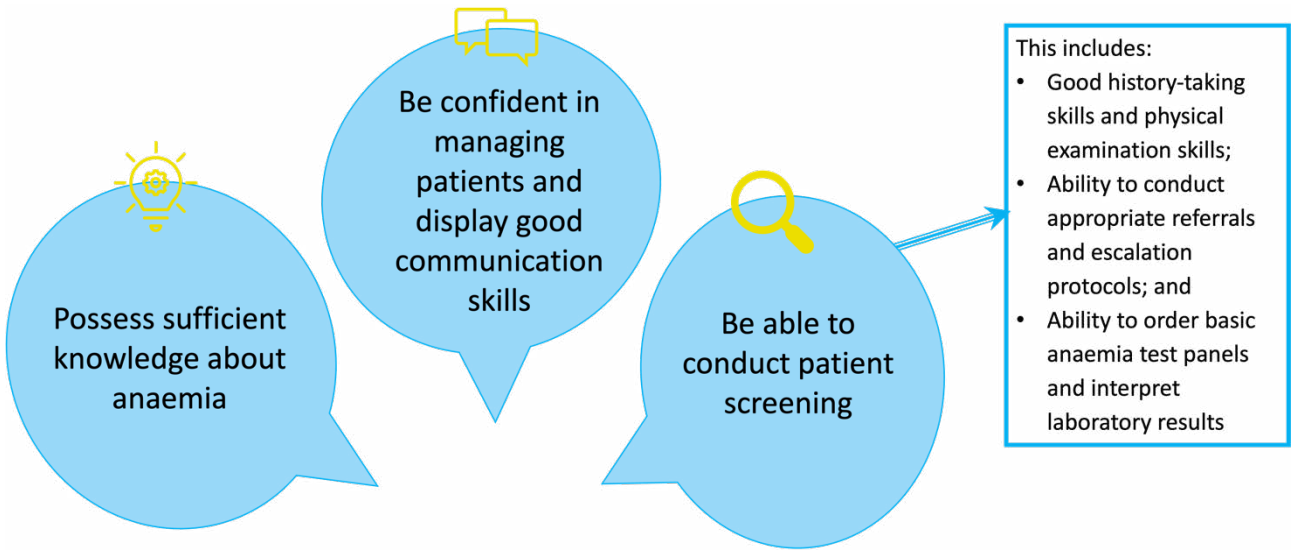

Figure 3: Competencies needed to support pharmacists' role in IDA

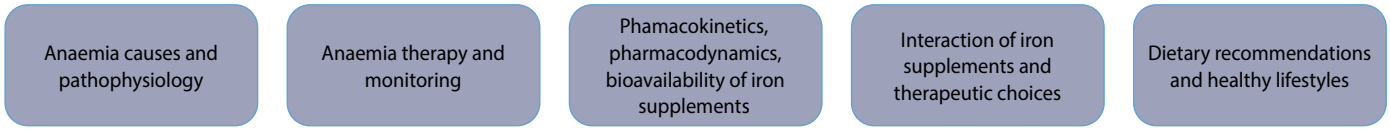

Figure 4. Knowledge that pharmacists should have related to IDA[27,28]

3. IDA management in adults

3.1 Identification and investigation of IDA

Early identification is pivotal in effectively managing IDA, and pharmacists can play a role in this process. They can support detecting potential cases, assessing patients' symptoms and signs, reviewing medical and medication histories, recommending additional tests and making referrals when necessary. This proactive approach can occur in various healthcare settings, including community pharmacies, hospitals and primary healthcare centres.[28]

3.1.1 Signs and symptoms

In community or primary healthcare settings, pharmacists can support identifying common signs and symptoms of ID, with or without anaemia, such as fatigue and weakness,[15,59-62] pale skin,[15,61] dizziness,[15,61] shortness of breath,[60] fast or irregular heartbeat,[59] strange cravings to eat items that are not food,[15,62] a tingling or crawling feeling in the legs,[62] cold hands and feet,[62] tongue swelling or soreness,[60,61] brittle nails,[15] hair loss[62] and headache.[15,61] By asking targeted questions during patient interactions, pharmacists can pick up on these symptoms and suggest further testing if necessary (see Figure 5).

3.1.2 Medical and medication histories

Examining medical and medication histories helps tailor the treatment according to the cause and severity of iron deficiency.[63,64] A comprehensive history-taking approach facilitates accurate diagnosis and guides appropriate management of IDA. Some key aspects to be considered are blood donation history, previous history of IDA, dietary intake, overt blood loss and haemoglobinopathies. Additionally, conducting a thorough medication history is crucial, particularly the use of NSAIDs or anticoagulants.[65] Individuals with underlying conditions leading to IDA should either be treated or referred to a specialist, such as a gastroenterologist or a gynaecologist, for comprehensive care.[66]

Pharmacists can ask the following questions to identify the common signs and symptoms of IDA:

- Have you been feeling unusually tired or fatigued lately?
- Do you often feel weak or find it difficult to perform routine tasks?
- Have you noticed that your skin appears paler than usual?
- Do you experience shortness of breath, especially after physical activity?
- Have you noticed any changes in your nails, such as brittleness or spooning (concave shape)?
- Do you often feel dizzy or lightheaded?
- Have you experienced any unusual cravings, such as a desire to eat ice, dirt or starch?
- Have you noticed any changes in your appetite or weight?

Figure 5: Questions that pharmacists can ask to identify signs and symptoms of ID, with or without anaemia

3.1.3 Examination and investigation

Some key aspects of examination include pallor assessment (conjunctiva, mucous membranes, nail),[15,61] vital signs (blood pressure, heart rate and respiratory rate),[59,60] cardiovascular examinations (heart murmurs),[67] respiratory assessment (shortness of breath),[59,60] skin and hair changes (koilonychia, dryness),[15,62] and evaluation of oral cavity.[60,61]

Some diagnostic tests contribute to the confirmation of IDA:

- **Serum haemoglobin —** Anaemia is defined as follows: Hb < 13 g/dl (men aged over 15 years), Hb < 12 g/dl (non pregnant women aged over 15 years and children aged 12–14 years of age).[68,69]
- **Red cell indices —** A mean corpuscular volume (MCV) less than 95 femtolitres has a sensitivity of 97.6% for iron deficiency anaemia. Other red blood cell changes associated with iron deficiency include reduced mean cell Hb (MCH) — hypochromia, increased percentage of hypochromic red cells, anisocytosis (variation in the size of red blood cells), and poikilocytosis (presence of irregularly shaped red blood cells)[69]
- **Serum ferritin levels —** Serum ferritin is the primary test to diagnose absolute iron deficiency for patients without inflammation.[70] While a ferritin level of ≤ 15 microgram/l was traditionally used for iron deficiency diagnosis in adults, a newer approach suggests a threshold of ≤ 30 microgram/l, providing 92% sensitivity and 98% specificity, which is now commonly used.
- **Transferrin saturation (TSAT) —** TSAT is not influenced by chronic inflammation as is the case with ferritin and is an important arbiter of iron status, especially in the face of chronic inflammation. A TSAT of < 20% is indicative of IDA.[59,71]
- **Hepcidin level —** Hepcidin level is decreased (< 6 ng/ml) or normal (6–46 ng/l) in IDA,[72] but this can be affected by factors such as circadian rhythm and hepatic and renal function. Hepcidin assessment can be useful to confirm Iron Refractory

1. **Prepare the patient:** Explain the procedure to the patient and ensure they are comfortable. Clean the area where the blood sample will be taken (usually a fingertip or a vein in the arm) with an alcohol swab.
2. **Collect the sample:** For a haemoglobin test, a sample of blood is taken by pricking the fingertip or inserting a needle into a vein in the patient's arm. For infants, the sample may be obtained by pricking the heel.
3. **Perform the test:** Apply the blood sample to the test strip or cuvette of the point-of-care testing device. Ensure that the sample adequately fills the required area.
4. **Analyse the results:** Insert the test strip or cuvette into the device and wait for it to process. The device will display a haemoglobin measurement.
5. **Interpret the results:** Compare the patient's haemoglobin level with reference ranges provided by the device manufacturer or relevant health guidelines.
6. **Document and communicate:** Record the results in the patient's health record and communicate them to the patient and their healthcare provider.

Figure 6: General steps on how to perform a point-of-care haemoglobin test[73]

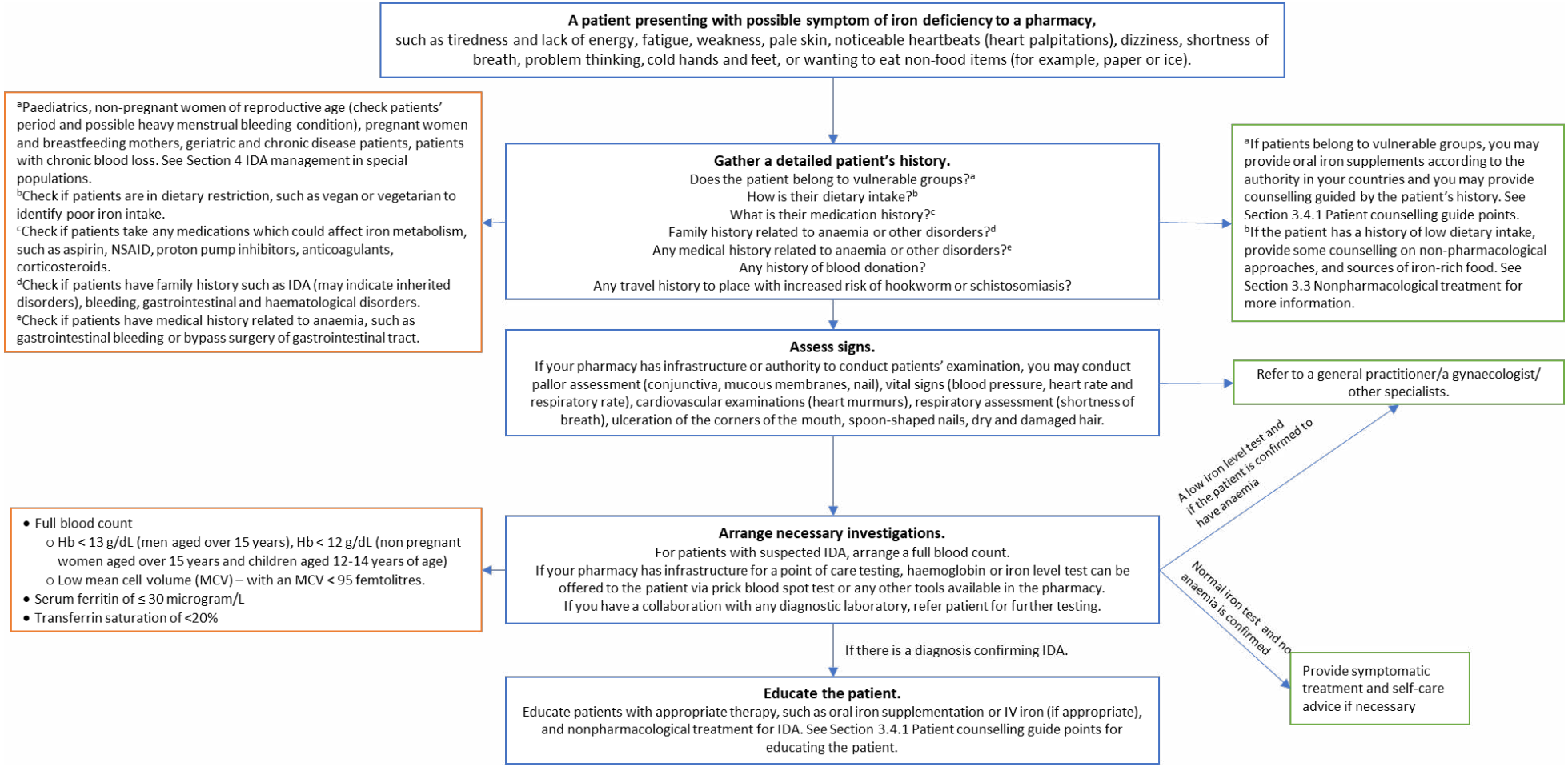

Figure 7: Flowchart to guide pharmacists in identifying patients with suspected IDA in a community pharmacy or primary healthcare setting[15,59-62,67,69,73-76]

Iron Deficiency Anemia (IRIDA), but this assessment is not routinely or widely used in clinical practice.[67,72]

- **Reticulocyte haemoglobin (RetHe) —** Combining hepcidin and reticulocyte haemoglobin levels can effectively differentiate between IDA and anaemia of chronic disease. When hepcidin levels are within the normal range, and RetHe is less than 30 pg, it suggests the presence of IDA.[72] Reticulocyte haemoglobin is accurate but frequently not accessible for many practitioners and patients.

Recognising that the accessibility of advanced tests can be a challenge for rural areas in certain nations, where such tests may not always be easily obtainable or affordable, it becomes imperative to explore alternative, cost-effective approaches for rural healthcare. Pharmacists should be vigilant in aligning their practices with the national guidelines regarding commonly employed diagnostic tests for IDA within their respective countries.

In some countries and facilities, pharmacists can conduct initial screening tests for anaemia, such as point-of-care testing for haemoglobin or iron level test. These tests are quick, easy to perform, and provide immediate results, enabling pharmacists to identify potential cases of IDA during a routine pharmacy visit. Some general steps on how to perform a point-of-care haemoglobin test are outlined in Figure 6.

3.1.4 Referrals

If the point-of-care test results or the presence of signs and symptoms suggest IDA, pharmacists can refer patients to a general practitioner, a gynaecologist or a specialist for further testing and diagnosis. This ensures that patients receive appropriate medical attention in a timely manner. Treating underlying causes of IDA is also critical, and pharmacists are advised to consult a general practitioner, a gynaecologist or a specialist. Interprofessional collaborative approaches are important in IDA management.

It is important to note that the scope of pharmacy practice in some countries may vary, and pharmacists need to refer patients directly to a general practitioner, a gynaecologist or other specialist for further evaluation before initiating treatment. Therefore, pharmacists are advised to follow national guidelines regarding their roles in screening, including the availability of point-of-care testing in pharmacy.

Figure 7 is a flowchart to guide pharmacists in identifying patients with suspected IDA in a community pharmacy or a primary healthcare setting.

3.2 Pharmacological treatments

3.2.1 Iron repletion therapy

Iron repletion therapy involves iron administration orally and parenterally (such as intravenous, intramuscular (not common in practice) or intradialytic (specific for patients with chronic kidney disease). The decision-making process between these options involves considering factors such as underlying cause, symptoms severity, therapy objectives, response to prior therapy, desired pace of haematological improvement, patient preference, cost and accessibility to treatment.[63,77]

3.2.1.1 Oral iron

Oral iron is commonly regarded as the first-line treatment option due to its affordability and widespread availability compared with intravenous iron (IV iron). While it is generally effective, in cases where oral iron is not poor tolerated or certain medical conditions are present, IV iron may be required.[78]

Dosing regimen and iron-containing preparations

The conventional therapeutic approach involving high dose iron supplementation has been demonstrated to increase hepcidin levels and reduce iron bioavailability, especially when taken multiple times a day.[79] The initial recommended dose of oral iron in adults is 100–200 mg elemental iron once daily or in two or three divided doses. However, there is growing evidence supporting the efficacy of lower daily doses,[80,81] which are found to have fewer gastrointestinal side effects. If patients exhibit poor tolerance to oral iron supplementation, it is advisable to use a lower dose, intermittent dosing schedules or try different formulations.[82] This therapeutic dose is determined by the severity of symptoms, patients' ferritin levels, their age and adverse gastrointestinal reactions.[83]

There is a wide range of iron-containing preparations available in the market. They vary in terms of dosage, type of iron salt and whether the iron is present in its ferrous or ferric form.[84] The ferrous form of iron (Fe^{2+}) found in the most widely used iron supplements

Table I: Common doses and elemental iron content of available oral iron formulations

Form	Strength (Elemental)	Formulation	Adult dosage
Ferrous bisglycinate chelate	24 mg tablet	24 mg ferrous bisglycinate chelate, 60 mg Vitamin C, 350 µg folate, 15 µg Vitamin B12	One tablet per day
Endosomal iron	24 mg capsule	24 mg endosomal iron, 60 mg Vitamin C, 350 µg folate, 15 µg Vitamin B12	One capsule per day
Sucrosomial iron	15 mg capsule	15 mg sucrosomial iron, 45 mg Vitamin C	One capsule per day
Sucrosomial iron	21 mg capsule	21 mg sucrosomial iron, 70 mg Vitamin C, 10 µg Vitamin D3, 1.75 ug Vitamin B12, 1 mg Vitamin B6	One sachet per day
Ferric polymaltose	50 mg capsule	50 mg iron(III)-hydroxide polymaltose complex, 150 µg folic acid	One tablet per day
Ferric polymaltose	100 mg tablet	100 mg iron(III)-hydroxide polymaltose complex	One tablet per day
Ferrous sulphate	50 mg tablet	50 mg ferrous sulphate	One tablet per day

FROM THE EXPERTS IN IRON TECHNOLOGY[1-4]

Ferrous Forte® somal

AWARD WINNING TECHNOLOGY ENDORSED BY THE WHO[4]

Contains the smallest endosomal iron particles with 99 % bioavailability & no expected digestive system side effects [1,4,5]

FERROUS FORTE® SOMAL - IT'S WHAT'S ON THE INSIDE THAT MATTERS

WHO: World Health Organisation

References: 1. Ferrous Forte® Somal professional information, August 2022. **2.** Ferrous Forte Tablets professional information, September 2021. **3.** Kim HJ, Bae SH, Kim HJ, *et al*. Cytotoxicity, Intestinal Transport, and Bioavailability of Dispersible Iron and Zinc Supplements. *Front Microbiol*. 2017;8:749. doi:10.3389/fmicb.2017.00749. **4.** Data on file, iNova Pharmaceuticals. 2022. **5.** Sucrosomial iron patent document.

Scheduling status: Ⓢ **Proprietary name (and dosage form):** Ferrous Forte® Somal Capsules. **Composition:** Each capsule contains: 24 mg elemental iron (from SunActive™ ferric pyrophosphate. SunActive™ is a registered trademark of Taiyo Kagaku Co., Ltd), 350 mcg folic acid (from Magnafolate™ C, a registered trademark of Lianyungang Jinkang Hexin Pharmaceutical Co., Ltd), 15 mcg vitamin B12, 60 mg vitamin C. **Complementary Medicines:** Health Supplements. This unregistered medicine has not been evaluated by the SAHPRA for its quality, safety or intended use. For full prescribing information, refer to the professional information available at www.inovapharma.co.za. Further information is available on request from iNova Pharmaceuticals. **Name and business address of applicant:** iNova Pharmaceuticals (Pty) Ltd **Co. Reg. No.** 1952/001640/07, 15E Riley Road, Bedfordview. **Tel. No**. 011 087 0000. IN/2257/24.

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is preferred due to its higher solubility, resulting in higher bioavailability in dietary supplements than ferric iron (Fe^{3+}).[85] All soluble iron molecules have side effects that impact absorption and bioavailability, with these side effects increasing as the dose rises. However, newer Ferric Pyrophosphates with micronised encapsulated iron molecules allows for a different absorption route due to molecule size. Therefore despite being insoluble, their modification with microencapsulation and alternative absorption pathways leads to much higher bioavailability without the associated side effects. There are several oral iron preparations available for the treatment of anaemia, as shown in Table I.

For the initial treatment of IDA, the British Society of Gastroenterology recommends taking one tablet of oral iron daily, containing ferrous sulfate, fumarate or gluconate.[60] This is attributed to their affordability, acceptable tolerability, good bioavailability, high efficacy, and availability in different formulations in correcting anaemia and restoring iron stores.[60,84] A recent review of 111 studies involving 10 695 participants looking at different oral iron preparations indicated that slow-release ferrous sulfate is more tolerable than conventional immediate-release ferrous iron salts.[91] Additional common types of iron formulations include ferrous ascorbate, ferrous succinate, carbonyl iron, ferric citrate, liposomal iron, haem iron polypeptide, endosomal irons, sucrosomal irons and polysaccharide iron complexes.[63]

Pharmacokinetic properties of oral iron

Bioavailability of iron depends on several factors, including the form of iron administered (with the ferrous form being more easily absorbed), the dosage, the level of erythropoiesis, dietary intake and existing iron reserves. The absorption of iron in the gastrointestinal tract increases in individuals with iron deficiency. The oral bioavailability of iron can range from less than 1% to over 50%, and one of the factors influencing the absorption of iron is the quantity of iron stored in the body.[92] Taking iron alongside meals can also reduce the bioavailability of oral iron by up to 75%.[93] This implies that iron should be taken either during fasting in the morning or during intervals between meals throughout the day.

Certain compounds found in foods, such as phytate in whole grains and calcium in milk, can hinder iron absorption.[94] In addition to phytate and calcium, phenolic compounds, including phenolic monomers and polyphenols (tannic acid and tannins), also hinder iron absorption through a complex formation of chelates with iron in the gastrointestinal lumen.[95] Polyphenols are particularly abundant in tea, coffee, cocoa, red wine and some herbal teas.[96,97] Drinking a cup of tea resulted in a 64% decrease in iron absorption from a test meal, whereas drinking a cup of coffee led to a reduction of 39%.[98] The inhibitory effect of tea on iron absorption disappears within an hour.[99]

Vitamin C may improve iron absorption by exerting its iron-reducing and chelating effects.[100] Some studies have shown that this may not be clinically effective at enhancing iron absorption, but many national guidelines recommend consuming iron in food or supplements with foods or drinks containing vitamin C, while avoiding substances that inhibit iron inhibitors is recommended.[100] Vitamin C can counteract and abolish the inhibitory effect of polyphenols on iron absorption, indicating that ascorbic acid has a higher affinity to iron than polyphenols.[101]

Commonly prescribed medicines, including proton pump inhibitors and histamine-2 receptor antagonists, can impede iron absorption.[102,103] Gastric acid plays a vital role in aiding the absorption of non-haem iron. It accomplishes this by releasing iron from food particles and converting it from the less absorbable ferrous form to the more easily absorbed ferric form. Hence, PPIs and histamine-2-receptor antagonists that suppress gastric acid production can impair iron absorption.[102] Other medicines that may interact with iron are tetracyclines, where there is a pharmacokinetic interaction (decreased oral absorption of both iron and tetracyclines), and thyroid agents where there is possible pharmacokinetic interaction (decreased thyroxine absorption).[92]

Numerous underlying medical and surgical conditions can lead to impaired iron absorption. These include inflammatory bowel disease, coeliac disease, chronic pancreatitis, *Helicobacter pylori* infection, gastrectomy, gastric bypass and small bowel resection. Patients with persistent gastrointestinal or gynaecologic bleeding or other forms of blood loss might find it challenging to absorb adequate enteral iron to counterbalance these losses, even when absorption is not impaired. In situations where oral iron therapy alone proves insufficient or ineffective, exploring alternative approaches is crucial.[78]

Side effects of oral iron

Common side effects that pharmacists should communicate to patients include:[104,105]

- **Gastrointestinal issues** — Gastrointestinal side effects associated with oral iron repletion therapy are very common, often leading to non-adherence in up to 50% of patients. This can result in treatment discontinuation and, consequently, inadequate therapeutic outcomes.[106,107] The issues can include constipation, diarrhoea and stomach upset, such as stomach cramps, nausea or vomiting. While it is better to take oral iron on an empty stomach, with the presence of gastrointestinal side effects, it is sometimes recommended to take oral iron with meals.
- **Dark stools** — Iron supplements can make the stool black or dark green. This is generally harmless and should not be a cause for concern.[104,105]
- **Metallic taste** — Some people may experience a metallic taste after taking iron supplements.[104,105]
- **Teeth staining** — Liquid iron formulations, such as ferrous sulfate drops, syrups, elixirs and suspensions, may cause teeth staining.[108]
- **Other side effects** — Less common side effects can include fainting, dizziness, chest pain and fast heartbeat.[104,105]

Treatment duration and monitoring parameters

The goal of oral iron treatment is to increase haemoglobin levels by 2 g/dl within four weeks.[109] An increase of 1 g/dl in haemoglobin levels following one month of treatment is considered an adequate response to therapy.[110] For adults, treatment should be continued for three months after the anaemia is corrected to ensure the replenishment of iron stores.[111] The correction of anaemia should be confirmed by normalisation of ferritin levels or TSAT.

3.2.1.2 Parenteral iron

Parenteral iron can be administered intravenously, intramuscularly or intradialytically.

IV iron is a rapid and effective treatment for IDA, offering advantages over oral therapy and blood transfusion.[78] The main advantage of IV iron lies in its capacity to bypass the gastrointestinal tract, reducing mucosal irritation and related side effects.[112] Additionally, healthcare providers have confidence in patient adherence. IV iron has demonstrated higher efficacy than oral iron and is generally better tolerated. However, its widespread use is constrained by availability and cost considerations.[113] Funder institutions normally requires 3 month of oral iron therapy before they are willing to cover the cost of IV iron therapy.

The use of intramuscular (IM) iron therapy for iron repletion is generally discouraged in current recommendations.[114] This is because IM iron is poorly absorbed, no safer than IV iron therapy, and can result in local side effects such as pain and skin discolouration at the injection site.[115,116] However, it is important to note that there are specific clinical scenarios where IM iron therapy might still be appropriate, and these decisions should be made based on clinical judgement.

Intradyalitic treatment refers to administering iron therapy during haemodialysis sessions. Intradialytic iron supplementation using ferric pyrophosphate citrate was demonstrated to maintain haemoglobin levels safely, reduce the need for erythropoiesis-stimulating agents, and to help manage anaemia in patients with chronic kidney disease who are undergoing haemodialysis.[117]

When to treat patients with IV iron

IV iron administration should be considered for patients with one or more of the following:[64,118,119]

- Demonstrated intolerance, poor adherence or lack of efficacy with oral iron due to gastrointestinal side effects despite modification of dose, timing and frequency.
- Pregnancy beyond the first trimester with haemoglobin levels below 10.5 g/dl, at which oral iron is unlikely to provide sufficient iron for fetal development.
- Iron deficiency with severe anaemia (e.g. Hb < 7 g/dl) and stable haemodynamics, while severe anaemia with organ ischaemia is treated with transfusion.
- Presence of comorbidities interfering with oral iron absorption (e.g., inflammatory bowel disease, chronic renal impairment).
- There is inadequate time for oral iron to achieve a suitable response when surgery is imminent.
- Ongoing blood loss surpassing the capacity of oral iron absorptive to meet needs (heavy menstrual bleeding, mucosal telangiectasias).
- Malabsorption syndromes (coeliac disease, Whipple's disease, bacterial overgrowth), which potentially compromise iron absorption.

Studies suggested that IV iron is not necessarily associated with acute and chronic infection risk.[120-122] A prospective study

Table II: Parenteral iron formulations available in the market[63]

Compound	Concentration of elemental iron	Recommended amount per dose[a]	Infusion time[b]
Low-molecular-weight iron dextran (LMW ID)[c]	50 mg/ml	Single dose of 1 000 mg (diluted in 250 ml normal saline) or multiple doses of 100 mg.	2–6 h
Ferrous gluconate (FG)	12.5 mg/ml	Multiple doses of 125 to 250 mg.	12.5 mg/ min
Iron sucrose (also referred to as iron saccharate)	20 mg/ml	Multiple doses of 200 to 300 mg. Typically ranging from 1 to 3 weeks.[126]	100 mg/30 min
Ferumoxytol	30 mg/ml	Single dose of 1 020 mg or 2 doses of 510 mg, given 3 to 8 days apart.	15 min
Ferric carboxymaltose[d]	50 mg/ml	For weight ≥ 50 kg: 1 or 2 doses of 750 mg, administered at least 7 days apart. For weight < 50 kg: 1 or 2 doses of 15mg/kg, administered at least 7 days apart.	15 min
Ferric derisomaltose (previously called iron isomaltoside)	100 mg/ml	For weight ≥ 50 kg: A single 1 000 mg dose or up to 3 doses of 500 mg, administered over 7 days For weight < 50 kg: A single dose of 20 mg/kg	Infusion time ranges between > 15min and ≥ 30min

[a] A 25 mg test dose before infusion of a full dose of iron dextran is required; test doses are not required with the other agents but are often recommended in patients with multiple drug allergies or a history of prior reactions to IV iron.[127]

[b] The infusion time depends on the dose and whether it is being administered in a diluted or undiluted form. Refer to the updated drug product inserts for specific guidance.

[c] High molecular weight iron dextran (HMW ID) is no longer available. LMW ID can be administered intramuscularly; however, it is considered painful and less effective than intravenously.

[d] There are some advantages of this iron preparation compared to other available iron formulations; however, this preparation is the most expensive preparation and inaccessible for many patients. Pharmacists need to consider cost-effectiveness in advising the treatment.

involving 988 patients undergoing haemodialysis across 19 European centres, followed over six months with 51 episodes of bacteraemia, revealed no association between IV iron and the risk of infection.[123] Infection should not be seen as a contraindication to intravenous iron repletion therapy if a careful evaluation of the risk/benefit supports the treatment of the anaemia.

Dosing regimen and IV iron preparations

A range of IV iron preparations is available, and the selection of which formulation to use depends on several factors, including cost considerations, the preference of the patient and physician, and the product's availability.[124] Older IV iron formulation, such as high-molecular-weight dextran iron, has been withdrawn due to their unfavourable safety records, characterised by a relatively high incidence of anaphylactic reactions.[125]

Concerning the dosing regimen, a formulation with a smaller dose would be more suitable for patients who have frequent hospital visits, such as individuals undergoing haemodialysis due to chronic kidney disease. On the other hand, larger-dose preparations are more convenient for patients who require rapid iron replenishment. Furthermore, there can be variations in how well different patients tolerate certain formulations.[63] Table II provides a list of parenteral iron formulations.

All these preparations, as listed in Table II, are equally effective in managing iron deficiency and share a similar safety profile.[105,128,129] Some key differences include cost, formulary agreements, procurement agreements, the frequency of visits or time needed to administer the full dose.[64] Healthcare professionals are advised to refer to the product monographs, as certain formulations recommend weight-based dosing.[63,64]

Pharmacokinetic properties

Iron is administered intravenously as iron carbohydrate complexes, composed of polynuclear iron(III)-hydroxide surrounded by the carbohydrate ligand. The ligand aims to stabilise the complex and protect it against further polynuclearisation. Some pharmacokinetics parameters for intravenous iron preparations are set out in Table III.

Side effects of IV iron

Newer intravenous iron preparations rarely lead to infusion-related reactions. However, hypersensitivity-type and infusion reactions (approximate incidence 0.5%) are more common than for oral iron or placebo.[120] Severe hypersensitivity reactions and serious adverse events, such as anaphylaxis, are rare. Identification and management of these reactions have been extensively documented in the literature.[120,121,136]

Hypophosphataemia has been identified as one of the side effects of all types of IV iron preparations. This incidence appears to be linked to the molecules complexed to the iron rather than the iron itself.[60] Hypophosphataemia is more commonly observed with ferric carboxymaltose than with other formulations.[137-139] The rates of hypophosphataemia among various preparations are as follows: ferric carboxymaltose (58%), iron derisomaltose (4%) and iron sucrose (1%). However, the clinical importance of these rates has not been determined. Most cases involved are biochemically moderate (serum phosphate in the range 0.32–0.64 mmol/l) and asymptomatic, resolving without any intervention.[140,141] Nonetheless, due to the rare association with hypophosphataemic osteomalacia, the Medicines and Healthcare Products Regulatory Agency (United Kingdom) issued a recommendation in 2020 suggesting monitoring serum phosphate levels in patients with risk factors for hypophosphataemia. This recommendation also extends to those who receive prolonged or multiple high-dose infusions of ferric carboxymaltose.[142]

Skin staining due to iron deposition, also referred to as cutaneous siderosis or haemosiderin staining, is a rare side effect associated with IV iron infusions.[143] Siderosis is characterised by iron accumulation in various tissues, leading to brownish-grey skin discolouration. Skin discolouration or extravasation at the infusion site occurs in approximately 1.6% of cases.[144] There have been a

Table III: Pharmacokinetics parameters for some iron preparations[130]

Parameters	Sodium ferric gluconate	Iron sucrose	Ferric carboxymaltose	Iron dextran USP/BP	Ferumoxytol
Reactivity with transferrin	High	Medium	Low	Low	Low
Dosage used for the pharmacokinetics characteristics (mg Fe)	125[a]	100[b]	100/1 000[c]	500–2 000[d]	316[e]
terminal k_{el} — first-order rate constant for elimination (h^{-1})	0.488	0.145	0.094/0.074	0.024[d]	0.048
terminal $t_{1/2}$ — half-life (h)	1.42	5.3	7.4/9.4	27–30[f]	14.7
C_{max} — peak concentration (mg Fe/L)	20.6	35.3	37/331	-	130
AUC — area under the curve (mg Fe/L*h)	43.7	83.3	333/6 277	6,853[g]	2,912
CL — clearance (L/h)	2.99	1.23	0.26/0.16	-	0.11
V_c — Initial distribution volume (L)	2	3.2	2.7/2.1	3.0	2.3

[a] Study in iron deficient subjects[131]
[b] Study in healthy volunteers[132]
[c] Study in volunteers with mild iron deficiency anaemia[133]
[d] Study in iron deficient patients[134]
[e] Study in normal subjects and hemodialysis patients[135]
[f] Calculated from a study conducted by Henderson et al. (1969)[134]
[g] Calculated for a dose of 500 mg iron by using t1/2 (terminal kel) and Vd

limited number of reported skin staining associated with IV iron, primarily involving ferric carboxymaltose,[145-147] iron sucrose[148] and iron polymaltose infusions.[149-152] This adverse effect can be concerning for patients from an aesthetic standpoint and may cause emotional distress.

IV iron administration demonstrates no increase in adverse events leading to treatment discontinuation and no increase in mortality. Additionally, there was no increased risk of severe adverse events related to cardiovascular, respiratory, neurological, thromboembolic, constitutional or gastrointestinal effects with IV iron administration.[120]

Treatment duration and monitoring parameters

The treatment goal of IV iron is to increase haemoglobin levels by at least 2 g/dl within four to eight weeks.[153] It is recommended to conduct a follow-up assessment of haemoglobin and ferritin levels after at least four weeks following IV iron administration.[64] This four- to eight-week window also allows sufficient time for erythropoiesis and iron utilisation.[154] In cases of chronic ongoing blood loss, as seen in conditions such as hereditary abnormal uterine bleeding or haemorrhagic telangiectasia, more frequent follow-up appointments may be necessary to assess the treatment response and establish the appropriate dosing regimen.[64,154] If haemoglobin and iron status fail to return to normal range, it is essential to carefully identify the underlying causes of this lack of improvement.[155]

3.2.2 Blood transfusion for severe IDA

Red blood cell transfusion leads to an immediate and transient increase in haemoglobin levels, delivering around 200–250 mg of iron per blood unit.[78] However, red blood cell transfusion is not the recommended approach for treating IDA, except when urgent oxygen delivery elevation is needed, such as when patients have angina pectoris or cardiac failure, or when IDA is complicated by severe, ongoing acute bleeding.[118]

Patients with severe IDA, which is characterised by Hb levels below 7 g/dl, with symptoms of insufficient oxygen delivery (e.g., syncope, chest pain) are likely to gain benefit from transfusion. However, most patients with severe anaemia generally experience fatigue and do not require transfusion. If the decision is made to transfuse a patient for IDA, a single unit of red blood cells is often sufficient. Further increases in Hb can be facilitated through oral or intravenous iron.[156]

The Choosing Wisely campaigns, operating across different jurisdictions and medical specialties, have underscored the importance of restricting red blood cell transfusions. They encourage the selection of alternative therapeutic approaches when they are appropriate and accessible.[156-159] The risks linked to transfusion include transmitting infectious diseases, transfusion-associated lung injury, haemolytic transfusion reactions, cardiac overload due to transfusion, and alloimmunisation.[160] Red blood cell transfusion as a treatment option for patients with IDA is not only unfavourable from a diagnostic perspective but also in terms of cost-effectiveness.[160] Transfusions' financial and ethical implications can vary based on how they are calculated.[161] Healthcare professionals are advised to refrain from transfusing red blood cells for individuals with iron deficiency, regardless of their haemoglobin levels, unless there is a lack of haemodynamic stability.[156,162]

3.3 Non-pharmacological interventions

3.3.1 Dietary modification

Pharmacists can empower individuals to make informed dietary choices through their role in nutritional education in collaboration with dietitians.[163] The optimal approach to improving iron levels involves a combination of strategies such as introducing iron-rich foods into the diet, food fortification,[124,164] using "enhancers" to improve micronutrient absorption, avoiding substances that hinder micronutrient absorption ("inhibitors"), and harnessing beneficial food processing techniques.[124,163]

3.3.1.1 Iron-rich foods

Incorporating various iron-rich foods into the diet is essential, and it is equally important to consider how the body can effectively absorb iron from dietary sources.[165,166] It depends on the type of iron consumed from different food sources with different absorption levels in the body.[167,168]

Iron-rich foods encompass animal and plant sources.[124] Haem iron is the most common in daily diets and is present solely in animal-based products. It demonstrates a high bioavailability, approximately between 25% and 30%. On the other hand, non-haem iron, found in plant- and animal-based products, shows a bioavailability range of around 1% to 10%.[169,170] Incorporating haem iron derived from animal-based sources (particularly beef, lamb, pork and chicken) into non-haem iron meals will further enhance the overall bioavailability and absorption of iron from a meal.[171] Some foods containing haem iron and non-haem iron can be seen in Figure 8 and Figure 9, respectively.

Improving dietary diversity is important; however, the expense and accessibility of animal products and fruits and vegetables frequently constrain patients in their efforts to get more nutritious food.[124,164] It is essential for pharmacists to consider their patients' socio-economic conditions when advising an increase in the intake of iron-rich foods.

3.3.1.2 Food fortification

Food fortification refers to adding micronutrients to food and beverages, thereby enriching their nutritional content, using, for example, meal ingredients or condiments.[172] This can include using isolated iron compounds, such as iron salts or chelates, or ingredients naturally rich in iron, such as meat and its derivatives. The selection of these compounds is determined by the intended characteristics of the final product, such as taste and colour, and may be influenced by costs.[172] Iron is most commonly fortified in wheat and maize flour, infant formula and cereals.[164,173]

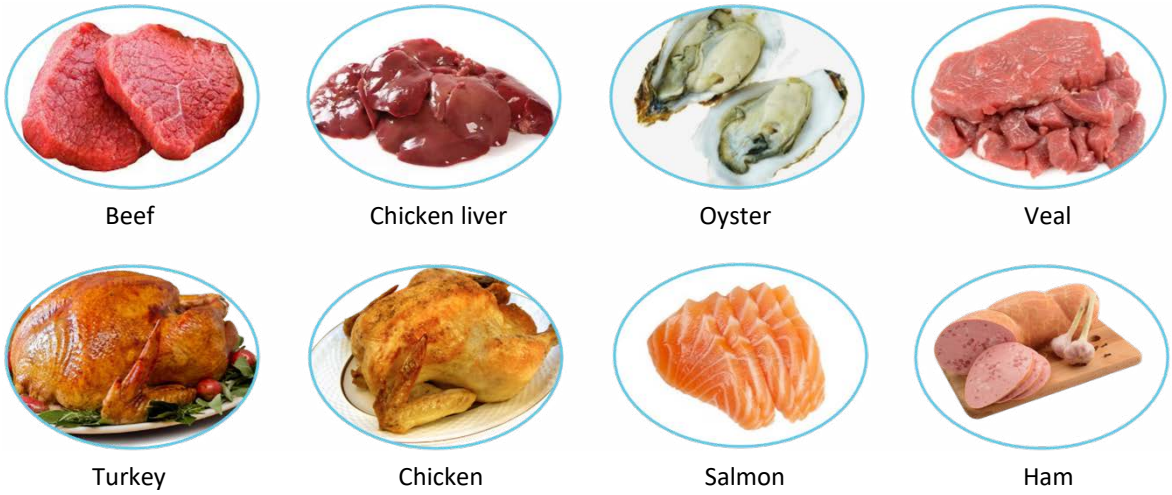

Figure 8: Foods containing haem iron

Figure 9: Food containing non-haem iron

According to the WHO, several iron compounds are used for fortification in food.[164] They are divided into three types based on their solubility properties, namely, freely soluble (usually the preferred option), poorly water-soluble but soluble in dilute acids, and water-insoluble and poorly soluble in dilute acids. These three types of iron compounds are as follows:

- **Iron compounds that are water-soluble** — Ferrous sulfate, ferrous gluconate, ferrous lactate and ferric ammonium citrate[166] are used to fortify products such as pasta, edible salt, flour and infant foods.[174] They can change the colour and taste of food products.[166]
- **Iron compounds that are poorly water-soluble but soluble in dilute acids** — Ferrous fumarate is commonly used to fortify infant cereals, and ferric saccharate is utilised in chocolate drink powders.[164] They induce fewer alterations in the taste and colour of the final product.[166]
- **Iron compounds that are water-insoluble and poorly soluble in dilute acids** — Ferric phosphate compounds, such as ferric orthophosphate and ferric pyrophosphate, are used to fortify rice, certain infant cereals and foods containing chocolate.[164] They have lower absorbability, but they do not affect the organoleptic characteristics of the food product, making them a viable choice.[166] They are also more cost-effective than the other types. However, they are generally considered a last-resort option, particularly when the target population's diet contains inhibiting factors for iron absorption.

Encapsulated forms of several iron compounds are readily available in the market. These include ferrous sulfate and ferrous fumarate, coated with hydrogenated oil, such as soybean, cottonseed or ethyl cellulose and Ferric Pyrophosphate coated with a lecithin layer.[164,166] The encapsulated coatings in iron compounds play a role in preventing oxidative damage, thereby mitigating sensory changes to fortified food products.[164] Encapsulation of micronised particles with a lecithin layer allows for endosomal absorption and better bioavailability without expected side effects.

3.3.1.3 Enhancing iron absorption

Adding "enhancers" such as citric acid, malic acid or vitamin C may enhance iron absorption from plant-based foods.[175] For example, consuming foods rich in vitamin C, such as citrus fruits,

strawberries and bell peppers, can enhance absorption of non-haem iron.

3.3.1.4 Avoiding iron inhibitors

Reducing the intake of certain foods and beverages, such as tea and coffee, which contain compounds that can hinder iron absorption, can be advantageous.[171] Moreover, the bioavailability of iron compounds is not solely determined by their solubility properties but is also influenced by dietary composition. This includes the proportion of iron-inhibiting factors in the diet, notably iron-binding phytates found in cereals and other staple foods like sorghum and pulses, as well as polyphenolic compounds in fruits and vegetables.[172]

3.3.1.5 Harnessing beneficial food processing techniques

Food processing methods, such as soaking, fermentation, germination and thermal or mechanical processes, can also improve iron bioavailability and absorption from non-animal sources.[176] For example, soaking and sprouting cereal and pulse grains results in a decrease in phytate content and an increase in iron absorption.

3.3.2 Lifestyle modification

Lifestyle modifications play a role in the comprehensive management and treatment of IDA. Patients are encouraged to adopt various general practices to improve their condition. Lifestyle recommendations that pharmacists can advise include:

- It is important patients follow recommendations from healthcare professionals regarding supplementation and dietary changes to manage their iron levels effectively.
- Patients can be encouraged to have a diet rich in iron-containing foods, such as lean meats, beans and dark leafy greens, and pair them with vitamin C-rich foods, such as citrus fruits, to enhance absorption. Limiting the consumption of substances inhibiting iron absorption, such as excessive tea or coffee, can also be beneficial.
- Staying well-hydrated aids in the optimal absorption of dietary iron.
- Regular health check-ups are important for monitoring iron status and overall well-being.
- Patients who regularly donate blood should remain vigilant by monitoring their iron levels and adhering to responsible blood donation guidelines to ensure it does not compromise their health.
- Treating the underlying cause is crucial in managing IDA. There could be a possibility where healthcare professionals recommend additional tests or treatment to address the root issue.

3.4 Supporting pharmacists' roles in IDA treatment and management

3.4.1 Patient counselling guide steps

Patient adherence and treatment compliance can enhance haematological indices in patients with IDA, which can be done through patient counselling over time.[177,178] Creating a comfortable and conducive environment for patient counselling is important as it fosters open engagement and understanding.[178]

Figure 10 illustrates patient counselling guide steps to optimise patient outcomes and improve patient adherence and treatment compliance.

3.4.1.1 Establishing open-ended communication[178]

Communication is a tool that is needed to establish a connection with the patient.[179] An open-ended communication can be established through the following:[178]

- Creating a safe communication environment by initiating an introduction as the attending healthcare provider.[178] To ensure effective communication, it is important to confirm the patient's preferred language and communicate using it. In cases of a language barrier, use an interpreter to facilitate the discussion.
- Obtaining patient's consent to continue the conversation and confirm if the patient has ever been diagnosed with IDA.

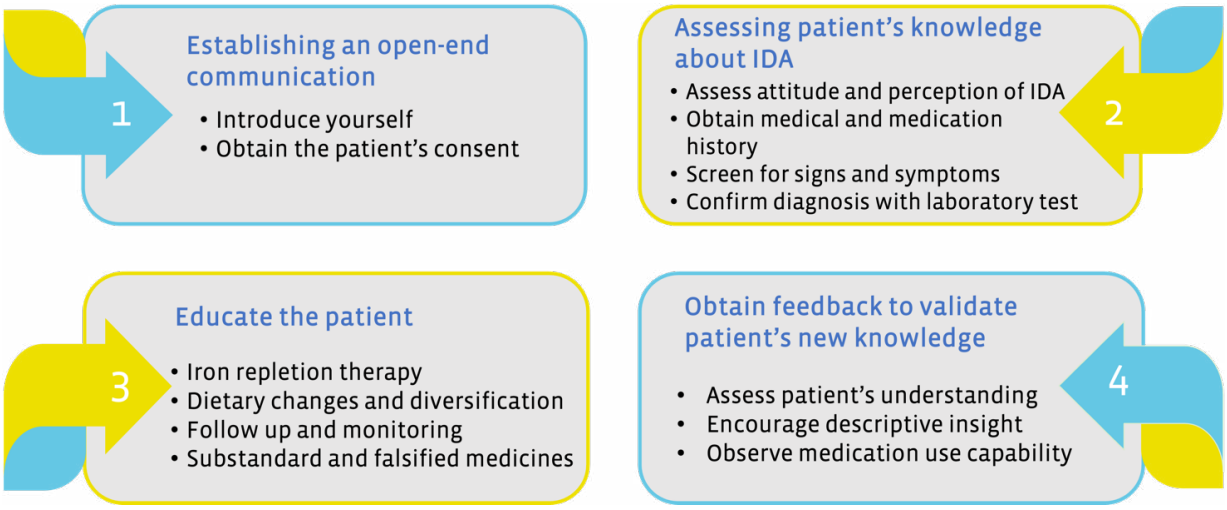

Figure 10: Patient counselling guide point

3.4.1.2 Assessing patient's knowledge about IDA[178]

Patients' health literacy is important as it links to medication adherence, and pharmacists are recommended to assess patients' knowledge about IDA.[180] Patients should be asked open-ended questions to evaluate their knowledge.[178]

1. **For patients not diagnosed with IDA, assess their knowledge by:[178]**
    a. Gathering their medical and medication histories, including their dietary habits and other risk factors (see Section 3.1.2: Medical and medication histories for details).
    b. Identifying their signs and symptoms, such as fatigue, pallor and shortness of breath (see Section 3.1.1: Signs and symptoms for details).
    c. Confirming IDA diagnosis through test results in collaboration with other healthcare professionals (see Section 3.1.3: Examination and investigation for details).
    d. Continue to the steps under point 2 (patient diagnosed with IDA) below.
2. **For patients diagnosed with IDA, to avoid misconception and promote adherence to medication, their knowledge should be assessed by:[178]**
    a. Understanding their attitude towards and perception of IDA. This is through acknowledging and confirming patients' symptoms and asking about their treatment goals so the approach will be patient-centred by building on their goals.
    b. Gathering their complete medication history, which relates to any prior health conditions they may have experienced.
    c. Providing them with non-pharmacological advice, which includes dietary change advice.

3.4.1.3 Educating patients[178]

Some points that could be considered in educating patients are as follows:

- **Iron repletion therapy —** Dosage, Results, Underlying issues, and General information (DRUG) method can be used to educate patients on iron repletion therapy and cover important aspects of medication counselling.[178]
    a. D (Dosage) — Ensure that patients know the proper dosage and administration instructions by directing them to the prescription information of specific iron therapy.
    b. R (Results) — Discuss that the treatment duration may extend up to six months, aligning with the time needed to improve clinical blood parameters during regular treatment. Additionally, explore the potential consequences of not adhering to the prescribed regimen.
    c. U (Underlying Issues) — Discuss all possible side effects and difficulties patients may experience with iron therapy. Also, discuss possible drug interactions that may affect the effectiveness of these treatments and potential gastrointestinal issues that patients may encounter, particularly with oral iron therapy. Patients can also be advised on how to manage or minimise side effects, such as by (i) drinking sufficient fluid if medically appropriate to minimise constipation; (ii) switching to every other day dosing or taking with food if intolerable gastrointestinal side effects; (iii) switching to formulation which has evidence for lower incidence of constipation due to incorporation of ingredient such as sorbitol[181]; and (iv) drinking water or chewing gum to possibly help reduce the metallic taste.
    d. G (General Information) — Broaden the discussion to encompass all aspects of blood health. Elaborate on how various micronutrients, including folic acid (particularly vital for expectant mothers), vitamin C, vitamins B_{12} and B_6, copper and manganese, play essential roles in maintaining overall blood health. Additionally, provide guidance on the correct usage and storage of medicines and ensure that patients are informed about whom to contact for any inquiries or concerns.
- **Dietary changes** — Dietary changes and food diversification can boost iron intake. Pharmacists play an important role in promoting healthy lifestyles and can educate patients on various food sources (see Section 3.3: Non-pharmacological).[43,178,182]
- **Follow up** — Appropriate therapy follow-up should also be communicated with patients. A 30-day follow-up is recommended to determine parameters such as haemoglobin, blood cell indices and iron status to assess treatment response. If therapy is continued, subsequent follow-ups at six-month intervals should be conducted to monitor response status.
- **Substandard and falsified medicines** — Substandard and falsified medicines cause harm to patients and affect all regions of the world.[183] Educating patients on the importance of getting medicines from registered pharmacy outlets and not from unregulated platforms online or illegal street markets is important.

3.4.1.4 Obtaining feedback to validate patients' new knowledge[178]

Pharmacists can do the following to obtain feedback from patients:

- **Assess patient's understanding —** Devote time to verify patients' understanding of IDA and lifestyle changes needed to manage their condition.[178]
- **Encourage descriptive insight —** Ask patients to describe how they will use the medicines that have been prescribed.[178] Leverage this opportunity to address any concerns or questions they might have.[178]

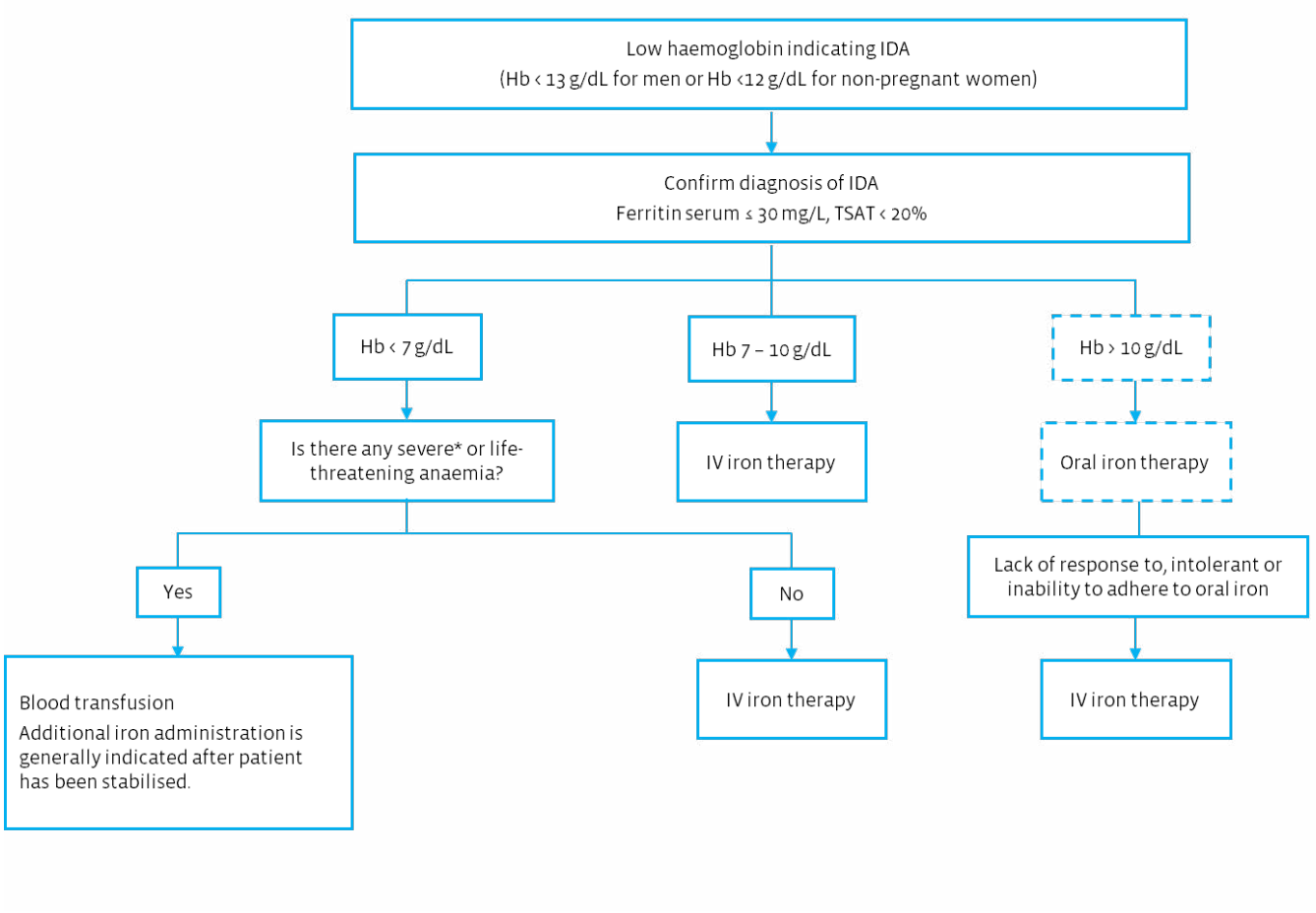

Figure 11: Treatment and management of IDA in adults[64, 77, 184-186]

- **Observe medicines use capability** Identify any potential barriers to adherence by observing the patient's attitude and providing more necessary information to address any concerns.[178]

Flowchart of IDA treatment and management in primary and secondary care settings

Early intervention of IDA enhances physical and mental well-being, reduces fatigue and cognitive impairment, alleviates other symptoms and complications and improves quality of life.[153] Collaborative approaches among health professionals are essential in effectively managing IDA. Figure 11 illustrates IDA treatment and management for adults in primary and secondary care settings.

References available on request.

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Stepping up: a pharmacist's role in managing diabetes and foot ulcers

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Abstract

Diabetes mellitus (DM) is a significant global health problem, with over 537 million adults affected in 2021. A crucial complication of DM is diabetic foot ulcers (DFUs), which result from nerve damage and impaired circulation, leading to loss of function and high medical costs. The role of pharmacists in managing diabetes and DFUs has evolved from strictly dispensing medication to being healthcare providers that are actively involved in patient education on glycaemic control, wound care strategies, and promotion of medication adherence. Treatment of DFUs is mainly focused on maintaining a moist wound environment, preventing infection and pressure offloading. This article highlights the essential role of pharmacists in a multidisciplinary healthcare team to enhance patient outcomes by applying their expertise to reduce diabetes-related complications such as DFUs.

Keywords: diabetes mellitus, diabetic foot ulcers, diabetic foot ulcer treatment, diabetes management, pharmacist interventions

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Diabetes mellitus: a global health concern

Diabetes mellitus (DM) is one of the leading non-communicable diseases and significantly contributes to early mortality and disability.[1,2] It has emerged as one of the most rapidly escalating global health crises of the 21st century, responsible for an estimated 6.7 million deaths in 2021. According to the International Diabetes Federation, there were approximately 537 million adults between the ages of 20 and 79 living with diabetes worldwide in 2021 (representing 1 in 10 people).[3] Projections indicate that by 2030, the number of individuals with diabetes will increase to 643 million, and by 2045, it will reach 784 million, translating to approximately 1 in 8 people.[3] This escalating trend has substantial economic repercussions globally due to increased healthcare costs and loss of productivity, with low- to middle-income countries bearing the greatest burden, as they house the majority of affected individuals.[1,3]

Diabetes is a chronic condition marked by either a lack of insulin, resistance to its effects, or a combination of both.[4] This disruption in insulin function leads to improper regulation of carbohydrate, fat, and protein metabolism, resulting in abnormally high blood glucose levels, often exceeding the normal range of 3.5–5.5 mmol/L.[1,4,5] Individuals living with diabetes often exhibit symptoms such as excessive urination (polyuria), increased thirst (polydipsia), increased appetite (polyphagia), and unintended weight loss.[6,7] The three primary categories of the disease are Type 1, Type 2 and gestational diabetes.[1,8]

Type 1 diabetes mellitus

Type 1 DM is defined by a significant or complete absence of insulin production, leading to elevated blood sugar levels due to an autoimmune attack on the insulin-producing beta cells of the pancreas.[4,8,9] While the precise cause remains unclear, it is believed to stem from a combination of genetic predisposition and environmental factors.[1,8] Previously known as juvenile-onset diabetes due to its diagnosis primarily in children and adolescents, there has been a noticeable rise in cases among adults as well.[7,10] Managing the condition requires daily insulin therapy to maintain blood glucose levels within a healthy range.[10] However, some individuals may not exhibit symptoms initially, leading to delays in diagnosis and an increased risk of complications.[11,12]

Type 2 diabetes mellitus

Type 2 DM is the most common form of the disease, accounting for approximately 90–95% of all diagnosed cases.[7,13] Individuals diagnosed with Type 2 DM experience insulin resistance, which can occur due to insufficient insulin production or the body's target cells failing to respond effectively to insulin.[4,14] Consequently, individuals with Type 2 DM experience chronically elevated blood glucose levels.[7] The symptoms of Type 2 DM are usually milder than Type 1 DM and develop more gradually, which often results in delayed diagnosis, as the symptoms may go unnoticed for several years.[5,7,15] Due to this slow progression, many Type 2 DM patients are already at an increased risk of microvascular and macrovascular complications by the time they are diagnosed.[7] While Type 2 DM is most frequently associated with adults, it is increasingly being observed in younger populations due to the rising incidence of childhood obesity, a major risk factor in the development of insulin resistance.[2,4] Additional risk factors include a sedentary lifestyle, advancing age, a history of gestational diabetes, and a strong genetic predisposition.[7] The cornerstone of managing Type 2 DM involves lifestyle modifications, such as adopting a healthy diet and regular physical activity to encourage weight loss, which is critical as obesity plays a significant role in insulin resistance.[16] If these measures fail to adequately control blood sugar levels, pharmacological interventions are introduced.[4,16]

Gestational diabetes mellitus

Gestational diabetes mellitus (GDM) is a form of diabetes that develops during pregnancy when blood glucose levels exceed the normal range but are not high enough to be classified as diabetes.[17] This can lead to complications for both the mother and baby during pregnancy and at delivery. While GDM typically resolves after childbirth,[1] it poses a heightened risk of Type 2 DM in the future for both the mother and her child.[4,17]

Considering that DM is a complex disease resulting from the interplay of various factors,[18] community pharmacists can significantly contribute to the care of patients living with diabetes by providing education on diabetes progression, medications, and lifestyle modifications, as well as monitoring glycaemic control.[19] Their involvement helps in the effective management of the condition and facilitates the early detection of potential complications, ultimately improving prognosis, quality of life, and reducing overall healthcare costs.[20,21]

Role of pharmacists in diabetes management

The role of community pharmacists in the management of diabetes has evolved from simply dispensing medication to actively managing and following up on patients.[22] Community pharmacists contribute to identifying medication-related issues and recommending modifications to treatment plans for doctors to consider.[22] Pharmacists manage diabetic patients through telephonic follow-ups, on-site visits, or management of patients from a central location.[23] Although a majority of these services exist within primary healthcare facilities, pharmacists can provide these services in a community or retail setting.[23] Pharmacist-led educational interventions in patients living with diabetes include self-management with an emphasis on healthy eating, exercise, self-monitoring, problem-solving, and reduction of risks such as smoking.[23,24] Importantly, pharmacist-led medication programmes have been demonstrated to be instrumental in the management of glycaemic control.[24]

In the treatment of diabetes, the primary goal for most patients should be to keep their HbA1c level at or below 7% and self-monitored plasma glucose, fasting or pre-prandial levels between 4–7 mmol/L and postprandial levels between 5–10 mmol/L.[25] In patients with a recent diagnosis, safely achieving an HbA1c level of 6.5% or lower can help prevent the onset of retinopathy, nephropathy and neuropathy.[25] However, for older patients and those with multiple health conditions, severe vascular issues, advanced chronic kidney disease, or frequent severe hypoglycaemia, an HbA1c range of 7.1–8.5% is considered appropriate.[25]

Insulin replacement therapy and continuous glucose monitoring (CGM) are typically recommended for individuals with Type 1 DM.[26] For GDM, lifestyle modifications and CGM are recommended prior to initiation of pharmacotherapy.[27] In isolated cases, insulin is provided to manage glycaemic control in individuals with GDM.[27] In addition to lifestyle modifications, metformin is recommended as the first-line treatment for Type 2 DM, except when contraindicated.[25,28] When combined with metformin most drugs for Type 2 DM are effective in the reduction of HbA1c levels. A summary of pharmacotherapy for Type 2 DM recommended in 2017 by the Society of Endocrinology, Metabolism and Diabetes of South Africa is shown in Table I. The clinical response to these drugs varies, with some patients exhibiting favourable outcomes and others demonstrating no therapeutic response.[25] Therefore, the optimal drug selection should be individualised in different Type 2 DM patients. Pharmacists are able to provide recommendations on patient-tailored treatment regimens based on dosing, potential adverse reactions, drug adherence, safety, efficacy, tolerability, and affordability.[23,29]

The use of pharmacotherapy and other interventions to maintain glycaemic control is important, as uncontrolled blood glucose levels can lead to complications over time. Therefore, in addition to assisting in optimising glycaemic control, pharmacist-led interventions can aid in the monitoring and reduction of complications associated with diabetes.[30] While monitoring of early signs of complications associated with diabetes is primarily the responsibility of physicians and specialists, pharmacists can advise patients to self-monitor and report any abnormalities.[31] When such abnormalities are reported, pharmacists could provide over-the-counter medication for symptomatic relief, and refer the patients to a specialist for a comprehensive examination.

Despite interventions aimed at optimising glycaemic control and monitoring of early symptoms, diabetic complications can still emerge due to the complexity of the disease, genetic factors and

Table I: Recommended pharmacotherapy options for Type 2 diabetes mellitus management in South Africa[25]

Therapy level	Preferred options	Alternative options	Notes
Monotherapy	Metformin XR	Gliclazide MR, DPP4i, SGLT2i, GLP-1a, Pioglitazone, Insulin	If HbA1c target is not reached, intensify to dual therapy.
Dual Therapy	Metformin XR + Gliclazide MR	Pioglitazone, SGLT2i, DPP4i, GLP-1a, Insulin	Consider dual therapy if HbA1c > 9% at diagnosis. Adjust based on response.
Triple Therapy	Metformin XR + Gliclazide MR + GLP-1a	SGLT2i, Insulin (basal), Pioglitazone, DPP4i	Add Insulin or GLP-1a in cases of inadequate control on dual therapy.
Complex Therapy	Metformin XR + basal insulin	GLP-1a or additional oral therapy	Insulin should be titrated and supported by education and CGM.

Metformin XR- extended-release metformin, Gliclazide MR- modified-release sulfonylurea, DPP4i- Dipeptidyl peptidase-4 inhibitor, SGLT2i- Sodium/glucose cotransporter-2 inhibitor, GLP-1a- Glucagon-like peptide-1 receptor agonist, CGM- continuous glucose monitoring.

associated comorbidities.[32] These complications often progress without noticeable symptoms until they reach a more advanced stage.[33] This highlights the necessity of continuous screening and vigilant care in preventing the impact of long-term complications associated with diabetes.

Complications associated with diabetes mellitus

Complications associated with DM can be categorised as either microvascular or macrovascular.[12,21] Microvascular complications affect small blood vessels and can result in conditions such as diabetic retinopathy, which may cause blindness, diabetic nephropathy, potentially leading to kidney failure, and diabetic neuropathy, which can cause nerve damage, leading to pain, loss of sensation, and a heightened risk of infections, particularly in the feet. In contrast, macrovascular complications impact larger blood vessels, significantly increasing the risk of cardiovascular diseases, such as coronary artery disease, which can lead to heart attacks, cerebrovascular disease, contributing to strokes, and peripheral artery disease, which can impair circulation to the limbs.[34] These complications cause considerable psychological and physical distress for both patients and caregivers, while also placing a substantial burden on healthcare systems.[20,21,34] Among these, peripheral neuropathy is one of the most common complications, with a lifetime prevalence of approximately 50% in people living with diabetes, making it a leading cause of disability due to foot ulceration and amputation.[35,36]

Diabetic foot ulcers (DFUs) and their relevance

Diabetic foot ulcers (DFUs) are among the most severe and costly complications of diabetes. They are primarily caused by neuropathy and ischaemia resulting from angiopathy and hyperglycaemia-induced metabolic changes.[37,38] Peripheral neuropathy, which affects approximately 50% of people living with diabetes, leads to a loss of sensation in the extremities, making patients unaware of minor injuries caused by pressure, bruises, or cuts. These injuries can progress into poorly healing ulcers.[39-41] Additionally, vascular changes can disrupt circulation to the sole of the foot, increasing the risk of developing peripheral arterial disease (PAD), which is marked by narrowing or blockage of lower-limb arteries.[42,43] Microbial infections can further complicate DFUs, ranging from mild cellulitis to severe gangrene, which may necessitate amputation.[44]

These DFUs significantly reduce patients' quality of life and are costly to treat if not managed promptly and effectively.[20,21] To minimise costs and improve patient outcomes, including efficient wound healing and closure, it is crucial to manage DFUs promptly through comprehensive assessment and a timely multidisciplinary treatment approach.[45,46]

Therapeutic management of DFUs

Pharmacists are ideally placed to recommend effective pharmacotherapy for DFUs. They can offer guidance on antibiotic use in line with clinical guidelines and support patients with medication adherence and foot inspections. Additionally, they can advise on suitable dressings and topical treatments, ensuring that both diabetes management and ulcer care are properly addressed.[47] Management strategies for wound care in DFUs should involve maintenance of a moist wound environment, infection control, debridement of devitalised tissue, wound area pressure relief and regular follow-up monitoring.[45,48,49]

Table II: A guide to dressing choice for moisture control in wounds

Dressing type	Moisture control	Characteristics and advantages
Alginate[51,53-56]	Heavily exuding wounds	• Capable of absorbing up to 20 times their weight in fluid • Form a gel-like substance when in contact with exudate • Can be used on infected wounds (antimicrobial alginate formulations are available)
Hydro-conductive[51,57,58]	Heavily exuding wounds	• Draws exudate away from the wound surface • Removes toxic components such as slough, wound debris and bacteria that compromise wound healing • Suitable for chronic wounds
Foam[51,59-61]	Moderately to heavily exuding wounds	• Highly absorbent, waterproof, non-adherent and non-occlusive • Can be used under compression • Can be used in infected wounds if combined with antimicrobial agents as they are impermeable to bacteria
Hydrocolloids[51,62-65]	Low to moderately exuding wounds	• Create a gel-like environment upon contact with wound exudate, establishing a moist wound interface • De-slough necrotic wounds • Not recommended for infected wounds
Gauze[51,60]	Low to moderately exuding wounds	• Comes in woven and non-woven forms, can be impregnated with various products, such as petrolatum, iodides, and antimicrobials • Woven form not recommended as a primary dressing (fibres can dry out and stick to wound bed) • Can be used on draining, necrotic, and infected wounds, wounds requiring debridement or packing, wounds with tunnels, tracts, or dead space • Inexpensive and easily accessible
Hydrogel[51,53,62]	Dry low exuding wounds	• Rehydrate the wound bed and reduce pain • Promote autolytic debridement • Can be used with topical medications on infected wounds • Does not damage granulation tissue

Wound moisture balance

The maintenance of moisture balance is essential for successful wound healing. This can be achieved by using appropriate dressings, which should be selected based on the specific characteristics of the wound. The ideal dressing should create a moist environment, absorb excess exudate, prevent maceration of surrounding tissue and form a protective barrier to exclude bacteria.[45,50,51] The choice of dressing can significantly impact wound healing by promoting or hindering the process. Table II offers a brief summary of dressings available for moisture control in wounds. A detailed description of these dressings can be found in other published works by the authors.[45,51,52]

Infection control

DFUs are often secondarily infected by staphylococci, streptococci, coliforms, and anaerobic bacteria, leading to complications such as cellulitis, abscesses, gangrene and osteomyelitis.[28] Pharmacists play a vital role in managing diabetic foot infections (DFIs) by recommending appropriate pharmacotherapy, providing direction for antibiotic use in accordance with clinical guidelines, and supporting patients with medication adherence. In addition, they assist with wound care by recommending suitable dressings and topical treatments. Table III provides a summary of antimicrobial agents available as dressings or topical treatments which are recommended for infected DFUs. A more detailed description of these dressings can be found in previously published work by the authors.[51]

To effectively assess infection severity, pharmacists must be able to recognise key signs such as purulence, warmth, erythema, swelling, tenderness, and systemic symptoms like fever or chills. Superficial wound infections can be treated with topical antimicrobials, however, once cellulitis is present systemic antibiotics will be required.[49] According to the South African Standard Treatment Guidelines (STGs) and Essential Medicines List (EML), amoxicillin/clavulanic acid is recommended as the first-line systemic treatment for DFUs.[28]

Wounds which are necrotic or severely infected with biofilm formation may require debridement. This can be achieved by surgical, hydrosurgical, sharp, mechanical, autolytic techniques or maggot therapy. Debridement may also be used to eliminate eschar, surface layers, damaged matrix and thick calluses surrounding the ulcers.[45,49-52] The pharmacist may advise the patient to consult their doctor or wound care specialist to debride the wound or may be required to dispense dressings which facilitate debridement in order to aid healing processes.

Pressure offloading

Offloading is a crucial component in the management of DFUs, as it helps reduce pressure on the affected area, promoting healing and preventing further complications.[75] Pharmacists can assess the patient's specific needs and recommend appropriate offloading devices based on the ulcer's location and severity. When treating DFUs with poor circulation around the ulcer, compression stockings or pressure bandages should be used alongside appropriate wound dressings.[76] Additionally, off-loading strategies must be implemented to reduce abnormal pressure. Offloading can be achieved through various methods, such as total contact casting (considered the gold standard), shoe modifications, the use of insoles or sponge devices, wedge-sole shoes, moonboots, or crutches. Ensuring proper footwear size and seamless hosiery is also important for DFU prevention.[45,49]

Advanced wound care

The management of DFUs has evolved with the introduction of newer therapies such as negative-pressure wound therapy (NPWT), hyperbaric oxygen therapy (HBOT), topical growth factors, bioengineered skin equivalents, adipose tissue-derived stem cells, bone marrow-derived stem cells, and platelet-rich

Table III: Antimicrobial agents recommended for diabetic foot ulcers

Antimicrobial agent	Characteristics	Benefits
Silver dressings[51,66,67]	Contain ionic silver for immediate and controlled release to inhibit pathogen growth, especially of antibiotic-resistant strains.	• Available in various formulations: transparent film, hydrocolloids, hydrogels, foams, alginates, hydrofibers, and composites • Cost-effective • Creates moist wound dressing interface
Iodine[51,66,68]	Povidone iodine ointment/impregnated sheet or as a cadexomer iodine paste/flat sheet which has broad spectrum antimicrobial activity.	• Highly effective against bacterial, protozoal and fungal infections • Removes biofilm • Promotes autolytic debridement
Honey[51,53,69,70]	Biological wound dressings containing honey with broad spectrum antimicrobial activity and multiple bioactive properties that work together to accelerate the healing process.	• Reduce wound odour • Autolytic debridement properties • Moist wound healing interface
Polyhexamethylene biguanide (PHMB)[51,71-73]	Dressings infused with the antiseptic agent PHMB, available in gel disks or foam form, effective against both bacterial and fungal infections	• Have a sustained effect • Effective against drug resistant wound pathogens
Chlorhexidine[51,74]	Paraffin tulle coated with chlorhexidine antiseptic agent effective against a broad range of gram positive and negative bacteria	• Can be used on small, superficial moderately infected wounds

plasma.[52,75] While these treatments show promise in enhancing healing outcomes, a significant portion of the data comes from small randomised controlled trials and require further research to establish standardised protocols and clarify their long-term efficacy and safety profiles.[75]

Collaborative care approach

An interprofessional team approach, involving the patient, wound care specialists, and various healthcare providers, typically leads to the best outcomes for managing DFUs.[45,77] Successful multidisciplinary teams, particularly those addressing glycaemic control, wound management, vascular disease, and infection, are linked to a reduced risk of major amputations in patients with severe DFUs.[78] Continuous monitoring and regular reassessment of the patient and the ulcer are essential to adjust treatment as needed. Prompt referrals and clear communication within the team help prevent complications, and ongoing follow-up after healing is crucial to prevent recurrence of the ulcer.[45] The role of a community pharmacist within a multidisciplinary team for treating DFUs is multifaceted, encompassing screening, medication management, patient education, interprofessional collaboration, monitoring, and community outreach.[20,79] By leveraging their expertise, pharmacists contribute significantly to improving patient outcomes and reducing the risk of complications associated with DFUs. Their involvement not only enhances the quality of care but also supports the overall goal of minimising amputations and improving the quality of life for individuals living with diabetes.[80,81]

Conclusion

Pharmacists are key players in the multidisciplinary management of diabetes and its associated complications such as DFUs. The pharmacist's role has expanded from dispensing medications to actively managing patient care and providing ongoing follow-up. In addition to ensuring the safe use of medications, they can offer screening services, counsel patients on the importance of blood sugar control, advise on lifestyle modifications, and explain risk factors associated with DFUs.[19] The pharmacist's role within the multidisciplinary healthcare team is essential and should not be underestimated. Thus, it is essential for pharmacists to continuously educate themselves on the disease and its related complications to ensure they deliver the highest quality care to patients.

Conflict of interest

The authors have no conflict of interest to declare.

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The evolution of vaccines: global and African perspectives in the pharmaceutical industry

Dr Prosper Hiag
FIP Vice-President

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Introduction

One of the greatest contributions to public health has been the development of vaccines, which provide immunity to infectious diseases and save millions of lives every year. The development, manufacturing, and distribution of vaccinations have been greatly aided by the global pharmaceutical industry. The environment of the sector has clearly changed in the last few years, particularly with regard to Africa. With an emphasis on the function of the International Pharmaceutical Federation (FIP), this article examines the perspectives that are emerging in the pharmaceutical industries in Africa and around the world.

1. The global pharmaceutical industry: a changing landscape

Major companies in North America, Europe, and Asia have long held a dominant position in the global pharmaceutical sector. In the African continent, Northern Part of Africa (Morocco, Algeria, Tunisia), sub-Saharan Africa (a part of South Africa) have improved in access to health insurance, well-organised health systems and well-established pharmaceutical industries; Recent patterns, however, point to a more inclusive and diverse environment.

The COVID-19 pandemic accelerated the need for rapid vaccine development and distribution, highlighting the importance of global collaboration and the potential of emerging markets and the pivotal role of vaccines, particularly in preventing COVID-19 infections.

2. Innovations and technological advances

One of the most notable changes in the global pharmaceutical industry is the rapid advancement in vaccine technology. mRNA vaccines, developed by companies like Pfizer-BioNTech and Moderna, have revolutionised vaccine development. The success of mRNA vaccines during the COVID-19 pandemic has spurred further research into their potential applications, including vaccines for other infectious diseases and cancer.

3. Global collaboration and equity

The pandemic also underscored the need for global cooperation to ensure equitable access to vaccines. Initiatives like COVAX, co-led by Gavi, the Vaccine Alliance, the World Health Organization (WHO), and the Coalition for Epidemic Preparedness Innovations (CEPI), have aimed to provide fair access to COVID-19 vaccines for all countries, regardless of income. While challenges remain, such as supply chain issues, sub-standard medicines, medicines costs and vaccine hesitancy, these efforts have highlighted the importance of solidarity and shared responsibility in global health.

4. The African pharmaceutical industry: a growing force

Previously, rather than manufacturing vaccines, Africa was simply a beneficiary of them. However, this dynamic is changing as African countries invest in developing their pharmaceutical industries. This shift is driven by the recognition that self-sufficiency in vaccine production is crucial for public health security and economic growth.

Another initiative is the African Vaccine Manufacturing Accelerator (AVMA), a high-level event co-hosted in Paris by the Government of France, the African Union, and Gavi, the Vaccine Alliance, along with the support of Team Europe. This initiative will provide a finance mechanism established to make up to US$ 1.2 billion available over ten years commencing with AVMA's launch in June 2024 to accelerate the expansion of commercially viable vaccine manufacturing in Africa.

5. Building capacity and infrastructure

Several African nations have made significant strides in building the necessary infrastructure for vaccine production. South Africa, Algeria, Morocco, Egypt, and Senegal are emerging as key players in this space. For example, South Africa's Biovac Institute is collaborating with international partners to produce COVID-19 vaccines locally. These efforts are part of a broader trend to reduce reliance on imports and strengthen the continent's ability to respond to health emergencies.

6. Partnerships and technology transfer

Collaboration with global pharmaceutical companies and international organisations has been essential in developing Africa's vaccine production capacity. Technology transfer agreements, joint ventures, and partnerships have enabled African countries to acquire the expertise and technology needed to manufacture vaccines. The African Union and the Africa Centers for Disease Control and Prevention (Africa CDC) have been instrumental in facilitating these collaborations and advocating for increased investment in the continent's pharmaceutical sector.

7. *The role of the International Pharmaceutical Federation (FIP)*

The FIP is a global organisation representing pharmacists, pharmaceutical scientists, and pharmaceutical educators. FIP plays a crucial role in shaping the pharmaceutical industry's future by promoting best practices, supporting research and innovation, and advocating for policies that improve public health.

The FIP Development Goals supporting vaccination programme worldwide are:

8. *FIP's efforts in vaccine advocacy and education*

FIP has been active in promoting the importance of vaccines and supporting pharmacists' role in vaccination. Pharmacists are increasingly recognised as key players in the vaccine delivery chain, providing access to vaccines and educating the public about their benefits. FIP has developed guidelines and resources to support pharmacists in these roles, helping to improve vaccine coverage and combat misinformation. Some of the programmes and activities are highlighted below:

- Transforming Vaccination Globally, Regionally, Nationally: Accelerating equity, access and sustainability through policy development and implementation. https://transformingvaccination.fip.org/
- FIP's vaccine equity programme centred around advancing vaccine equity and life-course immunisation. https://equityrx.fip.org/vaccine-equity
- The FIP vaccination reference guide. https://www.fip.org/file/5158
- The FIP Global Roadmap 2030: Sustainable advancement for pharmacy worldwide. https://developmentgoals.fip.org/globalroadmap2030/

9. *Global partnerships and collaboration*

FIP collaborates with various international organisations, including the WHO, to advance global health initiatives. Through these partnerships, FIP advocates for policies that enhance vaccine access and equity. The organisation also emphasises the importance of research and innovation in developing new vaccines and improving existing ones.

Conclusion

The global and African pharmaceutical industries are undergoing significant transformations, with new perspectives emerging on vaccine development, production, and distribution. The rapid advancement of vaccine technology, increased global collaboration, and the growing capacity of African countries to produce vaccines are reshaping the industry's landscape. The FIP continues to play a vital role in advocating for vaccines and supporting the pharmaceutical community in addressing public health challenges. As the world faces ongoing and emerging health threats, the importance of vaccines and the pharmaceutical industry's role in safeguarding global health cannot be overstated.

Where to from here?

Nhlanhla G Mafarafara
President, SAAHIP

"A dream is not a dream unless dreamed by the entire village." This is the reflection of a 12-year-old Japanese girl after her family lost all they had after the 1945 fire-bombing. This left her family devastated, homeless, and begging for food while pushing the little belongings they had on a wheelbarrow. She and her mother began "dreaming" together of a new "reality." She went on to form new connections and new friends and attracted recognition for her activist role.

I invite you today, as a hospital pharmacist, to dream with us. Following the FIP World Congress held from 1-4 September 2024 in Cape Town, South Africa is left with a high-level call to action that can only be fulfilled by a national dream towards realising quality, accessible, patient-centred pharmaceutical services for all. My first call of action for all of you is "Where are you in relation to current practice, norms of standards, and innovations?"

Reflections from FIP

There are five things I would like us to reflect on in the context of South Africa.

FIP's Priority Actions

The FIP has identified 12 priority work programmes that are to be carried out throughout the international pharmacy community (see Figure 1). These priority programmes are relevant to South Africa. As a nation, association, and institutions in different locations, identifying with these means we are proactively engaging in finding relevant solutions from a universal perspective and applying them in our unique situations. The aim is to achieve equitable health, which requires that there be consensus from governors, researchers, policymakers, pharmaceutical educators, statutory councils, practice managers, and practitioners. South Africa is a fertile ground that is seen with forward-thinking solutions that are already in place, although at times applied on one side of the sector.

Achieving equitable access to healthcare in South Africa

Nhlanhla G Mafarafara

The COVID-19 pandemic has taught us three things: the need to improve access to vaccines for the African continent, efficiency in the medicines and vaccines supply chain, and access to financing for health. Over the past five years, South Africa has experienced budget cuts and a shortage of human resources for health, which is a hard blow for pharmacy as well as increasing inequality. Learning from this experience as well as other factors, the Minister of Health, Dr Aaron Motsoaledi, in his address to the congress, raised five critical issues that must be considered to deal with to improve healthcare:

A. Addressing health inequalities across the world. Some countries have cutting-edge innovations and advanced systems, while other countries grapple to provide basic healthcare services.

B. The urgency of transforming health. This includes strengthening the supply chain, improving health infrastructure, and addressing human resource constraints. The conceptual framework ought to be redesigned and realigned to current and future needs.

C. Embracing innovations and technology to transform service delivery processes and improve efficiency and decision-making and tackling antimicrobial resistance, medicine shortage, and substandard medicines.

D. Investing in sustainable and equitable financing for health to protect human rights.

E. Making advancements in the commitment to public health.

These actionable steps cannot happen with pharmacists standing by the fence spectating in the gallery of decision-making. Pharmacists are

Figure 1: FIP Priority Work program. Presented by the FIP President, Paul Sinclair during the FIP World Congress held in Cape Town from 1-4 September 2024

key stakeholders and drivers of change. In the space of pharmaceutical service delivery, these five considerations should be discussed across all levels in such a way that each of us finds a unique space for contribution within the value chain.

Transformation in the role of pharmacists

South Africa has a vision to have long and healthy lives for all. According to Statistics South Africa, the life expectancy is 63.6 years for males and 69.2 years for females. The infant mortality rate is 22.9/1 000 live births. The HIV prevalence is estimated to be approximately 12.7% with over 8 million South Africans living with HIV.

This is but to paint a picture of public health challenges with economic impact. Other problems such as antimicrobial resistance, non-communicable diseases, and vaccine-preventable diseases need to be brought under control. Pharmacists also play a critical role in dealing with pandemics and outbreaks. We also have an opportunity to participate in addressing climate change and global warming. The impact of pharmaceuticals (manufacturing, packaging, and waste disposal) is among the areas in which pharmacists can actively engage policymakers as a contribution to a safe planet.

The future of pharmacists is continuously improving as the roles evolve and expand. During the FIP, other areas where pharmacists should lead or are leading are self-care, family planning, disease prevention, wellness programs including holistic health, health promotion and education, quality assurance, chronic disease management, pharmacovigilance and causality assessments post adverse drug reactions (ADRs), medication adherence, antimicrobial stewardship, clinical pharmacy services, medication use reviews, disaster management and more. The space is limitless.

How far have you applied yourself as a pharmacist? In her address to the congress, the Executive Director of the PSSA, Refiloe Mogale, invited pharmacists to, among other things, optimise medicine use, collaborate with other healthcare providers, advocate for the expansion of the role of pharmacists, support research and adoption of innovative technologies, educate the public about the role of pharmacists and the benefits they offer and ensuring efficient procurement and distribution. In her words, she said, "When you put a pharmacist in a room, they will change the setup of that room".

As hospital pharmacists, we have been provided a great tool in the Basel Statements to think broadly about how to improve the role of pharmacists in hospitals. The tool covers a wide range of services and areas to work, advocate, research, and teach. Find your special corner and make it bright.

Achieving Universal Health Coverage

The goal of achieving universal health coverage is possible. It will, however, require that collectively, we must see the whole picture of health, address health technologies, develop a robust primary health care (PHC) centred approach, "look closely at how we work together to serve the patient and ensure continuity in planning", (Dr Nicholas Crisp) and make advancement in Artificial Intelligence (AI). When considering AI as a tool to integrate into evidence-based medicines, pharmacists should also strive to address the ethical challenges that come with it as well as the future impact in advanced practice and efficiency in delivering care. This should be the starting point.

Where to from here?

We should all endeavour to find an answer to this question. My invitation to you is threefold: Participate, Collaborate, and Innovate.

- Participate in all the dialogues and conversations that affect and influence pharmacy. There must be no conversation about pharmacy or medicines where a pharmacist is not involved. Not just as participants, but as drivers of change.
- Advancement in pharmaceutical care cannot be achieved by working in silos. We should all strive to join forces with other healthcare professionals to build bigger and more scalable solutions for pharmacies in South Africa. The days of representing pharmacy in isolation have led us to a weakened front. A cord of three strands is not easily broken.
- What was, what is and what will be is a result of men and women seeking better ways of doing things. There will always be a better way to do what we are doing. Such ways must be sought, pursued, studied, and implemented. We should not defend discomfort. Our pursuit is that of a better world, better healthcare, and better pharmaceutical services, together.

Success story of young pharmacists

Success story of young pharmacists

These success stories are hosted by Mr Kesentseng Jackson Mahlaba, who is a pharmacist and a lecturer. He is a health advocate in vaccine hesitancy, medicine management and rational medicines use in order to improve access to and adherence to medicines by patients and communities at large. He is the current Chairperson of the North Gauteng branch of the South African Association of Hospital and Institutional Pharmacists and a scientific advisor to the South African Vaccination and Immunisation Centre at Sefako Makgatho Health Sciences University.

If you want to be hosted to share your success story as a vibrant young pharmacist who has less than 5 years' experience post their internship, please email Kesentseng at kesentseng.mahlaba@smu.ac.za.

Meet Ntandoyakhe Nxumalo

1. **Introduce yourself to the readers of SAPJ so that they have a broader understanding of your journey to this point.**

   My name is Ntandoyakhe Nxumalo. I'm a young clinical pharmacist with a very special interest in HIV medicine management, aiming to establish antiretroviral stewardship programs. As you would know as pharmacists that we've got antibiotic stewardship; now, we're trying to establish a very broad structure of antiretroviral stewardship programs. My other passion lies in paediatric patients.

2. **Where did you study pharmacy, and what made you choose pharmacy as a career choice?**

   I did my undergrad pharmacy degree at Sefako Makgatho Health Sciences University (SMU). It was during my final year when I realised I wanted to know and to do more incorporating, more direct patient contact. So, I then thought clinical pharmacy was my go-to. I then did my master's degree at SMU.

   From a very young age, everyone back home knew that I had this big desire to save lives. And I think the best way I saw I could go about this was through the use of medicine. So then I thought to myself, you know what, my journey will begin with a pharmacy degree. I truly feel fortunate as a pharmacist to be the first point of reference for many people who need healthcare services.

3. **Most, if not all students, experience obstacles during their study period. What were some of those obstacles for you and how did you go about overcoming them?**

   SMU is a very good institution to be in and it is mostly inclusive for all. On a personal side, members of the LGBTI community at times fell short with regard to inclusivity e.g. having structures in place that catered for vulnerable students and populations within the campus. Academically, I think one of the biggest obstacles that I came across during my undergraduate studies was the workload we were faced with, especially in my first year.

   Later, during my academic internship, I found it very difficult to manoeuvre pharmaceutics and for obvious reasons, of course (laughs). This subject was not my strongest point, but I thought to myself, I am a smart candidate and I knew I could progress well with more effort.

4. **If you could highlight one thing that kept you motivated during your studies, what would it be and why?**

   I think it's my passion for the pharmacy profession, it's when I get to provide pharmaceutical care as a clinical pharmacist at a patient's bedside. It is when I intervene to aid vulnerable and dependent patients to a point where they get to walk out of the hospital to their families, healthier and alive. There is truly nothing that drives and pushes my passion more than that.

5. **They say: If you want to go fast, go alone but if you want to go far, go together. During your time at university, who were some of the people who "walked with you" to get you to the point of graduation?**

   My first support was my family, particularly my mother and siblings. Secondly, getting to the point of graduation was heavily attributed to the financial support (bursary) I received from a programme that offered healthcare course tuition. This particular funder also allocated mentors who can relate and understand challenges of university life for all the students who were awarded the bursary. I was privileged to be able to sit with my mentor on a regular basis. Personally, I think that having mentor support is what assisted me throughout my studies. More so due to my background where no one has ever gone to university at home,

mostly they could not relate to challenges I would face from time to time.

6. **Where is your other support structure (fellow BPharm undergrad classmates)?**

   WOW! It is exciting to know that so many of my friends are spread out in all sectors of pharmacy. Other are regulatory pharmacists while others are industrial pharmacists. Some are in pharmacy practice (retail) and unsurprisingly! others are in management positions.

7. **Coming from an academic environment, how did you experience internship at first and were you able to see how the BPharm degree prepared you for the practice setting?**

   What a wonderful journey! from exposure to teaching, assessing and research work. I must say, research at master's level evoked a passion in me, I did not know was there. I'm a researcher at heart! Then there was a team that received me when I started my internship, a team of people who held my hand and walked the journey with me. At that time, they were seeing potential in me I did not see, I can safely say I am this person today thanks to them and I strongly believe that I can do what they did for me for the next person.

   My undergraduate was very well structured, exposing me to practice-based learning in all sectors of pharmacy. This exposure aimed to develop employer-ready candidates, hence I believe I can thrive in any industry of pharmacy. It's a pity where I am now, I find it very homey, I do not see me leaving academia.

8. **Since completion of internship, how did you advance through the pharmacy profession to this point? What posts and positions followed?**

   After graduating with my master's degree in clinical pharmacy, I went and did my community service in retail pharmacy in a rural community in the Northwest during the COVID-19 pandemic. I was fortunate to be chosen to be one of the champions in my area. Due to the high number of COVID-19 vaccinations we were doing, I ended up enrolling for an immunisation techniques course. Post my community service, I was employed in a private sector hospital where I was exposed more to clinical pharmacy practice. I then moved to a big hospital in the Eastern Cape where I worked as a clinical pharmacist fully looking after four ICUs, and general wards. It was during this time where I saw myself bringing change in my work space. What an exciting and fulfilling time in my life.

   Currently, I work for SMU as a lecturer in the School of Medicine where I teach pharmacology to most courses e.g. medicine, nursing, physiotherapy, dietitian, dentistry, oral hygiene, dental therapy. But excitingly! I am moving to the School of Pharmacy soon, where I'll be working in the Department of Clinical Pharmacy, where I will be teaching and training undergraduate and postgraduate students.

   During your employment in a hospital setting where you worked as a clinical pharmacist, how did you find interprofessional collaborative practice?

   In practice, a lot of healthcare professionals in most instances work independently and/or are territorial. I would not be confrontational under these circumstances but share my knowledge. What is most unfortunate is that patients are the ones who get compromised.

   What can be done to improve it?

   Now currently, in my career as a lecturer, I've been involved in Interprofessional Education and Collaborative Practice (IPECP). This programme brings collaborative teamwork among health sciences students in tertiary institutions where each discipline intervenes to a case presented in order to improve patient morbidity. Remember! we all can learn from one another as healthcare professionals. This programme aims to ensure that young graduates start their careers appreciating working in a collaborative team. I was privileged in the past while at SMU to be part of the team that worked on the IPECP programs with the University of KwaZulu-Natal.

9. **How do your current daily duties and responsibilities compare to what you envisioned a pharmacist doing when you selected pharmacy as a career path?**

   At the beginning of my pharmacy journey, I used to see myself at the dispensary window dispensing medication to patients. This idea of a pharmacist quickly faded as I progressed in my undergrad when I realised that there is more to pharmacy.

   My duties currently, even though I'm not at the patient's bedside, play a vital role in preparing future healthcare professionals, ensuring that future generation of healthcare professionals would be well knowledgeable to give their best in practice.

10. **How would you define "success"?**

    WOW!!! In short, success is an internal thing based on individuals' preferences, it is a state of mind. What I can say now, is that I'm not yet successful. I wake up every day and I say to myself, I can do more, have the potential to do more and I will fight to be more.

11. **How does your definition of success align or differ from the world's or South Africa's perception of success?**

    Mh!!! I study, I qualify, I work and buy a car and a house and I wait for retirement, that is it. That's how people define success. I define my success with my career, I simply want to be more.

12. **Tell us what makes your story a success story, from which readers can tap inspiration from.**

    Your background can never define you, if I look at where I come from (disadvantaged rural background with a single parent), an environment that constantly tries to tell you that you will not amount to anything in life! I am not there yet, but have done better for myself. Let me put it into context, my high school did not have a microscope, during biology class we only saw a cell

drawn on a chalkboard and have our teacher define it in IsiZulu, you can imagine what this did to my transitioning to varsity life. I never knew that there was someone called a lecturer during my early childhood years, but hey, look at me now!

13. Which elements do you think one needs to impact your environment, whether your community, profession, or workplace? Do you believe you have made an impact in pharmacy to date?

I think the most important thing that we do not do is going back to where we come from to engage and support our communities. We need to also support young, vulnerable pharmacists, provide platforms for them to showcase their skills/capabilities and award them proper recognition. This is how I see us growing and being united as pharmacists.

I have tried to make an impact in line with what I just said above. I attend the SAPSF conference (I was once an executive committee member) annually ,where I get to paint an actual realistic picture to students attending of what they're going to see out in practice. Further, I prepare clinical skills competition using real life cases not of treating hypertension independently but treating it while considering comorbidities. The aim is to ensure that students understand how to approach internship onwards and have access to mentors.

14. What is the ONE thing every reader can contribute to make pharmacy a better profession or more valued by our patients?

Always ensure that every environment you find yourself in, when you walk out, people need to know better and do better. It lies with continuous training. You pharmacists need to put in more clinical hours!

15. How would you like to be remembered one day?

As the one who touched people's lives more than anything, regardless of who or where they are in life. I want you to be remembered as the man who made a difference in people's lives.

News

Pharmacy month

Edenvale Regional Hospital Pharmacy initiated a week-long campaign during Pharmacy Month in order to put the spotlight on the pharmacy profession and show our patients and staff our role in quality healthcare provision.

The theme for this year was:

As Pharmacy Month is meant to focus on the pharmacy profession and

show our patients and staff what we are able to offer, we implemented the following initiatives to create awareness:

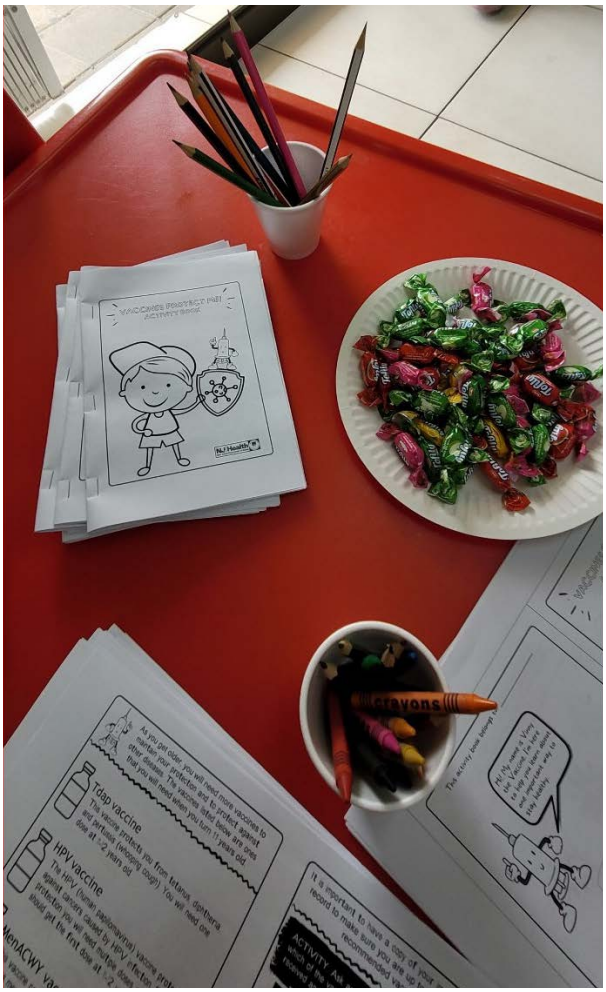
- For the opening of our campaign, on Monday the 16th, a representative from Cipla provided training to pharmacy staff on vaccination. Topics that were covered: the various vaccines available from Cipla and the importance of vaccination. This session was beneficial in continuing our professional development.
- Our community service pharmacist and pharmacist intern conducted a daily 5-minute presentation to our patients on the topic of "*Let's Talk about Vaccines*". They provided valuable information on the importance of vaccination. They also briefly discussed a few of the various vaccines available and the importance of each. They had posters to serve as visual aids to support their presentation.
- Our staff advised our patients on the importance of vaccination and alleviated any doubts or fears that they may have. Patients were encouraged to utilise the knowledge of the pharmacy team for any vaccine-related queries.
- We set up a kiddie's corner with chairs and a table where our little patients could colour in pictures while they waited with their parents/grandparents/guardians to receive their medication. We prepared a lovely vaccine-related activity booklet for our young patients to have fun and, at the same time, learn about vaccines while they visited our pharmacy. We also gave them treats (cookies, candies, lollipops, chips) throughout the week.
- We had a coffee station where our patients could enjoy a hot cup of coffee and some cookies to go with it. We also provided our patients with fruit and water.
- Lastly, just for the spirit of pharmacy week, we also had a dress code for the remainder of the week. Each day we wore a different colour to show our unity as a team. On Friday we celebrated our unique and beautiful heritages by dressing up in traditional attire.
- The campaign was a great success overall and it was met with great enthusiasm from staff and patients alike.

Our OPD decorated in bright colours to celebrate Pharmacy Month

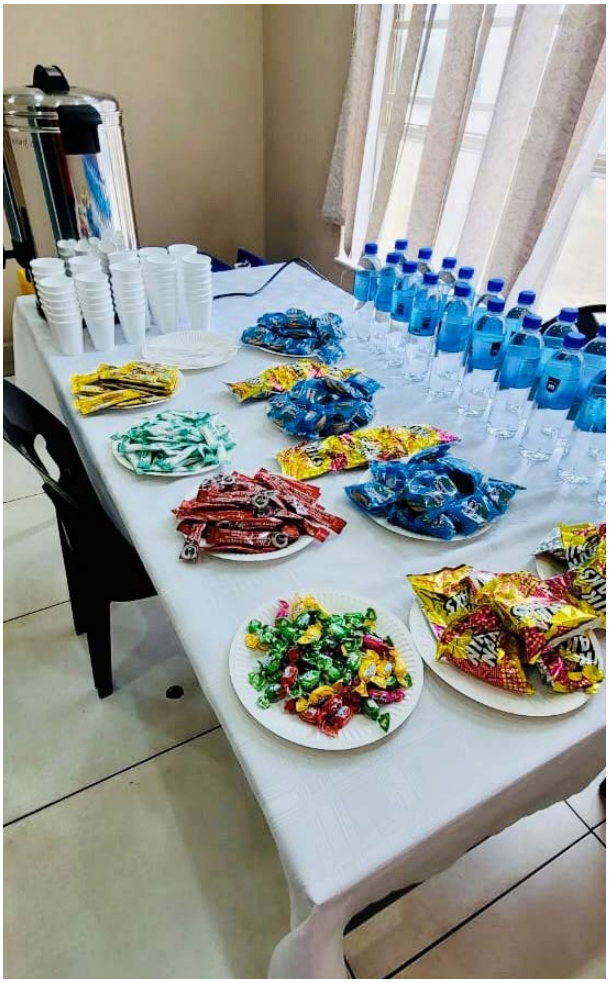
Pharmacy team dressed in red and blue with white coats for the opening of the Pharmacy Month campaign; Angelique Scharneck (Cipla) joined us on the opening day

Our community service pharmacist, together with pharmacy staff, presenting to the patients on vaccination

Our pharmacist intern presenting to the patients on vaccination



The kiddie's corner that had vaccine-activity books, colour pencils, crayons, and treats for our little visitors



The coffee station for our patients to enjoy hot coffee, delicious cookies, fresh fruit and refreshing water

Pharmacy staff dressed up to celebrate their beautiful cultures and heritages

Obituary

The passing of Pravin Gordhan

The PSSA was saddened to learn of Pravin Gordhan's passing on Friday, 13 September 2024. Even though he hasn't been a practising pharmacist for many years, he is proof of pharmacists' versatility and what can be achieved if one sets one's mind to it. We have collected messages from a few fellow pharmacists who knew him as a student or a practising pharmacist.

Obituary: Pravin Gordhan – pharmacist, activist, administrator, political leader

12 April 1949 - 13 September 2024

Mr Pravin Gordhan passed away on 13 September 2024, aged 75, after a short battle with cancer. Known widely and affectionately as "Mr PG," he obtained his Bachelor of Pharmacy degree at the University of Durban-Westville (UDW) in 1973 and completed his internship at the then King Edward VIII Hospital (now Victoria Mxenge Hospital).

It was in his years of hospital pharmacy practice that "Mr PG" first established his presence as an inspiring political guide to a generation of young students at the University of Natal Medical School. Many still recall their visits to the Pharmacy Department, and the seminal role this exposure had in their maturing political awareness and engagement. In 1981, Pravin Gordhan's employment was terminated and he then opened a community pharmacy in Durban's "Casbah". Organised pharmacy failed one of its own at this point, refusing to stand by a call that he either be charged or released from detention. That failure led to a schism in hospital pharmacy structures that took many years to be repaired. In these years, he was subject to repeated detention and banning orders.

Pravin Gordhan was integrally involved in the formation of civil society structures, such as the Durban Housing Action Committee, which were to coalesce as the United Democratic Front (UDF). Former Minister Trevor Manuel has recalled that "In many ways, the ideas behind the UDF were born on the balcony of Pravin's flat in Edward Street".

After serving as chairperson of the multiparty negotiations, the Convention for a Democratic South Africa (CODESA), he entered parliament in the first democratic administration in 1994. He was the chair of the Portfolio Committee on Constitutional Development, Provincial Affairs and Local Government, steering the adoption of the Constitution of the Republic in 1996. Apart from a stint as a transformative Commissioner of the South African Revenue Service, he also served as Minister of Finance (twice), Minister of Cooperative Governance and Traditional Affairs, and lastly, as Minister of Public Enterprises.

However, it was his highly principled stance against State Capture, his call for South Africans to "join the dots", that ensured his enduring reputation. As President Ramaphosa put it: "We have lost an outstanding leader whose unassuming persona belied the depth of intellect, integrity and energy with which he undertook his activism, his duty as a parliamentarian and his roles as a member of Cabinet." He added: "as a beacon of our fight against corruption, Pravin Gordhan stood up to derision and threats emanating from some in our nation who were scorched by his insistence that justice be dispensed against those who sought to undermine our democracy and raid our public resources and assets."

Although Pravin Gordhan did not practise as a pharmacist for many years, the profession was proud, eventually, to claim him as one of their own. In his address to the 2016 SA Pharmacy Council National Pioneer Pharmacy Awards he touched on issues of corruption and social justice, but also the pivotal role of the profession in the delivery of healthcare. He noted that: "*We have to find new ways of ensuring not only better access to medicines, but more effective ways of people accessing medicines, including chronic medicines, without going through burdensome queues. There is much to be done to ensure that civil servants become real public servants.*"

In a final address for the 130th anniversary of the founding of the Natal Indian Congress, drafted from his hospital bed, Pravin Gordhan called for a "reset". He sets us a task: "*Let us open a new chapter on united, progressive, mass mobilisation and campaigning which builds national unity, social cohesion and a new optimism and determination to build a better South Africa.*"

As South Africa strives to deliver universal health coverage, we would do well to reflect on the lessons Pravin Gordhan provided, of a life of service, of enduring principled stances, based on deeply held convictions, of humility and commitment, of bravery. In his own final words: "*I have no regrets, no regrets... We have made our contribution.*"

Message from Prof Vassie Naidoo

I knew Pravin Gordhan (PG) from the UDW.

They were the first batch of students that enrolled for the B. Pharm (4-year course) degree. PG was a few years ahead of me.

I got to know him well during the 1972 student uprisings. He was amongst a few of the other BSc Pharm students who were instrumental in teaching me about politics, the right to a fair and just society irrespective of colour, creed and religion. It was the start of the Black Conscious Movement—the Steve Biko era. We had learnt from these senior students that nothing comes without a sacrifice.

We had to make decisions that would benefit society as a whole and not just a handful of people.

So, at the tender age of 18, I cut my teeth into politics and became an activist on campus. Subsequent to my completing my degree, I was active in community activism, especially in the 1980's.

Pravin was very involved in the Chatsworth Housing Action Committee – uplifting the lives of the poor and downtrodden.

I want to end by thanking the SAPC during the presidency of Prof Mano Chetty and I also on SAPC at the time where it was decided that we send him a letter of apology for the wrong of the past in striking him off the SAPC register.

In 1994, when democracy reigned, he was invited to speak at PSSA KZN Coastal Branch, I also attended. He called me aside and told me that I should get involved with the PSSA. *(At the time I was only involved with Pharmaguild South, a group of community pharmacists mostly from Chatsworth and surrounding areas that got together to form a community pharmacist association with the view to approach stakeholders such as medical aids etc. to better improve community pharmacy.)*

That was when I became involved in the PSSA. I went on to become its first woman chairperson, served on the National Executive and became a Fellow of the PSSA. It was PG's insistence and guidance that I got involved.

An amazing person, incorruptible, steadfast in his views, resilient and a pharmacist. I feel proud to have been mentored by him.

Message from Lallie Moodley

My friendship with Pravin Gordhan began in 1969 at the University on Salisbury Island (known as Bush College), where we enrolled for B Pharmacy. In our first year, the male students were forced to wear ties every day, and this was the first time when I realised how he could mobilise with ease. He encouraged us females to support the males in a walk out of the lecture room and we refused to return until the rector reversed his decision. That was the beginning of a special relationship that we shared for 55 years.

In 1972, we were moved to UDW, and we had many protests. Pravin played a major role in changing the attitude of management towards the plight of students. Many of us did not attend the graduation ceremony of a "tribal "college, so after 1994, a special graduation was held for us.

We then started work at King Edward VIII Hospital (KEH) as interns and tried to learn as much as possible to improve service to patients. Pravin was very community-oriented, so he made sure that we trained the nurses in the wards with regard to tidiness of medicine cupboards and expiry dates, etc. We also had a good relationship with the doctors regarding advice on drugs. Pravin did not take anything lightly and always had questions. He was always willing to learn and to teach. He became very active politically in the 70's, always fighting for the rights of the underprivileged. He worked at the hospital until his arrest in the 80's. After his release, he was not taken back into employment at KEH. A fellow pharmacist offered him employment at Central Pharmacy in Smith Street.

Thereafter he decided to open a Pharmacy in Prince Edward Street, Durban. He was watched by the authorities, so I helped out whenever I could because he was always at meetings, sometimes held at the back of the pharmacy.

He then encouraged me to open a retail pharmacy which I did with much assistance from him even to the extent of designing the pharmacy and the business cards, stamps etc. He was truly an amazing individual, able to divide his attention between pharmacy and all the other ideas he had for the country and still be efficient and not complain.

During operation Vula, he had to be in hiding so we offered him and the late Billy Nair a safe place in our house. Pravin was referred to as my cousin, "Uncle Dan" to everyone. My daughters learnt a lot from him at that time.

When I relocated to Pretoria he welcomed me to stay with him and his family and was very upset when I was ready to move on my own. That's the type of person he was. My husband, daughters and I are forever indebted to him for always caring about me and guiding me. Pravin will sadly be missed by my family.

Message from Sathia Padayachee

I worked with Pravin in 1981 at KEH in Durban. Pravin was a senior pharmacist and I had just completed my internship the year before and was just a junior pharmacist. He was an incredible human being working selflessly for our freedom and democracy. He has inspired so many lives and spread joy amongst all of us. From pharmacists to labourers to cleaners, all were equal in his eyes. May you rest in internal peace. RIP, Pravin Gordhan.

Message from Barry Kirtnasamy

I fondly remember Pravin at King Edward Hospital Pharmacy and his mentoring of us as medical students with Noddy Jinabhai. It was the early days of our formative years as young activists. Later in life a beacon of hope for our democracy and a better life for all despite his detention and torture under the regime and later to stand tall in defending us against State Capture. Humble to the end and never let the high office take him away from the grassroots activists. May his soul rest in peace and condolences to his family and all comrades who shared personal moments with one of the greatest sons of the struggle.

Message from the PSSA President – Tshifhiwa Rabali

As President of the Pharmaceutical Society of South Africa (PSSA) and on behalf of the pharmacy profession, I would like to send my sincere condolences to his family and friends. As pharmacists, we always felt represented by him at the highest echelon of the government of South Africa. May his soul rest in eternal peace.

sapj

CPD questionnaire • September/October

An update on vitamin and mineral supplementation: is it essential?

1.	**What is the primary focus of the article " An update on vitamin and mineral supplementation: is it essential?"**
a	The cost-effectiveness of vitamin and mineral supplements.
b	The necessity and impact of multivitamin and mineral supplementation for overall health.
c	The role of vitamins in enhancing athletic performance.
d	The differences between synthetic and natural supplements.
2.	**Why should smokers or former smokers avoid MVM products that provide large amounts of beta-carotene or vitamin A?**
a	They can lead to an increased risk of heart disease.
b	They reduce the effectiveness of blood thinners like warfarin.
c	They can cause malabsorption of essential nutrients.
d	Studies have linked these nutrients to an increased risk of lung cancer.
3.	**What does the article suggest regarding the continuous use of vitamin and mineral supplements?**
a	It may be beneficial for certain populations but not necessary for everyone.
b	It is universally recommended for all individuals.
c	It should be avoided entirely.
d	It is essential for everyone, regardless of dietary intake.
4.	**What role do vitamins and minerals play in cognitive health, according to recent studies?**
a	They have no significant effect on cognitive function.
b	They may improve global cognition and episodic memory.
c	They only improve memory in children.
d	They can replace the need for mental exercises.

Stepping up: a pharmacist's role in managing diabetes and foot ulcers

5.	**In the treatment of diabetes, the primary goal for most patients should be to keep their HbA1c level at or below:**
a	7%
b	12%
c	15%
d	20%
6.	**What is the first-line pharmacotherapy treatment for Type 2 Diabetes, except when contraindicated?**
a	Insulin.
b	Metformin.
c	Sulfonylureas.
d	SGLT2 inhibitors.
7.	**Which one of the following is the gold standard for offloading in diabetic foot ulcers?**
a	Shoe modifications.
b	Moonboot.
c	Crutches.
d	Total contact casting.
8.	**Which one of the following would not form part of a pharmacist's role in the multidisciplinary management of diabetes and its associated complications:**
a	Glycaemic control.
b	Screening services.
c	Wound debridement.
d	Counsel of patients on lifestyle modifications.

Dry eye disease: a comprehensive overview for pharmacists

9.	**What is the primary cause of dry eye disease?**
a	Increased tear production.
b	Disruption in the tear film.
c	Excessive blinking.
d	Overproduction of meibomian gland secretions.
10.	**Which of the following is NOT a common symptom of dry eye disease?**
a	Burning sensation in the eyes.
b	Light sensitivity.
c	Increased visual acuity.
d	Stringy mucus in or around the eyes.
11.	**What is the first-line treatment for most patients with dry eye disease?**
a	Antibiotics.
b	Corticosteroids.
c	Lubricants.
d	Surgery.
12.	**Which nutrient has been demonstrated to reduce inflammation and stabilide the tear film in dry eye disease?**
a	Vitamin C.
b	Zinc.
c	Vitamin B12.
d	Omega-3 Fatty Acids.

The answers for these CPD questions will be in the upcoming issue of the SAPJ.
This activity can contribute towards your CPD compliance.

CPD answers • July/August

1. a	2. d	3. c	4. b	5. c	6. c	7. b	8. d	9. b	10. a	11. c	12. c	13. b	14. c
				15. c	16. b	17. a	18. c	19. a	20. c				

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