

CANNT JOURNAL JOURNAL ACITN

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**The education of nurses
performing pediatric hemodialysis:
A literature review**



CANNT|ACITN
Canadian Association of Nephrology Nurses and Technologists
l'Association canadienne des infirmières et infirmiers et des technologues de néphrologie

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Letter from the Editors

Dear nephrology nurses and technologist community, it feels like it was yesterday we saw all of you at the amazing **CANNT Conference** in PEI, and here we are ready to close 2023. For those who attended the conference in PEI this past October, we hope you have remained as inspired and invigorated as you were at the conference. The organizing committee from PEI did a great job in delivering a conference that simultaneously educated, inspired, and entertained the audience. In keeping with the theme of **CANNT STOP! WON'T STOP! Finding Creative Ways to Bridge the Gap**, attendees left PEI with renewed energy to explore ways to contribute to new knowledge and deliver quality care to the nephrology population we serve.

In this issue, we present the lead article by Wood (2023) titled "The education of nurses performing pediatric hemodialysis: A literature review" that identified educational needs leading to the creation of an educational module in pediatric hemodialysis for registered nurses, which will be published as a Continuing Education Series article in a future issue.

We hope our lead article inspires nurses to pursue a career in pediatric nursing in the area nephrology.

At **CANNT Journal**, we have a small, but very talented team that ensures what we offer in every issue of the journal is quality work, as we showcase excellence in nephrology nursing and technological writing. We would like to acknowledge Events Management Plus (**CANNT's** national office) for their unparalleled professionalism, efficiency, and commitment to **CANNT** and the **CANNT Journal**. Our editorial efforts would be for naught were it not for the support of our partners at EM+. We are indebted to the authors and contributors to the journal for their time and generosity in sharing their unique research and practice interests in the **CANNT Journal**. Similarly, our viability as a journal also rests

with the contribution of the manuscript peer reviewers whom we thank for their generosity in sharing their knowledge and expertise, and our partnership and collaboration with Pappin Communications and Lemieux Bédard. Last, we thank our journal readership for your interest and consumption of our quarterly publication. We heavily encourage nephrology nurses and technologists to submit manuscripts for publication in the **CANNT Journal** in the form of observational studies, clinical trials, case reports, literature reviews, solutions that address clinical practice issues, or quality improvement projects. We wish to remind the readership that manuscript submission to the **CANNT Journal** is now fully online. You may submit online <https://cannt-acitn.ca/cannt-journal-new/>

We are happy to announce that the **CANNT Journal** is now an Open Access journal. Open access is a publishing model for scholarly communication that makes articles available to readers in the whole world at no cost, using a unique digital object identifier (DOI) similar to an electronic signature that identifies the article and provides it with a permanent web address (URL).

On behalf of the team at the **CANNT Journal**, we wish you a safe and prosperous start to the new year!

Warm regards from your **CANNT Journal** co-editors,



Jovina Bachynski
MN-NP Adult, RN(EC),
CNeph(C), PhD Student



Rosa M. Marticorena
CNS, CNeph(C),
DClinEpi, PhD

Message des rédactrices

C'hère communauté de soins infirmiers et de technologues en néphrologie, votre présence au superbe congrès de l'ACITN, tenu à l'Île du Prince Édouard, nous est restée à l'esprit comme si c'était hier. Quoi qu'il en soit, il est maintenant déjà temps de dire au revoir à l'année 2023. Pour les personnes ayant assisté au congrès de l'ACITN à l'Île du Prince Édouard en octobre dernier, nous espérons que vous êtes toujours aussi inspirées et stimulées que vous l'étiez pendant l'événement. Son comité d'organisation a réalisé un formidable exploit en mettant sur pied un congrès qui, en plus d'être divertissant et instructif, a su éveiller la créativité des participants. Dans l'esprit du thème de cette année, *CANNT Stop! WON'T STOP! Finding Creating Ways to Bridge the Gap* (L'ACITN en action – Trouvons des moyens créatifs de combler l'écart), les participants ont quitté l'Île du Prince Édouard fraîchement déterminés à trouver des moyens de prendre part à l'enrichissement des connaissances et à prodiguer des soins de qualité à leurs patients en néphrologie. Dans ce numéro, nous présentons l'article principal de Wood (2023) intitulé « La formation des infirmières pratiquant l'hémodialyse pédiatrique : une revue de la littérature » qui a identifié les besoins éducatifs menant à la création d'un module éducatif sur l'hémodialyse pédiatrique pour les infirmières autorisées, qui sera publié sous forme d'article de la série Formation continue dans un prochain numéro. Nous espérons que notre article principal inspirera les infirmières à poursuivre une carrière en soins infirmiers pédiatriques dans le domaine de la néphrologie.

Notre petite mais très talentueuse équipe de la *Revue de l'ACITN* veille à présenter des travaux de qualité dans chaque numéro afin de mettre en valeur l'excellence des soins infirmiers et des écrits technologiques en néphrologie. Nous tenons à remercier les employés du bureau national de l'ACITN (Events Management Plus, EM+) pour leur professionnalisme, leur efficacité et leur engagement inégalés envers l'ACITN et sa revue. Nos efforts éditoriaux seraient vains sans leur aide. Nous sommes reconnaissantes envers les auteurs et les contributeurs ayant généreusement consacré leur temps à exprimer leurs

intérêts uniques en matière de recherche et de pratique en néphrologie dans la *Revue de l'ACITN*. Le succès de notre périodique repose aussi sur la contribution des pairs examinateurs ainsi que sur nos partenariats et notre collaboration avec Pappin Communications et Lemieux Bédard. Nous les remercions pour le temps, les connaissances et l'expertise qu'ils ont la grande générosité de nous offrir. Enfin, nous tenons à remercier nos lecteurs de l'intérêt qu'ils portent à nos publications trimestrielles. Nous encourageons vivement la communauté de soins infirmiers et de technologues en néphrologie à nous soumettre des manuscrits sous forme d'études observationnelles, d'essais cliniques, d'études de cas, de revues de la littérature, de solutions à des problèmes cliniques et de projets d'amélioration de la qualité. Nous aimerions rappeler à nos lecteurs que la soumission des manuscrits à la *Revue de l'ACITN* se fait désormais entièrement en ligne à l'adresse <https://cannt-acitn.ca/cannt-journal-new/>.

Nous avons le plaisir d'annoncer que la *Revue de l'ACITN* est désormais une revue en libre accès. Le libre accès est un modèle de publication de la communication savante qui permet aux lecteurs de partout dans le monde d'accéder gratuitement aux articles grâce à un identificateur d'objets numériques (DOI) unique, une sorte de signature numérique qui répertorie l'article et lui attribue une adresse URL permanente.

Au nom de l'équipe de la *Revue de l'ACITN*, nous vous souhaitons un début d'année prospère et sécuritaire !

Salutations cordiales de la part des rédactrices de la *Revue de l'ACITN*,



Jovina Bachynski
M. Sc. inf., IP (adulte), IA
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Rosa M. Marticorena
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President's Message

It is a pleasure to write to you as your new president for 2023–2024 for CANNT-ACITN. I continue to express my sincere and deep appreciation for your unrelenting perseverance and dedication.

It has been a difficult and significant year with many hallmarks of change that demonstrate how our collective influence, resiliency, and impact continue to find creative ways to bridge the gap within our communities.

Canada is home to large diaspora communities and we have seen how events surrounding armed international conflict can lead to division. I know that many are heavily impacted by the ongoing violence, displacement, and humanitarian crises that continue to unfold in Gaza and Israel. My heartfelt sympathy and prayers go out to all, and we must not lose sight of our shared responsibilities to one another and our community.

Additionally, the pandemic certainly placed an unexpected burden on health-care providers and the health system, and I am continually inspired by the aptitude, talent, and devotion exhibited by nephrology practitioners across Canada. Thank you for all that you do to advance nephrology care. CANNT-ACITN recognizes and appreciates your efforts, and we are committed to promoting the nephrology nursing profession and reaching new heights in making Canada a healthier, better country.

This year, we have reached a new milestone and successfully increased our membership to 370 as of December 9, 2023. I invite you to be a part of something innovative, influential, and vibrant and take advantage of up to date developments in health and healthcare.

At CANNT-ACITN we have also welcomed new board members, I would like to congratulate Deidra Goodacre – CANNT President Elect & Treasurer,

Kokab Younis – CANNT VP of Western Region and Andrea McTavish – CANNT VP of Atlantic Region. Welcome to the Board! We are always looking for members to get involved in our committees, and we encourage anyone interested to join us.

A huge **THANK YOU** to those who attended the CANNT-ACITN National Conference 2023, in Charlottetown, PEI, “CANNT stop, won’t stop - Finding creative ways to bridge the gap.” Please continue to take advantage of our open-access CANNT Journal, nephrology guidelines, webinars, networking opportunities, CANNT awards, bursaries, and research grants. <https://cannt-acitn.ca/>

I’d like to take this opportunity to thank everyone on our team for the wonderful contributions you’ve made to the CANNT-ACITN organization over the last year. We have some exciting developments to look forward to and I’m looking forward to seeing the profession and organization flourish, as we work together to have another successful year.

Again, I want to express my heartfelt gratitude for your commitment to CANNT-ACITN. Remember you have a unique opportunity to enhance the quality of care provided to individuals with kidney disease. I can’t wait to see, hear, and experience all the wonderful things we’ll be able to accomplish together. We at CANNT are looking forward to great things in 2024.

Regards,

Alicia Moonesar



**Alicia Moonesar, DNP,
MScN, BScN, NP-PHC (she/
her)
President – CANNT-ACITN**

Message de la présidente

J'ai le grand plaisir de vous écrire en tant que nouvelle présidente de l'ACITN en 2023–2024. Une fois de plus, je tiens à vous exprimer ma sincère et profonde reconnaissance pour votre persévérance et votre dévouement continus.

Malgré les difficultés rencontrées, la dernière année a été déterminante. Elle a été marquée par de nombreux vecteurs de changement qui ont mis en évidence que notre influence, notre résilience et notre portée nous permettent sans cesse de trouver des moyens créatifs de combler les lacunes au sein de nos communautés.

Le Canada est la terre d'accueil d'importantes diasporas. Or, nous l'avons constaté, les événements en lien avec les conflits armés internationaux peuvent semer la division. Je sais que beaucoup de personnes sont touchées par la violence incessante, les déplacements forcés et les crises humanitaires qui font rage à Gaza et en Israël. C'est pourquoi je leur exprime ma sincère compassion et leur adresse mes prières. Nous ne devons pas perdre de vue nos responsabilités communes les uns envers les autres dans la société.

Par ailleurs, il ne fait aucun doute que la pandémie a placé une charge inattendue sur le système de santé et les professionnels qui y travaillent. À cet égard, les aptitudes, le talent et le dévouement dont ont fait preuve les praticiens en néphrologie de partout au Canada m'inspirent continuellement. Merci à vous tous pour votre

contribution aux progrès des soins infirmiers en néphrologie. CANNT-ACITN reconnaît et valorise vos efforts; nous sommes déterminés à promouvoir la profession des infirmières et infirmiers en néphrologie et à atteindre de nouveaux sommets pour faire du Canada un pays en meilleure santé.

Cette année, nous avons franchi un nouveau cap en atteignant, le 9 décembre 2023, le nombre de 370 membres. Je vous invite à prendre part à une vision innovante, influente et dynamique de même qu'à rester à l'affût et à tirer parti des nouveautés en médecine et en soins de santé.

CANNT-ACITN a également accueilli de nouveaux membres au sein de son conseil d'administration. J'aimerais féliciter Deidra Goodacre, présidente désignée et trésorière de l'ACITN, Kokab Younis, vice-présidente de la région de l'Ouest, et Andrea McTavish, vice-présidente de la région de l'Atlantique. Je vous souhaite la bienvenue au conseil d'administration! Nous sommes toujours à la recherche de membres désireux de s'impliquer dans nos comités; nous encourageons toute personne intéressée à se joindre à nous.

Je tiens à dire un énorme **MERCI** à tous les participants au congrès national 2023 de CANNT-ACITN, qui s'est déroulé sous le thème *CANNT stop, won't stop – Finding creative ways to bridge the gap* (L'ACITN en action – Trouvons des moyens créatifs de combler l'écart), qui a eu lieu à Charlottetown, à l'Île du Prince

Édouard. Continuez à profiter de notre contenu en libre accès, dont la *Revue de l'ACITN*, les lignes directrices en néphrologie, les webinaires, les occasions de réseautage, les prix de l'ACITN, les bourses d'études et les subventions de recherche (<https://cannt-acitn.ca>).

J'aimerais profiter de l'occasion pour remercier toute l'équipe pour la contribution incroyable qu'elle a apportée à CANNT-ACITN au cours des dernières années. Des nouveautés motivantes se profilent à l'horizon et j'ai hâte de voir la profession et l'organisation fleurir à la suite du travail que nous effectuerons ensemble pour veiller à ce que la prochaine année soit tout aussi prospère que la précédente.

Encore une fois, je tiens à vous exprimer ma profonde gratitude pour votre dévouement à CANNT-ACITN. N'oubliez pas que vous avez une occasion unique d'améliorer la qualité des soins prodigués aux personnes atteintes de maladies du rein. Je suis impatiente de voir, d'entendre et de vivre toutes les merveilleuses choses que nous arriverons à accomplir ensemble. Chez CANNT-ACITN, nous attendons avec impatience de grandes choses en 2024.

Cordialement,

Alicia Moonesar



D^{re} Alicia Moonesar, DPI,
M. Sc. Inf., B. Sc. Inf.,
IPSPL (elle)
Présidente, CANNT-ACITN

CANNT in Action

A heartfelt thank you to our incredible members, sponsors, and attendees who contributed to the success of this year's CANNT Conference in Charlottetown, PEI, held October 26-28. The event commenced with an enlightening update from Michael Gardam, CEO of Health PEI, challenging us to reimagine our healthcare system. His presentation ignited discussions on innovation, empowerment, and actionable change—urging us to focus on fostering diverse opinions, embracing safe risk-taking, nurturing generative relationships, and concentrating on what lies within our control.

The program delved into diverse topics, from addressing chronic kidney disease-associated pruritus to enhancing patient care through collaborative education involving nursing technologists. Sessions also covered best practices in ultrasounds, Artificial Intelligence (AI) utilization in predicting admission risks, and the nuances of goal-setting for renal patients. Throughout, the emphasis was on innovative solutions to bridge gaps, expertly curated by the 2023 CANNT Planning Committee. Thank you to Rachael Blair, Lauren Wry, Sarah Reid, Andrea McTavish, Donna MacDonald, and Danielle McConnell for all your efforts. We also would like to thank our CANNT Office team, Sarah Seward, Jennifer McCann, Pamela Lyons, and Meryem Crockett for supporting and executing a very successful event. We encourage our members to review the excellent presentations from the conference, which are now available on the CANNT website.

Looking ahead to 2024, CANNT is excited to share forthcoming updates. We've been diligently crafting the patient pamphlet on *Kidney Organ Trafficking* and developing educational materials for patients. We will be developing a similar pamphlet for healthcare professionals in nephrology. Additionally, expect an enhanced website design aimed at improving accessibility for our members.

In an exciting development, the CANNT Board has decided to transition the *CANNT Journal* into an open access journal, giving access to education and research in nephrology. Now, anyone can access the online journals and share them with peers and colleagues, aligning with our commitment to expanding resources and educational content in nephrology care, and fostering inclusivity. Thank you to our co-editors Jovina and Rosa for leading this initiative.

Welcoming our new board members, Kokab Younis and Andrea McTavish, as Regional Vice Presidents for Western and Atlantic Canada, respectively, we're thrilled to collaborate on and furthering our mission of educating nephrology professionals while advocating for patient excellence.

In 2024, anticipate regular regional updates tailored for our members. The Atlantic region, having hosted the conference, eagerly looks forward to strengthening relationships with our members. In Quebec, the Fédération interprofessionnelle de la santé (FIQ) that represents 80,000 nurses, nursing assistants, respiratory therapists and clinical perfusionists, went on strike December 8–14 over salary and working

conditions. This comes after 95% of the FIQ Members voted in favour of the strike in 2023. We seek your feedback on how CANNT can advocate for our nephrology nurses and technologists. The Western region faces organizational changes, as Alberta Health Services has proposed changes that include changes to staff mix and service redesign, repurposing of sites or relocating of staff, and we're committed to supporting our members affected by these transitions.

In Ontario, the region is working on transplant education, gearing up to launch an initiative addressing organ trafficking. Mark your calendars for next year's conference in Canada's capital city, Ottawa, from October 24–26, 2024, at the Ottawa Conference and Event Centre.

Reflecting on this past year, we've been inspired by our collective dedication to learning and growth. As the new year begins, we anticipate continuing our efforts to provide top-tier education and networking opportunities, and we will continue our efforts to collaborate with other nephrology groups, so we can continue raising the bar for patient care in nephrology.

Thank you for being an integral part of the CANNT community. Here's to a year of progress, collaboration, and innovation!



Megan Howes,
Executive Director,
CANNT

JOIN THE CANNT COMMUNITY

The Canadian Association of Nephrology Nurses and Technologists (CANNT) provides leadership and promotes the best nephrology care and practice through education, research, and communication. Join today and receive:

- Discount of the Annual Conference registration fee.
- Educational opportunities at a reduced cost or free to members.
- Connections to the latest information and resources related to nephrology, technology or nursing.
- Networking opportunities with colleagues practicing in your nephrology specialty on a national level.
- Opportunities for collaborative networking and problem solving through participation in a Refined Clinical Practice Group.
- CANNT Awards and Research Grants offered to individuals in recognition of their excellence in the workplace and/or to further their studies in Nephrology.

Learn more at cannt-acitn.ca

L'ACITN en action

Nous aimerions remercier chaleureusement nos membres exceptionnels, nos commanditaires et tous les participants qui ont contribué au bon déroulement du congrès de l'ACITN de cette année, tenu du 26 au 28 octobre à Charlottetown, à l'Île-du-Prince-Édouard. Pour y donner le coup d'envoi, le directeur général de Santé Î.P.É., Michael Gardam, a fait une présentation enrichissante dans laquelle il nous a lancé le défi de réinventer le système de soins de santé. S'en sont suivis des débats sur l'innovation, l'autonomisation et la transformation concrète du système. En outre, la présentation nous a incités à promouvoir la diversité d'opinions, à accepter la prise de risques réfléchis, à nourrir les relations fécondes et à tirer parti de notre pouvoir d'agir.

Différents sujets étaient abordés durant le congrès : la prise en charge du prurit associé aux maladies rénales chroniques, la collaboration en matière de formation avec les technologues en soins infirmiers dans l'optique de bonifier les soins prodigués aux patients, etc. Dans le cadre des séances, il a aussi été question des pratiques exemplaires relatives aux ultrasons, à l'utilisation de l'intelligence artificielle pour anticiper les risques d'hospitalisation et aux subtilités entourant l'établissement des objectifs pour les patients atteints de maladies rénales. Du début à la fin, le congrès avait pour visée d'apporter des solutions novatrices afin de combler des lacunes qui avaient été soigneusement définies par le comité de planification 2023 de l'ACITN. À ce sujet, nous saluons tous les efforts déployés par Rachael Blair, Lauren Wry, Sarah Reid, Andrea McTavish, Donna MacDonald et Danielle McConnell. Nous tenons aussi à remercier le personnel administratif de l'ACITN, à savoir Sarah Seward, Jennifer McCann, Pamela Lyons et Meryem Crockett, qui ont tout mis en œuvre pour assurer le succès retentissant de l'événement. Nous invitons nos membres à revoir les excellentes conférences qui ont été données pendant le congrès; elles sont maintenant accessibles sur le site Web de l'ACITN.

À l'ACITN, c'est avec enthousiasme que nous avons envie de vous présenter les nouveautés à venir en 2024. D'abord, nous avons travaillé d'arrache-pied pour préparer un feuillet informatif destiné aux patients concernant le trafic de reins ainsi que des documents de renseignements à leur intention. Nous prévoyons maintenant de préparer un autre feuillet pour les professionnels de la santé en néphrologie. De plus, nous comptons améliorer la conception de notre site Web afin de le rendre plus accessible pour nos membres.

Autre nouvelle excitante : le conseil d'administration de l'ACITN a décidé de faire de la *Revue de l'ACITN* une publication à libre accès, de sorte que l'éducation et la recherche en néphrologie soient ouvertes au public. Désormais, conformément à notre volonté d'accroître la quantité de ressources et de contenu pédagogiques en néphrologie et de favoriser l'inclusivité, tout le monde peut accéder à la revue en ligne et la transmettre à des paires et des collègues. Nous remercions nos co-rédactrices Jovina et Rosa d'avoir mené cette initiative.

Par ailleurs, nous souhaitons la bienvenue à Kokab Younis et Andrea McTavish, qui ont accepté, respectivement, les postes de vice-présidente de la région de l'Ouest et de vice-présidente de la région de l'Atlantique au sein de notre conseil d'administration. Nous nous réjouissons de cette nouvelle collaboration qui permettra de faire progresser notre mission d'éducation des professionnels de la néphrologie tout en prônant l'excellence des soins aux patients.

En 2024, nous prévoyons de faire régulièrement l'état de la situation régionale pour nos membres. Depuis qu'elle a accueilli, le congrès, la région de l'Atlantique est impatiente de consolider ses relations avec nos membres. Au Québec, la Fédération interprofessionnelle de la santé (FIQ) – qui représente 80 000 infirmiers et infirmières, infirmiers et infirmières auxiliaires, inhalothérapeutes et perfusionnistes

cliniques – a prévu de faire la grève du 8 au 14 décembre pour dénoncer le salaire et les conditions de travail de ses membres. En effet, lors du vote tenu en octobre, 95 % des membres de la FIQ s'étaient prononcés en faveur d'une grève. Nous sollicitons donc vos commentaires pour savoir comment nous pouvons militer pour notre personnel infirmier et nos technologues de néphrologie. Pour ce qui est de la région de l'Ouest, elle doit composer avec les changements organisationnels proposés par Alberta Health Services, notamment en ce qui concerne la composition du personnel, la restructuration des services, la requalification des installations et la réaffectation des employés. Nous entendons soutenir nos membres qui sont touchés par cette transition.

Quant à la région de l'Ontario, elle travaille à améliorer la formation en matière de transplantation et s'occupe en vue de lancer une initiative pour lutter contre le trafic d'organe. Retenez bien la date du congrès de l'année prochaine, qui se déroulera du 24 au 26 octobre dans la capitale canadienne, au Ottawa Conference and Event Centre.

Durant la dernière année, notre dévouement commun à l'égard de l'apprentissage et la croissance nous a inspirés. À l'approche de la nouvelle année, nous avons hâte de poursuivre notre travail, qui consiste à offrir de la formation et des occasions de réseautage de la meilleure qualité qui soit. Nous continuerons à collaborer avec les autres groupes qui travaillent en néphrologie, de manière à améliorer sans cesse les soins aux patients atteints de maladies rénales. Merci de faire partie intégrante de la communauté de l'ACITN. Que la nouvelle année soit remplie de progrès, de collaboration et d'innovation!



Megan Howes,
Directrice générale,
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The education of nurses performing pediatric hemodialysis: A literature review

By Brittany Woodman

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There is very little known about the epidemiology of pediatric kidney disease worldwide (Harambat & Madden, 2023). Much of the data related to pediatric kidney disease is derived from renal replacement registries, which have inconsistencies and gaps in reporting data (Harambat & Madden, 2022). However, among the information available it is evident that kidney disease among the pediatric population is prevalent. The incidence of pediatric acute kidney injury (AKI) worldwide ranges from 18.7% to 26.9% (Kaddourah et al., 2017; Raina et al., 2021; Sutherland et al., 2013). Comparatively, the incidence of chronic kidney disease (CKD) has been reported from nine to 13 cases per one million children and a prevalence of 55 to 77 cases per one million children (Harada et al., 2022). The mortality rate among children who progress to CKD is 30 to 50 times higher compared to that of the general pediatric population (Harambat & Madden, 2022; Mitsnefes et al., 2013).

In Canada, historically, kidney disease has been rare in childhood with incidence rates ranging from 6.9 to 21.8 per million in the zero to 4-year-old and 15 to 19-year-old age groups (Canadian Institute for Health Information, CIHI, 2022). Nationally in 2022, the number of persons with end-stage kidney disease ages zero to 19 was far less, only 86, compared to more than 6,000 for ages ranging from 20 to 75 plus (CIHI, 2022). Nevertheless, the incidence rate of kidney disease among children ages zero to 19 has increased in Canada with 10.5 per million in the year 2003 and 13.0 per million in 2022 (CIHI, 2022). Recently, this increase has also been reported among children worldwide and has been attributed to multi-organ inflammatory syndrome (MIS-C) because of COVID-19. According to the Canadian Pediatric Society (2021), the incidence of emergency pediatric hemodialysis due to AKI, secondary to MIS-C, has increased across Canada.

BACKGROUND

Renal replacement therapy (RRT) is used as a treatment for kidney disease among children and has three forms: peritoneal dialysis (PD), hemodialysis (HD), and continuous renal replacement therapy (CRRT) (National Kidney Foundation, 2022). Each modality has specific indicators that determine which is chosen for treatment. These typically include the need for ultrafiltration (i.e., fluid removal) for symptomatic

volume overload and solute removal (i.e., urea, potassium) for uremia or removal of a toxin (Rees, 2017). Difficulty with ventilation and prone positioning due to fluid volume overload precedents the need for emergency HD (Alabbas et al., 2021). The rapidity of solute generation and its urgency for removal, as in tumour lysis syndrome, hyperammonemia, hyperkalemia, or ingestion of dialyzable toxins, also require HD to sustain life (Rees, 2017). PD has been the modality of choice for decades to treat AKI in children. However, with the technological development in dialyzer and extracorporeal circuit(s) specific to pediatric size in recent years, the quality of HD treatment offered to children has improved considerably (Zitzelsberger et al., 2019). HD is, at present, considered to be a safe and efficient treatment for pediatric renal impairment (Sousa et al., 2008).

Pediatric HD is generally rare and pediatric nephrology centres have a limited number of patients receiving RRT at any given time (Samuel et al., 2010). Nationally, seven Canadian provinces including Alberta, British Columbia, Manitoba, Nova Scotia, Ontario, Saskatchewan, and Quebec have dialysis units with the ability to treat pediatric patients. The Hospital for Sick Children (SickKids) in Toronto, Ontario, has the largest pediatric dialysis program in Canada and one of the largest pediatric nephrology divisions in North America (SickKids, 2022). Dialysis programs from other provinces often seek information for policy development and education from SickKids (Rose Nemec, Pediatric Hemodialysis Coordinator at SickKids, personal communication, June 5, 2021).

Newfoundland and Labrador, Prince Edward Island, New Brunswick, Northwest Territories, Nunavut, and Yukon are far less populated compared to other provinces (Statistics Canada, 2022). Historically, as a result, a pediatric HD program has not been financially warranted, and children with kidney disease are transported to and treated in larger hospitals such as SickKids in Toronto. With the rise in pediatric nephrology cases nationally, there is a need for hospitals to have the ability to treat children in every province; however, challenges are present. For example, most nephrologists in smaller populated provinces do not have a specialization in pediatrics. Newfoundland and Labrador, for example, has one nephrologist with a specialization in pediatric nephrology.

To establish more pediatric HD programs in dialysis units across the country, the education of nurses is of the utmost importance. Canadian children undergo hospital-based HD with registered nurses performing the treatments (Cho, 2020). As HD is complex and technical, nurses performing the treatment must be fully knowledgeable and competent in their skills to ensure enhanced patient and family outcomes (Cho, 2020; Rees, 2017). The current role of the nurse in the

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management of critically ill patients requiring RRT is fundamental (Ricci et al., 2015). Competency can be achieved through continuing educational opportunities including participation in educational modules, sessions, and online learning (College of Registered Nurses of Newfoundland and Labrador, 2014). Researchers have demonstrated that the implementation of educational resources such as lecture and simulation significantly improved nurses' knowledge and practice related to pediatric HD (Ahmed et al., 2019; Hassona et al., 2012; Saeed & Al-Mosawi, 2020).

In this literature review, the results of a comprehensive literature search specific to pediatric HD will be presented. The HD experience of the child, family, and nurse will be explored. The current educational content and delivery methods used to educate nurses about pediatric HD will also be presented. The results of the literature review will provide background for the development of an educational resource to improve the knowledge and skills of the nurses who are responsible for performing HD on pediatric patients in Canada and, ultimately, improve patient and family outcomes.

METHODS

A literature search was performed using the following databases: CINAHL, PubMed, Nursing & Allied Health, Google Scholar, Medline, Education Research Complete, Academic Search Complete, and Education Resources Information Center. Search terms included: education, resource, nurs*, pediatric or child or children or adolescent, guideline, hemodialysis or dialysis, kidney failure, nephrology, and experience. Inclusion criteria were published within the last 20 years and written in the English language. Literature was screened based on the abstract or introductory paragraphs where relevance to the topic was identified. Sources were chosen based on their relevance to the topic of interest. A broad search was performed of global sources, which identified various sources including published guidelines and research articles. All were evaluated for the quality of content. Details of all sources can be found in the literature review tables located in Appendix A. An environmental scan with consultations was also performed, allowing the focus to be narrowed from worldwide to Canada.

THE CHILD AND FAMILY EXPERIENCE

The experiences of the child and family during the HD process were a common theme within the literature. The experience of being informed that initiating dialysis is essential to maintain life can be a devastating, life-altering experience for children diagnosed with kidney failure and their caregivers (Nuel, 2012). For weeks, months, or years, these children's lives are disrupted because they must return to the hospital to be dialyzed about three times a week, for three or four hours each visit. For as long as it is necessary, HD constitutes a central feature of their everyday lives, with significant consequences on home, school, and recreational activities (Zitzelsberger et al., 2019).

Abreu et al. (2014), Currier and Zimmerman (2019), El-Gamsay and Eldeeb (2017), Kilis-Pstrusinska, et al. (2013),

and Zitzelsberger et al. (2019) found that children receiving HD have challenges with physical and social functioning. Children reported physical discomfort and limits in daily activity and were observed to sleep less, have a reduced engagement in physical exercise, and had body image issues. Children also reported side effects from treatments including cramping and fatigue, which adversely affected their daily activities. Alterations in their physical appearance, particularly related to vascular access, caused feelings of embarrassment. Socially, children felt isolated and alone with a sense of everyday confinement and constraints having an impact on their lives outside of HD. Children felt that HD limited their social time due to the amount of time taken for preparation, duration, and completion of the treatments. Craven et al. (2023) found that children with CKD were chronically absent from school for doctor appointments, feeling sick, and being bullied.

Family members, particularly parents of the children undergoing HD, have several sources of distress relating to their child being on HD. Emotional distress is a prominent issue for parents whose children undergo HD (Cimete 2002; House et al., 2022; Ong et al., 2021; Wightman et al., 2019). Parents experience feelings of guilt, grief, and powerlessness because of their child's diagnosis. They feel grief because of their perceived role as a caregiver in contributing to the disease process, which is compounded by enforcing a strict diet and fluid restrictions on their children. Witnessing their child undergo dialysis and painful medical procedures causes feelings of grief and powerlessness. Emotional effects on the family dynamics also occur as parents feel they are neglecting their other children and/or partners to care for their sick child. As HD requires several lengthy hospital visits, parents feel that their time with their other family members is reduced. If they had other children, they expressed a feeling of uncertainty about how it would affect them in the future (Cimete 2002; Ong et al., 2021; & Wightman et al., 2019). House et al. (2022) found that parents experienced a disruption and redefining of their role as parents, often struggling to evolve into the medical provider role. They also found that parents were leveraging dual identities as parent and medical provider to try to positively impact their child's experience by voicing their perspectives, watching over their child's care, and preparing for future changes in their child's health.

THE NURSES' EXPERIENCE

The dialysis nurse plays a vital role in providing information, care, support, understanding, and therapeutic counseling to the child and their family throughout the HD process (Ibrahim, 2019). High-quality nursing care is imperative to contribute to positive patient and family outcomes. Sometimes, however, nursing care lacks the necessary adequacy and safety of patients due to nursing burnout (Shahdadi & Rahnama, 2018). The many responsibilities of the nurse during the care of the child undergoing HD can lead to their emotional and physical exhaustion, especially with a heavy workload and lack of resources. Providing care for patients with chronic diseases such as end-stage renal disease, working in an environment with complex

HD machines demanding attention, and coping with the increased expectations of patients is stressful (Kavurmaci, 2014).

Ibrahim et al. (2019), Kavurmaci et al. (2014), Mellor et al. (2015), and Shahdadi and Rahnama (2018) found that nurses' attitudes about the care of children undergoing HD are often negative, due to feelings of burnout, depression, and anxiety. Excessively long workdays, high workloads, and insufficient resources to accomplish the job led to a depletion in the nurses' physical and emotional resources. These authors further reported the nurses felt a lack of education relating to the patient's disease affected their quality of care, causing negative attitudes. Nurses frequently reported tension between them and the child's parents, including balancing responsibilities and control over the child's care. Nurses reported frustration with parents, especially related to nonadherence and parents' dishonesty in reporting their behaviours, which added to their difficulties in managing care and maintaining a positive attitude towards the patients. Mellor et al. (2015) discussed the competing responsibilities between nurses, parents, and minors, how responsibility should be transferred to minors as they mature, and the process of transferring this responsibility. The emotional and physical damage experienced by the nurses often extended to their family environment, creating negative outcomes in their personal lives, such as relationship strain.

NURSING EDUCATION NEEDS IN PEDIATRIC HD

There are few provinces and territories in Canada with hospitals that can dialyze children. Nevertheless, there is potential for children across Canada to need HD treatment. Nurses are primarily dialyzing an adult population. Therefore, there is a lack of education and knowledge related to dialyzing children nationwide. If a facility has the potential to dialyze children, nurses need to have appropriate education and training for pediatric dialysis care (Chand et al., 2017). Even with experienced dialysis nurses, this may require a substantial initial period of education, training, and supervision for them to deliver pediatric dialysis care independently. Nurses need to have specialized education related to childhood development and the ramifications of neurocognitive and physical disabilities so explanations and interventions can be carried out in a non-threatening, developmentally appropriate manner (Chand et al., 2017).

Increasing nurses' knowledge and experience with children undergoing HD is necessary to resolve the challenges in the care of these patients to improve the quality of care provided by nurses and prevent burnout (Shahdadi & Rahnama, 2018; Kavurmaci et al., 2014). AKI among children can be very complex, causing an increased need for nursing education to improve patient and family outcomes. Salman and Muttaleb (2023) found that nurses working in pediatric HD units had poor practice in the application of standardized precaution measures, including infection prevention measures of fistula cannulation and catheter site care. Rafay et al. (2021) found that nurses had a better understanding of their role regarding the emotional, social, and physical needs of children undergoing HD when they attended education

courses. Keeping nurses updated on new information and procedures relating to HD will aid their ability to adapt to change to ensure best practice and, ultimately, enhance patient and family outcomes (Shahdadi & Rahnama, 2018).

Emphasis needs to be placed on the importance of continuous training based on a needs assessment to identify gaps in nursing knowledge and skills for those caring for children undergoing HD (Ibrahim et al., 2019). Periodic training programs and refresher courses should be provided to nurses to improve their knowledge, which will reflect in their performance (Bayoumi & Mahmoud, 2018; Yousef et al., 2019). Therefore, well-organized educational resources that enable healthcare providers to become educated and to provide, monitor, and evaluate care are critical (O'Grady et al., 2017).

EDUCATIONAL CONTENT

Although the principles of HD are similar for adults and children, the differences need to be addressed. Knowing the differences will allow nurses to safely perform HD and reduce potential complications, thereby improving life expectancy and quality of life for patients (Rees, 2017). Throughout the literature review, two essential aspects of competence in nursing knowledge and skill in pediatric HD were identified: central venous catheter (CVC) infection prevention and specific areas for nursing assessment of the pediatric patient. CVC infection rates are high among the pediatric HD population (Almond et al., 2021; Araujo de Souza et al., 2011; Borzych-Duzalka et al., 2019; Chand et al., 2009; O'Grady et al., 2017; Paglialonga et al., 2016). Nurses must have the knowledge and skill to prevent these infections and, ultimately, prevent high morbidity and mortality among this population (Chand et al., 2009). Nursing assessment, including patient fluid status and dialysis prescription, was also prevalent within the literature. As children are much smaller than adults, a small error in fluid calculations or dialysis prescription programming can be fatal, therefore ensuring nurses are knowledgeable about these parts of the assessment is critical (Cho, 2020).

CVC INFECTION PREVENTION

The CVC is the most used vascular access in children in North America with between 78–83% usage in the United States (Araujo de Souza, 2011; Chand et al., 2009; Rees, 2017) and represents the sole initial vascular access for pediatric HD (Cho, 2020). The CVC places children at high risk for infection because of patient comorbidities such as cardiovascular impairment and malnutrition, and numerous human, environmental, and procedural factors (Ahmed et al., 2019). Catheter-related bloodstream infections (CRBSIs) alone have a reported incidence of 1.1 to 5.5 episodes per 1,000 catheter days and are associated with increased morbidity, hospitalization, and death (Miller et al., 2016). As per the United States Renal Data System (2020) sepsis rates associated with CVCs are approximately 80 per 100 patient-years, as compared to only 10 per 100 patient-years for arteriovenous fistula (AVF). Borzych-Duzalka et al. (2019) found infectious complications were only reported in their participants with

CVCs (1.3/1,000 catheter days) and required replacement in 47% compared to participants with an AVF. Comparing adults and children, rates of CRBSI in patients in pediatric intensive care units are higher than those in patients in adult intensive care units (Paglialonga et al. 2004). The Public Health Agency of Canada (2020) reported the number of CRBSIs that occurred in 40 Canadian hospitals between 2008–2018. Pediatric intensive care units (ICU) had a higher infection rate at 1,450 CRBSIs compared to adult ICUs at 1,331.

The CVC can be colonized with organisms by either of two main routes. The first route is intraluminal colonization, which occurs during repeated handling of the line, the hub, or from administering contaminant solution via the catheter (Ouda et al., 2019). The second route is extraluminal colonization, which originates from the skin at the insertion site and migrates along the external surface of the line.

Intraluminal: Antimicrobial Locks

Almond et al. (2021), Lok et al. (2020), and O'Grady et al. (2017) address the use of antimicrobial locks to prevent CVC infection. Catheter lock is a technique by which an antimicrobial solution is used to fill a catheter lumen and then allowed to dwell some time while the catheter is idle (i.e., not in use) (O'Grady et al., 2017). This practice is recommended by both Lok et al. (2020) and O'Grady et al. (2017) in patients with a CVC who are at high risk of infection such as pediatric patients. In their literature reviews, Almond et al. (2021) and Lok et al. (2020) found that researchers have demonstrated a substantially lower frequency of catheter-related infection with an antimicrobial lock solution, compared with an anticoagulant lock solution. O'Grady et al. (2017) also found similar results in their meta-analysis as through several randomized controlled trials, researchers determined the rate of CVC infection was significantly lower in the group whose catheters were locked with an antimicrobial solution.

O'Grady et al. (2017) recommend that nurses should be educated regarding evidence-informed procedures for the insertion and maintenance of intravascular catheters, and appropriate infection control measures to prevent intravascular catheter-related infections such as antimicrobial lock solutions. As pediatric HD patients have a high rate of catheter-related infection, nurses need to know and understand all prevention methods. Understanding indications for prophylactic antimicrobial use can provide nurses with the tools for patient advocacy, specifically in their high-risk pediatric HD patients that may benefit from these lock solutions.

Extraluminal: CVC Site Maintenance

External CVC site maintenance includes dressing changes and a physical examination of the CVC exit site. Almond et al. (2021), Lok et al. (2020), and O'Grady et al. (2017) recommend weekly CVC dressing changes with skin preparation of 2% chlorhexidine and sterile transparent or semi-permeable dressing to cover the catheter site. Monitoring of signs and symptoms of bacteremia/septicemia is imperative for early detection and treatment. Inspection of the CVC exit site may reveal Dacron cuff migration that places the CVC at risk of infection. Exit-site infection is indicated by the presence of erythema, swelling, tenderness, and purulent drainage

around the CVC exit and the part of the tunnel external to the cuff. Signs of tunnel infection are swelling, erythema, fluctuance, and tenderness over the CVC tunnel central or proximal to the cuff. See Appendix B for a glossary of terms.

Einstein et al. (2011) found that very low infection rates (one per five CVC years) and prolonged CVC survival times (about one year) were achievable in their participants by adhering to strict catheter management protocol. They attributed their low infection rates to only allowing CVCs to be handled by highly trained nursing staff. Both Lok et al. (2020) and O'Grady et al. (2017) recommend educating dialysis nurses to ensure proper dressing technique and the ability to identify physical signs of infection.

NURSING ASSESSMENT

Although the principles of HD are similar for adults and children, there are technical aspects of the procedure and complications that are unique to the pediatric population. These differences must be recognized and addressed by nurses to perform pediatric HD effectively and safely, thereby reducing complications (Ashby et al., 2019). These differences are outlined in guidelines for dialyzing children by Ashby et al. (2019), Cho, (2020), Fischbach et al. (2005), Rees (2017), and Sousa et al. (2008). Details and quality of these guidelines can be found in the literature review summary tables located in Appendix A.

Fluid Status

Three articles were identified that addressed the child's fluid status as an important subject for nurses to understand. All authors agree that there are vast differences in the assessment of fluid removal between pediatric and adult populations (Fischbach et al., 2005; Rees, 2017; Sousa et al., 2008). Fluid status is calculated based on a patient's prescribed target weight, or the patient weight if the kidneys were fully functional and able to remove fluid from the body (Rees, 2017). Target weight is ordered by the nephrologist; however, nurses are responsible for the assessment of the weight and recommended changes to the prescription based on their assessment. As Ashby et al. (2019) suggested, target weight assessment in children and adolescents is particularly challenging as it needs frequent adjustment in line with growth or periods of illness. Overestimation of target weight will result in chronic fluid overload leading to hypertension and left ventricular hypertrophy, whereas chronic under-hydration is likely to detrimentally affect residual kidney function and lead to increased symptomatic hypotension both during and immediately post-dialysis.

Rees (2017), Sousa et al. (2008) and Fischbach et al. (2005) outline specific recommendations for fluid assessment among children including calculations to be used by nurses during the assessment of patient fluid status. These authors recommend a fluid removal of no more than 5% of the patient's body weight in one session or 0.2 mL/kg per hour. Removal of more than recommended will likely result in intradialytic hypotension and hemodynamic instability. All three authors also recommend frequent monitoring of children's target weight with weekly assessment for those under 40 kilograms.

Dialysis Prescription

There are significant differences between the child and adult composition and indications for the dialysis prescription which includes the dialyzer, tubing, blood flow rate, and session duration and frequency. Nurses must be knowledgeable and competent in the ability to differentiate between the required prescriptions for adults and children. For each patient, a nephrologist develops an individual dialysis prescription to ensure adequate solute clearance and the removal of excess fluid (Rees, 2017).

The type of dialyzer used depends on the patient's residual renal function (Ashby et al., 2019; Cho, 2020; Rees, 2017; Fischbach et al., 2005). The dialyzer acts as the artificial kidney, removing fluid and solutes or toxins. There are two types of dialyzers: low-flux and high-flux. Low flux dialyzers have a moderate permeability, meaning the removal of solutes is moderate. High-flux dialyzers have high permeability, solutes are removed at a high rate. If the patient has little residual kidney function, a high-flux membrane is recommended as they improve permeability for middle and larger molecules. For children, the size of the dialyzer is much smaller compared to adults as the surface area is like that of the patient's body and selected according to the patient's size (Cho, 2020; Sousa et al., 2008).

The tubing, or circuit, used for children is much smaller than that used for adults. The selection of tubing for the child is dependent on the priming volume. The tubing contains between 24–140 mL of the patient's blood at one time while HD is ongoing. It is imperative to ensure the tubing is small enough so that the child is not depleted of blood volume which can cause complications such as hypotension. A child can tolerate a maximum of ten to 15 percent of their total blood volume in the circuit (based on individual institutions), and a safe volume of the circuit is targeted at eight percent of the total blood volume of the child (Cho, 2020; Fischbach et al., 2005; Rees, 2017; Sousa et al., 2008).

Blood flow is also an important aspect of the dialysis prescription addressed by Fischbach et al. (2005), Rees (2017), and Sousa et al. (2008). The blood flow is the speed at which the blood is pumped out of the child and into the circuit (Rees, 2017). Blood flow determines solute clearance by optimizing diffusion and convection. These authors indicate that blood flow speed must be adjusted to the size of the child and should not exceed their maximum extracorporeal volume in mL/min (i.e., up to bodyweight x 8 mL/min) to maintain their cardiovascular status. A blood flow rate of 150–200 mL/min or 3–7 mL/min per kilogram is recommended. This flow is much smaller than that of an adult, which is typically 300–400 mL/min (Rees, 2017).

For children, the session duration is like that of an adult as it is dependant on the predetermined amount and rate of solute clearance and fluid removal (Ashby et al., 2019; Fischbach et al., 2005; Rees, 2017; Souza et al., 2008). Sessions typically range from three to four hours, rarely being shorter than four hours. For most infants and children weighing less than 10 kilograms, the need for more than three sessions a week may be required as their diet consists

of fluid (milk), hence seven sessions a week are frequently prescribed to prevent fluid overload. As children are growing, frequent assessment of the adequate number and duration of each session is recommended.

EDUCATIONAL DELIVERY

As the purpose of this project is to deliver an educational resource, a comprehensive literature search to identify methods of educational content delivery and their subsequent effects on nurses' knowledge and practice was completed. Several articles were identified where researchers examined the effect of the implementation of an educational intervention on nurse's knowledge and/or skills related to pediatric HD (Ahmed et al., 2019; Bayoumi & Mahmoud, 2018; Dennison, 2011; Hassona et al., 2012; Machaly et al., 2020; Ouda et al., 2019; Saeed & Al-Mosawi., 2020; Saleh et al., 2018; Yousef et al., 2019; Windt, 2016). Common educational delivery methods included lectures, active group discussion, demonstration and re-demonstration, simulation, booklet, and e-module.

Lecture

The most common educational modality identified was lecture (Aboushady et al., 2022; Bayoumi & Mahmoud, 2018; Hassona et al., 2012; Saeed & Al-Mosawi., 2020; Saleh et al., 2018; Yousef et al., 2019). A lecture is an oral presentation bridging verbal communication with writing and media technologies to provide flexible, adaptable, robust, and contemporary methods to deliver content (Phillips, 2020).

Lecture was implemented as an educational tool related to infection control practices in a pediatric HD unit by Bayoumi and Mahmoud (2018) and Yousef et al. (2020) as they examined handwashing, wearing gloves, gown, mask, use of disinfection, and CVC dressing change technique. They used an interactive lecture with a discussion that included content from the CDC guidelines for CVC infection prevention and found significant improvements in nurses' knowledge and practice related to infection control techniques as a result. Saleh et al. (2018) also found improvements in nurses' knowledge and practice in infection control measures along with generalized standards of practice. These included their ability to identify symptoms of fluid overload and electrolyte imbalance, correct dialysis machine programming, CVC care including dressing change, nutrition recommendations for patients, and medication administration competency.

Hassona et al. (2012) observed improvements in knowledge and practice related to catheter care, procedures of disconnecting the patient from the machine, troubleshooting machine alarms, and possible complications during HD such as low blood pressure as a result of their educational lecture. Similarly, Saeed and Al-Mosawi (2020) found an improvement in nurses' general practice knowledge of pediatric HD, and Aboushady et al. (2022) found an improvement in nurses' knowledge and practices related to AVF cannulation in children. Overall, there were significant results observed in all six studies that used lecture as an educational intervention to improve the knowledge and practice of nurses working with pediatric patients undergoing HD.

Simulation

Ahmed et al. (2019), Machaly et al. (2020), and Ouda et al. (2019) used simulation including role-play, demonstration and re-demonstration as their primary educational intervention modalities. Role play is a dramatic approach in which individuals assume the roles of others; it increases observational skills, improves decision-making, and increases comprehension of complex human behaviors (Phillips, 2020). Demonstration showed learning outcomes through projects, presentations, or learning objects which is revealing the degree to which learners have met the learning objectives. Visibly showing a process often aids in retention, allowing skills to become more understandable as a result (Phillips, 2020).

CVC infection prevention and control was the focus of several education sessions (Ahmed et al., 2019; Ouda et al., 2019). General infection control precautions in the pediatric HD unit included handwashing, wearing gloves, and aseptic technique during the connection and disconnection of the patient to the HD machine. General knowledge of the CVC along with specific knowledge related to hand hygiene, dressing change, and disinfection of hubs and lumens was also included in the sessions. Machaly et al. (2020) focused on general HD procedures including pre-, intra-, and post-dialysis care and intra-hemodialytic complications. Content for the simulation sessions was obtained through a need's assessment of the nurses and research material including guidelines from the CDC for infection control. During the simulation practices of role-play and demonstration, the nurses were observed directly by the researchers.

Simulation resulted in significant improvements in nurse's knowledge and practice in pediatric HD. Ahmed et al. (2019) and Ouda et al. (2019) reported a significant difference in nurses' knowledge and practice scores related to infection control. Similarly, Ahmed et al. (2019) found significant differences in their knowledge of infection control pre- and post-education program. Highly significant differences were observed between nurses' practice before the program and six months after the program, especially with handwashing, wearing gloves, and medication administration preparation. Ouda et al. (2019) found an improvement in nurses' total practice scores post-program, compared with pre-program. They also found that there were fewer catheter-associated infections post-program.

Machaly et al. (2020) reported an improvement in nurses' practice after three weeks of implementing the HD guidelines related to pre- and post-HD assessment and complications. The guidelines were developed based on recommendations from the National Kidney Foundation, American Nurses Association, and medical journals. The authors used demonstration and redemonstration for elements of practice such as nursing assessment of vital signs, weight measurement, and monitoring machine values. Before the guidelines were implemented, slightly less than two-thirds of the nurses had good total knowledge and practice scores based on the pre-intervention survey results. Their total knowledge and practice scores improved significantly after three weeks of implementing the guidelines. Overall, all three studies

observed significant differences in nurse's knowledge and practice related to pediatric HD because of an educational program utilizing active learning modalities including role-play and demonstration.

Online module

An online learning module has been used to improve the knowledge of nurses working with pediatric HD patients. Windt (2016) used interactive simulation in their module, which involved the user having the ability to simulate pediatric HD using the HD equipment. Dennison (2011) used similar modalities, using scenarios depicting complications of HD, beginning with frequently noted complications, such as hypotension and muscle cramps, to less frequent but higher acuity complications, including pyrogenic reactions, dialysis disequilibrium syndrome, hemolysis, and air embolism. An interactive module was created through roll-over fields, which provide added information, audible sounds, or added pictures to enhance the learning process. Roll-over fields are identified by highlighted or underlined areas and pictures. When the browser or mouse moves over that area, further information is displayed to the learner regarding the identified text. Both authors evaluated the nurse's knowledge after the implementation of the module through a questionnaire. Windt (2016) found that much of the sample agreed or strongly agreed that the content presented in the module improved their level of comfort when managing patients receiving RRT. Most nurses agreed or strongly agreed that the amount and type of information presented was appropriate for their learning needs. Dennison (2011) showed a significant difference between nurses of differing years of dialysis experience after the implementation of the online module. They observed a greater increase in knowledge among the less experienced nurses (less than 3 years) compared to those with more experience (greater than 3 years).

IMPLICATIONS

A comprehensive search of the literature was performed that revealed several sources specific to the experiences of patients, families, and nurses in pediatric HD. These experiences along with guidelines and educational modalities will be used to improve the knowledge and skills of nurses in pediatric HD through the development of an educational resource. The literature review revealed the existence of significant knowledge gaps. The guidelines that will be used for the education resource content from CDC and National Kidney Foundation are from credible resources published in the United States and the United Kingdom. There were no published guidelines, policies, or procedures specific to pediatric HD within Canada. It is unclear within the published literature which guidelines Canadian pediatric HD programs are following. The development of standards of practice for a newly developed pediatric HD program would require several consultations with large fully developed national programs such as SickKids in Toronto, Ontario.

Several sources from one country, Egypt, were found. Pediatric HD is very specialized and has traditionally had

a limited population base. Individual pediatric nephrology centers have a limited number of patients receiving HD at any given time. Therefore, it is challenging for single centers to recruit enough patients to perform adequately powered clinical studies to evaluate treatment and outcomes in this patient population (Samuel et al., 2010). With the recent increase in pediatric HD, more research is required within North America to develop a stronger evidence base. Although the sources from countries outside of North America are relevant to this current project's content and delivery, to ensure the project is the most suitable and specific to Canada, the consultations and environmental scan will focus on both local and national sources within Canada. These sources will include local experts in the field and a review of other educational programs within Canada specific to HD such as SickKids in Toronto, the largest pediatric HD program in the country.

CONCLUSION

The literature search performed revealed literature from varying sources and several countries around the world. These sources included guidelines, review articles, and quantitative and qualitative research related to pediatric HD. The experience of the patient and family, nurse, and the content and delivery methods to be included in an educational resource were presented. The goal is to improve nurse's knowledge and skill of pediatric HD. There are gaps within the literature, including a lack of North American resources, specifically Canadian. The content of the resource will include the data found in the literature review combined with an extensive environmental scan and consultations with field experts locally and nationally. The resource will contribute to improved knowledge and skills specific to pediatric HD among staff nurses and ultimately, enhanced patient and family outcomes.

REFERENCES

- Aboushady, R. R., Bahgat, R. S., Sabaq, A. G., & Mohammed, R. A. (2022). Effect of educational guidelines on nurses' performance related to the care of arteriovenous fistula puncture for children undergoing hemodialysis. *Journal of Nursing Science – Benha University*, 3(1), 36–50. <http://jnsbu.journals.ekb.eg>
- Abreu, I.S., Nascimento, L.C., Lima, R.A.G., & Santos, C.B. (2015). Children and adolescents with chronic kidney disease in hemodialysis: Perception of professionals. *Rev Bras Enferm*, 68(6), 712–718. <http://dx.doi.org/10.1590/0034-7167.2015680604i>
- Ahmed, S. M., Mohamed, A. R., & Ahmed, S. M. (2019). Effect of an educational program about infection control precautions in pediatric hemodialysis units. *Minia Scientific Nursing Journal*, 4(1), 77–88. <https://mc.minia.edu.eg>
- Almond, P. S., Emran, M. A., Koehler, S. M., & Al-Akash, S. I. (2021). Pediatric hemodialysis access. *Seminars in Pediatric Surgery*, 30, 1–25. <http://doi.org/10.1016/j.sempedsurg.2021.151121>
- Araujo de Souza, F., Oliveira, E.A., Silva, J.M., & Lima, E. (2011). Hemodialysis vascular access in children and adolescents: A ten year retrospective-cohort study. *Brazil Journal of Nephrology*, 33(4), 422–430. <http://doi.org/10.1590/S0101-28002011000400006>
- Ashby, D., Borman, N., Burton, J., Corbett, R., Davenport, A., Farrington, K., Flowers, K., Fotheringham, J., Fox, R. N., Franklin, G., Gardiner, C., Gerrish, R. N., Greenwood, S., Hothi, D., Khares, A., Koufaki, P., Levy, J., Lindley, E., Macdonald, J., ... Wilkie, M. (2019). Renal association clinical practice guideline on hemodialysis. *BMC Nephrology*, 20(379), 1–36. <http://doi.org/10.1186/s12882-019-1527-3>
- Bayoumi, M. H., & Mahmoud, N. F. (2018). Effect of an education program on nurses' knowledge and practice regarding care of central venous line in pediatric hemodialysis: evidence-based practice guidelines. *Egyptian Nursing Journal*, 14, 87–99. http://doi.org/10.4103/ENJ.ENJ_16_17
- Borzych-Duzalka, D., Shroff, R., Ariceta, G., Yap, Y., Paglialonga, F., Xu, H., Kang, H. G., Thumfart, J., Aysun, B., Stefanidis, C. J., Fila, M., Sever, L., Vondrak, K., Szabo, A. J., Szczepanska, M., Ranchin, B., Holttä, T., Zaloszyk, A., Bilge, I., ... Schmitt, C. P. (2019). Vascular access choice, complications, and outcomes in children on maintenance hemodialysis: Findings from the international pediatric hemodialysis network (IPHN) registry. *American Journal of Kidney Diseases*, 74(2), 193–202. <http://doi.org/10.1053/j.ajkd.2019.02.014>
- Canadian Institute for Health Information. (2022). *Treatment of end stage organ failure in Canada, Canadian organ replacement register, 2013 to 2022; End stage kidney disease and kidney transplants – data tables*. <https://www.cihi.ca/en/access-data-and-reports/data-tables>
- Canadian Pediatric Society. (2021). *Pediatric inflammatory multisystem syndrome temporally associated with COVID-19*. <https://www.cps.ca/documents/position/pims>
- Centers for Disease Control and Prevention. (2021). Information for healthcare providers about multiorgan inflammatory syndrome in children (MIS-C). <https://www.cdc.gov/mis-c/hcp/>
- Chand, D. H., Valentini, R. P., & Kamil, E. S. (2009). Hemodialysis vascular access options in pediatrics: Considerations for patients and practitioners. *Pediatric Nephrology*, 24, 1121–1128. <http://doi.org/10.1007/s00467-008-0812-3>
- Chand, D. H., Swartz, S., Tuchman, S., Valentini, R. P., & Somers, M. J. (2017). Dialysis in children and adolescents: The pediatric nephrology perspective. *The American Journal of Kidney Disease*, 69(2), 278–286. <http://dx.doi.org/10.1053/j.ajkd.2016.09.023>
- Cho, H. (2020). Pediatric hemodialysis. *Child Kidney Disease*, 24, 69–74. <https://doi.org/10.3339/jkspn.2020.24.2.69>
- Cimete, G. (2002). Stress factors and coping strategies of parents with children treated by hemodialysis: A qualitative study. *Journal of Pediatric Nursing*, 17(4), 297–305. <http://doi.org/10.1053/jpdn.2002.126712>
- College of Registered Nurses of Newfoundland and Labrador. (2014). *Continuing Competency*. <https://www.crnsl.ca/continuing-competency>
- Craven, S., Brumbach, B. H., & Richardson, K. L. (2023). Parent and caregiver reported factors associated with school absenteeism in children with chronic kidney disease. *Pediatric Nephrology*, 38, 1591–1598. <http://doi.org/10.1007/s00467-022-0578002>
- Currier, H., & Zimmerman, C. T. (2019). Use of creative writing to illustrate lived experiences in hemodialysis-dependant children with chronic kidney failure. *Nephrology Nursing Journal*, 46(3), 293–298. PMID: 31199096

- Dennison, H. A. (2011). Creating a computer-assisted learning module for the non-expert nephrology nurse. *Nephrology Nursing Journal*, 38(1), 41–53. <https://go.gale.com>
- Eisenstein, I., Tarabeih, M., Magen, D., Pollack, S., Kassis, I., Ofer, A., Engel, A., & Zelikovic, I. (2011). Low infection rates and prolonged survival times of hemodialysis catheters in infants and children. *American Society of Nephrology*, 6, 793–798. <http://doi:10.2215/CJN.04810610>
- El-Gamasy, M. A., & Eldeeb, M. M. (2017). Assessment of physical and psychosocial status of children with ESRD under regular hemodialysis, a single centre experience. *International Journal of Pediatrics and Adolescent Medicine*, 4, 81–86. <https://doi.org/10.1016/j.jipam.2017.01.001>
- Fischbach, M., Edefonti, A., Schroder, C., Watson, A. (2005). *Pediatric Nephrology*, 20, 1054–1066. <http://doi:10.1007/s00467-005-1876-y>
- Harada, R., Hamasaki, Y., Okuda, Y., Hamada, R., & Ishikura, K. (2022). Epidemiology of pediatric chronic kidney disease/ kidney failure: Learning from registries and cohort studies. *Pediatric Nephrology*, 37, 1215–1229. <http://doi:10.1007/s00467-021-05145-1>
- Harambat, J., & Madden, I. (2022). What is the true burden of chronic kidney disease in children worldwide? *Pediatric Nephrology*, 38, 1389–1393. <http://doi:10.1007/s00467-022-05816-7>
- Hassona, F. M., Ali, M. H., Winkelman, C., Abdeen, M. A., & El-Wahab, E. A. (2012). Evaluation of an education program: A report from the hemodialysis unit in Zagazig university hospitals, Egypt. *Nephrology Nursing Journal*, 39(1), 53–59. <https://www.annanurse.org/resources/products/nephrology-nursing-journal>
- House, T. R., Rosenberg, A. R., Zimmerman, C. T., Barton, K. S., & Wightman, A. (2022). Caregiver perspectives of dialysis initiation for children with kidney disease: A qualitative study. *Pediatric Nephrology*, 37, 2457–2469. <http://doi.org/10.1007/s0046-022-05472-x>
- Ibrahim, M. A., Ouda, W. E., & Ismail, S. S. (2019). Assessment of nurses' performance regarding care of children undergoing hemodialysis therapy. *Egyptian Journal of Health Care*, 10(3), 113–125. <http://doi:10.21608/ejhc.2019.48125>
- Kaddourah, A., Basu, R. K., Bagshaw, S. M., & Goldstein, S. L. (2017). Epidemiology of acute kidney injury in critically ill children and young adults. *The New England Journal of Medicine*, 376(1), 11–20. <http://doi:10.1056/NEJMoa1611391>
- Kavurmaci, M., Cantekin, I., & Tan, M. (2014). Burnout levels of hemodialysis nurses. *Renal Failure*, 36(7), 1038–1042. <http://doi:10.3109/0886022X.2014.917559>
- Kidney Foundation of Canada. (2021). *What is kidney disease?* <https://kidney.ca/Kidney-Health/Newly-Diagnosed/What-is-Kidney-Disease>
- Kilis-Pstrusinska, K., Medynska, A., Chimielewska, I. B., Grenda, R., Kluska-Jozwaik, A., Leszcynska, B., Nedomagala, J., Olszak-Szot, I., Miklaszewska, M., Szczepanska, M., Thacsyk, M., Urzykowaska, A., Wasilewska, A., Zachwieja, K., Zajaczowska, A., Ziolkowska, H., Zagozdzon, I., & Zwolinska, D. (2013). Perception of health-related quality of life in children with chronic kidney disease by the patients and their caregivers: Multicentre national study results. *Quality of Life Research*, 22, 2889–2897. <http://doi:10.1007/s11136-013-0416-7>
- Lok, C. E., Huber, T., Lee, T., Shenoy, S., Yevzlin, A. S., Abreo, K., Allon, M., Asif, A., Astor, B. C., Glickman, M. H., Graham, J., Mosit, L. M., Rajan, D. K., Roberts, C., Vachharajani, T. J., & Valentini, R. P. (2020). KDOQI clinical practice guideline for vascular access: 2019 update. *American Journal of Kidney Diseases*, 4(2), 1–164. <https://doi.org/10.1053/ajkd.2019.12.001>
- Machaly, E. R., Bahgat, R. S., Hassan, H. H., & Kaf, R. H. (2020). Effect of implementing evidence-based nursing guidelines on nurses' performance about care provided for children undergoing hemodialysis. *International Journal of Nursing and Health Science*, 9(3), 21–28. <http://doi:10.9790/1959-0903032128>
- Mellor, J. S., Hulton, S., & Draper, H. (2015). Adherence in pediatric renal failure and dialysis: An ethical analysis of nurses' attitudes and reported practice. *Journal of Medical Ethics*, 41, 151–156. <http://doi:10.1136/medethics-2013-101659>
- Miller, M. M., Clark, E., Dipchand, C., Hiremath, S., Kappel, J., Kiaii, M., Lok, C., Luscombe, R., Moist, L., Oliver, M., & McRae, J. (2016). Hemodialysis tunneled catheter-related infections. *Canadian Journal of Kidney Health and Disease*, 3, 1–11. <http://doi:10.1177/2054358116669129>
- Mitsnefes, M. M., Laskin, B. L., Dahhou, M., Zang, X., & Foster, B. J. (2013). Mortality risk among children initially treated with dialysis for end-stage kidney disease, 1990–2010. *Journal of the American Medical Association*, 309(18), 1921–1929. <http://doi:10.1001/jama.2013.4208>
- National Kidney Foundation. (2022). *Kidney Disease: The Basics*. <http://www.kidney.org/news/newsroom/fsindex>
- Nuel, S. K. (2012). Medical traumatic stress symptoms in pediatric patients on dialysis and their caregivers: A pilot study. *Nephrology Nursing Journal*, 39(6), 483–488. <https://europepmc.org/article/med/23469414>
- O'Grady, N. P., Alexander, M., Burns, L. A., Dellinger, E. P., Garland, J., Heard, S. O., Lipsett, P. A., Masur, H., Mermel, L. A., Pearson, M. L., Raad, I. I., Randolph, A., Rupp, M. E., & Saint, S. (2017). Guidelines for the prevention of intravascular catheter-related infections, 2011. *Centers for Disease Control and Prevention*. 1–80. <https://www.cdc.gov/infectioncontrol/guidelines/bsi/index.html>
- Ong, Z. H., Ng, C. H., Tok, L. P., Kiew, M. J., Huso, Y., Shorey, S., & Ng, Y. P. (2021). Sources of distress experienced by parents of children with chronic kidney disease on dialysis: A qualitative systematic review. *Journal of Pediatric Nursing*, 57, 11–17. <http://doi:10.1016/j.pedn.2020.10.1018>
- Ouda, W. E., Mahmoud, F. S., Khalaf, S. M., & AbduAllah, R. (2019). Effect of educational program for nurses on central venous catheter maintenance bundle for critically ill pediatric patients, 1–13. <https://www.semanticscholar.org>
- Paglialonga, F., Consolo, S., Pecoraro, C., Vidal, E., Gianoglio, B., Puteo, F., Picca, S., Saravo, M. T., Edefonti, A., & Verrina, E. (2016). Chronic hemodialysis in small children: a retrospective study of the Italian pediatric dialysis registry. *Pediatric Nephrology*, 31, 833–841. <http://doi:10.1007/s00467-015-3272-6>
- Phillips, J. M. (2020). Strategies to promote student engagement and active learning. In D. M. Billings & J. A. Halstead (Eds.). *Teaching in nursing: A guide for faculty*. (pp. 286–303). Elsevier.
- Public Health Agency of Canada. (2020). *Device-associated infections in Canadian acute-care hospitals from 2009–2018*. <http://www.canada.ca>
- Rafay, A. S., Tantaqi, H. R., Farsy, E. M., & Ramadan, D. H. (2021). Role of pediatric nurses regarding children's needs undergoing hemodialysis therapy. *Egyptian Journal of Health Care*, 12(3), 496–509. <http://doi:10.21608/ejhc.2021.191643>
- Raina, R., Chauvin, A. M., Buchman, T., Askenazi, D., Deep, A., Ensley, M. J., Krishnappa, V., & Sethi, S. K. (2017). Treatment of AKI in developing and developed countries: An international survey of pediatric dialysis modalities. *PLoS ONE*, 12(5), 1–9. <http://doi:10.1371/journal.pone.0178233>

- Rees, L., Schaefer, F., Schmitt, C. P., Shroff, R., & Warady, B. (2017). Chronic dialysis in children and adolescents: Challenges and outcomes. *Lancet Child Adolescent Health*, 1, 68–77. [http://dx.doi.org/10.1016/S2352-4642\(17\)30018-4](http://dx.doi.org/10.1016/S2352-4642(17)30018-4)
- Ricci, Z., Benelli, S., Barbarigo, F., Cocozza, G., Pettinelli, N., Di Luca, E., Mettifofo, M., Toniolo, A., & Ronco, C. (2015). Nursing procedures during continuous renal replacement therapies: A national survey. *Heart, Lung, and Vessels*, 7(3), 224–230. <https://www.researchgate.net>
- Saeed, M. N., & Al-Mosawi, K. M. (2020). Effectiveness of a health education program of nurses' knowledge toward hemodialysis at pediatric teaching hospitals in Baghdad city. *Iraq National Journal of Nursing Specialities*, 33(1), 73–84. <https://www.iasj.net>
- Saleh, M. S., Ali, J. S., & Affi, W. M. (2018). Nurses' compliance to standards of nursing care for hemodialysis patients: Educational and training intervention. *International Journal of Nursing and Health Science*, 7(2), 48–60. <http://doi:10.9790/1959-0702094860>
- Salman, N. T., & Muttaleb, W. M. (2023). Evaluation of nurses' practices toward the application standard precaution measures in children hemodialysis unit. *Pakistan Heart Journal*, 56(2), 274–283. <http://www.pkheartjournal.com>
- Samuel, S. M., Tonelli, M. A., Foster, B. J., Nettel-Aguirre, A., Na, Y., Williams, R., Soo, A., & Hemmelgarn, B. R. (2010). Overview of the Canadian pediatric end-stage renal disease database. *BMC Nephrology*, 11(21), 1–6. <http://www.biomed-central.com/1471-2369/11/21>
- Shahdadi, H., & Rahnama, M. (2018). Experience of nurses in hemodialysis care: A phenomenological study. *Journal of Clinical Medicine*, 7(30), 1–8. <http://doi:10.3390/jcm7020030>
- SickKids. (2022). *Overview of Pediatric Hemodialysis*. Nephrology Department. <http://www.sickkids.ca/en/care-services/clinical-departments/nephrology>
- Sousa, C. N., Gama, M., Andrade, M., Faria, M. S., & Pereira, E. (2008). Haemodialysis for children under the age of two years. *Journal of Renal Care*, 34(1), 9–13. <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1755-6686.2008.00004.x>
- Statistics Canada. (2022). *Table 17-10-0009-01. Population estimates, quarterly*. <http://doi:10.25318/1710000901-eng>
- Sutherland, S. M., Ji, J., Sheikhi, F. H., Widen, E., Tian, L., Alexander, S. R., & Ling, X. B. (2013). AKI in hospitalized children: Epidemiology and clinical associations in a national cohort. *Clinical Journal of the American Society of Nephrology*, 8(10), 1661–1669. <http://doi:10.2215/CJN.00270113>
- United States Renal Data System. (2020). *Acute kidney injury. 2020 Annual Data Report*. <https://adr.usrds.org/2020>
- Wightman, A., Zimmerman, C. T., Neul, S., Lepere, K., Cedars, K., & Opel, D. (2019). Caregiver experience in pediatric dialysis. *Pediatrics*, 143(2), 1–14. <http://pediatrics.aappublications.org>
- Windt, K. (2016). Development of online learning modules as an adjunct to skills fairs and lectures to maintain nurses' competency and comfort level when caring for pediatric patients requiring renal replacement therapy (RRT). *Nephrology Nursing Journal*, 43(1), 39–47. <https://www.proquest.com>
- Yousef, Y. E., Elashir, U. M., Mahmoud, S. R., & Maghraby, N. (2019). The effect of nursing educational program on knowledge and practice of nurses regarding infection control measures for children under hemodialysis. *Egyptian Nursing Journal*, 16, 1–9. <http://doi:10.4103/2090-6021.257964>
- Zitzelsberger, H., McKeever, P., Peter, E., Chambon, A., Morgan, K. P., & Spalding, K. (2019). Doing technology time in a pediatric hemodialysis unit: An ethnography of children. *Health & Place*, 27, 112–119. <http://doi:10.1016/j.healthplace.2014.02.00>

Appendix A

Literature Summary Table

Study/Design	Methods	Key Results	Comments
<p>Authors: Aboushady et al. (2022)</p> <p>Design: Cross sectional</p> <p>Purpose: To evaluate the effect of educational guidelines on nurses' performance related to care of AVF puncture for children undergoing HD.</p>	<p>N: 41 nurses working in the Menufiya University Hospitals in Benha, Egypt.</p> <ul style="list-style-type: none"> Educational guidelines implemented related to cannulation of AVF. <p>Data Collection:</p> <ul style="list-style-type: none"> Convenience sample of nurses and all available children undergoing HD through AVF. Two tools used: <ol style="list-style-type: none"> Nurses structured questionnaire. Developed by the researcher and included nurses and child characteristics, nurses' knowledge. Observational checklist. Developed by researchers. Used before and after implemented educational guidelines. Featured items included before cannulation, during cannulation, and after cannulation. Reliability and content validity of tools tested by experts in field. <p>Analysis:</p> <ul style="list-style-type: none"> Data analysed using Statistical Package for Social Science (SPSS). Tests of significance, Chi-square test, Fisher exact test, F test, Independent t-test and correlation coefficient used. 	<p>Level of Knowledge:</p> <ul style="list-style-type: none"> 39.1% of nurses had a poor level of knowledge before the educational guidelines were implemented. 80.4% had a good level of knowledge after educational guidelines implemented. <p>Practice:</p> <ul style="list-style-type: none"> 52.2% of nurses had unsatisfactory practices before implementation of guidelines. 91.3% had satisfactory practice after implementation of guidelines. <p>Education Level/Years of Experience:</p> <ul style="list-style-type: none"> Highly statistically significant relationship between education level and years of experience and total knowledge before and after implementation of guidelines (p value = 0.000). Highly statistical significance relation between total practices of studied nurses and their educational level and years of experience before and after educational guidelines implementation (p-value < 0.000). <p>Main Themes:</p> <ul style="list-style-type: none"> Water and food restrictions Limitations imposed by the treatments Time dedicated to the treatment Change in body image related to the vascular access and growth Stigma related to the label of a "sick child" causing limited social interaction Lack of self-care due to life restrictions Hope of kidney transplantation 	<p>Strength of Design: Weak</p> <p>Quality: High</p> <p>Useful as provides evidence that supports improved knowledge as the result of education implementation.</p>
<p>Authors: Abreu et al. (2014)</p> <p>Design: Phenomenology</p> <p>Purpose: To identify quality of life impacting attributes related to health of children and adolescents with chronic renal failure, on HD.</p>	<p>N: 42 participants between 8 and 18 years, their parents, and caregivers.</p> <p>Data Collection:</p> <ul style="list-style-type: none"> Focus groups with the target-population and interviews with specialists. 14 focus groups were conducted. Two with children, five with adolescents and seven with their respective parents or caregivers. Conducted between August 2011-March 2013 in two hospitals. 12 open questions. Participants stimulated to interact, talking, and sharing their ideas about the proposed theme. Thematic and content analysis. 	<p>Main Themes:</p> <ul style="list-style-type: none"> Water and food restrictions Limitations imposed by the treatments Time dedicated to the treatment Change in body image related to the vascular access and growth Stigma related to the label of a "sick child" causing limited social interaction Lack of self-care due to life restrictions Hope of kidney transplantation 	<p>Strength: Strong</p> <p>Quality: High</p> <ul style="list-style-type: none"> Will be used in educational resource to improve nurses' understanding of the child's perspective of renal failure and HD.

Study/Design	Methods	Key Results	Comments
<p><u>Authors:</u> Ahmed et al. (2019)</p> <p><u>Design:</u> Uncontrolled before-after</p> <p><u>Purpose:</u> Evaluate the effect of an educational program of nurses' knowledge and practice regarding infection control measures in a pediatric dialysis unit.</p>	<p>N: 36 nurses working in the pediatric dialysis unit</p> <p>Country/setting: Minia, Egypt</p> <ul style="list-style-type: none"> Main teaching method simulation (role play, demonstration) Nurses divided into 9 groups. <p><u>Data Collection:</u></p> <ul style="list-style-type: none"> Pretest/post-test design Data collection from November 2016-April 2017 Statistical analysis using SPSS-19 Continuous data compared using t-test. Variables compared using chi-square test. <p>Tool: Interview questionnaire. Demographic data, nurse's knowledge of infection control (31 closed-ended questions), observational checklist (adopted from CDC to assess infection control practices). Proven reliability and validity.</p> <p>Post-test carried out immediately after intervention and 6 months later.</p>	<p>Post Intervention:</p> <p>Knowledge related to infection control significantly changed:</p> <ul style="list-style-type: none"> Infection control: P = 0.001 Hand washing: P = 0.001 General protection measures: P = 0.001 Precaution in dialysis: P = 0.005 Total knowledge: P = 0.001 <p>Practice related to infection control significantly changed:</p> <ul style="list-style-type: none"> Hand washing: P = 0.001 Wearing gloves: P = 0.001 Administration of injections: P = 0.001 Dialysis injectable medication administration: P = 0.001 Total nurses' practice about infection control: P = 0.001 <p>Main themes:</p> <ul style="list-style-type: none"> Surgical evaluation of the patient for whom HD access is being considered – etiology of kidney disease, medical history, social history, physical exam, vascular mapping. Vascular access operative procedure - AVF is preferred access. Most vascular access teams do not follow guidelines in choosing type of access. Hemodialysis catheter access – rationale, preparation, complications, operative strategy and technique, prevention/management of complications, postoperative care and prevention of long-term complications, outcome. Arteriovenous fistula – rationale, preoperative preparation, operative techniques and strategy, potential complications, post-operative care, long-term complications, outcome. Arteriovenous graft – indications, rationale, preoperative preparation, potential intraoperative complications, operative strategy and technique, prevention and management of complications, postoperative care, long-term complications, outcome. Comparison of hemodialysis access outcomes. 	<p><u>Strength:</u> Weak</p> <p><u>Quality:</u> Moderate</p> <p>No control for major confounders</p> <ul style="list-style-type: none"> Useful in the development of educational resource as it will aid in determination of the educational methodology used. <p><u>Strength/Quality:</u> Strong</p> <p>Useful as provides detailed information and guidelines for pediatric vascular access to be used in the educational resource.</p>
<p><u>Authors:</u> Almond et al. (2021)</p> <p><u>Design:</u> Narrative Literature Review</p> <p><u>Purpose:</u> To provide a concise, comprehensive, to-to-date reference on pediatric hemodialysis access and offer technical suggestions to improve outcomes.</p>	<ul style="list-style-type: none"> 172 sources reviewed and compiled into an overview of pediatric hemodialysis access. Unclear how data organised and analysed. 		

Study/Design	Methods	Key Results	Comments
<p><u>Authors:</u> Ashby et al. (2019)</p> <p><u>Design:</u> Guideline</p> <p><u>Purpose:</u> Provide a guidance on how to look after patients and how to run dialysis units and provides standards which units should in general aim to achieve.</p>	<p>A guideline published under The Renal Association – a leading professional body for the United Kingdom renal community.</p> <p>Guidelines used to answer the question: “what does good quality hemodialysis look like?”</p> <p>Based on several research articles found from systematic review. Searches were conducted in MEDLINE, PUBMED, Embase, and The Cochrane Library, and supplemented with papers handpicked from the reference lists of review papers. The strengths of the recommendations and the level of supporting evidence coded using the Modified GRADE system.</p>	<p>Main Topics:</p> <ul style="list-style-type: none"> • Planning, initiation & withdrawal of Renal Replacement Therapy • Vascular Access for Hemodialysis • Cardiovascular Disease • Blood Borne Viruses • Assessment of the Potential Kidney Transplant Recipient • Nutrition • Anemia • CKD-Mineral and Bone Disorder • Water Treatment Facilities • Dialysis Water and Dialysis Fluid Quality 	<p><u>Strength:</u> Strong</p> <p><u>Quality:</u> High</p> <ul style="list-style-type: none"> • Useful to guide the topics of pediatric HD that will be used in the educational resource.
<p><u>Authors:</u> Bayoumi & Mahmoud (2018)</p> <p><u>Design:</u> Uncontrolled before-after</p> <p><u>Purpose:</u> To investigate the effect nurses’ knowledge and practice in pediatric HD unit evidence of education program on -based practice (EBP) guidelines related to CVC care.</p>	<p>N: 40 nurses from two HD units of varying education level and years of experience</p> <p>Country/setting: Benha, Egypt</p> <ul style="list-style-type: none"> • One group of 40 nurses. Measuring knowledge related to CVC care. • Five groups – each group 6-8 nurses • Eight education sessions total. Lecture and group discussion using PowerPoint. <p><u>Data collection:</u> Tool 1 – Questionnaire with 2 parts: <i>Part 1:</i> Six closed-ended questions, including demographics and years of experience <i>Part 2:</i> 25 questions measuring knowledge of CRBSI among pediatric HD patients Each correct answer was assigned score 1 and wrong answer was assigned score 0. The total score was 25.</p> <p>Tool 2 – An observational checklist for CVC site performance, including hand washing, wearing mask and goggles, wearing sterile gown, wearing sterile gloves, use of disinfection, and dressing for CVC. Scores assigned if correct or incorrect.</p> <ul style="list-style-type: none"> • Content validity proven. Chronbach’s α equation 0.887. • Data collection conducted from April 2016 to October 2016 • Data evaluation = SPSS computer program Version 20 • Comparison of mean performed using paired-sample t-test and F-test. Correlation among variables tested using Pearson’s correlation coefficient. 	<ul style="list-style-type: none"> • Improvement in total knowledge of nurses as regards CRBSIs in pediatric HD unit, when compared with that before intervention and immediately after intervention, as well as that before intervention and after 6 months of implementation of teaching guidelines ($P \leq 0.01$) 	<p><u>Strength:</u> Weak</p> <p><u>Quality:</u> Moderate</p> <p>Issues:</p> <ul style="list-style-type: none"> • No control for major confounders • Used in determination of the educational method use based on the nurses’ responses in the article.

Study/Design	Methods	Key Results	Comments
<p>Authors: Borzych-Duzalka et al. (2019)</p> <p>Design: Prospective observational cohort</p> <p>Purpose: To study vascular access choice, placement, complications, and outcomes in children.</p>	<p>N: 552 children and adolescents from 27 countries on HD.</p> <ul style="list-style-type: none"> Followed up by the International Pediatric HD Network (IPHN) Registry between 2012 and 2017. 51% from Western Europe, 11% from Central Europe, 15% from Asia, 12% from Turkey, (5%) from North America, 3.5% from the Middle East, 2% from South America, and 0.5% from New Zealand. Median age at registry entry was 12.0 (IQR, 8.7–15.9) years, with 26 patients (5%) younger than 2 years and 52 (9%) older than 18 years. <p>Data Collection:</p> <ul style="list-style-type: none"> Data from the IPHN collected from incident and prevalent HD patients including demographics, vascular access, modality characteristics, routine access exit-site care, hematology and serum biochemistry levels, residual diuresis, molecule clearances (kt/v), and HD related complications. Data collection from HD onset to 6 months follow up. <p>Analysis:</p> <ul style="list-style-type: none"> Kolmogorow-Smirnoff test for normal distribution. Analysis of variation by Kruskal-Wallis test Differences in proportions measuring using X2 test Associations measured using Sperman correlation coefficient. Linear mixed-model analysis to assess differences in clinical and biomedical parameters among three access types. 	<p>313 (57%) patients followed up from HD initiation, and 249 (43%) prevalent on HD at the time of enrollment.</p> <p>Vascular Access Choice:</p> <ul style="list-style-type: none"> 73% received a CVC, 26% an AVF, and 1% an AVG. Most CVC's used in children under the age of 10, however, still accounted for 65% of those older than 10 years of age. <p>Vascular Access Characteristics:</p> <ul style="list-style-type: none"> Patient's with AVF/AVG were older than those with CVC's. Right internal jugular vein predominant site for CVC placement (61%). AVF commonly placed in left forearm (36%) and AVG in left upper arm (35%). Complications before use occurred in 16% of AVF, 35% AVG, and 9% CVC (P = 0.003). <p>Vascular Access Function</p> <ul style="list-style-type: none"> Average blood flow per body surface area higher for AVF compared to CVC. CVC had high rates of dysfunction including insufficient blood flow (33%), obstruction (24%), clotting (9%), leakage/breakage (12%), malposition (17%). Higher when placed in the femoral (56%) or subclavian (35%) vein compared to the internal jugular (P = 0.002). AVF dysfunction included thrombosis (58%) and insufficient blood flow (14%). <p>Infection:</p> <ul style="list-style-type: none"> Infectious complications only reported with CVC. Rate 1 per 26 catheter months (1.3/1,000 catheter days). <p>Outcome</p> <ul style="list-style-type: none"> Access survival was 70%, 64%, 62%, and 60% with CVCs and 92%, 90%, 86%, and 83% with AVFs after 1, 2, 3, and 4 years of HD. <p>Guidelines:</p> <ol style="list-style-type: none"> Access – CVC sole initial access for children. CVC choice dependent on patient size. Equipment – Blood flow, dialysate flow, and dialyzer size dependent on child's size. Prescription – Extracorporeal blood volume to not exceed 10% of patients size. Blood flow rate of 3-5ml/kg/min recommended. Adequacy - HD dose above which no significant reduction in negative outcomes or improvement in positive outcomes occurs. Measured using Kt/v (urea removal). 	<p>Strength of Design: Moderate</p> <p>Quality: Strong</p> <p>Useful to provide information regarding vascular access in resource.</p>
<p>Authors: Cho (2020)</p> <p>Design: Review Article</p> <p>Purpose: To discuss HD for the treatment of small children with RRT-requiring conditions, and consider indications, prescriptions, complications, and ethical issues.</p>	<ul style="list-style-type: none"> Published under the Korean Society of Pediatric Nephrology Written by Nephrologist in department of Pediatrics, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, South Korea Review of research related to guidelines for pediatric HD prescription, complications and ethical issues. From a physician point of view. 	<p>Guidelines:</p> <ol style="list-style-type: none"> Access – CVC sole initial access for children. CVC choice dependent on patient size. Equipment – Blood flow, dialysate flow, and dialyzer size dependent on child's size. Prescription – Extracorporeal blood volume to not exceed 10% of patients size. Blood flow rate of 3-5ml/kg/min recommended. Adequacy - HD dose above which no significant reduction in negative outcomes or improvement in positive outcomes occurs. Measured using Kt/v (urea removal). 	<p>Strength/Quality: Moderate</p> <ul style="list-style-type: none"> Several references are > 30 years old. Useful as it provides topics relating to pediatric HD that can be included in educational resource.

Study/Design	Methods	Key Results	Comments
<p>Authors: Cimete (2002)</p> <p>Design: Phenomenology</p> <p>Purpose: Describe the common stress factors and coping strategies of parents whose children had been treated by HD.</p>	<p>N: 31 parents of children undergoing HD (toddler to adolescent). 6 fathers and 25 mothers.</p> <p>Country/Setting: Istanbul, Turkey. Two pediatric HD units.</p> <p>Data Collection:</p> <ul style="list-style-type: none"> • Focus group interviews. • Semi-structured, open-ended questions. • Tape recorded with written notes. • 90 minutes in length. <p>Analysis:</p> <ul style="list-style-type: none"> • Audiotapes transcribed verbatim. • Content analysis. • Coding based on themes. 	<p>Common themes: Financial and bureaucratic problems</p> <ul style="list-style-type: none"> • Issues with wait times, insurance, financial problems. <p>Appearance and limitations of the child</p> <ul style="list-style-type: none"> • Growth and development reductions combined with diet and fluid restrictions. • Inability to care for other children. <p>Support systems</p> <ul style="list-style-type: none"> • Lack of familial support • Lack of economic support 	<p>Strength: Strong</p> <p>Quality: High</p> <ul style="list-style-type: none"> • Useful in the development of an educational resource to provide nurses with a better understanding of parent's experiences.
<p>Authors: Craven et al. (2023)</p> <p>Design: Cross-sectional</p> <p>Purpose: To examine patient and caregiver reported factors associated with school absenteeism in children with kidney disease to identify modifiable factors and improve school attendance.</p>	<p>N: 48 children ages 7–18 years with mild-moderate kidney disease</p> <p>Country/Setting: Oregon, USA</p> <p>Data Collection:</p> <ul style="list-style-type: none"> • Combination of chart review and in-person questionnaires. • Two questionnaire's – one for child and one for caregiver. • Collected between November 2018–August 2019. • Assessed self-reported number of full and partial missed school days, perceived health status, utilization of additional school accommodation, diagnosis of anxiety or depression, medication administration at school or home, caregiver age and relationship to child, caregiver education level, and family income. <p>Analysis:</p> <ul style="list-style-type: none"> • Descriptive statistics to characterize clinical characteristics of children, caregiver, and reported reasons for missing school. • Caregiver responses analyzed for non-Likert scale questions. • For Likert scale, both caregiver and child responses analyzed for variation. • Analysis using SAS software. 	<p>Missed school days:</p> <ul style="list-style-type: none"> • 21% (10/48) missed 18 days of school or more. • Median number full days = 10. • Median number partial days = 4. <p>Reasons for missed school days: Top three reasons include doctor appointments, feeling sick, and being bullied.</p>	<p>Strength: Weak</p> <p>Quality: High</p> <ul style="list-style-type: none"> • Small sample size, limiting generalizability. • Data collection tools have high validity and reliability. • Useful in providing a better understanding of children's experiences.

Study/Design	Methods	Key Results	Comments
<p><u>Authors:</u> Currier & Zimmerman (2019)</p> <p><u>Design:</u> Narrative Review</p> <p><u>Purpose:</u> To find ways to better understand children's experiences to better improve patient care, quality of life, and long-term functioning.</p>	<ul style="list-style-type: none"> Taxes, United States of America Examined 500 creative writing entries by hemodialysis dependant males and females. Age ranging from 5–25 years. Qualitative research methodology via direct content analysis to analyze content of entries. Line by line coding to identify themes. 	<p>Common themes:</p> <p>Physical shackle</p> <ul style="list-style-type: none"> Physical symptoms as a result from treatment such as cramping and fatigue. Strick diet and fluid intake. <p>Mental and emotional distress</p> <ul style="list-style-type: none"> Feeling of lost life. <p>Relying on hemodialysis machine</p> <ul style="list-style-type: none"> Being tied to machine but also grateful to be alive. <p>Dealing with problems</p> <ul style="list-style-type: none"> Feeling trapped but expressing resilience. <p>Being different</p> <ul style="list-style-type: none"> Looking and feeling different from other children. 	<p><u>Strength/Quality:</u> Moderate</p> <ul style="list-style-type: none"> Limited generalizability as results from one hospital Large cohort of data Useful in providing more information related to the child's experience.
<p><u>Authors:</u> Dennison (2011)</p> <p><u>Design:</u> Uncontrolled before-after</p> <p><u>Purpose:</u> Evaluate the effect of computer assisted learning module on nurses' knowledge of dialysis complications.</p>	<p>N: 60 nurses of varied experience working in one dialysis unit</p> <p><u>Country/setting:</u> New Jersey, New York</p> <ul style="list-style-type: none"> Implementation of an interactive online learning module Divided into 4 groups based on years of experience in dialysis (1–3 years N = 14, 4–9 years N = 11, 10–19 years N = 19, 20 of more years N = 16) <p><u>Data Collection:</u></p> <ul style="list-style-type: none"> Pretest/post-test to evaluate effectiveness of module. Survey of 10 questions. Proven validity and reliability. Data were analyzed utilizing PASW Statistics GradPack 17.0 Evaluation of knowledge test scores: one-way ANOVA. 	<p>Post Intervention:</p> <ul style="list-style-type: none"> Significant mean differences noted on the post-test (F3, 56] = 3.31, P = 0.027 partial 2 of 0.15) Nurses with three years or less had the greatest overall improvement of 21% compared to those with more than 3 years' experience (9–10%) as they had stronger knowledge base due to previous education. Difference between pre/post test scores between groups P = 0.039 	<p><u>Strength:</u> Weak</p> <p><u>Quality:</u> Moderate</p> <p>Issues:</p> <ul style="list-style-type: none"> No control for major confounders Useful as can use the nurses' responses in determining educational resource method.
<p><u>Authors:</u> Eisenstein et al. (2011)</p> <p><u>Design:</u> Retrospective Cohort</p> <p><u>Purpose:</u> To determine HD catheter infection rates and survival times in children and analyse the factors influencing these parameters.</p>	<p>N: 39 children with ESRD (median age 10 years) with a CVC.</p> <p><u>Country/Setting:</u> Pediatric HD unit at Meyer Children's Hospital in Haifa, Israel.</p> <p><u>Data Collection:</u></p> <ul style="list-style-type: none"> Between January 2001 and December 2009 Demographic, clinical, laboratory, and microbiologic data on patients and their HD-CVCs were obtained. Evident criteria for infection diagnosis determined. Routine management protocol of CVC care clearly defined and followed by staff. <p><u>Analysis:</u></p> <ul style="list-style-type: none"> Analysis on all patients grouped together and separately. Instances of CVC removal subdivided by the cause of removal: infection, malfunction (obstruction, self expulsion, tear), successful kidney transplantation, or patient death. 	<ul style="list-style-type: none"> Of the 29 patients in the study, 18 (62.1%) were children (>1 year of age) and 11 (37.9%) were infants (<1 year of age). During the study period, there were 12 episodes of catheter infections, of which 9 (4 in infants and 5 in children) were culture positive. CVC infection rate for all 59 catheters was 0.52/1000 CVC days or one infection per 62 CVC months. The infection rates for infants and children were 1.06/1000 CVC days (one infection per 31 CVC months) and 0.42/ 1000 CVC days (one infection per 78 CVC months), respectively. Despite a very significant increase in both catheter days (311%) and HD treatments (375%) from 2001 to 2009, the number of infection episodes remained very low, between zero and three per year. 	<p><u>Strength:</u> Medium</p> <p><u>Quality:</u> Moderate</p> <ul style="list-style-type: none"> Small sample size, one location. Useful for educational resource as provides information in CVC infection prevention.

Study/Design	Methods	Key Results	Comments
<p><u>Authors:</u> El-Gamsay & Eldeeb (2017)</p> <p><u>Design:</u> Cross-sectional</p> <p><u>Purpose:</u> To clarify bio demographic characteristics, common complaints, and physical, and psychosocial status of children with ESRD under regular maintenance HD.</p>	<p>N: 30 children ages 6–16 years with ESRD undergoing HD at a pediatric nephrology unit.</p> <p><u>Country/Setting:</u> Tanta, Egypt</p> <p><u>Data Collection:</u></p> <ul style="list-style-type: none"> July 2015–January 2016 Three structured questionnaires measured the bio demographic data of children and their parents, common complaints before and after the onset of HD. Assessment sheet of nutritional habits, sleeping patterns, daily physical activities, school achievement, the emotional, behavioral and social aspects of children, and different social relationships. Proven V&R <p><u>Analysis:</u></p> <ul style="list-style-type: none"> SPSS version 20 and Microstat-W. Categorical data presented as number and percentages; quantitative data expressed as the mean \pm standard deviation. 	<ul style="list-style-type: none"> 70% of children slept less than 8 h a night. 75% of the studied children engaged in no physical exercise. For over 50% of the children, the main reasons for not practicing exercise were fear of injury and vascular access. All children experienced irregular attendance to school; 43.3% had high marks, 36.7% had low marks, and 20% failed to pass exams. 80% complained of parent's overprotection. Two-thirds of the studied children were introverted, preferring isolation from other. 	<p><u>Strength:</u> Weak</p> <p><u>Quality:</u> High</p> <ul style="list-style-type: none"> 46% participants between ages 14–16, limiting generalizability of findings. Useful in the development of an educational resource as it provides the nurse with improved understanding of the experience of a child on HD.
<p><u>Authors:</u> Fischbach et al. (2005)</p> <p><u>Design:</u> Guideline</p> <p><u>Purpose:</u> Recommendations based on technological developments in pediatric HD.</p>	<ul style="list-style-type: none"> Written guideline published under The European Pediatric Dialysis Working Group. Established in 1999 by pediatric nephrologists from different European countries with a major interest in dialysis. Addressed the main factors affecting hemodialysis prescription and management in children including fluid removal, dialyzer size, blood circuit volume, and vascular access. Guidelines were initiated and discussed at meetings of the group and refined by e-mail discussion to develop a consensus, on the basis of cumulative clinical experience and reported studies 	<p><u>Guidelines:</u></p> <ol style="list-style-type: none"> The dialysis unit: <ul style="list-style-type: none"> In a pediatric center with nutritional and educational support. Water Quality <ul style="list-style-type: none"> Free from microbiological contamination The dialysis machine: <ul style="list-style-type: none"> Has ultrafiltration control and option for single and double needle dialysis. Blood lines: <ul style="list-style-type: none"> Available in infant size and biocompatible Principles of blood purification <ul style="list-style-type: none"> Small solute clearance from diffusion to convection Extracorporeal blood access and circulation: <ul style="list-style-type: none"> Total extracorporeal blood volume should be less than 10% of total patient blood volume. Blood flow rate of 150–200 ml/min is sufficient. Dialyzer choice: <ul style="list-style-type: none"> Synthetic, low-flux, dependent on desired urea and toxin removal The dialysate: <ul style="list-style-type: none"> Bicarbonate buffered with low calcium (1.25 mmol/L) Dry weight assessment: <ul style="list-style-type: none"> Difficult to define in children. No unique method, need for regular assessment. Close collaboration with dietician. Session, prescription, and monitoring <ul style="list-style-type: none"> Individualized, assessment regularly, psychosocial of patient and family is needed. 	<p><u>Strength:</u> Strong</p> <p><u>Quality:</u> High</p> <ul style="list-style-type: none"> Some citations used as support greater than 20 years old. Useful because it provides topics important for nurses to understand when dialyzing a pediatric patient that will be used in an educational resource.

Study/Design	Methods	Key Results	Comments
<p>Authors: Hassona et al. (2012)</p> <p>Design: Uncontrolled before-after</p> <p>Purpose: To provide an overview of the effect of an educational program based on clinical practice guidelines to improve the knowledge and performance of nurses in HD setting.</p>	<p>N: 38 nurses working in HD units at Zagazig University Hospital.</p> <p>Country: Egypt</p> <ul style="list-style-type: none"> Implementation of an educational program developed from international standards and national guidelines. <p>Data Collection: Knowledge questionnaire: Assessed nurses' knowledge about the care of patients receiving HD. 36 multiple-choice questions grouped under nine categories (clots of the shunt, termination of session, leakage of blood, infection control, dialysis disequilibrium syndrome, hypervolemia, instructions to patients, weight loss, and hemolysis). Observation checklist: Assessed individual nurse performance and had four main sections, each with several subsections. These included a) direct care to the patient undergoing HD that detailed three subsections (pre-dialysis phase, intradialytic phase, and termination phase), b) care for patients with intradialytic problems that detailed five problems (hypotension, muscle cramps, hypertension, dyspnea, and chest pain), c) infection control measures that detailed six subsections (measures related to health care team, patients, dialysis machine and equipment, safe waste management, and unit safety), and d) health education provided to the patient that detailed three subsections (related to vascular access care, diet and fluid restrictions, and general instructions).</p>	<ul style="list-style-type: none"> Significant gains in the number of nurses who achieved a satisfactory total knowledge score immediately post-intervention and three months after the intervention ($P < 0.001$). The highest significant gains were in the subcategories related to instructions to the patient in the posttest (91.4%), and hypervolemia in the follow-up test (97.1%). Gains in number of participants who achieved a satisfactory performance score. The number increased from 0 to 25 in the immediate post-intervention phase. The highest significant gains were in actions related to care for intradialytic problems in the post-test (96.3%) and in actions related to infection control in the follow-up test (82.9%). Significant, strong, positive correlation between the number of participants achieving satisfactory knowledge scores and the number of the participants achieving satisfactory performance scores as a total ($r = 0.741$, $P = 0.000$). 	<p>Strength: Weak</p> <p>Quality: Moderate</p> <ul style="list-style-type: none"> No controls for confounders. Useful in the development of educational resource to determine the educational methodology through the responses of nurses.
<p>Authors: House et al. (2022)</p> <p>Design: Phenomenology secondary analysis</p> <p>Purpose: To better understand caregiver experience at the crucial time of dialysis initiation and explore opportunities to better support patient and family-centered care delivery.</p>	<p>N: 35 caregivers of children beginning hemodialysis or peritoneal dialysis.</p> <ul style="list-style-type: none"> Primary caregivers of children ages zero to 18 years. Three hospitals: Seattle Children's Hospital, Texas Children's Hospital, and The Children's Hospital of Wisconsin (All within the USA) March 2016–April 2017 <p>Data Collection: Semi-structured interviews in-person (86%) and by phone (14%) lasting 70 min average.</p> <p>Interview tool high reliability and validity proven by field experts.</p> <p>Interviews conducted by nephrologist (not in direct care of child), psychologist, or research assistant (no bias reported).</p> <p>Analysis: Interviews were recorded, transcribed, deidentified, and entered Dedoose software for analysis.</p> <p>Inductive thematic analysis used.</p>	<p>Three major themes:</p> <ol style="list-style-type: none"> Parenting disrupted – disruption of the parenting role due to unexpected, emergent circumstances and vast information accompanying child's diagnosis. Redefining parenting – sought to reestablish innate parental role and foster their medical provider role through reassurance their child could survive and communicate/engage in care planning with medical team. Leveraging dual identities – to create positive experience for child, caregiver role leveraged through voicing their perspectives, watching over child's care, and preparing for future changes. 	<p>Strength: Strong</p> <p>Quality: Moderate</p> <p>Limited diversity and generalizability.</p> <p>Secondary analysis of previously collected data, therefore, data did not fit area of interest specifically.</p> <p>Useful in development of resource to better understand caregiver experiences related to child starting dialysis.</p>

Study/Design	Methods	Key Results	Comments
<p><u>Authors:</u> Ibrahim et al. (2019)</p> <p><u>Design:</u> Cross-sectional</p> <p><u>Purpose:</u> Assess nurses' performance regarding care of children undergoing HD therapy.</p>	<p>N: A convenience sample of 50 nurses from two HD units located in hospitals</p> <p><u>Country/setting:</u> Cairo and Ain Shams, Egypt</p> <p><u>Data Collection:</u> Three tools: 1. Self-administered questionnaire sheet (26 questions about HD knowledge) 2. Observational checklists (89 steps to rate nurses' practice) 3. Attitude rating scale to assess nurses' performance regarding care of children.</p> <p>Data c Data collection over 6 months (March-Aug) Each Education session 30 min, 3 days per week. Prov - Proven V&R of all tools.</p> <p><u>Analysis:</u> SPSS - SPSS version 20 Statist - Statistical analysis included; percentage (%), chi-square (X2), and Pearson correlation (R)</p>	<ul style="list-style-type: none"> 62% had satisfactory knowledge about CRF and 46% unsatisfactory. 72% of nurses had satisfactory of HD complications. 48% unsatisfactory knowledge of nursing care after HD 56% had incompetent level of practice regarding care during HD and dry weights. 56% of nurses had negative attitude towards caring for children on HD. Only 6% had a positive attitude. 56% had an incompetent level of practice regarding care of child on HD 	<p><u>Strength:</u> Weak</p> <p><u>Quality:</u> High</p> <ul style="list-style-type: none"> Useful in determining the educational method for resource based on the nurses' responses in the article.
<p><u>Authors:</u> Kavurmaci et al. (2014)</p> <p><u>Design:</u> Cross-sectional</p> <p><u>Purpose:</u> Determine the burnout levels of hemodialysis nurses working in HD units and their relationship with some sociodemographic variables.</p>	<p>N: 28 nurses working in 4 HD units.</p> <p><u>Country/setting:</u> Erzurum, Turkey</p> <p><u>Data Collection:</u> • Two-part questionnaire – demographics and The Maslach Burnout Inventory (MBI), a self-administered questionnaire, was used to measure burnout in the second part. • Proven V&R</p> <p><u>Analysis:</u> • SPSS 16.0 program (Chicago, IL) and evaluated with percentage, mean, independent samples t test, one way analysis of variance (ANOVA), correlation, Kruskal–Wallis analysis of variance, and Mann–Whitney U test.</p>	<ul style="list-style-type: none"> The MBI score subscales of the nurses provided a mean emotional exhaustion score (EE) of 17.07 ± 8.29, depersonalization (DP) score of 5.89 ± 4.13 and personal accomplishment (PA) score of 20.64 ± 4.10. Statistically significant difference between DP and PA with gender; marital status and EE; EE and PA with state of having a child; educational status and EE ($P < 0.05$). Nurses working in HD units experience a medium-level burnout in terms of subscales of EE and DP, and a high-level burnout in terms of subscale of PA. 	<p><u>Strength:</u> Weak</p> <p><u>Quality:</u> High</p> <ul style="list-style-type: none"> Useful because it can be used to improve understanding of the environment in which resource will be implemented.

Study/Design	Methods	Key Results	Comments
<p>Authors: Kilis-Pstrusinka et al. (2013)</p> <p>Design: Cross-sectional</p> <p>Purpose: Analyse the health-related quality of life (HRQoL) in Polish children with CKD on HD.</p>	<p>N: 203 children with CKD on HD and their 388 parents/proxies</p> <p>Country/setting: Poland. 12 pediatric nephrology centers.</p> <p>Data Collection:</p> <ul style="list-style-type: none"> • Chart review for patient demographics • The Pediatric Quality of Life Inventory (PedsQL) 4.0 was used to assess HRQoL • Assesses physical (8 items), emotional (5 items), social (5 items) and school/ nursery school (5/3 items) functioning in adolescents and children. • Proven V&R <p>Analysis:</p> <ul style="list-style-type: none"> • Descriptive statistics • Kolmogorov-Smirnov test for distribution • Mann-Whitney test, the student's t test and the Kruskal-Wallis test were used, to compare the different studied groups. • Chi-squared test or Fisher's exact test was used for comparison between groups • R for Windows, version 2.15.1 and MedCalc for Windows, version 12.3.1.0 	<ul style="list-style-type: none"> • HLQoL scores for all CKD groups were significantly lower in all domains compared with international population norms for healthy children ($p < 0.0001$). • Patients treated with dialysis assessed their physical and social functioning lower than patients not receiving dialysis. • Children: 50.54 (40.22–64.13) $P = 0.001$, Parents/care givers: 49.46 (40.22–62.5). $P = 0.0001$ 	<p>Strength: Weak</p> <p>Quality: Moderate</p> <p>Issues:</p> <ul style="list-style-type: none"> • Not all parents completed QOL survey. Some that did complete it may not have been primary caregiver. • Useful because it provides information to improve nurses' understanding of children's experience.
<p>Authors: Lok et al. (2019)</p> <p>Design: Clinical Practice Guideline for Vascular Access</p> <p>Purpose: A comprehensive document intended to assist multidisciplinary practitioners care for chronic kidney disease patients and their vascular access.</p>	<ul style="list-style-type: none"> • Published by the National Kidney Foundation – a national health organization in the United States. • Provides several clinical practice guidelines in nephrology that set the standards of treatment for all aspects of kidney disease. • Establish quality of care for kidney patients worldwide with research and several publications in national journals such as the American Journal of Kidney Disease. • Accumulation of new evidence related to vascular access of HD patients. • Appraisal of the quality of the evidence was independently conducted by using a Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach, and interpretation and application followed the GRADE Evidence to Decision frameworks. • Each guideline statement is accompanied by rationale/ background information, a detailed justification, monitoring and evaluation guidance, implementation considerations, special discussions, and recommendations for future research. 	<p>Guidelines Specific to Nursing Pediatric Patients:</p> <p>CVC Infection Prevention:</p> <ul style="list-style-type: none"> • Use of specific prophylactic antimicrobial locks in patients in need of long-term CVC who are at high risk of CRBSI, especially in facilities with high rates of CRBSI (eg, $>3.5/1,000$ days) • Infection surveillance team to monitor, track (in an electronic database), help prevent, and evaluate outcomes of vascular access infections and CVC related infections. • Designate only trained individuals who demonstrate competence for the access, use, and maintenance of CVC. • Provision of training, auditing, and feedback for frontline staff with respect to CVC care, connection, and disconnection procedures. 	<p>Strength: Strong</p> <p>Quality: High</p> <ul style="list-style-type: none"> • Some recommendations based on low-moderate evidence. • Useful as it provides guidelines specific to pediatric central line infection to be used in educational resource.

Study/Design	Methods	Key Results	Comments
<p><u>Authors:</u> Machaly et al. (2020)</p> <p><u>Design:</u> Uncontrolled before-after</p> <p><u>Purpose:</u> Determine the effect of implementing evidence-based nursing guidelines on performance of nurses providing care to children undergoing HD.</p>	<p>N: 36 nurses who provide care to children at two HD units</p> <p><u>Country/setting:</u> Suez Canal, Egypt</p> <ul style="list-style-type: none"> Implementation of guidelines to improve nurses' knowledge and practice in pediatric HD. Improve overall knowledge of pediatric HD including mechanisms of AKI and nursing assessment skills before, during, and after HD. <p><u>Data Collection:</u></p> <ul style="list-style-type: none"> Pretest: Assessment of nurse's knowledge and practice. Posttest: Assessment of nurse's knowledge and practice 3 weeks guideline post intervention. Observational checklist to measure practice. Proven V&R of all tools. <p><u>Analysis:</u></p> <ul style="list-style-type: none"> SPSS software. Descriptive statistics (mean, range, standard deviation). Group comparison = chi squared test. 	<ul style="list-style-type: none"> 61.7% of the studied nurses had good total knowledge mean scores before implementing the guidelines and their total knowledge mean scores improved to 88.3% after three weeks of implementing the guidelines. There was a highly statistically significant difference in total knowledge scores of the studied nurses, where p value=0.000. 55% of the studied nurses had low total practice mean scores regarding pre, intra and post dialysis nursing care before implementing the guidelines, while the majority (80%) had high total practice mean scores three weeks after implementing the guidelines. There was a highly statistically significant improvement in total practice scores of the studied nurses, where p value=0.000. 61% of the studied nurses had unsatisfactory total practice mean scores regarding care for children with intra hemodialytic complications before implementing the guidelines, while more than three quarters (78%) of them had satisfactory total practice mean scores after three weeks of implementation of the guidelines. There was a highly statistically significant improvement in total practice scores of the studied nurses before and after three weeks of implementing the guidelines, where p value=0.000. <p>Two main themes:</p> <ol style="list-style-type: none"> Participant's perceptions and experience of non-adherence <ul style="list-style-type: none"> Balancing responsibilities with the child and parents Adopted a parenting role Frustration with non-adherence (parent and child) Participants responses to non-adherence <ul style="list-style-type: none"> Acting in the minor's best interest Using persuasion to improve adherence 	<p><u>Strength:</u> Weak</p> <p><u>Quality:</u> Moderate</p> <ul style="list-style-type: none"> No control for major confounders. Post-intervention timeline short. Useful in determining the educational resource method based on the nurses' responses in the article.
<p><u>Authors:</u> Mellor et al. (2015)</p> <p><u>Design:</u> Phenomenology</p> <p><u>Purpose:</u> Examine ethical issues that non-adherence in pediatric renal failure generate.</p>	<p>N: 11 pediatric and experienced nurses working in a large inner city dialysis unit</p> <p><u>Country/setting:</u> Birmingham, United Kingdom</p> <p><u>Data collection:</u></p> <ul style="list-style-type: none"> In-person interviews (27–72 min). Digitally recorded, transcribed verbatim. Analyzed using content analysis. No theory to direct analysis – group up approach Thematic analysis with coding 	<p>Two main themes:</p> <ol style="list-style-type: none"> Participant's perceptions and experience of non-adherence <ul style="list-style-type: none"> Balancing responsibilities with the child and parents Adopted a parenting role Frustration with non-adherence (parent and child) Participants responses to non-adherence <ul style="list-style-type: none"> Acting in the minor's best interest Using persuasion to improve adherence 	<p><u>Strength:</u> Strong</p> <p><u>Quality:</u> High</p> <p><u>Issues:</u></p> <ul style="list-style-type: none"> Using persuasion causing ethical conflict among nurses. Useful to include the experience of the nurse caring for pediatric patients in an educational resource.

Study/Design	Methods	Key Results	Comments
<p><u>Authors:</u> O'Grady et al. (2017)</p> <p><u>Design:</u> CRBSI Prevention Guideline</p> <p><u>Purpose:</u> Guideline developed for healthcare professionals responsible for surveillance and infection control of intravascular catheters.</p>	<p>Country/setting: United States of America</p> <ul style="list-style-type: none"> Published by Centers for Disease Control and Prevention Prepared by a working group comprising members from professional organizations representing the disciplines of critical care medicine, infectious diseases, healthcare infection control, surgery, anesthesiology, interventional radiology, pulmonary medicine, pediatric medicine, and nursing. The working group was led several reputable worldwide medical organizations such as Society of Critical Care Medicine (SCCM), Infectious Diseases Society of America (IDSA), Society for Healthcare Epidemiology of America (SHEA), Surgical Infection Society (SIS), American Society of Critical Care Anesthesiologists (ASCCA), Association for Professionals in Infection Control and Epidemiology (APIC), Pediatric Infectious Diseases Society (PIDS), and the Healthcare Infection Control Practices Advisory Committee (HICPAC) of the CDC. 	<p>Key Recommendations in Pediatric Population Specific to Nursing:</p> <ul style="list-style-type: none"> Educate and periodically assess knowledge and practice of healthcare personnel responsible for CVC maintenance CVC dressing: Use transparent, semi-permeable polyurethane dressings. Cleanse with 2% chlorhexidine. Monitor the site visually when changing the dressing or by palpation through an intact dressing on a regular basis. If patients have tenderness at the insertion site, fever without obvious source, the dressing should be removed to allow thorough examination of the site. Use prophylactic antimicrobial lock solution in patients with long term catheters who have a history of multiple CRBSI despite optimal maximal adherence to aseptic technique. 	<p>Strength: Strong</p> <p>Quality: High</p> <p>Published by a major operating component of the Department of Health and Human Services in the United States.</p> <p>Supported by high-quality research studies and field experts.</p> <ul style="list-style-type: none"> Useful as provided guidelines related to vascular access that will be used in educational resource.
<p><u>Authors:</u> Ong et al. (2021)</p> <p><u>Design:</u> Systematic Review</p> <p><u>Purpose:</u> To identify sources of distress among parents caring for children with chronic renal disease undergoing HD</p>	<p>N: 13 papers with the experience of 183 parents met inclusion criteria.</p> <p>Country: Singapore</p> <p><u>Data Collection:</u></p> <ul style="list-style-type: none"> Six electronic databases searched: PubMed, Embase, PsycINFO, Scopus, Cochrane, Google Scholar <p><u>Analysis:</u></p> <ul style="list-style-type: none"> Three-step inductive thematic synthesis method used to form descriptive themes and the Critical Appraisal Skill Program (CASP) qualitative checklist to appraise the quality of included articles Evaluation of studies performed by two authors. 	<p>Five themes:</p> <ol style="list-style-type: none"> Disease related distress – diagnosis, treatment, and prognosis stressful for parents. Personal struggles – physical, social, and relationship struggles. Family structure – feeling unable to care for other children or spouse. Lack of resources – lack of formal and informal support. Unrealistic social expectations – stigmatism of caregivers and discrimination of child. 	<p>Strength: Strong</p> <p>Issues: Most studies setting Western countries – limiting generalizability to other parts of the world.</p> <ul style="list-style-type: none"> Useful information to be included in educational resource to improve nurses' understanding of the child/parent experience.

Study/Design	Methods	Key Results	Comments
<p>Authors: Rafay et al. (2021)</p> <p>Design: Cross-sectional</p> <p>Purpose: To assess the role of the pediatric nurse regarding children's needs undergoing HD therapy.</p>	<p>N: 50 pediatric nurses caring for children undergoing HD therapy.</p> <p>Country: Egypt</p> <p>Data Collection: A questionnaire consisting of three parts:</p> <ol style="list-style-type: none"> 1. Demographics 2. To assess nurses' knowledge regarding renal failure and HD 3. Quality of life scale to determine the needs of children undergoing HD <p>Analysis: Data revised, coded, and entered using personal computer. SPSS used for entry and analysis. Descriptive statistics used to present data. Chi-squared test and spearman correlation used. Statistical significance measured at p-value <0.05.</p>	<ol style="list-style-type: none"> 1. Highly statistically significant relationships between total knowledge of the studied nurses about renal failure and hemodialysis and their educational level, years of experience and attend training courses at ($P < 0.01$) 2. Highly statistically significant relationship between the total role of the nurses regarding the needs of children undergoing HD therapy and their educational level, years of experience and attend training courses at ($P < 0.01$) 3. Highly significant positive correlation between total nurse's knowledge about renal failure and hemodialysis and their total role regarding to the needs of children undergoing HD 	<p>Strength: Weak</p> <p>Quality: Moderate</p> <p>Issues:</p> <ul style="list-style-type: none"> • Purposive, small sample • No control for confounders • Useful in understanding nurses experience in caring for children undergoing HD.
<p>Authors: Rees (2017)</p> <p>Design: Guideline/Literature Review</p> <p>Purpose: Highlights dialysis modality selection, complications, and patient outcomes</p>	<ul style="list-style-type: none"> • Guidelines for HD for children are from the Institute of Child Health in London, UK published under Wolters Kluwer. • Recommendations based on current, peer reviewed literature. 	<ul style="list-style-type: none"> • Vascular access – Type and selection including AVF and CVC. • HD equipment – Tubing, dialyzer and machine. Maximum 10% blood volume in extracorporeal circuit. Size of dialyzer dependent on child size. Machine must have: fluid removal system, ability to use low blood flow speeds, ability to use lines of varying blood volumes. • Dialysis prescription – Developed so there is adequate solute and fluid removal. • Provision and assessment of HD – based on a well-functioning vascular access, obtain optimum weight, adequate clearance, avoid complications during HD including pain and hypotension, psychosocial support. • Complications – Nutrition/growth, mineral and bone disorder, cardiovascular disease, anemia. • Long-term outcome – Mortality (> 30 times higher than children without CKD) 	<p>Strength/Quality: High</p> <ul style="list-style-type: none"> • Useful because guidelines are directly applicable to topics included in educational resource.
<p>Authors: Saeed & Al-Mosawi (2020)</p> <p>Design: Uncontrolled before-after</p> <p>Purpose: Assess the effectiveness of health educational program on nurses' knowledge toward HD at Pediatric Teaching Hospitals.</p>	<p>N: 30 nurses working in the Child Welfare Teaching Hospital and the Child's Central Teaching Hospital.</p> <p>Country/setting: Iraq</p> <ul style="list-style-type: none"> • Educational program to improve nurses' knowledge of pediatric HD using lecture. Pretest/posttest. <p>Data Collection:</p> <ul style="list-style-type: none"> • Questionnaire: Five domains each one multiple choice questions, the participant chose one answer. The overall sum of questions is 48. Proven V&R. • January 19–22, 2020 <p>Analysis:</p> <ul style="list-style-type: none"> • Statistical Package of Social Sciences (SPSS) 	<ul style="list-style-type: none"> • Statistically significant difference between relationships pretest and posttest-1 (before and after lecture). When the p-value < 0.05 ($P = 0.000$). • Elevation in nurses' knowledge due to effect educational program where the p-value <0.05. 	<p>Strength: Weak</p> <p>Quality: High</p> <ul style="list-style-type: none"> • Useful to aid in determining which educational methodology used for resource based on the nurses' responses.

Study/Design	Methods	Key Results	Comments
<p>Authors: Saleh et al. (2018)</p> <p>Design: Uncontrolled before-after</p> <p>Purpose: To evaluate the efficacy of education and training interventions on nurse's compliance to standard of nursing care for HD patient.</p>	<p>N: 41 nurses working in the HD unit at El-Menia University Hospital.</p> <p>Country/setting: Egypt</p> <ul style="list-style-type: none"> Implemented educational program (lecture) to improve the knowledge and practice of nurses in pediatric HD. 10 sessions, 45–60 min. <p>Data Collection:</p> <ul style="list-style-type: none"> A questionnaire examining knowledge (35 multiple choice questions that were categorized under 5 sub items: clinical manifestation, Dialysis machine, Shunt care, Nutrition and medication lastly infection control. Observational checklist for performance. 5 main parts: hemodialysis phases, infection control measures, health education, collaboration with health care team, and environment of the unit. Proven V&R of all tools. Analysis using SPSS software. 	<ul style="list-style-type: none"> 68.3% of nurses weren't aware of HD nursing care standards. More than half of nurses (61.0%–56.1%) hadn't attended conference during the past 5 years and attended hadn't educational lectures respectively. There were increasing percent in nurses achieved very good and excellent overall total knowledge and performance in the post-test and the follow-up compared with the pre -test periods, increase in total mean scores for the observations related to overall performance of infection control. there was a strong positive relationship between nurse's knowledge and their performance were dedicated in the post tests at ($P < 0.001$). 	<p>Strength: Weak</p> <p>Quality: High</p> <ul style="list-style-type: none"> No control for confounders. Useful in determining which educational method chosen for resource based on the nurses' responses.
<p>Authors: Salman & Muttaleb (2023)</p> <p>Design: Cross sectional</p> <p>Purpose: To evaluate nurses practices toward the application of standardized precaution measures in a pediatric hemodialysis unit.</p>	<p>N: 45 purposive sample of nurses working in five hemodialysis units in Egypt.</p> <p>Data Collection:</p> <ul style="list-style-type: none"> July 1–March 20, 2023 Measured nurses practice toward: Routine disinfection of dialysis station before patient, arteriovenous fistula (AVF) cannulation, AVF de-cannulation, catheter exit site and disconnection, injectable medication preparation and administration, routine disinfection of dialysis station after patient. Self-administered questionnaire and checklist based on Centers for Disease Control audit tool and checklist. <p>Analysis:</p> <ul style="list-style-type: none"> Statistical software SPSS 26.0. Using descriptive statistics. 	<p>Nurses showed poor practices in the following:</p> <ul style="list-style-type: none"> Before beginning dialysis session: hand hygiene, removal of previous patient supplies. AVF cannulation: wearing gloves, disinfection of patient's skin, aseptic needle insertion, hand hygiene. AVF de-cannulation: hand hygiene, glove application, aseptic removal of needles. Catheter exit site: hand hygiene, allowing aseptic to dry, no contact of exit site after cleansed, applying dressing aseptically. Catheter disconnection: disconnect catheter from bloodline aseptically, scrub catheter hub with antiseptic, attach new caps aseptically. Medication preparation and administration: Aseptically prepare vial with alcohol, scrub injection port of dialysis machine, administer medication aseptically. Routine disinfection of station after patient left: wipe all surfaces with disinfection wipes, allow surfaces to air dry before reuse, hand hygiene. 	<p>Strength: Poor</p> <p>Quality: High</p> <p>Useful in understanding the need for further nursing education in dialysis units.</p>
<p>Authors: Shahdadi & Rahnama (2018)</p> <p>Design: Phenomenology</p> <p>Purpose: Describe the living experiences of nurses in HD care.</p>	<p>N: 9 nurses working in a HD unit.</p> <p>Country: Iran</p> <p>Data Collection:</p> <ul style="list-style-type: none"> Semi-structured interviews with open-ended questions. 45 min to 1 hour over 1–2 sessions in January 2017. Data saturation achieved. <p>Analysis:</p> <ul style="list-style-type: none"> Interviews recorded and hand-written. Colizzi approach for data analysis (extracting data and organizing into themes). Study rigor and validity proven. 	<p>Two Main Themes:</p> <ol style="list-style-type: none"> <i>Care Inhibitors</i> – nursing shortage, financial and family problems, inexperienced nurses, fatigue and mental stresses, heavy work load. Patient emotional sensitivity, difficulty in getting patient's trust. Poor management including inadequate ventilation of the department, lack of equipment, weak cooperation of head nurse. <i>Care Facilitators</i> – nurses experience, emotional relationship between nurse and patient, high education level, and safe environment. 	<p>Strength: Strong</p> <p>Quality: High</p> <ul style="list-style-type: none"> Useful to include the experience of nurses to better understand the environment in which the educational resource will be implemented.

Study/Design	Methods	Key Results	Comments
<p><u>Authors:</u> Sousa et al. (2008)</p> <p><u>Design:</u> Review Article</p> <p><u>Purpose:</u> To provide recommendations specific to pediatric HD based on guidelines within the literature.</p>	<ul style="list-style-type: none"> Professional opinion of professional university teacher and nurse with 10 years dialysis experience combined with recommendations published by Pediatric Nephrology Journal. Country: Portugal 	<p>Guidelines: <u>Vascular Access</u> – CVC most commonly used. Catheter size dependent on child size.</p> <p><u>Technical Aspects:</u> <i>Extracorporeal circuit (lines and dialyzer)</i> – Dialyzer choice recommendations based on child size. High-flow not recommended.</p> <p><i>HD Monitor</i> – Blood flow and dialysate flow. Depends on weight and length of dialysis. Short treatments recommended for first session. Blood flow 150-200ml/min or 5-7 ml/kg.</p> <p><i>Infants</i> – Circuit volume to not exceed more than 10% of child's blood volume to prevent complications such as deoxygenation and hypotension.</p>	<p><u>Strength/Quality:</u> Moderate</p> <ul style="list-style-type: none"> Several references outdated (more than 20 years old). Unclear of sources V&R. Useful to include guidelines in combination with other resource to support the topics chosen in the educational resource.
<p><u>Authors:</u> Wightman et al. (2019)</p> <p><u>Design:</u> Phenomenology</p> <p><u>Purpose:</u> Describe the experience of parental caregivers of children receiving HD.</p>	<p>N: 35 caregiver-child dyads whose child was receiving hemodialysis.</p> <p>Country/setting: Three pediatric dialysis units in Seattle, Texas, and Wisconsin, USA</p> <p><u>Data collection & Analysis:</u></p> <ul style="list-style-type: none"> Purposive sampling Semi structured interviews with caregiver's average 70 minutes Digitally recorded and transcribed verbatim with field notes Recruitment ceased at data saturation Content analysis – themes identified using coding. Computer software Vivo 11 was used to assist with storage, coding, and searching of data. 	<p>4 major themes:</p> <ol style="list-style-type: none"> Caregiver medicalization <ul style="list-style-type: none"> Needing to master new medical terms, skills, and routines. Emotional adjustment. <ul style="list-style-type: none"> Feelings of guilt, grief, stress, feeling like they caused the disease. Eventually acceptance. Pragmatic adaptation <ul style="list-style-type: none"> Needing to adjust to the upheaval, responsibilities, and stressors. Social adjustment <ul style="list-style-type: none"> Changes in relationships. New relationships with other caregivers and stress on their existing relationships. 	<p><u>Strength:</u> Strong</p> <p><u>Quality:</u> High</p> <ul style="list-style-type: none"> Useful because the parents' experiences will be used to improve the nurses understanding of pediatric HD.
<p><u>Authors:</u> Windt (2016)</p> <p><u>Design:</u> Cross sectional</p> <p><u>Purpose:</u> Implementation of a structured system and set of resources to support routine education, and the development of two online, interactive learning modules to provide additional exposure to RRT throughout the year.</p>	<p>N: 173 nurses working in HD unit with varying years of experience.</p> <ul style="list-style-type: none"> Implementation of an online learning module to improve knowledge of pediatric HD among nurses. <p><u>Data Collection:</u> Survey to measure staff comfort and skills level with HD in pediatric population.</p>	<ul style="list-style-type: none"> Over 72% (125 respondents) agreed or strongly agreed that the content presented in the module improved their level of comfort when managing patients receiving RRT. Twenty-two percent (38 respondents) neither agreed nor disagreed that the module increased their comfort level. Over 75% (130 respondents) agreed or strongly agreed that the amount and type of information presented was appropriate for their learning needs. When asked how often modules should be assigned, 43 felt yearly was adequate, 73 thought biannual modules were appropriate, 19 wanted three times per year, and 38 felt four modules per year would be best. There were 30 total comments, both positive and negative. Some liked the videos; others did not think they were very good. Others liked the information about the warmer. Some remarked that it was a good review and should be given biannually or be available when a patient is on CRRT. Still others felt that more hands-on training was needed. 	<p><u>Strength:</u> Weak</p> <p><u>Quality:</u> High</p> <ul style="list-style-type: none"> Useful because it will help determine which educational methodology used for educational resource.

Study/Design	Methods	Key Results	Comments
<p><u>Authors:</u> Yousef et al. (2019)</p> <p><u>Design:</u> Uncontrolled before-after</p> <p><u>Purpose:</u> Assess the knowledge and practice of nurses following an education intervention regarding the prevention of infection for children under HD.</p>	<p>N: 32 nurses working in the pediatric dialysis unit</p> <p>Country/setting: Assuit, Egypt</p> <ul style="list-style-type: none"> Nurses divided into small groups containing 2–4. Education session (lecture) 1 hour duration with a total of 9 sessions <p><u>Data collection:</u> Tool 1: Questionnaire. Assess current knowledge before education program. 60 questions. Each right answer was given a score of 1 and a wrong answer was given a score of 0.</p> <p>Tool 2: Observational checklist sheet. Assess nurses' practice for children under HD. Applied before and 2 months after the implementation of the educational nursing program. Each scored 'done correctly' (a score of 1) or 'not done' (a score of 0).</p> <ul style="list-style-type: none"> Content validity of study tools = 96%. Reliability estimated using α Cronbach's test for the tools, and its result was R=0.66. Nurse's knowledge and practices were evaluated before, immediately after, after 2 months of implementation. Duration = 1 year, lasting from July 2014 to August 2015. Data were tabulated and statistically analyzed using the computer program SPSS. Data were expressed as mean, SD, number, and percentage. T-test was used to compare between numeric variables and the χ^2 - test to compare between nonparametric variables. A probability level of 0.05 was adopted. 	<p>Post Intervention:</p> <ul style="list-style-type: none"> Improvements in the nurses' knowledge regarding renal failure (15.53±5.56 vs. 32.27±3.36), HD (16.23±8.05 vs. 29.20±5.76), and infection control measures (48.93 ±16.67 vs. 113.37±10.61) and total knowledge (80.70 ±18.48 vs. 174.83±18.37) after the educational program (P = 0.000). Improvements in the nurses' practice scores regarding hand-washing (P<0.001), changing gloves (P = 0.001), wearing mask (P = 0.000), skin preparation technique (P = 0.000), dealing with blood, body secretions, and fluids (P = 0.000), and maintaining clean environment and safe injection practices in addition to the mean total practice score (66.17±8.67 vs.78.00±6.82). 	<p><u>Strength of Design:</u> Weak</p> <p><u>Quality:</u> Moderate</p> <p><u>Issues:</u></p> <ul style="list-style-type: none"> No control for major confounders Useful to aid in determining the educational methodology used based on the nurses responses in the article.
<p><u>Authors:</u> Zitzelsberger et al. (2019)</p> <p><u>Design:</u> Ethnography</p> <p><u>Purpose:</u> Describe and interpret children's perceptions of and responses to the HD unit's temporal, spatial, and technological regimes, and relations.</p>	<p>N: 11 children between the ages of 7- and 17 years receiving HD at a pediatric HD unit.</p> <p>Country/setting: Ontario, Canada.</p> <p><u>Data Collection:</u></p> <ul style="list-style-type: none"> Multiple methods including: structured observations, focused interactions, and guided activities. Conducted during or just prior to the child's treatment. Collected written notes, mapping, digital photographs, child's drawings and writings. <p><u>Analysis:</u></p> <ul style="list-style-type: none"> Conceptual framing by thematic analysis 3 processes: description, analysis, and transformation. Study rigor & quality proven. 	<p>Three themes:</p> <ol style="list-style-type: none"> <i>Time</i> – everyday rituals and routines. Children felt time was long, taking up too much of their lives. <i>Space</i> – everyday confinement and constraints. Children felt they were confined to a machine, limiting their social interactions with other children and lack of privacy. <i>Technology</i> – everyday life on HD. Children felt anxiety and wonder when their body was incorporated with a machine. Physical boundaries broken between self and machine. 	<p><u>Strength:</u> Strong</p> <p><u>Quality:</u> High</p> <ul style="list-style-type: none"> Useful in improving nurses' understanding of the child experience on HD to be included in educational resource.

Legend: AKI = acute kidney injury; HD = hemodialysis; ESRD = end-stage renal disease; V & R = validity & reliability; AVF = arteriovenous fistula

Appendix B

Glossary of Terms

Convection	Water, toxins, and waste molecules are pushed through a semi permeable membrane, such as a dialyzer, using hydrostatic pressure (Messer et al., 2009).
Cuff Migration	The Dacron cuff migrates or moves out of the catheter exit site therefore the catheter tip is no longer in the correct position and delivery of dialysis through the catheter is no longer possible (British Columbia Renal Agency, 2019).
Dacron cuff	Part of the catheter which is under the skin and helps to keep it in place because the body's own tissue grows and attaches to it. This cuff is situated between the exit site of the catheter and the neck incision (Ash, 2004).
Diffusion	When blood and dialysis fluid with different concentrations of molecules are separated by a semi-permeable membrane, the molecules move through the membrane to the lower concentration (Messer et al., 2009).
Dialysis Disequilibrium	Clinical syndrome of neurologic deterioration that is seen in patients who undergo hemodialysis. Symptoms include restlessness, headache, mental confusion, and coma. It can occur in patients during or immediately after their first treatment (Zepeda-Orozco & Quigley, 2012).
Dialyzer	An artificial filter containing fine fibers that are hollow with microscopic pores, also known as semi-permeable dialysis membrane. Toxins, urea and other small particles can pass through the membrane and are removed from the blood (Fresenius Medical Care, 2021).
Exit-site Infection	Hyperemia, induration, and/or tenderness ≤ 2 cm from catheter exit site. May be associated with fever and purulent drainage from the exit site (O'Grady et al., 2017).
External to the Cuff	Part of the catheter that is not tunneled under the skin and is fully exposed (O'Grady et al., 2017)
Hemolysis	The destruction of red blood cells which can occur during HD as the result of shear stress when they circulate through the circuit, and are, therefore, at risk for fragmentation. Additionally, blood osmotic changes, dialysate contaminants, or hyperthermia can cause hemolysis during HD (Saha & Allon, 2017).

CANNT Journal Manuscript Submission Guidelines

DESCRIPTION

CANNT Journal is a quarterly publication that showcases excellence in nephrology nursing and technological writing through peer-reviewed articles that examine current issues and trends in nephrology nursing and technological practice, education, and research. *CANNT Journal* is the official journal of the Canadian Association of Nephrology Nurses and Technologists and supports the association's mission to serve its membership by advancing the development of nephrology nursing and technological knowledge. The journal is indexed in MEDLINE and CINAHL.

EDITORIAL POLICIES

CANNT Journal welcomes manuscripts related to nephrology nursing and technological education, practice, research, or health policy. The manuscript must be the sole intellectual property of the authors. Once accepted, manuscripts become the permanent property of *CANNT Journal*, and may not be reproduced elsewhere without written permission from the publisher.

We prefer manuscripts that present new clinical information or address issues of special interest to nephrology nurses and technologists. In particular, we are looking for:

- Original research reports
- Relevant clinical articles
- Innovative quality improvement reports
- Narratives that describe the nursing experience
- Interdisciplinary practice questions and answers
- Literature or systematic reviews

We also encourage letters to the editor as a way to promote dialogue and alternative perspectives to articles published in *CANNT Journal*. Choose "Letters to the Editor" from the Section dropdown on the submissions page.

SUBMISSION DECLARATION

Submission of the article implies that the work described has not been published elsewhere (except in the form of an abstract or a published lecture), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and responsible authorities where the research was carried out, and that, if accepted, it will not be published elsewhere in the same form without the written consent of the copyright holder. Upon acceptance of the submitted material, the author(s) must transfer copyright ownership to *CANNT Journal*. Statements and opinions contained within the work will remain the responsibility of the author(s).

PEER REVIEW

CANNT Journal operates on a double-blind peer review process. The names of the reviewers will not be disclosed to the author(s) submitting the manuscript, and the name(s) of the author(s) will not be disclosed to the reviewers.

All contributions will be initially assessed by the editors for suitability for the journal. Manuscripts deemed suitable are sent to two independent expert reviewers to assess the quality of the paper. A manuscript will only be sent for review if the editors determine that the paper meets the appropriate quality and relevance requirements in keeping with the particular aim and scope of *CANNT Journal*.

The editors are responsible for the final decision regarding acceptance or rejection of the manuscript. Editors are not involved in decisions about papers that they have written themselves or have been written by family members or colleagues, or which relate to products or services in which the editor has an interest. All manuscript submissions are subject to the journal's usual independent peer review process.

The criteria for acceptance for all manuscripts include the quality and originality of the research or intellectual material, its significance/appeal to journal readership, and the general writing style.

PREPARING THE SUBMISSION

The following components are required for all submissions. Manuscripts that do not meet these requirements will be returned to the corresponding author for technical revisions before undergoing peer review.

The manuscript should be submitted in separate files in the following order: title page; abstract with key words; main text including references; and figures/tables. A cover letter may be supplied at the authors' discretion.

Title page

Include:

- Title of the manuscript (concise and informative)
- Short running title of fewer than 40 characters
- Full names, highest academic degrees, and affiliations of all authors with email address and telephone/fax number of corresponding author
- Authors' institutional affiliations (department, institution, city, country) where research work was conducted
- Any acknowledgements (including disclosure of funding), credits, or disclaimers, conflict of interest statement for all authors

Abstract and keywords

Submit structured or summary abstract of up to 250 words. Word limit includes headers in a structured abstract (e.g., *background, purpose, method, findings, and discussion*).

The abstract should be a succinct summary of the major issue, problem, or topic being addressed, and the findings and/or conclusions in the manuscript. It should not duplicate material in the main text. It should not contain sub-headings, abbreviations, or reference citations.

Provide up to eight keywords that describe the contents of the manuscript.

Main text (manuscript, reference list)

Main text:

- Maximum length 15–20 pages, double-spaced
- Use the *Publication Manual of the American Psychological Association* (APA) 7th edition (copyright 2020) for style and format guidelines.
- As manuscripts are double-blind peer reviewed, the main text should not include any information that might identify the authors. Therefore, do not include any identifying information (i.e., authors' names).
- Number all pages consecutively in the upper right-hand corner.
- Cite tables/figures consecutively.
- Be sure to approve or remove all tracking changes in your Word document before uploading.

References:

- Use only sources from credible and high-quality journals.
- Double-spaced at the end of the manuscript
- Citations and reference list is to be styled according to the APA 7th edition (copyright 2020).
- Provide URL for all references where available.
- Ensure that every reference cited in the text is also present in the reference list (and vice versa).

Tables/figures

- Submit each table or figure as a separate file, and as editable text and not as an image.
- Prepare tables/figures according to APA 7th edition (copyright 2020).
- Cite tables/figures consecutively in the text, and number them in that order. Do not embed tables/figures in the manuscript text file.
- Number table and figure consecutively in accordance with their appearance in the text and place the title of the table/figure and any table/figure notes below the table/figure body.
- Use tables sparingly and ensure that the data presented in them clarify and supplement, rather than duplicate, results described in the main text. Only tables that are 3 manuscript pages or shorter will be accepted to be published within the article.
- Authors using previously published tables and figures must include written permission from the original publisher. Such permission must be attached to the submitted manuscript.



MANUSCRIPT SUBMISSION

Once the submission materials have been prepared in accordance with instructions in “Preparing the Submission” above, manuscripts must be submitted online at: <https://cannt-acitn.ca/journal/ojs/index.php/canntj>

New users must click “Register” at the upper right of the page. Once logged in, select “Submissions” from the “About” dropdown.

AFTER SUBMISSION

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Preliminary

Preliminary review by the editors to determine the suitability of the article for peer review. The editors assess all manuscript presentation requirements including style and format of the manuscript.

Editorial peer review

The peer review process determines scholarly merit of the article. All manuscripts are reviewed by two members of the Editorial Review Panel. The acceptance criteria for all papers lie in the quality and originality of the work and its significance to journal readership. Manuscripts are only sent to reviewers if the editors determine that the paper merits further review.

Determination of eligibility for publication

After the peer review, the editors make a decision regarding the eligibility of the article for selection based on the comments and recommendations of the reviewers. Based on the peer review evaluation, the editors make one of the following decisions:

- Accept without revisions
- Accept after completing minor revisions
- Re-submit after completing major revisions – re-review by original reviewers
- Reject

AFTER ACCEPTANCE

Corresponding authors will receive a PDF proof of the article. The page proof should be carefully proofread for any copyediting or typesetting errors. It is the authors' responsibility to ensure that there are no errors in the proofs. Authors should also make sure that any renumbered tables, figures, or references match text citations and that figure legends correspond with text citations and actual figures. Proofs must be returned within the deadline specified by the editors.

Alterations to the proof that are beyond those required to correct errors or to answer queries, or are a reworking of previously accepted material will **not** be allowed. The editors reserve the right to deny any changes that do not affect the accuracy of the content.

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The corresponding author will receive a hard copy of the journal issue as well as a PDF copy of the article.

If accepted, your article must not be published elsewhere in similar form, in any language, without the consent of the publisher. You may not post the PDF file of your copyedited article, or your final published article in any repository or online social media site.

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Authors of accepted peer-reviewed articles have the choice to pay a fee to allow perpetual unrestricted online access to their published article to readers globally, immediately upon publication. This option has no influence on the peer review process. All manuscripts are subject to *CANNT Journal's* standard double-blinded peer-review process and will be accepted or rejected based on their own merit.

The article processing charge of \$250.00 is charged on acceptance of the manuscript and should be paid within 5 days by the author(s). Payment must be processed for the article to be published open access.

CONFLICTS OF INTEREST AND SOURCE OF FUNDING

At the time of manuscript submission, authors should disclose any potential sources of conflict of interest, which includes any financial interest or relationship that might be perceived as influencing the authors' objectivity. The existence of a conflict of interest does not preclude publication. Authors must also declare if they have no conflict of interest to declare. Sources of funding should be included on the title page under the heading "Conflicts of Interest and Source of Funding." Each author must complete and submit the journal's copyright transfer agreement, which includes a section on the disclosure of potential conflicts of interest.

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At the time of submission, the submitting author will be presented with the copyright transfer and conflict of interest form. Co-authors will receive an email with instructions to also complete the form in order to proceed with the review process.

EDITORIAL OFFICE CONTACT DETAILS

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Lignes directrices pour la soumission des manuscrits au *Journal ACITN*

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Le *Journal ACITN* est une revue publiée trimestriellement qui met en valeur l'excellence des écrits sur les soins infirmiers et les technologies en néphrologie par le biais d'articles évalués par des pairs qui examinent les questions et les tendances actuelles de la pratique, de la formation et de la recherche dans ce domaine. Le *Journal ACITN* est la revue officielle de l'Association canadienne des infirmières et infirmiers et des technologues de néphrologie et soutient la mission de l'association pour servir ses membres en perfectionnant le développement des connaissances en matière de soins infirmiers et de technologies en néphrologie. La revue est référencée dans les bases de données MEDLINE et CINAHL.

POLITIQUES RÉDACTIONNELLES

Le *Journal ACITN* accepte les manuscrits portant sur la formation, la pratique, la recherche sur les soins infirmiers et les technologies de néphrologie ou la politique en matière de santé. Le manuscrit doit être la propriété intellectuelle unique des auteurs. Une fois acceptés, les manuscrits deviennent la propriété permanente du *Journal ACITN* et ne peuvent être reproduits ailleurs sans l'autorisation écrite de l'éditeur.

Nous préférons les manuscrits qui présentent de l'information clinique nouvelle ou qui abordent des problématiques d'intérêt particulier pour les infirmières et infirmiers et les technologues en néphrologie. Plus précisément, nous recherchons :

- Rapports de recherche originaux;
- Articles cliniques pertinents;
- Rapports sur des approches innovatrices en matière d'amélioration de la qualité;
- Textes narratifs relatant une expérience de pratique infirmière ou technologique;
- Textes sous forme de questions et de réponses sur la pratique interdisciplinaire;
- Revues de littérature ou revues systématiques.

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La soumission de l'article laisse entendre que l'œuvre décrite n'a pas été diffusée autre part (sauf sous la forme d'un résumé ou d'une présentation orale publiée), qu'elle n'est pas à l'étude pour publication ailleurs, que

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Le *Journal ACITN* fonctionne selon un processus d'évaluation par les pairs à double insu. Les noms des évaluateurs ne seront pas divulgués à l'auteur ou aux auteurs qui auront soumis le manuscrit, de même que le ou les noms des auteurs ne seront pas divulgués aux évaluateurs.

Toutes les contributions seront initialement évaluées par les rédactrices en chef pour leur pertinence à la revue. Les manuscrits réputés acceptables sont envoyés à deux experts indépendants qui en évalueront la qualité. Un manuscrit ne sera envoyé pour évaluation que si les rédactrices en chef déterminent que le manuscrit répond aux exigences de qualité et de pertinence appropriées, conformément à l'objectif et au champ d'application particuliers du *Journal ACITN*.

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PRÉPARATION DE LA SOUMISSION

Les éléments suivants sont requis pour toutes les soumissions. Les manuscrits qui ne répondent pas à ces exigences seront renvoyés à l'auteur-ressource en vue de révisions techniques avant d'être soumis à l'évaluation par les pairs.

Le manuscrit doit être soumis en fichiers séparés dans cet ordre : page titre; résumé avec mots clés; corps du texte incluant les références; et les figures ou les tableaux. Une lettre de présentation peut être fournie à la discrétion des auteurs.

Page titre

Inclure :

- Titre du manuscrit (concis et descriptif)
- Titre court comptant moins de 40 caractères
- Nom complet, diplôme de plus haut grade et affiliations de tous les auteurs, adresse courriel et numéros de téléphone/télécopieur de l'auteur-ressource
- Affiliations institutionnelles des auteurs (département, établissement, ville, pays) où les travaux de recherche ont été réalisés
- Tous les remerciements (y compris la divulgation du financement), les crédits ou les avertissements, un énoncé de conflit d'intérêts pour tous les auteurs

Résumé avec mots clés

Soumettre un résumé structuré ou succinct de 250 mots au maximum. La limite de mots inclut les en-têtes dans un résumé structuré (p. ex., *contexte, objet, méthode, résultats et discussion*).

Le résumé doit être une description succincte de la question, du problème ou du sujet principal abordé dans le manuscrit, ainsi que les résultats ou conclusions présentés. Il ne doit pas reproduire le corps du texte. Il ne doit pas contenir de sous-titres, d'abréviations ou de citations de référence.

Fournir jusqu'à huit mots clés qui décrivent le contenu du manuscrit.

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Corps du texte :

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- Se servir du guide de style *Publication Manual of the American Psychological Association (APA)*, 7^e édition (droit d'auteur 2020) pour les lignes directrices en matière de style et de format
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- S'assurer d'approuver ou d'éliminer toutes les modifications de suivi de votre document Word avant le téléversement

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L'examen du manuscrit se déroule en trois étapes avant que la décision ultime soit prise sur le statut de l'article aux fins de publication.

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Examen préliminaire par les rédactrices en chef afin de déterminer la pertinence de l'article aux fins d'évaluation par les pairs. Les rédactrices en chef examinent toutes les exigences de présentation de manuscrits, notamment le style et le format du manuscrit.

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Le processus d'évaluation par les pairs détermine la valeur scientifique de l'article. Tous les manuscrits sont évalués par deux membres du comité d'évaluation rédactionnelle. Les critères d'acceptation pour tous les textes reposent sur la qualité et l'originalité de l'œuvre et sur son importance aux yeux du lectorat de la revue. Les manuscrits sont envoyés aux évaluateurs uniquement si les rédactrices en chef décident que le texte mérite un examen plus approfondi.

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Après l'évaluation par les pairs, les rédactrices en chef prennent une décision concernant l'admissibilité de l'article à la sélection en se fondant sur les commentaires et les recommandations des évaluateurs. Selon l'évaluation par les pairs, les rédactrices en chef prennent l'une des décisions suivantes :

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- Accepter le manuscrit une fois les modifications mineures apportées
- Soumettre de nouveau le manuscrit une fois les modifications majeures apportées – réévaluation par les évaluateurs d'origine
- Rejeter le manuscrit

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Les auteurs-ressources recevront une épreuve en format PDF de l'article. L'épreuve d'imposition doit être soigneusement relue afin de détecter toute erreur d'édition ou de composition. Il incombe aux auteurs de s'assurer que les épreuves sont exemptes d'erreurs. Les auteurs doivent également s'assurer que les tableaux, les figures ou les références renumérotés correspondent aux citations du texte et que les légendes des figures correspondent aux citations du texte et aux figures réelles. Les épreuves doivent être renvoyées dans le délai précisé par les rédactrices en chef.

Les modifications apportées à l'épreuve qui vont au-delà de ce qui est nécessaire pour corriger des erreurs ou pour répondre à des questions ou qui constituent un remaniement du matériel précédemment accepté **ne** seront **pas** permises. Les rédactrices en chef se réservent le droit de rejeter toute modification qui n'influe pas sur l'exactitude du contenu.

APRÈS LA PUBLICATION

L'auteur-ressource recevra une copie papier du numéro de la revue ainsi qu'une copie PDF de l'article.

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Des frais de traitement de l'article de 250,00 \$ sont facturés à l'acceptation du manuscrit et doivent être payés dans les cinq (5) jours par le ou les auteurs. Le paiement doit être traité pour que l'article soit publié en accès libre.

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Au moment de la soumission du manuscrit, les auteurs doivent divulguer toute source potentielle de conflit d'intérêts, ce qui inclut toute relation ou tout intérêt financier qui pourrait être perçu comme influençant leur objectivité. La présence d'un conflit d'intérêts n'empêche pas la publication. Les auteurs doivent également déclarer qu'ils n'ont aucun conflit d'intérêts à déclarer. Les sources de financement doivent figurer sur la page titre sous la rubrique « Conflits d'intérêts et source de financement ». Chaque auteur doit remplir et soumettre le formulaire d'entente de transfert du droit d'auteur de la revue, lequel comprend une section sur la déclaration de conflits d'intérêts potentiels.

ENTENTE DE TRANSFERT DU DROIT D'AUTEUR

Au moment de la soumission, l'auteur qui soumet un manuscrit recevra un formulaire d'entente de transfert du droit d'auteur et de déclaration de conflits d'intérêts. Les coauteurs recevront des directives par courriel pour aussi remplir le formulaire afin d'amorcer le processus d'évaluation.

COORDONNÉES DU BUREAU DE LA RÉDACTION

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