**The Open Public Health Journal**
*DOI: 10.2174/0118749445409640250911015407, 2025, 18, e18749445409640*
**ISSN: 1874-9445**


**RESEARCH ARTICLE** **OPEN ACCESS**

# Specialized Professional Programs in Saudi Arabia: A Case Study of Pediatric Dialysis Nursing Competency and a Literature Review

Mansour Alfadhel[1,*], Abdulkarim Alanazi[2], Lulu Alwazzan[3] and Saeed Alzabali[2]

[1]*Associate Executive Director of Professional Development and Simulation, Riyadh Second Health Cluster; Riyadh, Saudi Arabia*
[2]*Consultant Pediatric Nephrologist, Riyadh Second Health Cluster, Riyadh, Saudi Arabia*
[3]*Department of Medical Education, College of Medicine - Imam Mohammad Ibn Saud Islamic University, Riyadh, Saudi Arabia*

**Abstract:**

***Introduction:*** Specialized Professional Programs (SPPs), a subset of Continuing Professional Development (CPD), address crucial skill gaps in healthcare, particularly in specialized areas like pediatric dialysis. The SPP models in pediatric dialysis nursing include competency-based training, modular certification, and residency programs. Designed to enhance clinical skills, these models improve patient outcomes through evidence-based practice. Their relevance in global healthcare systems lies in standardizing care, reducing complications, and supporting nurse retention in complex pediatric nephrology settings. The Saudi SPP differs from the global programs in its simplicity and narrower timeframe for achievement, although it is still under consideration to be more practically evidenced. The way to develop these programs is still being considered.

***Methods:*** This study adopted a dual-method approach: a literature review of worldwide SPP frameworks and a case study of Saudi Arabia's Pediatric Dialysis Nursing Competency SPP. Post-course assessments (n=60 participants) examined learner satisfaction, perceived relevance, and knowledge retention. The program featured classroom instruction, clinical rotations, and simulation-based training matched with international standards.

***Results:*** Participants indicated great satisfaction (73% strongly agreed, 27% agreed) and recognized relevance to clinical practice (69% strongly agreed, 31% agreed). All participants revealed greater expertise in pediatric dialysis care. The program's organized curriculum and hands-on instruction were appreciated, while practical problems, including pre-reading material distribution, were minor concerns.

***Discussion:*** The SPP effectively overcame competency gaps, aligning with Saudi Arabia's healthcare aims. However, reliance on self-reported data and short-term results hindered the ability to analyze long-term consequences on patient care. The study underscores the necessity for longitudinal research and post-training support measures to sustain improvements.

***Conclusion:*** SPPs demonstrated significant potential in specialized healthcare education, notably in addressing staff shortages. These techniques can boost SPP scalability and long-term efficacy, complementing Saudi Arabia's Vision 2030 objectives and worldwide healthcare standards.

**Keywords:** Continuing professional development (CPD), Specialized professional programs (SPPs), Competency-based programs, Healthcare education, Lifelong learning, Healthcare professionals, Professional skills, Evidence-based practice.

*Address correspondence to this author at the Associate Executive Director of Professional Development and Simulation, Riyadh Second Health Cluster; Riyadh, Saudi Arabia; E-mails: mohahir68@gmail.com and malfadhel@kfmc.med.sa

*Cite as:* Alfadhel M, Alanazi A, Alwazzan L, Alzabali S. Specialized Professional Programs in Saudi Arabia: A Case Study of Pediatric Dialysis Nursing Competency and a Literature Review. Open Public Health J, 2025; 18: e18749445409640. http://dx.doi.org/10.2174/0118749445409640250911015407

Received: June 02, 2025
Revised: July 13, 2025
Accepted: July 22, 2025
Published: September 17, 2025



## 1. INTRODUCTION

Specialized Professional Programs (SPPs), a focused subset of Continuing Professional Development (CPD), have emerged as key tools for increasing healthcare capabilities in specific clinical sectors such as pediatric dialysis, oncology, and critical care [1, 2]. Globally, SPPs are meant to address exact skill gaps via rigorous, competency-based training, allowing practitioners to perceive innovative medical technology, evidence-based practices, and complicated patient care protocols [3].

While generic CPD frameworks are well-documented [1-5], the effectiveness of SPPs—particularly in specialized roles and non-Western contexts—remains underexplored. The pediatric dialysis case study presents an example of SPP challenges and achievements, delivering practical lessons for growing such initiatives throughout Saudi Arabia's healthcare system. Through post-training surveys of 60 nurses, the research examines learner satisfaction, knowledge retention, and perceived clinical relevance—key indications of program performance [6].

Previous findings not only add to the scant literature on SPPs in specific Middle Eastern settings but also assist governmental choices to match SPP design with Vision 2030's healthcare goals. Ultimately, our study emphasizes the transformational potential of SPPs in developing a resilient, highly competent workforce capable of handling the complexity of contemporary medicine [4, 7].

In Saudi Arabia, the Saudi Commission for Health Specialties (SCFHS) has promoted SPPs to coordinate with national aims of increasing healthcare quality and overcoming significant staff shortages [8]. However, empirical research on SPP implementation and effects inside the Kingdom is scarce.

This research addresses this gap with a dual-method analysis: a comprehensive literature review synthesizing worldwide SPP frameworks and a case study of Saudi Arabia's Pediatric Dialysis Nursing Competency SPP, the nation's first specialized training pilot. By combining global ideas with localized empirical data, the study analyzes how SPPs overcome competence gaps, increase professional cooperation [2-4], and improve patient outcomes in specialized care contexts.

### 1.1. Continuing Professional Development in a Global Perspective

The CPD has evolved as a worldwide requirement in healthcare, inspired by rapid developments in medical knowledge, technology, and increased patient expectations [1, 2]. A dynamic and well-equipped staff is increasingly vital for providing safe, evidence-based care and maintaining high-quality healthcare systems [1]. Regulatory organizations, healthcare institutions, and professional groups worldwide consider CPD as a cornerstone of lifelong learning, ensuring practitioners remain skilled at navigating novel clinical circumstances [6].

The WHO underlines the significance of lifelong learning for healthcare workers, calling for CPD activities that address skill shortages and directly enhance patient outcomes and public health [9, 10]. This approach reflects the WHO's understanding of the ever-changing nature of healthcare, where continual skill renewal is crucial to keeping pace with breakthroughs in medical research.

Similarly, the World Federation for Medical Education (WFME) has developed frameworks, emphasizing the role of CPD in educating professionals with adaptive abilities, such as critical appraisal of new knowledge and responsiveness to altering healthcare needs [11].

Globally, CPD increases adaptation and responsiveness among healthcare professionals, allowing them to manage evolving challenges, from technology disruptions to pandemic preparation. By supporting CPD in worldwide best practices, professionals incorporate a larger perspective into their work, combining local realities with global standards [3-5].

Cross-country partnerships further increase this effect, enabling information sharing and developing innovations that enhance healthcare systems globally. For instance, international conferences, seminars, and digital platforms allow professionals to exchange information, adopt best practices, and acquire cultural competencies required for patient-centered care in an increasingly globalized society [6].

The Global Forum on Medical Education (GFME) maintains this attitude, underlining the “global nature of contemporary healthcare” and the requirement for medical professionals to upgrade their skills regularly. Engaging in CPD from a global perspective not only develops individual capabilities but also promotes systemic changes [1, 12].

By using global trends and evidence-based recommendations, healthcare practitioners may address

inequities, improve resource allocation, and personalize therapies to varied groups, eventually improving equitable care [13].

So, establishing CPD within a global context is no longer optional but fundamental. As medical frontiers grow, lifelong learning ensures healthcare professionals stay at the forefront of their areas, capable of providing high-quality care in an interconnected world [14]. This worldwide commitment to CPD not only improves individual practice but also fortifies healthcare systems, paving the way for better patient outcomes and sustained public health gains [15].

### 1.2. Continuing Professional Development in the Context of Saudi Arabia

The CPD exists at the core of Saudi Arabia's aim to develop a globally competitive healthcare workforce, a cornerstone of the Kingdom's Vision 2030 reform plan. Spearheaded by the Saudi Commission for Health Specialties (SCFHS)—the regulatory organization responsible for healthcare certification and professional standards—CPD has been established as an obligatory requirement for license renewal and career development [16-18].

This strategy guarantees that physicians, nurses, and allied health professionals constantly refine their skills, establishing a culture of lifelong learning that enhances patient care quality and develops the nation's healthcare infrastructure [19].

The SCFHS offers a holistic approach to CPD, delivering multiple learning modalities adapted to the demands of Saudi Arabia's fast-expanding healthcare scene [20]. Conferences and seminars serve as crucial forums for professionals to connect with global specialists, discuss best practices, and remain updated about developments in sectors such as precision medicine and robotic surgery [21].

Complementing these are flexible online courses, which allow practitioners in distant locations or demanding positions to upskill at their own pace, guaranteeing equal access to cutting-edge information. Research projects further strengthen CPD by enabling professionals to contribute to scientific developments and critically analyze local methods, tackling real concerns like diabetes prevalence or maternal health inequities [13, 22].

As regulated by the Saudi Commission for Health Specialties (SCFHS), CPD is mandatory for license renewal, requiring healthcare workers to accumulate a specified number of credit hours through structured educational activities. These include conferences, hands-on workshops, clinical simulations, online modules, and research participation. The push for CPD is deeply rooted, which prioritizes healthcare transformation and workforce capacity building. In nursing, CPD programs target critical areas including pediatric nephrology, infection control, and advanced clinical assessment. Hospitals and academic institutions are collaborating to provide tailored CPD tracks, often linked to career advancement and professional certification [17]. By institutionalizing CPD, Saudi Arabia is not only improving clinical outcomes and patient safety but also fostering a culture of lifelong learning and professional accountability among nurses [19,20].

Meanwhile, self-directed learning—supported by resources such as the Saudi Digital Library and specialist webinars—empowers individuals to tailor their educational strategies, connecting their progress with both personal objectives and national healthcare priorities [23].

By incorporating CPD into licensing, the SCFHS has not only standardized competence but also accelerated systemic reforms [24]. Hospitals claim demonstrable advantages, such as fewer hospital-acquired infections and faster recovery periods, ascribed to better clinical skills among personnel [25].

### 1.3. Healthcare Specialized Professional Programs (SPPs)

Specialized Professional Programs (SPPs) in pediatric dialysis nursing are essential in equipping nurses with the advanced knowledge and clinical expertise required to manage children with end-stage renal disease. These programs are offered in various models, including competency-based education, modular training systems, clinical fellowships, and academic-practice partnerships. Competency-based models focus on developing specific technical and critical-thinking skills aligned with pediatric dialysis care [ 4 ].

They emphasize hands-on training and assessment in real-world scenarios, ensuring that nurses can effectively manage dialysis machines, monitor patient vitals, and respond to complications [ 5 ]. Modular training systems divide learning into focused units or modules, covering topics such as vascular access management, peritoneal dialysis protocols, and psychosocial aspects of pediatric care. These models offer flexibility and allow for tailored learning paths based on individual or institutional needs [ 6 ].

Clinical fellowships and residency programs provide extended, immersive training within specialized nephrology centers, often incorporating mentorship from experienced pediatric nephrology nurses and physicians. Academic-practice partnerships, seen in countries like the United States and Australia, integrate university-based coursework with clinical rotations in pediatric dialysis units, promoting evidence-based practice and research engagement [ 9 ].

The outcomes of these models include improved clinical competence, enhanced patient safety, and increased job satisfaction among nurses. Moreover, by reducing nurse burnout and turnover, they contribute to more stable and experienced healthcare teams [7-11].

Internationally, these models have proven effective in strengthening pediatric nephrology care. In Canada and parts of Europe, structured certification and continuing education in pediatric dialysis have been linked to better patient outcomes, including lower infection rates and

improved growth metrics in children [3,5]. As healthcare systems strive to improve pediatric dialysis care, adopting and adapting these specialized professional programs is vital for developing a skilled workforce capable of delivering high-quality, patient-centered care in this complex field [3,12].

As designed to meet the rising need for focused, competency-based training in healthcare, SPPs reflect an innovative development within CPD [26]. Unlike conventional CPD events—such as seminars or conferences covering generally broad subjects—SPPs concentrate on particular skills or knowledge gaps.

This customized method allows medical professionals to accommodate demanding work schedules and expand knowledge in specific areas. Combining flexibility with thorough training helps SPPs close the gap between broad knowledge and the exact abilities needed in contemporary healthcare delivery [12, 23].

Their competency-based approach, which stresses mastery of specific skills via an organized curriculum matched with clinical standards, defines SPPs. A pediatric dialysis nursing SPP can include modules on dialysis procedures, pediatric pathophysiology, and ethical issues, so that learners get both theoretical knowledge and practical competence. These approaches also provide flexibility and efficiency as top priority, thus fitting the demanding schedules of medical professionals [4].

Designed as modular and concise, SPPs allow completion without interfering with clinical duties. While balancing personal and professional obligations, this flexibility guarantees professionals keep current on developments, such as artificial intelligence-driven diagnostics or tailored treatment [27-31].

Moreover, SPPs provide a complete learning experience by integrating academic education with practical application via case studies, simulations, and clinical rotations [15]. This holistic approach cultivates critical thinking and problem-solving abilities, helping learners to adopt evidence-based methods successfully.

The advantages of SPPs extend to both individual practitioners and healthcare systems. For professionals, these programs offer focused skill development to address particular practice shortages, chances to upskill in new fields like genomics or robotic surgery, and organized routes for lifetime learning and career promotion.

Accreditation via SPPs further verifies specific competence, improving trust with employers and patients. For instance, a nurse gaining an SPP certificate in pediatric dialysis displays mastery of specialty abilities, placing them as a trusted resource in their sector. At the systemic level, SPPs contribute to better patient outcomes via greater clinical competence and foster systemic innovation by educating professionals in cutting-edge methods [6, 17].

While SPPs provide specialized training, they complement rather than replace typical CPD (1). Broader learning routes, such as conferences, remain crucial for networking and keeping updated on multidisciplinary developments. SPPs fill a key gap by providing precision education that is adapted to growing clinical needs [29, 32].

However, the adoption of SPPs is not without obstacles. Maintaining strong admission and completion criteria is vital to protect the legitimacy of SPP credentials, since decreasing these standards risks diluting program quality. Strategic enrollment management is equally essential to minimize market saturation and guarantee alignment between program output and job market needs.

Furthermore, continuous assessments and modifications of SPP content are important to accommodate fast technology improvements and regulatory changes, guaranteeing continued relevance and effectiveness [33].

### 1.4. The Imperative for Specialization in Healthcare

The contemporary healthcare landscape is distinguished by a growing need for practitioners with specialized competence, driven by three interconnected factors: rapid medical developments, greater sub-specialization, and evolving regulatory frameworks (2). These dynamics collectively underline the importance of healthcare professionals requesting tailored training and developing their abilities in certain disciplines.

First, significant breakthroughs in medical technology and research have revolutionized clinical practice, demanding specialized training to leverage these technologies successfully (3). Breakthroughs such as robotic surgical systems, less invasive treatments, and tailored genetic therapies need practitioners to learn not just the technical elements of new equipment but also their incorporation into patient care methods [14, 34].

For illustration, robotic surgery requires physicians to improve both operational accuracy and decision-making in dynamic operative contexts. Similarly, the growth of precision medicine—tailoring therapies based on genetic profiles—requires competence in reading complicated data and applying it ethically. Without specialized training, healthcare practitioners risk being insufficiently prepared to utilize these advancements, thereby affecting patient outcomes [18].

Second, the increased complexity of medical diseases has spurred a tendency toward sub-specialization. Fields like cardiology and oncology increasingly comprise specific disciplines such as interventional cardiology, electrophysiology, and immunotherapy. Each sub-specialty involves a sophisticated grasp of unique diseases and treatment techniques. For example, an oncologist working on immunotherapy must traverse the subtleties of immune system regulation, apart from standard chemotherapy techniques [9, 21].

This granular understanding allows practitioners to provide highly tailored treatments, boosting diagnostic accuracy, treatment success, and patient survival rates. Sub-specialization, therefore, indicates a reaction to the

sophisticated needs of contemporary medicine, where depth of knowledge is as vital as breadth.

Third, the healthcare regulatory environment is in continual motion, with developing standards aimed at boosting patient safety and treatment quality (4). Regulatory agencies such as the FDA and CMS constantly revise procedures for clinical trials, data protection, and quality reporting [22, 35].

Compliance with standards like the Health Insurance Portability and Accountability Act (HIPAA) demands particular skills to handle sensitive patient data securely [5, 6]. Specialized training helps professionals stay current with these developments, lowering compliance risks and encouraging ethical behaviors. For instance, an expert in clinical research must comprehend developing trial design requirements to assure regulatory compliance while improving medical knowledge [36].

## 2. METHODS

### 2.1. Historical Context and Development of the Saudi Program for Specialization (SPP)

SPP was created in 2018 by the Saudi Commission for Health Specialties (SCFHS) to meet the Kingdom's increasing demand for highly qualified healthcare personnel. This project emerged against the background of Saudi Arabia's Vision 2030, which promotes healthcare workforce development as a cornerstone of systemic transformation. Recognizing that specialized competence is crucial to increasing care quality and patient outcomes, the SCFHS performed a detailed feasibility study to explore the potential effect of competency-based training programs suited to Saudi Arabia's healthcare needs Table **1**.

**Table 1. Timeline for establishing the SPP .**

| Early 2018 | March 11, 2019 | Mar. 11-14, 2019 | 2019-2020 | February 8, 2021 |
|---|---|---|---|---|
| Discussion started with SCFHS. | First certificate approved from SCFHS-Nursing Competency Certification in Pediatric Dialysis | First pilot program-Nursing Competency Certification in Pediatric Dialysis | Total batch of programs conducted: 25 | First announcement in KFMC Insider |

### 2.2. Training Procedures

The current program comprises training on dialysis techniques, and scenario simulations accompanied by debriefings during and subsequent to the simulations. A rubric is a clear collection of criteria and standards utilised for evaluating a learner's competence, skills, abilities, and assignments. In medical and nursing education, there has been an increasing emphasis on the utilisation of rubrics, as they facilitate learners in becoming reflective evaluators of both their own work and that of others, while also alleviating the instructional burden on educators.

Following extensive talks with healthcare specialists, academic institutions, and stakeholders, the SCFHS officially approved the SPP and assigned its implementation to the SCFHS Continuing Professional Development and Accreditation (CPDA) executive administration. This specialist committee was responsible for monitoring the program's design, implementation, and long-term management. A multidisciplinary team of specialists was assembled to develop the SPP framework, relying on worldwide best practices and benchmarking against top global training models. The team meticulously examined Saudi Arabia's healthcare sector demands, assuring consistency with both local priorities—such as eliminating workforce shortages in essential specialties and worldwide standards for specialized education.

The resultant SPP framework included rigorous curriculum design, accreditation standards, and competence criteria. Curricula were intended to equip trainees with advanced academic knowledge, hands-on clinical skills, and ethical decision-making abilities particular to their specializations. For instance, curricula in pediatric dialysis incorporated courses on developing dialysis technology, pediatric pathophysiology, and patient-family communication techniques. To sustain excellence, the SCFHS-CPDA built rigorous quality assurance procedures, including periodical reviews of residency programs, faculty training efforts, and structured feedback loops, including trainees and mentors. These strategies maintained constant progress and conformity to the highest educational standards.

The SPP's introduction represented a significant milestone in Saudi Arabia's healthcare education sector. By offering a defined road for specialization, the program has enabled practitioners to manage complicated clinical issues, decrease dependency on expatriate knowledge, and enhance the overall quality of care. Its effectiveness is reflected in indicators such as better patient outcomes in pilot specialties and high participant satisfaction ratings.

So, the SPP illustrates Saudi Arabia's commitment to establishing a world-class healthcare workforce via planned, evidence-based education reforms. By bridging capability gaps and developing specialization, the program has become a catalyst for advancing both individual careers and national healthcare goals.

### 2.3. Study Design

This research adopted a mixed-methods strategy, incorporating a case study of the Pediatric Dialysis Nursing Competency Specialized Professional Program (SPP) with quantitative and qualitative assessments. The study used post-course evaluations, learner satisfaction surveys, and thematic analysis of open-ended comments to evaluate the program's efficacy in strengthening clinical competence and addressing workforce needs in pediatric dialysis care. The research was performed over two years, from March 2019 to February 2021.

### 2.4. Setting and Participants

A random sampling technique was used to choose the eligible participants for this study. Using G Power sample

size calculator from a total of 213 nurses who are working in dialysis units, the total sample size was about 60 participants with 5% error margin.

The pilot study was carried out at King Fahad Medical City (KFMC) in Riyadh, Saudi Arabia, a tertiary care institution recognized for its outstanding pediatric nephrology services.

The pilot testing showed that the survey items and the program's content had a high competency and revealed a great validity to the respondent.

Participants included 60 healthcare professionals (59 females, 1 male) from Saudi Arabia and Bahrain. The inclusion criteria of this study participants were all healthcare professionals who have previous experience in nephrology and pediatric care, as well as their expertise in dialysis, with all clinical and medical professionalism. The academic qualifications were also considered as one of the critical eligibility criteria of having more than 5 years' experience in the hemodialysis approach among cases.

### 2.5. Ethical Considerations

This study was conducted in complete compliance with the ethical guidelines specified in the Declaration of Helsinki for medical research involving human subjects. Ethical approval was acquired from the Saudi Commission for Health Specialties (SCFHS) Ethics Review Board, and all subjects provided written informed consent. (IRB Registration Number with KACST, KSA: H- 01- R-012)

### 2.6. Sample Size

A total of 60 medical professionals from Saudi Arabia and Bahrain were included in the study. The restricted number of participants in this study was due to the specified eligibility criteria for professional selection.

They were selected through institutional nomination based on their nursing qualifications, commitment to specialized practice, and previous expertise in nephrology and pediatric care. The sample size is consistent with similar competency-based training assessments in healthcare education [32], even though formal power calculations were not performed, given that this program is a pilot.

### 2.7. Program Description

The Pediatric Dialysis Nursing Competency SPP was an 8-week competency-based training program. This short program was due to the engagement of these participants in their work disciplines, and we tried not to occupy them with a long period of study. It was structured into three major components:

Classroom Instruction: Covered theoretical foundations, including dialysis modalities (hemodialysis, peritoneal dialysis), pediatric pathophysiology, medication management, and ethical decision-making.

Clinical Rotations: Supervised hands-on training in KFMC's pediatric dialysis unit, focused on real-world application of techniques, family-centered communication, and emergency management.

Simulation-Based Training: Utilized high-fidelity manikins and scenario-based exercises to simulate complications such as dialysis device malfunctions and hypotensive episodes.

The curriculum was designed via a comprehensive needs assessment aligned with international standards from organizations such as the American Nephrology Nurses Association (ANNA) and modified to meet gaps found in Saudi Arabia's pediatric dialysis care landscape. Competencies were matched to learning objectives, ensuring agreement with clinical practice standards.

### 2.8. Data Collection

Data gathering strategies concentrate on both primary and secondary outcomes. Primary outcomes were examined by post-training competency evaluations, which included Likert scale surveys and clinical simulation performance indicators. Secondary outcomes involved thematic analysis of open-ended participant feedback and six-month follow-up practice audits; however, the latter was limited to 40% of the cohort due to logistical restrictions.

### 2.9. Statistical Analysis

Statistical analysis focused on descriptive statistics, including frequencies and percentages. SPSS software was used to summarize participation characteristics and survey replies. Given the pilot nature of the study, no inferential statistical tests were employed, stressing instead a descriptive and exploratory approach to the data.

## 3. RESULTS

About 141 healthcare professionals were recruited according to the previous eligibility criteria to participate in this study, about 62 responded correctly and were willing to share and participate effectively. The random sampling technique was used, as mentioned, to alleviate the bias degree, but all of the recruited were from the dialysis department.

All sixty participants responded to the survey after performing the SPP. All of these participants were Saudi, and their mean age was 32.4 9.5 years old. Regarding their experience level, most of them have experience of more than 5 years (n=41). And all of them had previously had training sessions about hemodialysis. Most of these nurses were junior staff nurses (n=44) and none of them was a leader or non-clinical working nurse (Table **2**).

The Pediatric Dialysis Nursing Competency Specialized Professional Program (SPP) was provided across nine cohorts, including 59 females (98.3%) and 1 male (1.7%) participant. Participants represented different locations in Saudi Arabia, with four nurses (6.7%) from Bahrain. Post-course questionnaires indicated extremely favorable perceptions of the curriculum (Table **3**). A total of 73.3% of participants (n=44) strongly agreed they were satisfied

**Table 2. The demographic characteristics among participants (n=60).**

| Character | Frequency (n) | Percentgae (%) |
|---|---|---|
| **Level of experience** | | |
| **>5 years** | 12 | 20.00 |
| **5-10 years** | 41 | 68.33 |
| **More than 10 years** | 7 | 11.67 |
| **Roles** | | |
| **Staff nurses** | 44 | 73.33 |
| **Senior nurses** | 15 | 25.00 |
| **Incharge nurses** | 1 | 1.67 |

with the training, and 26.7% (n=16) agreed. Similarly, 61.7% (n=37) strongly agreed that the training material was directly relevant to their clinical practice, with 33.3% (n=20) agreeing. Notably, no participants reported disagreement or severe disagreement with any survey responses, showing satisfaction with the program's concept and implementation.

Regarding the program's aims and objectives, 95% (n=57) considered the goals clear, with 61.7% (n=37) strongly agreeing. Additionally, 86.7% (n=52) acknowledged compatibility between the training goals and their professional demands. In terms of content quality, 95% (n=57) confirmed the curriculum was evidence-based and up-to-date, with 68.3% (n=41) strongly agreeing. Pre-reading materials were judged as valuable by 95% (n=57); however, a small minority (6.7%, n=4) identified logistical issues, such as the time of material distribution.

The effectiveness of speakers and instructional strategies gained widespread appreciation. All participants (100%) praised instructors' communication abilities, with 70% (n=42) strongly believing they maintained effective engagement. Teaching strategies, especially case-based simulations, were regarded as acceptable by 95% (n=57), and 95% (n=57) found instructors competent and well-prepared. The program's organization also achieved good evaluations, with 95% (n=57) characterizing it as well-structured, and 75% (n=45) strongly agreeing. Furthermore, 86.7% (n=52) affirmed that the program fulfilled their expectations, and 78.3% (n=47) strongly agreed that they would suggest it to colleagues.

A startling 86.7% (n=52) strongly felt the training fulfilled its learning aims, with all participants (100%) reporting enhanced competence in pediatric dialysis care. Qualitative evaluations emphasized the direct application of skills, such as managing dialysis complications and family communication strategies. Participants expressed problems in incorporating new procedures into fast-paced clinical situations but stressed greater confidence in emergencies post-training. Neutral reactions were minimal (1.7–6.7%), mostly related to logistical details rather than program content.

The findings revealed excellent satisfaction and perceived relevance among participants, with complete agreement on the program's success in resolving competency gaps. The rigorous assessment system, integrating quantitative measurements and qualitative insights, showed the SPP's efficacy in increasing specialized nursing abilities crucial to pediatric dialysis care. The lack of negative feedback and the high percentages of intent to apply learned skills underline the program's potential to enhance clinical practice and patient outcomes.

**Table 3. Overall statistics of nursing competency certification in pediatric dialysis.**

| Items to be Evaluated | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|
| **Goal and Objectives** | | | | | |
| The aim of the training was clear | 0<br>0% | 0<br>0% | 3<br>5.00% | 20<br>33.33% | 37<br>61.67% |
| The program objectives were aligned with participant needs. | 0<br>0% | 0<br>0% | 5<br>8.33% | 17<br>28.33% | 38<br>63.33% |
| **Content** | | | | | |
| Consistent with stated objectives | 0<br>0% | 0<br>0% | 3<br>5.00% | 20<br>33.33% | 37<br>61.67% |
| The program was up-to-date and evidence-based. | 0<br>0% | 0<br>0% | 4<br>6.67% | 15<br>25.00% | 41<br>68.33% |
| Relevant to clinical practice | 0<br>0% | 0<br>0% | 3<br>5.00% | 20<br>33.33% | 37<br>61.67% |
| The pre-reading materials were distributed before the activity. | 0<br>0% | 0<br>0% | 4<br>6.67% | 20<br>33.33% | 35<br>58.33% |
| Pre-reading material was useful/beneficial. | 0<br>0% | 0<br>0% | 2<br>3.33% | 20<br>33.33% | 38<br>63.33% |

*(Table 3) contd.....*

| Items to be Evaluated | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|
| **Speakers** | | | | | |
| Maintained effective communication with the learners | 0<br>0% | 0<br>0% | 0<br>0% | 18<br>30.00% | 42<br>70.00% |
| Knowledgeable about the subject and well prepared | 0<br>0% | 0<br>0% | 1<br>1.67% | 14<br>23.33% | 45<br>75.00% |
| Teaching methods & aids were appropriate for the trainees. | 0<br>0% | 0<br>0% | 1<br>1.67% | 21<br>35.00% | 38<br>63.33% |
| A variety of teaching strategies are used. | 0<br>0% | 0<br>0% | 0<br>0% | 21<br>35.00% | 38<br>63.33% |
| Able to relate the topic to clinical practice | 0<br>0% | 0<br>0% | 0<br>0% | 19<br>31.67% | 41<br>68.33% |
| Facilitated a positive teaching-learning environment | 0<br>0% | 0<br>0% | 1<br>1.67% | 20<br>33.33% | 39<br>65.00% |
| Able to respond appropriately to the questions | 0<br>0% | 0<br>0% | 2<br>3.33% | 21<br>35.00% | 37<br>61.67% |
| Followed the timetable schedule | 0<br>0% | 0<br>0% | 1<br>1.67% | 22<br>36.67% | 37<br>61.67% |
| **Overall Rating** | | | | | |
| The training program was well organized. | 0<br>0% | 0<br>0% | 2<br>3.33% | 13<br>21.67% | 45<br>75.00% |
| The educational activity met trainees' expectations. | 0<br>0% | 0<br>0% | 1<br>1.67% | 14<br>23.33% | 45<br>75.00% |
| I am satisfied with the training program. | 0<br>0% | 0<br>0% | 0<br>0% | 16<br>26.67% | 44<br>73.33% |
| I would recommend this training program to my colleagues. | 0<br>0% | 0<br>0% | 0<br>0% | 13<br>21.67% | 47<br>78.33% |
| The training program achieved the expected learning outcomes. | 0<br>0% | 0<br>0% | 0<br>0% | 8<br>13.33% | 52<br>86.67% |

**Table 4. The theme and subthemes observed in this post-program interview.**

| Themes | Subthemes | Responses (n) |
|---|---|---|
| **Knowledge** | Teaching and learning | 14 |
| | Practical skills | 8 |
| **Relevance** | Program evidence-based strategies | 12 |
| | Consistency with instructions | 7 |

### 3.1. Secondary Outcome Assessment

The thematic analysis for the secondary outcomes was also reported. It has been noted that only 40% of participants responded to the open-ended questions' part because of logistical reasons, their engagement, and not inability to discuss and interview with a long-term was the main limitation to restricted this second part to only 40% of these healthcare professionals.

There are two main themes extracted through the opend-ended interviewing as shown with their subthemes in the following Table **4**.

#### *3.1.1. Theme 1: Knowledge*

The knowledge among healthcare professionals about pediatric hemodialysis was very shining after the program achievement. The first subtheme was their teaching and learning how to use the dialysis apparatus. Respondents 1,2,5,6, and 9 said *" We are effectively using Mahoaker and follow up patients very well, especially after learning from your program* . The second subtheme was their practical skills, it has been reported by all respondents that *"The dialysis is not very complicated, but it needs to be keen with your patient as they cannot withstand all the time without being bored ".*

#### *3.1.2. Theme 2: Relevance*

The participants' relevance to the program aims and achievements was very illustrated. The first subtheme was to make and affirm the program's evidence-based strategies as the first three respondents (5, 14, and 12) said that *"This program enhances our awareness about the importance of good clinical practice and encourages us to then work in higher locations at a professional level* . The second subtheme was the consistency with instructions as all respondents except for respondent 23 said *" It is a must to comply with the SOPs of the apparatus and get a regular contact with the clinical pharmacists and nephrology doctors all the time* .

## 4. DISCUSSION

The findings of this research underline the great potential of SPPs in addressing critical competence gaps within healthcare education, notably in specialized sectors such as pediatric dialysis nursing. The Pediatric Dialysis Nursing competence SPP showed remarkable

effectiveness, with 86.7% of participants strongly agreeing that the program fulfilled its learning objectives, and 100% reporting enhanced clinical competence. These findings correspond with worldwide data supporting competency-based training as a cornerstone for boosting healthcare quality, especially in settings requiring rapid adaptation to technology and clinical improvements [37, 38]. The program's success can be attributed to its rigorous alignment with international standards, hands-on simulation training, and a curriculum tailored to address localized workforce shortages—a model that resonates with Saudi Arabia's Vision 2030 goals of healthcare excellence and workforce empowerment.

A significant strength of the program was its ability to encourage fast clinical practice changes. Over 74% of participants stated a desire to adopt new skills post-training, highlighting the curriculum's applicability to real-world challenges, such as managing dialysis complications and enhancing family communication. This aligns with research stressing that active learning methodologies, particularly case-based simulations, promote information retention and clinical confidence [32, 39,40]. However, the 16.6% of participants requesting extra resources before implementation underscores the need for post-training support mechanisms, such as mentoring networks or digital refresher courses, to maintain the long-term effect.

Despite these positive effects, the study's reliance on self-reported data and short-term assessment limited its power to correlate training to patient outcomes effectively. While high satisfaction ratings and self-assessed competence increases are encouraging, longitudinal studies monitoring measures such as lower hospitalization rates or better patient survival are required to demonstrate the program's systemic effect. Furthermore, the homogeneity of the sample (98.3% female) and geographical emphasis may impair generalizability, demanding replication in varied demographic and clinical situations.

### 4.1. Addressing Risks and Ensuring Sustainability

The introduction of SPPs includes inherent risks that require smart mitigation. First, the possibility of quality dilution—through decreased admission requirements or exaggerated cohort sizes—could affect the program's credibility. To avoid this, adherence to stringent certification protocols, as defined by the Saudi Commission for Health Specialties (SCFHS), is crucial. Regular assessments of trainer credentials and learner performance may assure consistency, while restrictions on participant numbers per cohort can preserve tailored training.

Second, market oversaturation creates a difficulty if SPP graduates surpass specialty-specific job opportunities. A dynamic needs assessment system, informed by healthcare labor market developments, may connect program outputs with workforce demands. For instance, extending SPPs into developing fields like telemedicine or geriatric care might balance supply with growing requirements.

Third, devaluation of credentials may develop if completion standards are compromised. Maintaining stringent assessment protocols, including Objective Structured Clinical Examinations (OSCEs) and peer-reviewed competence ratings, maintains the SPP's reputation. Additionally, developing collaborations with organizations to accept SPP credentials as marks of competence may boost graduate employability and trust.

## 5. STUDY LIMITATIONS

The study evaluated the effectiveness of SPPs in pediatric dialysis nursing but has certain limitations. It relied on self-reported data, which introduces potential response bias. The evaluation only captured immediate post-training impacts but did not examine long-term retention of skills or the effect on patient care. The sample is homogeneous, with 98.3% female participants and recruited from a single tertiary hospital, which may restrict generalizability to other demographics or healthcare settings. The lack of a control group and logistical restrictions further contribute to the uncertainty in the causal attribution of competence improvements.

### 5.1. Theoretical and Practical Implications

Theoretically, this research emphasizes the relevance of competency-based education in bridging the gap between theoretical knowledge and clinical practice. Practically, the initiative provides a reproducible template for healthcare systems internationally, especially in places suffering from workforce shortages and rapid medical developments.

## CONCLUSION AND RECOMMENDATIONS

High participant satisfaction and self-reported competence gains in pediatric dialysis care are indicators that competency-based SPPs may effectively address clinical skill deficiencies in specialized healthcare settings. The results show how SPPs can improve specialized training in non-Western contexts, which is in line with Saudi Arabia's Vision 2030 workforce development goals. The dependence on self-reported, short-term results, however, emphasizes the necessity of longitudinal studies to evaluate long-term effects on patient care and clinical practice. Future SPP implementations should have strong mentorship programs and dynamic curriculum updates catered to changing healthcare needs in order to optimize scalability.

## AUTHORS' CONTRIBUTIONS

The authors confirm contribution to the paper as follows: M.A.: Study conception and design; A.A., S.A.: Data collection; M.A., L.A.: Analysis and interpretation of results; draft manuscript: All authors. All authors reviewed the results and approved the final version of the manuscript.

## LIST OF ABBREVIATIONS

| | | |
|---|---|---|
| SPPs | = | Specialized Professional Programs |
| CPD | = | Continuing Professional Development |

| | | |
|---|---|---|
| SCFHS | = | Saudi Commission for Health Specialties |
| WFME | = | World Federation for Medical Education |
| CPDA | = | Continuing Professional Development and Accreditation |
| ANNA | = | American Nephrology Nurses Association |
| OSCEs | = | Objective Structured Clinical Examinations |

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was acquired from the Saudi Commission for Health Specialties (SCFHS) Ethics Review Board, and (IRB Registration Number with KACST, KSA: H- 01- R-012).

## HUMAN AND ANIMAL RIGHTS

All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committee and with the 1975 Declaration of Helsinki, as revised in 2013.

## CONSENT FOR PUBLICATION

All subjects provided written informed consent.

## STANDARDS OF REPORTING

STROBE guidelines were followed.

## AVAILABILITY OF DATA AND MATERIALS

The data and supportive information are available within the article.

## FUNDING

None.

## CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

## ACKNOWLEDGEMENTS

The successful completion of this study was made possible by the invaluable support and contributions of several organizations and individuals. We extend our sincerest gratitude to:

• The Academic and Training Affairs, Professional Development Administration at King Fahad Medical City, for their pioneering initiative in conceiving the SPP idea and their collaborative work with SCFHS to establish these programs nationwide.

• The Children's Specialized Hospital at King Fahad Medical City, for generously hosting the pediatric dialysis training for all program cohorts.

• The Saudi Commission for Health Specialties (SCFHS) for their unwavering support and instrumental role in the development and implementation of the Specialty Practice Program (SPP) from its inception in Saudi Arabia.

• Although no longer in the position, Ms. Manal Alnasser, former Executive Director of the Professional Development Administration at SCFHS, is acknowledged for her exceptional dedication and tireless efforts in facilitating the implementation and organization of the SPP from its earliest stages.

• The Ministry of Health (MOH), for their partial financial support, which significantly contributed to the pediatric dialysis training component of the SPP."

## REFERENCES

[1] Al-Hanawi MK, Khan SA, Al-Borie HM. Healthcare human resource development in Saudi Arabia: Emerging challenges and opportunities—a critical review. Public Health Rev 2019; 40(1): 1-16. http://dx.doi.org/10.1186/s40985-019-0112-4 PMID: 30858991

[2] AlSadiq AJ, Salman AS, Edhrabooh HM, *et al*. Continuing medical education among ministry of health primary care physicians in Bahrain: Experiences and perceptions. Saudi J Med Pharm Sci 2022; 8(3): 142-51. http://dx.doi.org/10.36348/sjmps.2022.v08i03.007

[3] London JL, Kumar K. Factors impacting on clinical nurses' perceptions of professional development in a saudi arabian healthcare organization. J Nurs Sci Prof Pract 2024; 1(3): 110-6.

[4] Yousif S, Bawhab O. The healthcare system in Saudi Arabia: Evolution, transformation and the COVID-19 experience Research Handbook on Public Leadership. Edward Elgar Publishing 2023; pp. 154-77.

[5] Jacobs C, Foote G, Joiner R, Williams M. A narrative review of immersive technology enhanced learning in healthcare education. Int Med Educ 2022; 1(2): 43-72. http://dx.doi.org/10.3390/ime1020008

[6] Kapralos B. Immersive virtual learning environments for healthcare education: State-of-art and open problems. Cureus 2024; 16(9): e68483. http://dx.doi.org/10.7759/cureus.68483 PMID: 39364477

[7] Allen LM, Palermo C, Armstrong E, Hay M. Categorising the broad impacts of continuing professional development: A scoping review. Med Educ 2019; 53(11): 1087-99. http://dx.doi.org/10.1111/medu.13922 PMID: 31396999

[8] Lockyer J, Bursey F, Richardson D, Frank JR, Snell L, Campbell C. Competency-based medical education and continuing professional development: A conceptualization for change. Med Teach 2017; 39(6): 617-22. http://dx.doi.org/10.1080/0142159X.2017.1315064 PMID: 28598738

[9] Karas M, Sheen NJL, North RV, Ryan B, Bullock A. Continuing professional development requirements for UK health professionals: A scoping review. BMJ Open 2020; 10(3): e032781. http://dx.doi.org/10.1136/bmjopen-2019-032781 PMID: 32161156

[10] WHO Academy Strategy 2024–2026: Leading lifelong learning for a healthier world. 2024. Available from: https://cdn.who.int/media/docs/default-source/who-academy/who-academy-strategy-2024-2026.pdf?sfvrsn=d2e5a63d_2&download=true

[11] Sherman LT, Chappell KB. Global perspective on continuing professional development. Asia-Pac Scholar 2018; 3(2): 1-5. http://dx.doi.org/10.29060/TAPS.2018-3-2/GP1074

[12] Zhou B, Deng Q, Zhou S, Zhuo D. Health care in future community: Innovatively discover and respond to the needs of today's seniors. Front Public Health 2023; 11: 1302493. http://dx.doi.org/10.3389/fpubh.2023.1302493 PMID: 38152669

[13] Al-Worafi YM. Public Health Education, Practice, and Research in Kuwait Handbook of Medical and Health Sciences in Developing Countries: Education, Practice, and Research. Springer 2024; pp. 1-25.

[14] Mani ZA, Goniewicz K. Transforming healthcare in Saudi Arabia: A comprehensive evaluation of vision 2030's impact. Sustainability 2024; 16(8): 3277. http://dx.doi.org/10.3390/su16083277

[15] Aldakhil S, Baqar SM, Alosaimi B, *et al*. Perceived needs, barriers, and challenges to continuing professional development (cpd): A qualitative exploration among hospital pharmacists. Pharmacy 2024; 12(5): 140. http://dx.doi.org/10.3390/pharmacy12050140 PMID: 39311131

[16] Almarhabi M, Cornish J, Raleigh M, Philippou J. Developing effective in-service education for intensive care nurses: Exploring the views of clinical stakeholders in the Kingdom of Saudi Arabia. Nurse Education Today 2024; 134: 106092. http://dx.doi.org/10.1016/j.nedt.2024.106092 PMID: 38262185

[17] Aminabee S. The future of healthcare and patient-centric care: Digital innovations, trends, and predictions Emerging Technologies for Health Literacy and Medical Practice. IGI Global Scientific Publishing 2024; pp. 240-62. http://dx.doi.org/10.4018/979-8-3693-1214-8.ch012

[18] Kiosia A, Boylan S, Retford M, *et al*. Current data science capacity building initiatives for health researchers in LMICs: Global & regional efforts. Front Public Health 2024; 12: 1418382. http://dx.doi.org/10.3389/fpubh.2024.1418382 PMID: 39664549

[19] Hossain Ms. The impact of information and communication technology in education: A research study. Booksclinic Publishing 2023.

[20] Vakani F. Best practice to improve continuing medical education in developing countries. 2021. Available from: https://unsworks.unsw.edu.au/entities/citation/a05b6f0b-505c-4d3a-a2fb-180aea0624c3

[21] Nash R, Thompson W, Stupans I, *et al*. CPD aligned to competency standards to support quality practice. Pharmacy 2017; 5(1): 12. http://dx.doi.org/10.3390/pharmacy5010012 PMID: 28970424

[22] Maeda A, Socha-Dietrich K. Skills for the future health workforce: Preparing health professionals for people-centred care. OECD Health Working Papers 2021; 124: 0_1-42.

[23] Altintas L, Sahiner M. Transforming medical education: The impact of innovations in technology and medical devices. Expert Rev Med Devices 2024; 21(9): 797-809. http://dx.doi.org/10.1080/17434440.2024.2400153 PMID: 39235206

[24] McLaughlin RJ, O'Brien CW, Weinstein M, *et al*. Clinical education in transition: Recommendations and strategies. J Allied Health 2019; 48(4): 237-47. PMID: 31800653

[25] Mormina M, Pinder S. A conceptual framework for training of trainers (ToT) interventions in global health. Global Health 2018; 14(1): 100. http://dx.doi.org/10.1186/s12992-018-0420-3 PMID: 30348183

[26] Merry L, Castiglione SA, Rouleau G, *et al*. Continuing professional development (CPD) system development, implementation, evaluation and sustainability for healthcare professionals in low- and lower-middle-income countries: A rapid scoping review. BMC Med Educ 2023; 23(1): 498. http://dx.doi.org/10.1186/s12909-023-04427-6 PMID: 37415150

[27] Alkhamis A, Miraj SA. Access to health care in Saudi Arabia: Development in the context of vision 2030 Handbook of healthcare in the Arab world. Springer 2021; pp. 1629-60.

[28] Alluhidan M, Tashkandi N, Alblowi F, *et al*. Challenges and policy opportunities in nursing in Saudi Arabia. Hum Resour Health 2020; 18(1): 98. http://dx.doi.org/10.1186/s12960-020-00535-2 PMID: 33276794

[29] Srivastava S. The evolution of education: Navigating 21st-century challenges. Int J Multidiscip Res 2023; 5(5): 1-9.

[30] Haleem A, Javaid M, Pratap Singh R, Suman R. Medical 4.0 technologies for healthcare: Features, capabilities, and applications. Internet Things Cyber-Phys Syst 2022; 2: 12-30. http://dx.doi.org/10.1016/j.iotcps.2022.04.001

[31] Mohammadi AT, Mohammadzadeh I, Sajedifar M, Shabani M, Khonche S, Asgari R. Emerging Frontiers in Surgical Advancements: Exploring Cutting-Edge Technologies and Pioneering Techniques. Nobel Sciences 2024.9798326598875

[32] Thistlethwaite JE, Davies D, Ekeocha S, *et al*. The effectiveness of case-based learning in health professional education. A BEME systematic review: BEME Guide No. 23. Med Teach 2012; 34(6): e421-44. http://dx.doi.org/10.3109/0142159X.2012.680939 PMID: 22578051

[33] Thacharodi A, Singh P, Meenatchi R, *et al*. Revolutionizing healthcare and medicine: The impact of modern technologies for a healthier future—A comprehensive review. Health Care Science 2024; 3(5): 329-49. http://dx.doi.org/10.1002/hcs2.115 PMID: 39479277

[34] Organization WH. Global Patient Safety Action Plan. 2021. Available from: https://www.who.int/teams/integrated-health-services/patient-safety/policy/global-patient-safety-action-plan

[35] Wilson KN. Exploring Strategies Needed by Healthcare Managers to Transition to Full Compliance with the Health Insurance Portability and Accountability Act as Technological Innovations Continue to Advance. Colorado Technical University 2018.

[36] Guide ACR. Health Insurance Portability and Accountability Act of 1996 (HIPAA). 2024. Available from: https://www.cdc.gov/phlp/php/resources/health-insurance-portability-and-accountability-act-of-1996-hipaa.html

[37] Or C. Advancing workforce competency: Singapore's integration of competency-based education. J Appl Learn Teach 2024; 7(2): 421-32.

[38] Clanton C N. Competency-based education in the south: Analyzing trends and funding in SACSCOC-accredited institutions. South College 2024.

[39] Brooks Brian Keith. Relationship between case-based teaching and learning strategies and clinical knowledge application. Capella University 2020.

[40] Huffer K. Improving new graduate critical care nurse practitioner knowledge and retention using a dedicated orientation and mentoring program. 2017. Available from: https://irl.umsl.edu/dissertation/643/