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Original Research

Role of the pharmacist in parenteral nutrition therapy: challenges and opportunities to implement pharmaceutical care in Kuwait

Maram G. KATOUE^{ID}, Dalal AL-TAWEEL^{ID}

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ABSTRACT*

Background: Pharmacists can provide beneficial pharmaceutical care services to patients receiving Parenteral Nutrition (PN) therapy by working within Nutrition Support Teams (NSTs).

Objective: This study was designed to explore pharmacists' role in PN therapy in hospitals of Kuwait, sources of PN-related information, opinions on NSTs, perceptions about the barriers to pharmaceutical care implementation and views on how to enhance their practices.

Methods: Data were collected via face-to-face semi-structured interviews with the senior Total Parenteral Nutrition (TPN) pharmacists at all the hospitals which provide TPN preparation services (six governmental hospitals and one private hospital) in Kuwait. Descriptive statistics were used to describe pharmacists' demographic details and practice site characteristics. The interviews were audio-recorded, transcribed verbatim and analysed using thematic analysis.

Results: The pharmacists mainly performed technical tasks such as TPN compounding with minimal role in providing direct patient care. They used multiple different sources of TPN-related information to guide their practice. They reported positive and negative experiences with physicians depending on their practice environment. None of the hospitals had a functional NST. However, pharmacists expressed preference to work within NSTs due to the potential benefits of enhanced communication and knowledge exchange among practitioners and to improve service. Pharmacists perceived several barriers to providing pharmaceutical care including lack of reliable sources of TPN-related information, lack of a standard operating procedure for TPN across hospitals, insufficient staff, time constraints and poor communication between TPN pharmacists. To overcome these barriers, they recommended fostering pharmacists' education on TPN, establishing national standards for TPN practices, provision of pharmacy staff, development of NSTs, enhancing TPN pharmacists' communication and conducting TPN-research research.

Conclusion: TPN pharmacists in Kuwait are confined to performing TPN manufacturing processes. There are promising avenues for future development of their role in patient care. This can be achieved by overcoming the barriers to pharmaceutical care practice and providing pharmacists with educational opportunities to equip them with the clinical competencies needed to practise as nutrition support pharmacists with patient-centred roles.

Keywords: Parenteral Nutrition; Pharmacists; Professional Role; Professional Practice; Qualitative Research; Kuwait

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INTRODUCTION

Parenteral nutrition (PN) therapy involves the intravenous administration of nutritionally adequate admixtures consisting of water, dextrose, amino acids, electrolytes, vitamins and trace elements to patients who are unable to tolerate oral or enteral feeding.¹ When all the daily nutritional requirements are exclusively supplied to the patient by PN formulations, the therapy is called Total parenteral nutrition (TPN). This therapy has become a lifeline for patients with various clinical conditions such as premature neonates, critically ill patients and patients with permanent loss of gastrointestinal function. Parenteral nutrition therapy is ideally provided to patients by a multidisciplinary team called the Nutrition Support Team (NST) which consists of a physician, pharmacist, dietician and nurse who coordinate their efforts to optimize patient care.^{2,3}

Pharmacists are potentially able to contribute to the care of patients receiving PN therapy⁴ and to be an integral part of the NST.^{5,6} They are educated about the physiochemical compatibilities of parenteral solutions, pharmacotherapy principles and pharmaceutical care practice.⁷ Moreover, they can receive special training on nutritional support to develop specialized practice.³ Nutrition Support Pharmacy is a speciality with a focus on optimizing nutrition support therapy outcomes.³ However, the role of the pharmacist in PN therapy can vary among healthcare settings depending on the pharmacist's position, education and practice environment.³ This can range from having a limited role in compounding TPN formulations to the provision of direct patient care.³

Nutrition support pharmacists can provide variety of beneficial services related to PN therapy. Their scope of practice may include various roles such as the provision of direct patient care; consultations with other healthcare professionals, including those in entrepreneurial/industry; education of patients, caregivers, students, postgraduate trainees, colleagues, and the public; supervision of the compounding and dispensing of safe and effective TPN formulations according to standard aseptic techniques; and participation in nutrition support related research activities and quality improvement.³ These pharmacists can collaborate with other healthcare professionals within the NST to assess patients' nutritional needs, develop and implement an individualized nutrition care plan for

the patient, and monitor patient's response to PN therapy.³ They can also participate in the administrative management of nutrition support services at their organizations including the development documentation, implementation, and periodic review of organizational policies/protocols related to nutrition support therapy; and the development and the maintenance of an appropriate and cost-effective nutrition support formulary.³ Several studies have demonstrated the unique perspective, knowledge, and importance of pharmacists on NSTs and their positive impact on the efficacy and safety of PN therapy.⁴⁻⁶ The involvement of these pharmacists in providing direct patient care has been found to improve patients' nutritional status and clinical outcomes, to prevent and resolve PN-related complications, and to achieve significant cost savings.⁸⁻¹⁰

The primary mission of the pharmacist is to provide pharmaceutical care which involves the direct responsible provision of medication-related care for the purpose of achieving definite outcomes that improve a patient's quality of life.¹¹ This can be particularly relevant to PN therapy in view of the clinical nature of this task among the pharmacists' activities.¹² However, the implementation of pharmaceutical care practice has been suboptimal in many countries due to several barriers such as time constraints, insufficient staff and deficient clinical knowledge and communication skills of personnel.¹³⁻¹⁶ Pharmaceutical care is a collaborative process in which the pharmacist works directly with other healthcare professionals and the patient to design, implement, and monitor a therapeutic plan.^{11,14} In line with this, PN therapy is ideally viewed as a multidisciplinary service in which the pharmacist collaborates with other disciplines to optimize a patient's nutrition care plan.^{2,3} It is also an area where patient-oriented pharmaceutical care services have proven of value in countries where these services are well utilized.^{12,17} Therefore, PN therapy presents an ideal opportunity for the pharmacist to participate as part of a multidisciplinary team in the delivery of safe and effective nutrition care to patients. Furthermore, they can optimize the therapeutic management of these patients by detecting and resolving medication errors and/or drug-related problems.¹⁷

Healthcare is provided to patients in Kuwait primarily through the governmental healthcare sector at primary, secondary, and tertiary care levels. Pharmacists working in these settings have diverse educational backgrounds, with education and training from Kuwait and other countries. Hospital pharmacy TPN services were introduced into governmental hospitals in 1982. Over the years, TPN services have developed and become available at the six general hospitals, as well as in one private hospital in Kuwait. Each of these hospitals has a TPN unit located within the hospital pharmacy which provides TPN preparation service. In all governmental hospitals, TPN pharmacists utilize TPN calculation software and automated compounding devices (ACDs) to prepare PN formulations. In the only private hospital which provides TPN preparation services, PN

compounding and all related calculations are performed manually by the pharmacists.

Clinical pharmacy services are limited in Kuwait.¹⁸ Pharmaceutical care services are not provided systematically by all practicing pharmacists in the country, except some individual attempts made by motivated pharmacists.¹⁹ While there are several studies documenting pharmacists' TPN practices in developed countries²⁰⁻²², nothing is known about pharmacists' role in PN therapy in developing countries, including Kuwait. There is also little published research about pharmaceutical care in Kuwait^{15,16,23,24}, but none of these publications has investigated this area of practice. The aim of this study was to explore pharmacists' current role in PN therapy in Kuwait hospitals, their sources of TPN-related information, opinions on NSTs, perceptions about the potential barriers to the provision of pharmaceutical care in their practice and views on how to enhance their TPN practice and role in patient care.

METHODS

Study participants

The study aimed to obtain a breadth of understanding of the pharmacists' role and experiences in PN therapy in Kuwait hospitals. Due to the exploratory nature of this study, a qualitative research method was employed to understand the experiences, views and attitudes from the perspectives of the participants.^{25,26} Therefore, a decision was made to use a purposive sample by which the study participants were deliberately selected to reveal the beliefs and experiences that would be most informative to the research questions.²⁵ The participants were the senior TPN pharmacists (P1-P7) at the seven hospitals (H1-H7) which provide TPN services in Kuwait. This included six governmental hospitals and one private hospital.

The interviews

Data were collected via in-depth, face-to-face semi-structured interviews with the pharmacists using an interview topic guide that was developed based on a literature review (Table 1). The interview topic guide was reviewed by three Professors from the Kuwait University Faculty of Pharmacy and the principal investigator (a pharmacist) to enhance its content validity. The first part of the interview aimed to collect demographic details of the pharmacists and their practice site characteristics. The remainder of the interview topic guide was designed to provide a broader description and comprehensive understanding on the pharmacists' role in the

Table 1. The interview topic guide

1. Role of the pharmacist in the provision of TPN services at hospitals
2. Pharmacists' views on Nutrition Support Teams (NSTs)
3. Pharmacists' sources of information and how they update their knowledge on PN therapy
4. Pharmacists' perceptions on the barriers to the provision of pharmaceutical care in their practice
5. Pharmacists' views on enhancing their TPN practice and role in patient care

Participant	Gender	Age (years)	Overall practice experience in pharmacy (years)	Practice experience in TPN (years)
P1	Female	28	2	0.3
P2	Male	49	24	7
P3	Female	29	6	3
P4	Male	30	8	2
P5	Male	54	30	10
P6	Male	56	33	16
P7	Female	50	20	17

provision of TPN services in the hospitals, views on team approach to patient care exemplified by NSTs, sources of information on PN therapy, opinions on the barriers to pharmaceutical care practice and suggestions on how to overcome these barriers and improve their role in patient care. During the interviews, the principal investigator (MGK) asked the participants open-ended questions to gain insights into their thoughts and to allow them raise the issues that they believed important.²⁵ The interviews were conducted in English and were held at the pharmacists' work place (the TPN units). Each interview lasted for approximately one hour.

Ethical approval

Participants were assured of the confidentiality and anonymity of their responses. Ethical approval for the study was obtained from the Joint Committee for the Protection of Human Subjects in Research of the Health Science Centre, Kuwait University and Kuwait Institute for Medical Specialization, Kuwait.

Data analysis

The interviews with the senior TPN pharmacists were audio-recorded and transcribed verbatim. Thematic analysis was used to analyse the interviews' transcripts.²⁷ The transcripts were read repeatedly and the emerging topics were identified and categorized as themes and sub-themes. Qualitative approach has been increasingly used in health services research in pharmacy for descriptive objectives, for example to look at different aspects of professional practice from the point of view of groups of practitioners.²⁵ The identified themes in this study were used to explore and describe pharmacists' views and experiences. To enhance the rigour of qualitative data analysis²⁸, the two authors carried out an independent assessment of the transcripts to identify the themes. Then, they discussed the emerging themes following their initial review of the transcripts. Any disagreements were negotiated and differences were reconciled in the proposed themes until an agreed coding frame was

established. Following that, the two authors independently coded the transcripts using the defined coding frame. They evaluated all coding, reconciled differences and agreed on the final presentation of data. Attempts to guarantee the trustworthiness of the data included the transparent process of analysis, the involvement of the two authors who read and compared ideas on the transcripts, and the search for disconfirming evidence during the analysis. Quotes that support understanding of the themes/sub-themes were identified. The quotes were defined by a code: P and a number (1-7) representing a participant from a specific hospital.

RESULTS

Study participants' demographic details and practice site characteristics

Seven pharmacists were interviewed, of whom four (57.1%) were male pharmacists. Table 2 presents pharmacists' demographic characteristics. Six of the pharmacists were graduates from institutions outside Kuwait. The basic qualification of all pharmacists was BPharm degree. Only two pharmacists had postgraduate degrees. Table 3 illustrates pharmacists' practice site characteristics and their scope of practice in relation to TPN at each hospital. The number of pharmacists working at each of the TPN units was limited. The only exception was noted in the private hospital included in this study where 8 pharmacists were involved in the manual compounding of TPN formulations. The number of pharmacy technicians involved in TPN services was minimal across the hospitals.

Results from the interviews

The analysis of the interview transcripts revealed six main themes with a number of sub-themes. The identified themes and subthemes (Table 4) are described in the following section.

Hospital	Num. beds	Number of Personnel		Average number of TPN orders/day	Pharmacists' scope of practice in relation to TPN
		Pharmacist	Technician		
H1	806	3	1	65	TPN compounding; Patient education; Administrative roles
H2	409	4	-	5	TPN compounding; Design of TPN regimen; Patient monitoring; Patient education; Administrative roles
H3	682	2	-	3	TPN compounding; Design of TPN regimen; Administrative roles
H4	431	2	1	20	TPN compounding Administrative roles
H5	857	1	1	25	TPN compounding; Design of TPN regimen; Administrative roles
H6	756	1	2	40	TPN compounding Administrative roles
H7	180	8	-	4	TPN compounding Administrative roles

Table 4. The identified themes and sub-themes from the interview transcripts

Main themes	Sub-themes
1. Pharmacists' role in TPN services	Role of the pharmacist in TPN compounding Role of the pharmacist in the design of TPN regimen Role of the pharmacist in patient monitoring Role of the pharmacist in patient/caregiver education Administrative roles Pharmacists' perceived self-confidence and job satisfaction
2. Pharmacists' education and training needs	Varied training backgrounds Poor undergraduate training on PN therapy Lack of access to continuing professional development programmes on PN therapy
3. Pharmacist-physician collaboration	Active pharmacist-physician collaboration Poor pharmacist-physician collaboration
4. Views on Nutrition Support Team (NSTs)	Pharmacists' preferences regarding team approach to patient care Benefits of NSTs Barriers to the existence of NSTs at the hospitals
5. Perceived barriers to optimizing pharmacist role in patient care and TPN services	General organizational barriers Pharmacist-specific barriers
6. Improvement of pharmacist role in patient care and TPN services	General organizational enablers Pharmacist-specific enablers

1. Pharmacists' role in TPN services

Pharmacists had different roles related to TPN services, including compounding of TPN formulations, design of TPN regimens, monitoring patients' response to therapy, educating home TPN patients and administrative roles. Pharmacist involvement in these tasks varied among the hospitals.

Role of the pharmacist in TPN compounding: All participants reported that they were mainly responsible for receiving and reviewing the TPN orders, and compounding TPN formulations in the TPN units:

"We only receive the TPN orders and compound the TPN bags. We don't see the patients." (P1)

Role of the pharmacist in the design of TPN regimen: Most participants reported that they do not have any role in the nutritional assessment of the patients and the design of TPN regimens, as these tasks were performed by the physicians. Three out of the seven pharmacists participated in the design of TPN regimens. One of the pharmacists indicated that he frequently collaborates with dietitians in patients' nutritional assessment and TPN design. On the other hand, two pharmacists reported that they design the TPN regimens jointly with the physicians who approach them at the TPN unit:

"The physician visits the TPN unit with the patient file to discuss the case with the pharmacist. The physician and pharmacist together agree on the appropriate TPN formula to serve patient's needs." (P5)

Role of the pharmacist in patient monitoring: The majority of participants stated that they had no role in monitoring patients receiving PN therapy or in following-up their progress:

"We don't have any role in monitoring the patients as this is performed by the physicians and nurses." (P6)

Overall, participants reported that they had limited contact with patients on the wards. Only one

participant indicated that he visited patients on the wards to assess their nutritional needs, design the TPN regimen and monitor their response to PN therapy:

"I go to the ward with the dietitians to assess the patient's nutritional requirements and design the TPN regimen" "We follow the patient during PN therapy on the ward." (P2)

Role of the pharmacist in patient/caregiver education: The TPN units at three hospitals supplied TPN formulas to a limited number of home TPN patients. The pharmacists working in these settings participated in patient/caregiver education on TPN:

"The pharmacists follow up with family members/caregivers of home TPN patients to ensure their adequate education on TPN. We also developed a printed brochure on TPN administration guidelines for the nurses taking care of home TPN patients." (P2)

Administrative roles: The TPN pharmacists performed other administrative tasks such as stock control of TPN solutions and disposables. They also coordinated the work with other hospital departments such as the Infection Control Department regarding the sterility evaluation of the TPN units and the Biomedical Services Department for equipment maintenance.

Pharmacists' perceived self-confidence and job satisfaction: The variation in pharmacists' roles in PN therapy among hospitals was reflected in differences in their self-confidence and job satisfaction. Pharmacists who reported being actively involved in direct patient care (only two participants) were more confident and satisfied about their professional roles than those who were merely involved in TPN compounding (five participants):

"The pharmacist is the expert in TPN design and formulation and is more knowledgeable regarding TPN design than the physician."..."I am satisfied about the development in TPN service in Kuwait hospitals and the increasing

demand on us as a source for TPN formulations.” (P5)

“I am not satisfied about the pharmacist limited role in TPN preparation.” (P6)

2. Pharmacists' education and training needs

None of the pharmacists had any postgraduate qualification or professional certification related to nutrition support. The interviews revealed apparent education and training needs for TPN pharmacists to enhance their practices.

Varied training backgrounds: The interviews exposed lack of standardized training for the pharmacists prior to their work in TPN units. While some participants had good training on TPN, others were not trained at all:

“I attended two training courses on TPN before I started my work at the hospital.” (P4)

“I have never taken any courses on TPN. I just taught myself about it.” (P6)

Three pharmacists received basic training courses on TPN organized by the Ministry of Health, while the remaining pharmacists were trained by senior pharmacists. Other sources of training included courses conducted by the company supplying the equipment or by visiting experts.

Poor undergraduate training on PN therapy: Participants felt that their undergraduate education and training related to TPN were inadequate to meet the responsibilities of their current jobs:

“Our background knowledge regarding TPN from our undergraduate study is limited and the type of work we are involved in is critical. We need more training.” (P1)

Lack of access to continuing professional development programmes on PN therapy: Some participants complained about lack of continuing educational programmes on PN therapy for pharmacists:

“Unfortunately, we don't have any continuing medical education (CME) activities related to TPN in Kuwait.” (P3)

When being asked about their sources of information and how they update their knowledge on PN therapy, participants stated that they use textbooks, scientific journals and websites, especially the American Society for Parenteral and Enteral Nutrition (ASPEN) website. Only one pharmacist reported that she once attended a scientific meeting on TPN abroad.

3. Pharmacist-physician collaboration

Participants reported that they interacted daily with the physicians who request PN therapy. The specialities mostly involved were the pediatricians, intensive care physicians, surgeons and gastroenterologists. Evidence of both active and poor pharmacist-physicians collaboration emerged from the interviews.

Active pharmacist-physician collaboration: Two participants described a collaborative relationship with some physicians, in which the physician trusts the pharmacist as a partner in patient care:

“The assessment of the case is performed together by the physician and pharmacist. Most physicians depend on pharmacists for the design of TPN regimens.” (P3)

Poor pharmacist-physician collaboration: Most participants reported that their communication with physicians mainly occurred when they needed clarification or adjustment of the TPN orders:

“We communicate with physicians if any clarification or adjustment is needed of the TPN order. For example, if we find any component out of range, we call the physician to discuss the necessary adjustment.” (P2)

Some participants indicated that the physicians took over all the therapeutic decisions related to PN therapy, excluding the pharmacists from having any role in patient care. They mentioned that some physicians were uncooperative with pharmacists or resistant to their role on the wards:

“There is one physician who doesn't request any TPN formulas through our unit. You can't force some physicians to cooperate.” (P3)

“As pharmacists, we are not allowed to enter the area where the physicians work.” (P4)

4. Views on NSTs

After providing participants with the definition of a NST, none of them reported the existence of such team at the hospitals. Participants' views on NSTs were then explored. These views are outlined in the next section.

Pharmacists' preferences regarding team approach to patient care: All participants expressed preference for the collaborative approach to patient care that can be delivered by a NST, through which the pharmacist can be actively involved in patient care:

“I certainly prefer the team approach. I also hope that the pharmacists can go with the physicians to the wards to assess patients and jointly take the therapeutic decisions related to TPN.” (P4)

Benefits of NSTs: Participants identified several potential benefits of NSTs including enhanced communication and knowledge/opinions exchange among practitioners, time saving and improved service:

“This team will give us different opinions from different healthcare professionals resulting in better outcomes for the patient and decreased errors.” (P1)

“It will save the time for the pharmacists and improve the service.” (P6)

Barriers to the existence of NSTs at hospitals: Participants listed a number of barriers to the development of NSTs at the hospitals. These

included organizational/administrative barriers, insufficient staff and physicians' preference to assume total responsibility for clinical decision-making:

"I think the absence of this team is due to organizational issues, e.g. lack of guidelines to develop NSTs at hospitals. In addition, there may be insufficient staff to establish NST." (P1)

"The physicians believe that PN therapy is their own responsibility. They take over all the decisions related to TPN." (P4)

5. Perceived barriers to optimizing pharmacist role in patient care and TPN services

After informing the participants about the definition of pharmaceutical care¹¹, they identified several barriers to implementing pharmaceutical care in their practice in relation to TPN. These barriers were categorized as general organizational barriers and pharmacist-specific barriers as described in the following section.

General organizational barriers:

Lack of a reliable source of information on TPN: Participants perceived the lack of a reliable source of information related to TPN as one of the main barriers to optimizing their practices:

"We don't have specific source of information about TPN. It depends on the pharmacist-dependent search for information." (P1)

Lack of a standard operating procedure across the hospitals: Participants cited the variation in the TPN operating procedures across the hospitals as another barrier to optimal TPN service. This can influence the role of the pharmacist in maintaining safe communication between the hospitals and consequently, patient safety at transition of care between these settings:

"We don't have a standard reference for our work. Each hospital has its own TPN protocol which is different from one hospital to another. This can create communication problems among the hospitals." (P4)

Lack of time: Many participants complained of the overwhelming workload and lack of time which prevent them from having an active role in patient care:

"I used to go to the wards myself to check patients' medical charts, but now because of the overwhelming load that we have and lack of time, I review patients' lab results with their TPN orders at the TPN unit." (P5)

Insufficient staff: A number of participants perceived shortage of pharmacy staff as a major barrier to the provision of optimal TPN services:

"Lack of staff is a main barrier. We have shortage in pharmacy technicians and even the ones available are not cooperative or interested to learn about TPN." (P3)

Pharmacist-specific barriers:

Pharmacists' weak role in patients' care plans: Most participants stated that they practised in the TPN units away from patients' care areas. This limited their clinical role in managing patients' care plans:

"We don't have any role as clinical pharmacists in the management of patients because we don't go to the wards to see them. The overall picture about the patient is not clear to us by contacting other staff by phone." (P4)

Pharmacists' weak role in TPN formulary selection: All participants reported that they had no say regarding the selection of TPN products as these products were supplied to hospitals by the Central Medical Stores, Kuwait Ministry of Health:

"We don't have any opinion in requesting or changing any specific TPN products." (P1)

Poor communication between TPN pharmacists: Participants recognized that the poor communication between fellow TPN pharmacists represents another barrier to enhancing their practices, as this limits exchanging clinical expertise among TPN pharmacists:

"We don't have direct contact with other pharmacists working in the TPN units of other hospitals. We also don't have a society for us to exchange knowledge related to TPN." (P1)

6. Improvement of pharmacist role in patient care and TPN services

Recognizing the barriers to pharmaceutical care allowed participants to provide suggestions to improve their role in patient care and to enhance their practices in relation to TPN services. These suggestions were grouped under general organizational enablers and pharmacist-specific enablers as detailed in the next section.

General organizational enablers:

Development of national standards for TPN practices: Participants expressed an urgent need for a reliable standard reference to guide and standardize TPN practices in Kuwait hospitals:

"We need a reliable reference for information related to TPN practices and quality controls. We need TPN standards that all pharmacists can follow to guarantee the quality of our work in the TPN units." (P4)

Development of NSTs: Many participants greatly supported the idea of establishing active NSTs at their hospitals to improve patient care and TPN services:

"I think that TPN services can greatly improve if we could have a NST at the hospital." (P7)

Provision of more pharmacy staff to permit role redesign: Participants highlighted the need for more pharmacy staff. This would allow pharmacists to have patient-focused roles:

"Our job can be done very nicely if pharmacy technicians were available to help in TPN compounding. This can free-up our time to work on patients' cases on the wards." (P3)

Conducting TPN-related research: Some participants recommended conducting research activities locally to address some of the issues they encounter and they requested to be informed about their findings:

"We can benefit from a research to be conducted in Kuwait on calcium/phosphate compatibility in TPN solutions." (P4)

"If any research related to TPN is conducted at the Faculty of Pharmacy, we wish to be informed about it so that we can apply the findings." (P2)

Pharmacist-specific enablers:

Fostering pharmacists' education on PN therapy: All participants agreed that enhancing pharmacists' education on TPN is necessary to improve their practices. They recommended for educational interventions in the form of seminars, workshops or training courses to be delivered by Kuwait Ministry of Health, Faculty of Pharmacy and Pharmaceutical Association:

"Pharmacists' practices can only be improved by more training on TPN." (P5)

"We hope that Faculty of Pharmacy can organize continuing educational activities for TPN pharmacists, such as meetings, conferences and training courses related to TPN." (P2)

One participant suggested strengthening the TPN knowledge foundation in the Faculty of Pharmacy curriculum. Another participant recommended supporting TPN pharmacists to obtain specialty residency training and attain a board in nutrition support abroad such as the Board of Pharmacy Specialties, Nutrition Support Pharmacy (USA).

Enhancing communication between TPN pharmacists: Many participants voiced a need to enhance communication between TPN pharmacists for knowledge exchange. They suggested establishing a national society for TPN pharmacists to facilitate their contact. The society can also be responsible for the development of national standards for TPN practices and the publication of a regular bulletin on TPN:

"We need to have regular meetings for the pharmacists working in the TPN units of different hospitals to exchange experiences and discuss potential solutions for common problems." (P4)

DISCUSSION

Because of their unique qualifications, pharmacists can have significant contribution to the care of patients receiving PN therapy. This study explored the role of pharmacists in PN therapy in Kuwait

hospitals and revealed that pharmacists have limited roles in providing direct patient care.

The current study shows that pharmacists were mainly performing traditional tasks such as compounding and dispensing of TPN formulations. This is in line with the reported general practice of hospital pharmacists in Kuwait, which mainly involved technical roles such as filling drug orders and stock control.¹⁸ Most pharmacists had very limited contact with patients on the wards. However, a clinical pharmacist-based TPN service has been shown to improve patients' nutritional status and clinical outcomes as compared to the conventional care provided by staff nurses.¹⁰ Only two pharmacists reported that they visited patients on the wards (one pharmacist collaborated with the physicians and the other with the dieticians) to participate in patients assessment and the design of TPN regimens, and one of them monitored patients' response to PN therapy. Parenteral nutrition is a high-risk nutrition support modality and patients receiving this therapy need close monitoring to avoid PN-related complications.^{29,30} Pharmacists' involvement in monitoring these patients has long been proven to reduce costs and improve the patients' clinical outcomes^{8,9} and to resolve complications.⁴ Pharmacists with the adequate clinical training and specialty qualifications can develop and implement useful clinical pharmacy services in specialized areas such as renal dialysis³¹ and oncology.³² In a qualitative study about the role of pharmacists in outpatient dialysis centres, Salgado *et al.* showed that pharmacists demonstrated positive attitudes towards implementing a number of pharmacy services including medication reconciliation, medication review, patient education, promotion of compliance and involvement in protocol development.³¹ Therefore, there is an opportunity to improve the quality of care provided to patients receiving PN therapy in Kuwait hospitals by more involvement of pharmacists in the provision of clinical services to these patients. To be able to fulfill the requirements of that role, pharmacists need adequate educational preparation and clinical training on nutrition support.

The results of this study show that TPN pharmacists in Kuwait hospitals had various educational backgrounds and training levels related to PN therapy. The interviews highlighted an apparent need for educational preparation of pharmacists to undertake expanded practice roles. Participants recommended reinforcing TPN-related education and training at both undergraduate and continuing professional development levels. Pharmacists practicing in nutrition support must receive formal education and training with continuous competency assessment to take on their roles and responsibilities.³³ A professional organization such as ASPEN defines the qualifications required of nutrition support pharmacists.³ These pharmacists should demonstrate competence in nutrition support by either the completion of an educational training program in nutrition support therapy or the certification in nutrition support by a credentialing body such as the Board of Pharmacy Specialties (USA).³ This study identified lack of pharmacists

with specialty residency training or certification in nutrition support at the hospitals. This necessitates developing formal training programs to increase pharmacists' knowledge and skills in nutrition support and with the aim of becoming certified in nutrition support.³³ Upon completion of this program, pharmacists must demonstrate competence by being able to pass a proficiency examination.³⁴ Moreover, organizing continuing professional development programs on nutrition support therapy for practicing TPN pharmacists is needed to enhance their practices. Pharmacy students must be provided with adequate clinical training on the care of patients receiving PN therapy. Pharmacists prepared with adequate competencies, qualifications, and certifications on nutrition support are likely to contribute effectively to the tasks of NSTs and to patient care. This study also showed that pharmacists relied on multiple different sources of TPN-related information. A standard reliable reference for TPN-related information needs to be provided for pharmacists. The Kuwait Ministry of Health and Kuwait University Faculty of Pharmacy must collaborate to address the educational and information needs of TPN pharmacists in Kuwait.

In the present study, participants reported daily communication with physicians to clarify or adjust TPN order forms. Prescription errors in standardized TPN order forms are common reasons for pharmacists to query physicians.³⁵ Few participants recalled good collaboration experiences with some physicians, in which the physician trusts the pharmacist as an expert in TPN design and compounding. Physicians' lack of knowledge about TPN could have motivated them to rely on pharmacists for this service.⁴ This makes this aspect of patient care ideal to initiate pharmacist-physician collaborative practice. Sanchez *et al.* have demonstrated that adding a pharmacist to the care team providing PN therapy permitted direct intervention in partnership with physicians to be made, and was an effective approach for preventing and resolving PN-associated complications.¹² Other participants reported that physicians assumed total responsibility over all therapeutic decisions or were resistant to pharmacists' role in patient care. Pharmaceutical care practice requires good interprofessional working relationship between pharmacists and physicians.¹⁴ Lack of communication/coordination with physicians and lack of physicians' trust in the pharmacists' abilities have been cited as barriers to pharmaceutical care.^{16,23,24} Physicians in Kuwait have been found to be reluctant to accept pharmacists' provision of direct patient care.³⁶ However, pharmacists involvement in PN therapy alongside physicians has been proven of value in improving patients' nutrition support therapy outcomes^{4,37} and in preventing and resolving PN-associated complications.¹²

This study shows that the involvement of pharmacists in providing pharmaceutical care services to patient receiving PN therapy is currently limited in Kuwait and seems to depend on individual pharmacist initiative. Most of these pharmacists were relying on self-directed learning to enhance

their knowledge on TPN. Interestingly, participants who had a role in providing direct patient care were more confident and satisfied about their roles than those who were only involved in TPN compounding. Pharmacists' contribution to nutritional support services has been found to enhance recognition of pharmacists as resources by physicians, and increase job satisfaction for pharmacists.³⁷ This also supports the findings of an earlier study among hospital pharmacists in Kuwait, in which most participants believed that pharmaceutical care practice is professionally rewarding.¹⁶ Therefore, the involvement of pharmacists in the clinical areas of TPN would probably improve the efficacy and safety of this therapy, enhance the recognition of pharmacists by physicians as partners in patient care, and increase job satisfaction for pharmacists. This can only be achieved when the pharmacists possess the necessary competencies and formal qualifications in nutrition support. Instead of working in TPN units, pharmacists with adequate expertise in nutrition support should be encouraged to work with physicians on the wards. This would promote physicians' confidence in the pharmacists' clinical abilities and, consequently their partnership in patient care.

A team approach exemplified by NSTs was favoured by all participants, yet none of the hospitals had such teams. Dedicated NSTs, which routinely included pharmacists, have been employed to coordinate the delivery of PN therapy in many countries.^{2,20,21,38} Team approach to the care of patients receiving PN therapy ensures the clinical appropriateness of PN therapy^{2,5,21}, maximizes the efficiency of using the available resources³⁹ and minimizes PN-associated complications.^{5,21,30,40} There is a growing evidence showing that the involvement of NSTs in the management of nutrition support services helps avoid the inappropriate/non-justified PN therapy use and PN-associated metabolic and aseptic complications which translates into substantial cost savings.^{5,41,42} Pharmacists identified several potential benefits for NSTs, including enhanced communication and knowledge/opinions exchange amongst practitioners, time saving and improved service. In view of the established and perceived benefits of NSTs, healthcare professionals involved in PN therapy at hospitals of Kuwait are advised to coordinate their efforts within functional, well-managed NSTs to improve quality of care and cost expenditure.

Study participants' perceived barriers to the existence of NSTs were organizational / administrative barriers such as lack of guidelines for the development of NSTs, shortage of staff and physicians' assuming total responsibility for clinical decision-making. Physicians' attitudes including skepticism, rivalry, and ignorance have been among the problems that faced NSTs in the period of their growth in the USA.³⁸ Lack of interest from the medical staff could have limited the role of NSTs in patient care in other countries.²¹ Physicians need to be educated about the benefits of NSTs in optimizing the clinical and economical management of nutrition support services. The study revealed

lack of trained nutrition support staff and lack of coordination in delivering TPN care. Efforts are needed to prepare healthcare professionals with nutritional expertise who can work in a collaborative manner within proactive and well-managed NSTs. One way to enhance collaborative practice among healthcare professionals could be through providing interprofessional educational (IPE) opportunities for undergraduate healthcare students. This would allow students from each healthcare profession appreciate the value of the contributions made by other disciplines in patient care and, consequently promote the development of collaborative working relationships among future healthcare practitioners. The World Health Organization recognizes IPE as a necessary educational strategy to prepare collaborative healthcare practitioners who have learned how to work in an interprofessional team and are competent to do so.⁴³ There is also sufficient evidence to indicate that effective IPE enables effective collaborative practice⁴³ and can help improving the pharmacist-physician working relationship.^{7,44} Moreover, establishing national standards of TPN practices which include explicit guidelines on the development of NSTs is urgently needed.

In this study, participants identified several barriers to pharmaceutical care practice and they provided suggestions to overcome these barriers to enhance their role in patient care. Lack of a standard reference for TPN-related information and lack of standardization of TPN practices across hospitals were perceived as main organizational barriers to the pharmacist provision of optimal TPN services. The participants called for the development of a standard reference for safe TPN practices. A standardized process for TPN practices would improve patient safety and clinical appropriateness, and maximize resource efficiency.⁴⁵ This can overcome any miscommunication problems and ensure a seamless nutritional management for patients upon their transition between healthcare settings. Pharmacists felt that they had minimal role in the management of patients' care plans and the selection of TPN formulary. Pharmacists' participation in active NSTs can overcome these barriers, as this would allow them provide direct patient care and have a role in the development of TPN guidelines/standards and the selection of TPN formulary.²¹ To undertake these roles, pharmacists would require adequate education and training on nutrition support. There was an overwhelming consensus among participants on the need to foster pharmacists' education on PN therapy to enhance their role in patient care. Other reported organizational barriers included shortage of staff and time constraints, which concur with the reported barriers to pharmaceutical care in previous studies conducted in Kuwait.^{15,16,23,24} The number of pharmacists working at each TPN unit was minimal which can explain the limited role of the pharmacists in performing TPN compounding tasks and their lack of time to provide direct patient care. In addition, only four hospitals employed one or two pharmacy technicians in the TPN units. Many participants recommended for the provision of more pharmacy staff and they stressed on the need to

provide qualified pharmacy technicians to assist pharmacists in TPN compounding. Lack of pharmacist time can be partly overcome by better delineation between the roles of the pharmacist and the pharmacy technician. Allocating technical tasks such as TPN compounding and dispensing duties to technicians can permit role redesign and free-up the pharmacist's time to provide patient-centered care. Participants demonstrated positive attitudes towards team approach to patient care and they recommended for the development of NSTs to supervise the delivery of PN therapy. Using practitioners with nutrition support therapy expertise will contribute to the execution of safe PN system.^{3,45} Some participants suggested enhancing communication among TPN pharmacists and conducting research activities locally to address the issues they face in their practice. Health authorities need to consider these suggestions to enhance the quality of TPN services at Kuwait hospitals.

This study explored pharmacists' role in PN therapy and the barriers that hinder the implementation of pharmaceutical care services in this specialized area of practice. Further studies are needed to explore the opinions of other healthcare professionals including physicians, dieticians, and nurses in team approach to PN therapy and the barriers towards having functional NSTs. Identifying these barriers will help health authorities plan appropriate strategies to enhance the delivery of collaborative care to patients receiving PN therapy. Moreover, conducting future studies to evaluate the impact of pharmaceutical care services on the clinical and economical outcomes of PN therapy are also warranted once these services are provided systemically by TPN pharmacists in Kuwait hospitals.

Limitations

Some of the limitations that influence qualitative research in general apply to this study. A possible limitation is the participants' self-reporting of practices and experiences. It is possible that pharmacists offered socially desirable responses. However, this is less likely as they were assured about the confidentiality of their responses. Furthermore, the sample size included in this study was small and involved only seven participants. In qualitative research, the sample size is determined by the research questions and data saturation.²⁵ These were fulfilled by the comprehensive range of responses that were obtained from the seven participants who represented all the hospitals which provide TPN preparation services in Kuwait. Another limitation is that the findings of this study may not be generalizable to other countries. However, the transferability of these findings to other contexts might be possible if they can be considered appropriate/applicable to these settings.

CONCLUSIONS

Pharmacists practicing in TPN in Kuwait hospitals are mainly performing technical tasks such as TPN compounding. There are several barriers to the provision of optimal pharmaceutical care services in

their practices, including organizational and professional barriers. Health authorities and educational institutions must collaborate to overcome these barriers and assist the pharmacists to undertake expanded practice roles. Pharmacists must be provided with appropriate educational preparation to practise as nutrition support pharmacists with patient-centred roles. Healthcare professionals, including pharmacists with adequate clinical training and advanced certifications in nutrition support who practise within active NSTs are pivotal to the delivery of safe and efficacious PN therapy.

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CONFLICT OF INTEREST

The Authors declare that they have no conflicts of interest to disclose.

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