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RESEARCH ARTICLE

Are South African registered dietitians ready to take responsibility for prescription of parenteral nutrition and intravenous nutrients?

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Objective: To assess registered dietitians' (RDs') knowledge of their right to prescribe parenteral nutrition (PN) and intravenous nutrients (IVN) to adults, while exploring associated attitudes and practices.
Design: A mixed-methods approach included a descriptive study design and semi-structured interviews.
Setting: Dietitians registered with the Health Professions Council of South Africa, working in government and private sectors.
Subjects: Registered dietitians ($n = 145$), mostly female (95%), participated in an online self-administered questionnaire and semi-structured interviews ($n = 6$).
Results: Most participants (64%, $n = 93/145$) actively recommend PN/IV nutrients and felt RDs should have the authority to prescribe (77%, $n = 108/140$). Only 11% ($n = 11/104$) had a good knowledge score > 65%. Those practising for ≥ 7 years or with additional training demonstrated significantly better knowledge scores ($p < 0.001$ and $p = 0.002$), emphasising the need for additional training (PN: $p = 0.019$; IV nutrients: $p = 0.018$). Qualitative and quantitative findings underscored RDs' pivotal role in PN/IV nutrients prescription. It also revealed knowledge gaps pertaining to pharmaceutical aspects, IV nutrients, and prescribing rights. Participants agreed that prescription of IV nutrients remains the doctor's responsibility but emphasised the importance of multidisciplinary nutrition support teams.
Conclusion and implication: There was a disparity between RDs' perceived competence and their actual knowledge of PN and IV nutrients. Registered dietitians need more education and training to ensure their competency and confidence in the discussion, recommendation, and management of PN and IV nutrients for adults. The research suggests a need for clarity on legal responsibilities in prescribing rights to ensure consistency in prescription practices between healthcare professionals and health sectors in South Africa.

Keywords: attitudes, dietitians and prescription, intravenous nutrients, knowledge, parenteral nutrition, practices

Introduction

Critically ill hospitalised patients are deemed to be at risk of developing malnutrition.[1–4] To meet nutritional requirements, especially in the presence of a non-functional gastrointestinal tract (GIT), these patients mostly require parenteral nutrition (PN) as the sole source of nutrition.[5–7]

According to the Medicines and Related Substances Act, 1965 (Act 101), parenteral nutrition (PN) and intravenous (IV) nutrients are Schedule 3 and 4 substances requiring a prescription to treat serious illness.[8] These scheduled substances are safe provided they are used in controlled doses.[8] Careful monitoring of patients is crucial to prevent metabolic, physiological, mechanical, and infectious complications.[9,10] Furthermore, the micronutrient prescription should be individualised and provided daily from the start and for as long as PN will continue.[11–14] To minimise the risk associated with these IV regimens, it should be prescribed by a registered healthcare professional with comprehensive nutrition support training as well as a sound knowledge of pharmaceutical practices.[15–17]

To serve this purpose, a multidisciplinary team (MDT) of healthcare professionals (HCPs) involved in the patient's nutritional management should ensure that a complete and balanced PN formulation is prescribed.[5,18] Utilising these specialist teams has been reported to improve the safety and cost effectiveness of intravenous nutrition support in clinical settings.[6,19] While the implementation of nutrition support is legally the doctor's responsibility a recent systematic review found that, regardless of country, setting, or year of medical education, nutrition remains insufficiently integrated into the medical curriculum.[20] On the other hand, registered dietitians (RDs) have expertise in identifying patients at risk of malnutrition, selecting appropriate intravenous nutrition support therapy and routes, whilst ensuring macro- and micronutrient requirements are met.[21] The literature shows an improvement in outcomes when RDs are able to give their nutritional recommendations.[17,22] In fact, certain countries grant RDs prescription rights upon successful completion of examinations that assess their competency in clinical practice and their comprehension of pharmaceutical regulations.[23]

Currently, South African (SA) RDs operate only in an advisory capacity regarding PN and IV nutrient prescriptions as their scope of practice does not allow for written prescriptions of substances above Schedule 2.[16,24] Although dietetic students receive a certain level of training relating to PN as well as the basic concepts of IV nutrients, very little or no training is currently provided concerning pharmaceutical practices, legal requirements, or general prescribing principles of scheduled substances.[19,25,26]

In 2018, a task team was established by the Health Professions Council of South Africa (HPCSA) to consider permitting RDs

prescription rights for PN and IV nutrients. This would improve patients' access to more opportune nutritional care.[25] To implement this in a standardised manner the international approach of successfully completing an evaluation to be awarded prescription rights could be adopted.[25] To our knowledge, this study is the first of its kind in SA to explore the knowledge, attitudes, and prescribing practices of RDs regarding PN and IV nutrients in the adult patient population. For the purposes of this study, the researcher focused only on intravenously administered micronutrients comprising vitamins, minerals, trace elements, and IV electrolytes. Findings of this study could be valuable when establishing a need for training on this matter, empowering SA RDs, and broadening their scope of practice.

Methods

Study design and setting

A mixed-methods approach was used combining a descriptive study design and qualitative research methods. Quantitative data were collected via an electronic self-administered questionnaire on SurveyMonkey. Subsequently, semi-structured interviews were conducted using an online platform, to explore quantitative findings.

Study participants and data collection

For the quantitative component, the study population comprised all dietitians registered with the HPCSA at the time of data collection. All RDs were eligible to participate in the first three sections of the online questionnaire provided they had internet access. Therefore, the initial sample size was computed by estimating a proportion of the population ($n = 3\ 494$) within a certain degree of accuracy. By using a 95% confidence interval and a margin of error of 8%, a sample size of $n = 144$ was calculated to be representative of this study population. Those participants with recent experience in provisioning PN and IV nutrients were eligible to complete the remaining two sections of the questionnaire. This population was estimated at 800 RDs as per data obtained from a local PN manufacturing company in SA.

A self-administered questionnaire was developed based on relevant literature and questionnaires with similar objectives. The electronic questionnaire created on SurveyMonkey comprised five sections using closed-ended, open-ended and Likert-style questions and took 20–25 minutes to complete. After sociodemographic information on the study population was gathered, RDs' attitudes and knowledge regarding PN and IV nutrients were assessed. Participants actively involved in provisioning of PN and IV nutrients completed questions related to RDs' practices and attitudes towards their prescription rights in SA. Different sections of the questionnaire were completed by varying numbers of participants.

Information on the questionnaire was distributed via newsletters dedicated to dietitians, such as members of the Association of Dietitians in South Africa (ADSA) and South African Society of Parenteral and Enteral Nutrition (SASPEN); announcements at symposiums/congresses, relevant social media platforms (e.g. "Dietetics-Nutrition is a profession" Facebook page), as well as personal contacts. The link to the online questionnaire was shared via these platforms and electronic reminders were sent out bi-monthly during the period of data collection, March–June 2021.

A pilot study was conducted in February 2021 to assess content validity of the self-administered questionnaire and ensure relevance and appropriateness for the target population. Two experts in the field of dietetics and the prescription of PN and/or IV nutrients assessed the content accordingly. Five postgraduate students enrolled in the Master of Nutrition at Stellenbosch University were chosen to determine the face validity. Minor adaptations were made where necessary.

For the qualitative component, a purposive sampling technique was used to ensure that RDs selected had knowledge and experience regarding the prescription of PN and IV nutrients and were able to articulate and reflect on their use of these substances. Semi-structured interviews were conducted via an online platform, aiming to reach six to ten dietitians who represented both the private and public therapeutic sectors in SA. The discussion guide used for the semi-structured interviews was based on pertinent findings from the self-administered questionnaire to further explore the use of PN and IV nutrients as well as RDs' attitudes towards their prescription rights in SA. Interviews were conducted in English, were recorded digitally and lasted 40–60 minutes. Data saturation was reached after six interviews when no new themes, insights, or perspectives were emerging from the discussions. Only selected findings from the qualitative component will be included in this article. Results from both the quantitative and qualitative phases will be reported and discussed together.

Statistical analysis

Quantitative data was exported from SurveyMonkey (https://www.surveymonkey.com/) to Microsoft Excel (Microsoft Corp, Redmond, WA, USA) and analysed statistically using STATISTICA version 13.5 (https://docs.tibco.com/products/tibco-statistica-document-management-system-13-5-0). Basic descriptive statistics were utilised, and summary statistics described the variables. Distributions of variables were presented with histograms and/or frequency tables. Means were used as the measures of central location for ordinal and continuous responses, and standard deviations as indicators of spread.

Knowledge questionnaire scores were tallied and classified according to four cut-offs namely poor (0–49%), average (50–64%), good (65–74%), and very good (75–100%). The Mann–Whitney *U* test was used to analyse comparisons between not normally distributed nominal and continuous variables (e.g. additional training; practice years; knowledge questionnaire results); and Spearman's rank correlation coefficient was used for continuous variable analysis. The significance level was set at 95% ($p < 0.05$) in all hypothesis testing.

The Atlas TI software programme (https://atlasti.com/) was used to perform content analysis of transcribed interviews. Both deductive and inductive coding were employed, focusing on four themes related to RDs' knowledge, nutrition support teams, prescribing, and prescription rights, with a total of 19 codes identified. Quality control measures to ensure accurate data representation included reading and re-reading the transcription while listening to the audio-recordings to stay true to participants' original words and phrasing.

Ethical considerations

Ethics approval was obtained from the Health Research Ethics Committee (HREC) of Stellenbosch University (S20/11/328). Study participants were required to provide informed consent by ticking a checkbox at the beginning of the online

questionnaire. Throughout the study, confidentiality was ensured by separating any personal identifiers from data and personal information was kept anonymous. Participation was voluntary and participants could withdraw at any time.

Participants willing to be interviewed received the consent form by email beforehand and were required to provide written informed consent prior to the interview, acknowledging their voluntary participation and permission for interview recording.

All participants interested in winning one of two R1 000 vouchers could enter their email addresses at the end of the questionnaire and participants partaking in the semi-structured interviews each received a R200 retail voucher.

Results

Sociodemographic characteristics and recommendations

The 145 participants who completed the sociodemographic section were predominantly female (95%, $n = 137/145$) with a mean age of 33.5 years ±8 SD. Most participants (81%, $n = 117/145$) had obtained a bachelor's or honours degree as their highest level of education. Only 19% ($n = 27/145$) indicated ever receiving additional training regarding PN and IV nutrients. They attended masterclasses held by PN manufacturing companies and completed courses offered by the European Society for Clinical Nutrition and Metabolism (ESPEN) or relevant postgraduate modules as part of the course work. Participants had been practising dietetics for 7 years (mean 6.9 years ±3.2 SD) and mostly in urban areas (73%, $n = 106/145$) at private hospitals (39%, $n = 57/145$), private practice outpatients (30%, $n = 44/145$), and government tertiary hospitals (19%, $n = 28/145$).

Four of the six RDs who were interviewed were female and their age ranged from 27–44 years. Three of these participants held a master's degree in nutrition as their highest level of education. They were employed at government and private hospitals and had on average 14 years (range 6–21 years) of clinical practice experience.

Nearly two-thirds (64%, $n = 93/145$) of participants indicated recommending PN and IV nutrients during the previous 12 months. Those participants (36%, $n = 52/145$) who refrained from recommending PN and/or IV nutrients explained that it was not applicable to their daily practice (77%, $n = 40/52$) or they did not feel confident (12%, $n = 6/52$). Some did not receive referrals from the treating doctors (23%, $n = 12/52$) or the doctor prescribed their own PN or IV nutrients (6%, $n = 3/52$).

General attitudes regarding RDs' competence in parenteral nutrition and intravenous nutrients

The section in the questionnaire concerning participants' general attitude towards RDs' competence in PN and IV nutrients was completed by 140 and 137 participants, respectively. They were in consensus that RDs should possess knowledge concerning PN and IV nutrients (89%, $n = 125/140$ and 90%, $n = 123/137$ respectively). However, there was some disagreement as to whether all RDs are specialists in these areas (Agreed: PN: 46%, $n = 64/140$ and IV nutrients: 36%, $n = 49/137$). While 77% ($n = 108/140$) thought RDs should have the authority to legally prescribe PN, only 66% ($n = 90/137$) agreed on RDs prescribing IV nutrients (Table 1).

Table 1: General attitudes regarding RDs' competence in parenteral nutrition and intravenous nutrients ($n = 140$)

	Agree/fully agree	
Statement	**PN[#] % ($n = 140$)**	**IVN[##] % ($n = 137$)**
All RDs should be knowledgeable about PN/IV nutrients	89 (125)	90 (123)
All RDs are specialists in prescribing PN/IV nutrients	46 (64)	36 (49)
All RDs should have the authority to legally prescribe PN/IV nutrients	77 (108)	66 (90)
All RDs should be comfortable discussing PN/IV nutrients with their fellow multidisciplinary team members	92 (129)	87 (119)
I am comfortable discussing PN/IV nutrients with my fellow multidisciplinary team members	86 (120)	70 (96)
I believe that I effectively convey factual information regarding PN/IV nutrients to the members of the multidisciplinary team	83 (116)	71 (104)
I should learn more about PN/IV nutrients	87 (122)	93 (127)
I am interested in receiving formal training regarding PN/IV nutrients	90 (126)	94 (129)
Trustworthy knowledge regarding PN/IV nutrients is accessible to me	79 (111)	74 (101)
In general, I believe that PN/IV nutrients, if prescribed according to recommendations, are safe to use	99 (139)	96 (132)

[#]PN = parenteral nutrition (including total and supplemental PN).
[##]IVN = intravenous nutrients (including micronutrients, i.e. vitamins and minerals, trace elements, and electrolytes).

Participants with ≥ 7 years of dietetics experience and those who received additional training were statistically (Mann–Whitney U test, $p = 0.034$ and $p = 0.029$ respectively) more likely to feel comfortable discussing PN with their multidisciplinary team, and conveying factual information on this topic (Mann–Whitney U test, $p = 0.011$).

During the semi-structured interviews, an interviewee involved in student training in the government sector made the observation that she has seen a decline in dietetic students' knowledge of PN and IV nutrients and noted a marked difference in the knowledge levels of students from different universities. Accordingly, those participants with < 7 years of experience were keen to learn more (Mann–Whitney U test, PN $p = 0.018$ and IV nutrients $p = 0.017$). Participants with ≥ 7 years of dietetics experience were more likely to believe that trustworthy sources of knowledge on PN were accessible to them (Mann–Whitney U test, $p = 0.036$). These sources primarily included scientific journals (PN: 83%, 116/140; IV nutrients: 85%, 116/137), industry PN representatives (PN: 81%, 113/140; IV nutrients: 78%, 107/137), and congresses (PN: 67%, 94/140; IV nutrients: 61%, 83/137). There was a keen interest in receiving formal training on both topics (PN: 90%: 126/140; IV nutrients: 94%, 129/137). Interviewees recognised:

> 'I would be super willing to do it [additional training]. I think there is always something to learn.' (Government sector)

> '… new information comes out yearly, so frequent training would be actually beneficial.' (Government sector)

Knowledge concerning parenteral nutrition and intravenous nutrients in adults

A total of 104 participants completed the knowledge section in the online questionnaire. More than half (57%, *n* = 60/104) had a poor score (< 50%) and only 11% (*n* = 11/104) had a score > 65% (good and very good).

Participants (*n* = 104) performed well in the knowledge questionnaire on questions related to PN formulation (Correct: 76%, *n* = 79/104) and administration (Correct: 67%, *n* = 70/104) but performed poorly with concepts pertaining to PN complications (Correct: 28%, *n* = 29/104) and drug-nutrient considerations for PN (Correct: 27%, *n* = 28/104). Less than half of the participants knew the correct answers regarding nutrient requirements for both PN and IV nutrients (Correct: 45%, *n* = 47/104 and 36%, *n* = 37/104 respectively) (Figures 1 and 2).

In the section on IV nutrients in the knowledge questionnaire, participants performed well on concepts related to indications for IV nutrients in adults (Correct: 86%, *n* = 89/104) but performed poorly for concepts related to administration thereof (Correct: 21%, *n* = 22/104) (Figure 2).

Questions regarding prescription rights showed varied levels of understanding, with participants displaying uncertainty on pharmaceutical aspects (Correct: 45%, *n* = 47/104) and legal aspects related to IV nutrients (Correct: 55%, *n* = 57/104) (Figure 3). The qualitative results highlight the existence of knowledge gaps in pharmacological aspects:

> 'We don't focus as much on the pharmacological aspects. So, I think that pharmacological aspect needs to [include] everything, IV micronutrients, PN, and the other scheduled drugs.' (Government sector)

Participants who had received additional training on PN and IV nutrients since graduation were statistically more likely to achieve a higher score in the knowledge questionnaire ($p = 0.002$) (Figure 4). The qualitative component supports this divergence by highlighting the adequacy of the undergraduate

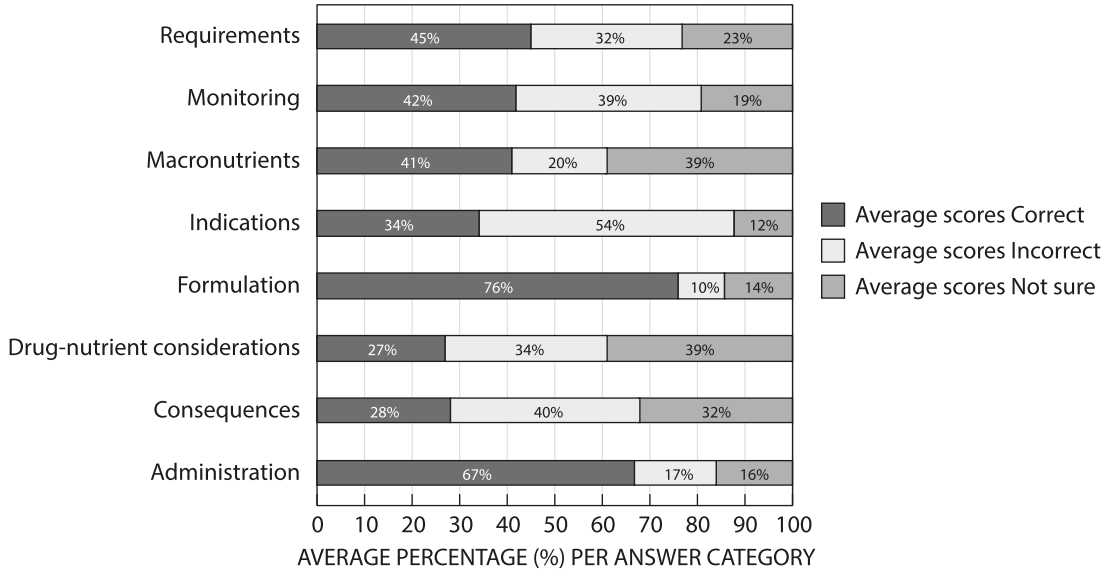

Figure 1: Responses to questions on PN concepts in knowledge questionnaire (*n* = 104).

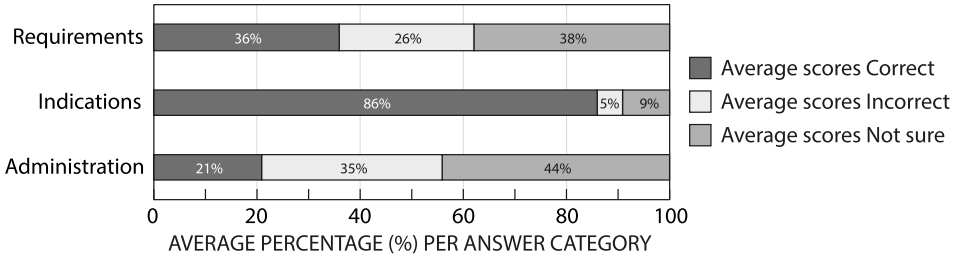

Figure 2: Responses to questions on IV nutrient concepts in knowledge questionnaire (*n* = 104).

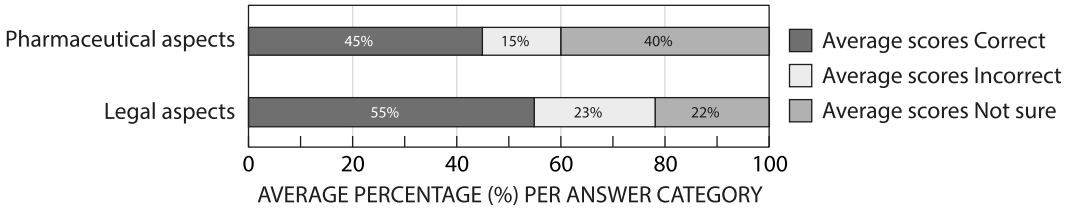

Figure 3: Responses to questions on prescription rights concepts in knowledge questionnaire (*n* = 104).

curriculum in terms of teaching the basic concepts pertaining to PN, but IV nutrient concepts are not covered effectively.

> 'We train our dietitians to be entry level dietitians. So, you need to know enough to be able to hold your own in a general setting.' (Private sector)

Participants practising as an RD for < 7years had a statistically lower score on the knowledge questionnaire than those with more experience (Mann–Whitney *U* test, $p < 0.001$) (Figure 5). Interviewees elaborated on the value of being a more experienced practitioner, feeling more comfortable and knowledgeable. A participant with 18 years of experience said:

> 'I think, at this stage of my career, I'm fully capable of starting a patient on [scheduled drugs]. But I do also understand that that's not something that an entry level dietitian would be able to do.' (Private sector)

An interviewee with only 6 years of experience indicated:

> 'In terms of prescribing IV nutrients, I wouldn't feel confident at all. Like, if a junior doctor asked me how much, say the potassium is low, how much IV potassium to give, I wouldn't feel confident in advising that.' (Private sector)

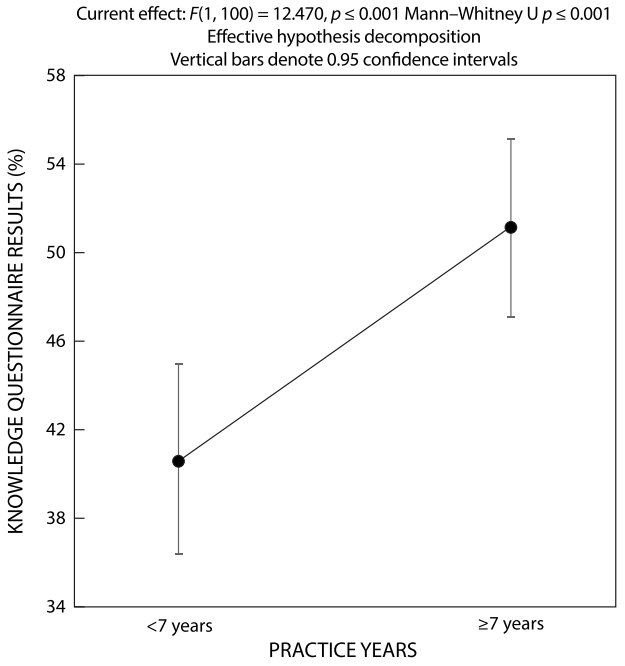

Figure 4: Comparison between additional training and knowledge results.

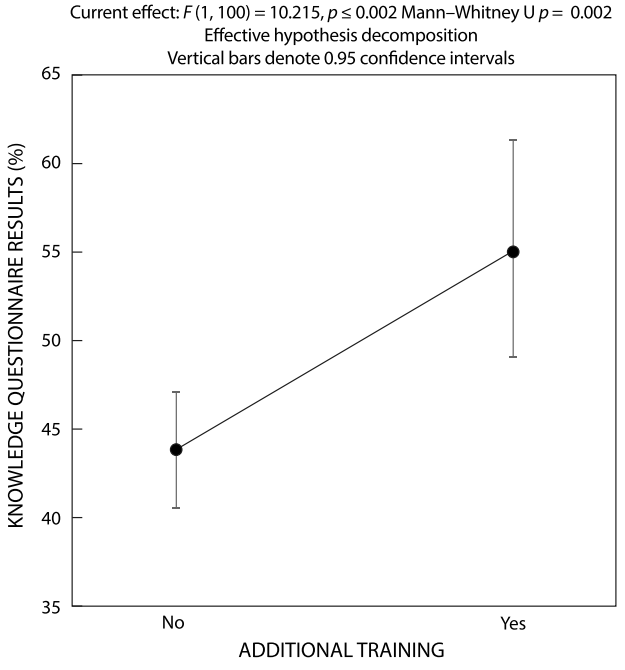

Figure 5: Comparison between practice years and knowledge questionnaire results.

Practices regarding the recommendation/ 'prescription' of parenteral nutrition and intravenous nutrients

Only participants actively involved in the recommendation and use of parenteral nutrition PN (64%, $n = 66/104$) and IV nutrients (63%, $n = 65/104$) in the previous 12 months completed the section concerning their practices. Even though participants indicated feeling knowledgeable about PN and IV nutrients (PN: 91%, $n = 60/66$ and IV nutrients 63%, $n = 41/65$), less than half agreed they received adequate formal training (PN: 50%, $n = 33/66$ and IV nutrients: 41%, $n = 26/65$). Overall, participants felt more knowledgeable about concepts pertaining to PN than to IV nutrients. These include use, safety risks, indications, contraindications, and pharmaceutical practices. Only 18% ($n = 28$) agreed with being knowledgeable regarding intravenous nutrients' interactions with one another (Table 2).

Most of the participants ($n = 59$) who completed the final section of the questionnaire concerning their prescribing

Table 2: Practices of recommending PN ($n = 66$) and IV nutrients ($n = 65$)

Statement	PN agree $n = 66$ % (*n*)	IV nutrients agree $n = 65$ % (*n*)
I have received adequate training regarding PN/IV nutrients at undergraduate/postgraduate level	50 (33)	41 (27)
I am knowledgeable regarding the use of PN/IV nutrients	91 (60)	63 (41)
I am knowledgeable regarding the safety risks associated with using PN/IV nutrients	94 (62)	63 (41)
I am knowledgeable regarding the indication for use of PN/IV nutrients	97 (64)	73 (47)
I am knowledgeable regarding the contraindications for using PN/IV nutrients in certain patients	86 (57)	59 (38)
I am knowledgeable on the pharmaceutical practices around mixing, ordering, and dispensing of PN/IV nutrients	56 (37)	47 (31)
I am frequently asked questions regarding PN/IV nutrients	73 (48)	53 (34)
I am knowledgeable regarding intravenous nutrients' interactions with one another	–	18 (28)

#PN = parenteral nutrition (including total and supplemental PN).
##IVN = intravenous nutrients (including micronutrients, i.e. vitamins and minerals, trace elements, and electrolytes).

practices reportedly recommended PN at least 2–5 times a week (39%, $n = 23/59$) or daily (15%, $n = 9/59$). The most common reasons for prescribing PN were listed in an open question as an inability to meet the patient's requirements through enteral nutrition/oral intake ($n = 17$); not having an accessible enteral route ($n = 14$) or a functional GIT ($n = 11$); or due to GIT surgery ($n = 14$). IV nutrients were mostly recommended for patients with increased micronutrient requirements ($n = 12$); inadequate intake ($n = 6$); and in the management of refeeding syndrome ($n = 6$) or burns patients ($n = 6$).

The vast majority of participants (97%, $n = 59$) recommended all-in-one PN, and 39% ($n = 22/59$) recommended IV nutrients with their prescription. Of the 50 participants (85%, $n = 50/59$) who recommended three-chamber bag (3CB) PN, 90% ($n = 45/50$) routinely recommended IV nutrients as part of the prescription. While water-soluble vitamins and glutamine were recommended independent of participants' PN 'prescription' (53%, $n = 31/59$ and 59%, $n = 35/59$ respectively) more than half of the participants would never do this.

The level of involvement of RDs depended on referring doctors' preferences. Two-thirds of participants confirmed the referring doctor signed off their prescriptions (PN: 66%, $n = 39/59$; IV nutrient: 68%, $n = 40/59$). Some were unsure about this (PN: 5%, $n = 3$ and IV nutrients: 8%, $n = 5$). The qualitative data suggest that there may be variations in practices across different hospitals or facilities.

> 'We sign or prescribe for it [PN] … it's not really the doctors who do that anymore here … . Certain facilities do that … [they] do need a doctor's go-ahead. But luckily, we don't.' (Private sector)

> 'Some of them like to refer but still like to have a lot of control over the situation. And others, if they refer, they're happy for you to do your thing in conjunction with theirs. And others, if they want to do everything themselves, they don't even refer to a dietitian, they'll prescribe.' (Private sector)

Compared with the private sector, more participants in the government sector indicated that their units had a multidisciplinary nutrition support team. Government RDs were predominantly the decision-makers regarding which PN regimen the patient should be on.

> 'The dietitian does pick and prescribe which one [PN] is the most appropriate for the patient, but it's definitely a, you know, a multidisciplinary decision.' (Government sector)

> 'In our setting, the dietitian plays the main role in what regime the patient should [be on].' (Government sector)

In the private sector, in the absence of multiple dietitians, being part of a structured nutrition support team (NST) that made its rounds in every ward would be challenging and time consuming, according to participants.

> 'The difference is, in a private hospital we work on a referral basis, so it's only when a doctor is invested or sees the value of having a dietitian, or invested in nutrition, that we are involved.' (Private sector)

Discussion

Registered dietitians (RDs) have the authority to recommend Schedule 1 and 2 medicines, as these are freely available over the counter. However, according to the General Regulations (2017) published under the Medicines and Related Substances Act 101 of 1965, regulation 34, Schedule 3 and 4 substances, which include PN and IV nutrients, a doctor is required, i.e. the legal prescriber, to write the order and sign for the prescription.[8] While RDs often carry the responsibility for making recommendations regarding the prescription of PN and IV nutrients, their training at undergraduate level appears to be inadequate regarding pharmaceutical practices as well as PN and IV nutrients. Subsequently, inexperienced RDs may lack confidence in working in this field. The quantitative and qualitative results from this study suggest a potential lack of clarity and understanding regarding the legal aspects and responsibilities for prescribing PN and IV nutrients.

General attitudes regarding SA RDs' competence to recommend/'prescribe' PN and IV nutrients

Even though research shows that SA nursing staff held the perception that RDs are experts in nutrition support compared with doctors,[27] until now, RDs working in ICUs in SA still do not have the legal authority to prescribe PN and IV nutrients.[8] Although 77% of all participants in this study agreed RDs should have the authority to prescribe PN, some still felt that prescribing IV nutrients was more within the doctor's scope of practice. Furthermore, less than half (46%) of participants who frequently recommend PN and IV nutrients agreed that RDs could be regarded as specialists in prescribing PN and IV nutrients.

A South African study (2015) showed that RDs working in private ICUs in SA had high confidence in self-reported nutrition support competency.[27] Similarly participants in this study with ≥ 7 years' experience were statistically more likely to feel comfortable discussing PN with their multidisciplinary team ($p = 0.034$) and convey factual information concerning PN ($p = 0.012$). These participants also voiced the opinion that RDs have a vast understanding of PN and IV nutrients and that they should have a say in or decide on the patient's nutrition plans. While some of the experienced RDs in this study shared their perception that doctors expect RDs to be more involved with the prescription of PN and IV nutrients, research shows that doctors frequently prescribe independent of the RD's advice.[28]

Similar to findings in this study, the literature shows that RDs and doctors working in paediatrics and with neonates in SA consulted scientific journals, published guidelines, and pharmaceutical companies' representatives as sources of reliable information.[16] As PN manufacturers also provide IV nutrients, industry representatives play a key role in promoting safer practices by providing educational material to HCPs.[29]

Regardless of participants' level of education, those with < 7 years' experience showed a particular need for formal training in both PN and IV nutrients. Furthermore, qualitative data emphasised the benefit of staying up to date with new information, which could be in the form of masterclasses on the topic of PN and IV nutrients. Another possibility is to offer 'study days', where RDs could gain knowledge regarding critical care topics in their own time and away from the working environment.[30]

Knowledge regarding PN and IV nutrients

To minimise the risk associated with Schedule 3 and 4 substances, the prescription should be compiled by someone

with comprehensive nutrition support training and a sound knowledge of pharmaceutical practices.[15,17,26] Findings from the online questionnaire revealed that only about half of the participants agreed that they are knowledgeable about the pharmaceutical practices surrounding PN and IV nutrients.

At least 9 out of 10 participants from the online questionnaire agreed that they are knowledgeable regarding the use and safety risks of PN with fewer (6 out of 10 participants) agreeing that they are knowledgeable regarding the use and safety risks of IV nutrients. However, when knowledge was assessed in the online questionnaire, it was found that only 1 out of 10 had a good knowledge score above 65%. This apparent discrepancy, combined with the finding that participants with < 7 years' experience had a statistically lower score in the knowledge questionnaire ($p < 0.001$), serves to support the need to investigate the current training and competence of SA RDs. According to participants, training opportunities on the topic of IV nutrients are still lacking in SA. They only indicated attending masterclasses presented by PN manufacturing companies and international PN courses presented by ESPEN.

Both quantitative and qualitative data from this study suggest a need for improvements in RDs' undergraduate curriculum to enhance training on IV nutrients and address the concerns raised by the participants. Currently, universities teach dietitians basic knowledge to provide competence as entry-level dietitians. Through years of experience and additional training participants in this study gained competence and confidence when working with PN and IV nutrients. The value of training is exemplified by an intervention study by Ameri et al. (2016), which found a significant improvement in knowledge of PN after nursing staff in a neonatal ICU attended a training programme ($p < 0.001$).[31]

In contrast to a group of British RDs who highlighted 'calculating nutritional requirements' as a specific topic on which they wanted more information,[30] the knowledge gaps identified in this study included pharmacological aspects of PN and IV nutrients; complications of PN; and also drug-IV nutrient interactions. Similarly, a review by Mestres and Duran (2009) highlighted the need for RDs to have a broad knowledge of pharmacology and to be aware of possible drug–food interactions that could occur.[32] In comparison, medical students, who have a vast knowledge of pharmacology and who inevitably earn the right to prescribe nutrition support such as PN and IV nutrients, are likely to have not received adequate nutrition support training at undergraduate or postgraduate level.[12,20,33]

Practices regarding recommendation of PN and IV nutrients

From the online questionnaire it was found that the majority of participants actively recommended PN and IV nutrients, with most participants recommending PN more than once per week. The ensuing remark by an interviewee that the RDs' involvement enhances the appropriateness of the selected PN and timeous initiation is supported by other studies that emphasise improvement in clinical outcomes, improved efficiency, and cost savings when allowing RDs prescription rights.[17,33–37]

All the participants agreed that, to some extent, they would define themselves as 'supplementary prescribers'. British RDs were granted the authority to serve as supplementary prescribers working in collaboration with a primary independent prescriber, typically a medical doctor, to develop and implement a customised nutritional plan for a patient.[38,39] Both the quantitative and qualitative findings in this study point to a lack of consistency in the prescription of PN or IV nutrients. Participants' involvement varied depending on the doctor involved, whose beliefs dictated specific nutrition therapies. In some cases, participants could not even implement a nutritional care plan constructed in partnership with the doctor. Two-thirds of participants confirmed the referring doctor signed off their prescriptions, but some RDs were even allowed to prescribe and sign off on PN prescriptions, independently. It is essential that RDs are cautioned that, until such time as current policy includes RDs as legal prescribers of PN and IV nutrients, they are operating outside their scope of practice in certain cases.[24]

Evidently a SA RD's scope of practice should be re-evaluated to potentially allow these 'experts in nutrition' to prescribe PN and IV nutrients. They will require successful completion of relevant training courses and to pass an examination.[19,34] This concept has been legalised in Australia, where a novice RD can become an accredited practising dietitian (APD). They need to further their education and training to expand their scope of practice, which allows them to provide PN and IV nutrient prescription.[23]

The participants shared the sentiment that having prescribing rights would protect the dietetics profession. The requirement to attend a structured course to earn these prescribing rights would provide RDs with expert knowledge and skills in prescribing PN and IV nutrients. It would also prevent RDs with limited knowledge and skills from prescribing PN and IV nutrients, which has the danger of bringing the dietetic profession into disrepute. The legal involvement of RDs in prescription would also protect the hospital and doctors. All these measures would help in achieving the ultimate goal of protecting the patient as well.

Currently, certain competencies will need to be established and evaluated before SA RDs will be granted prescription rights. However, participants in the qualitative component cautioned that if RDs' scope of practice broadens, they carry a greater responsibility. A review article by Roberts (2013) emphasised that RDs need to understand that doctors will expect more communication and accountability from individuals with prescribing rights.[34] Participants also stressed that, even if RDs are granted prescribing rights, nutrition support decisions should still include an MDT comprising doctors, RDs, nurses, pharmacists, and other allied HCPs.

Limitations

The study acknowledges its limitations as potential biases could arise due to self-reported information and inability to clarify questions. The topic was centred on critical care concepts, which may have deterred potential participants from contemplating participation in the online questionnaire although the initial sections of the questionnaire were open to all SA RDs. Participants may have experienced questionnaire fatigue, thus leaving the online questionnaire before completing all sections. The COVID-19 pandemic, which rapidly evolved during the planning and initiation of the study, also presented an unforeseen and unavoidable limitation regarding participants' time to complete an online questionnaire. The semi-structured interviews were conducted via an online platform and network connectivity was not always optimal. Online interviewing makes it difficult to interpret the interviewee's responses and body language accurately.

Conclusion and recommendations

PN and IV nutrients are Schedule 3 and 4 substances and therefore require advanced knowledge and comprehensive training to ensure nutrition support is optimised and risks are minimised. This study, the first of its kind in South Africa, revealed a disparity between RDs' perceived competence and their actual knowledge of PN and IV nutrients. Registered dietitians play an essential role in the prescription and management of PN and IV nutrients, but they need more education and training to ensure their competency and confidence in the discussion, recommendation, and management of PN and IV nutrients. The research suggests a need for clarity on legal responsibilities in prescribing and to ensure consistency in prescription practices between healthcare professionals and the health sectors in South Africa.

The study recommends engaging with regulatory bodies such as the Health Professions Council of South Africa (HPCSA) and South African Health Products Regulatory Authority (SAHPRA) to present evidence supporting the granting of prescription rights to SA RDs. This would necessitate revision of undergraduate curricula as well the development of formal training opportunities to bridge the apparent knowledge gap.

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Data availability statement – The data that support the findings of this study and related study tools are available from the corresponding author (BK), upon reasonable request.

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References

1. Blaauw R, Achar E, Dolman RC, et al. The problem of hospital malnutrition in the African continent. Nutrients. 2019;11(9):2028. https://doi.org/10.3390/nu11092028
2. van Tonder E, Gardner L, Cressey S, et al. Adult malnutrition: prevalence and use of nutrition-related quality indicators in South African public-sector hospitals. SA J Clin Nutr. 2019;32(1):1–7. https://doi.org/10.1080/16070658.2017.1410003
3. Comerlato PH, Stefani J, Viana MV, et al. Infectious complications associated with parenteral nutrition in intensive care unit and non-intensive care unit patients. Braz J Infect Dis. 2020;24(2):137–43. https://doi.org/10.1016/j.bjid.2020.02.002
4. Mooi NM, Ncama BP. Evidence on nutritional therapy practice guidelines and implementation in adult critically Ill patients: a systematic scoping review. Curationis. 2019;42(1):e1–13. https://doi.org/10.4102/curationis.v42i1.1973
5. Lappas BM, Patel D, Kumpf V, et al. Parenteral nutrition: indications, access, and complications. Gastroenterol Clin North Am. 2018;47(1):39–59. https://doi.org/10.1016/j.gtc.2017.10.001
6. McClave SA, Taylor BE, Martindale RG, et al. Guidelines for the provision and assessment of nutrition support therapy in the adult critically Ill patient: society of critical care medicine (SCCM) and American society for parenteral and enteral nutrition (A.S.P.E.N.). JPEN J Parenter Enter Nutr. 2016;40(2):159–211. https://doi.org/10.1177/0148607115621863
7. Barrocas A, Schwartz DB, Bistrian BR, et al. Nutrition support teams: institution, evolution, and innovation. Nutr Clin Pract. 2023;38(1):10–26. https://doi.org/10.1002/ncp.10931
8. Department of Health. Medicines and related substances act, (101/1965) general regulation. Government gazette No. 41064 Online] 25 August 2017;(859). https://www.sahpra.org.za › uploads › 2021/11.
9. National Department of Health. National total parenteral nutrition practice guidelines for adults, South Africa [Online]. 2016. https://www.health.gov.za.
10. Guenter P, Ayers P, Boullata JI, et al. Parenteral nutrition errors and potential errors reported over the past 10 years. Nutr Clin Pract. 2017;32(6):826–30. https://doi.org/10.1177/0884533617715868
11. Osland EJ, Ali A, Nguyen T, et al. Australasian society for parenteral and enteral nutrition (AuSPEN) adult vitamin guidelines for parenteral nutrition. Asia Pac J Clin Nutr. 2016;25(3):636–50. https://doi.org/10.6133/apjcn.022016.05
12. Blaauw R, Osland E, Sriram K, et al. Parenteral provision of micronutrients to adult patients: an expert consensus paper. JPEN J Parenter Enteral Nutr. 2019;43(S1):S5–23. https://doi.org/10.1002/jpen.1525
13. Singer P, Blaser AR, Berger MM, et al. ESPEN guideline on clinical nutrition in the intensive care unit. Clin Nutr. 2019;38(1):48–79. https://doi.org/10.1016/j.clnu.2018.08.037
14. Osland EJ, Ali A, Isenring E, et al. Australasian society for parenteral and enteral nutrition guidelines for supplementation of trace elements during parenteral nutrition. Asia Pac J Clin Nutr. 2014;23(4):545–54. https://doi.org/10.6133/apjcn.2014.23.4.21
15. Ayers P, Adams S, Boullata J, et al. A.S.P.E.N. parenteral nutrition safety consensus recommendations. JPEN J Parenter Enter Nutr. 2014;38(3):296–333. https://doi.org/10.1177/0148607113511992
16. Flint CS, Blaauw R, Van Niekerk E. Neonatal and paediatric parenteral nutrition prescription practices in South Africa. Clin Nutr. 2018;37(March):S311. https://doi.org/10.1016/j.clnu.2018.06.2084
17. Bahrami M, Jazayeri SMHM, Soltani F, et al. Impact of dietitians in errors associated to parenteral nutrition prescription. Indian J Public Health Res Dev. 2018;9(8):271–6. https://doi.org/10.5958/0976-5506.2018.00732.5
18. Mistiaen P, van den Heede K. Nutrition support teams: A systematic review. JPEN J Parenter Enter Nutr. 2020;44(6):1004–20. https://doi.org/10.1002/jpen.1811
19. Peterson S, Dobak S, Phillips W, et al. Enteral and parenteral order writing survey—A collaborative evaluation between the academy of nutrition and dietetics' dietitians in nutrition support dietetics practice group and the American society for parenteral and enteral nutrition (ASPEN) dietetics practice section. J Acad Nutr Diet. 2020;120(10):1745–53. https://doi.org/10.1016/j.jand.2020.01.015
20. Crowley J, Ball L, Hiddink GJ. Nutrition in medical education: A systematic review. Lancet Planet Health. 2019;3(9):e379–89. https://doi.org/10.1016/S2542-5196(19)30171-8
21. Corrigan ML, Bobo E, Rollins C, et al. Academy of nutrition and dietetics and American society for parenteral and enteral nutrition: revised 2021 standards of practice and standards of professional performance for registered dietitian nutritionists (competent, proficient, and expert) in nutrition support. Nutr Clin Pract. 2021;36(6):1126–43. https://doi.org/10.1002/ncp.10774
22. Arney BD, Senter SA, Schwartz AC, et al. Effect of registered dietitian nutritionist order-writing privileges on enteral nutrition administration in selected intensive care units. Nutr Clin Pract. 2019;34(6):899–905. https://doi.org/10.1002/ncp.10259
23. Dietitians Australia. Nutrition support interest group. Nutrition Support Role Statement [Online]. 2023 https://dietitiansaustralia.org.au/sites/default/files/2022-02/Nutrition-Support-Role-Statement-2020.pdf.
24. South Africa Government Gazette 4684. Health professions act 56 of 1974: regulations defining the scope of the profession of dietetics. Government Notice R891 of 26 April 1991:1–2. [Online] https://www.hpcsa.co.za/Uploads/professional_boards/dnb/regulations/regulations_gnr891_91.pdf.
25. Health Professions Council of South Africa. Professional board for dietetics and nutrition. Scheduled nutrition products prescription rights task team: terms of reference. [Online] June 2024. chrome-

extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.hpcsa.co.za/Content/upload/professional_boards/dnb/announcements/Terms_of_reference_PRTT.pdf
26. Guenter P, Boullata JI, Ayers P, et al. Standardized competencies for parenteral nutrition prescribing: the American society for parenteral and enteral nutrition model. Nutr Clin Pract. 2015;30(4):570–6. https://doi.org/10.1177/0884533615591167.
27. Hill LT. Nutrition support practices in South African ICUs: results from a nationwide pilot survey. S Afr J Crit Care. 2015;31(2):42–50. https://doi.org/10.7196/SAJCC.2015.v31i2.252
28. Barron E. Barriers associated with doctors' referral to dietitians in Gauteng, South Africa. Thesis Masters of Nutrition, Faculty of Heath Sciences, Stellenbosch University. 2006; December. https://scholar.sun.ac.za/server/api/core/bitstreams/f75cd97c-9655-40a4-8c28-3913725f4a0a/content.
29. Seres D. Prescribing parenteral nutrition safely. J Parenter Enteral Nutr. 2012;36(2 Suppl):27S–28S. https://doi.org/10.1177/0148607111435334
30. Lane C, Wedlake LJ, Dougherty L, et al. Attitudes towards and knowledge of nutrition support amongst health care professionals on London intensive care units. J Hum Nutr Diet. 2014;27(SUPPL2):339–51. https://doi.org/10.1111/jhn.12152
31. Ameri ZD, Vafaee A, Sadeghi T, et al. Effect of a comprehensive total parenteral nutrition training program on knowledge and practice of nurses in NICU. Glob J Health Sci. 2016;8(10):56478. https://doi.org/10.5539/gjhs.v8n10p135
32. Mestres C, Duran M. Importance of pharmacology knowledge by dieticians. Curr Nutr Food Sci. 2009;5(1):49–52. https://doi.org/10.2174/157340109787314749
33. Pojednic R, Gale D, McFarland M, et al. Physicians' perceptions of the registered dietitian are evolving: the importance of the RD on the health care team and order writing privileges. Top Clin Nutr. 2021;36(3):213–23. https://doi.org/10.1097/TIN.0000000000000255
34. Roberts SR. Improving patient outcomes through registered dietitian order writing. Nutr Clin Pract. 2013;28(5):556–65. https://doi.org/10.1177/0884533613499375
35. Peterson SJ, Chen Y, Sullivan CA, et al. Assessing the influence of registered dietitian order-writing privileges on parenteral nutrition use. J Am Diet Assoc. 2010;110(11):1703–11. https://doi.org/10.1016/j.jada.2010.08.003
36. Phillips W, Doley J. Granting order-writing privileges to registered dietitian nutritionists can decrease costs in acute care hospitals. J Acad Nutr Diet. 2017;117(6):840–7. https://doi.org/10.1016/j.jand.2016.06.009
37. Garg M, Swab M, Gibney D, et al. Influence of dietitians in preventing parenteral nutrition prescription errors in children. JPEN. J Parenter Enter Nutr. 2018;42(3):607–12. https://doi.org/10.1177/0148607117697935
38. Royal Pharmaceutical Society. A competency framework for all prescribers. [Online] 2021; September. https://www.rpharms.com/resources/frameworks/prescribing-competency-framework/competency-framework.
39. Culkin A, Gabe SM. Can dietitians prescribe safely? The prescribing practice of a nutrition support dietitian supplementary prescriber. Clin Nutr. 2022;37(2018):S64. https://doi.org/10.1016/j.clnu.2018.06.1269

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