CANNT JOURNAL
JOURNAL ACITN

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IN THIS ISSUE

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

Greetings! It is that time of year for the editorial team at *CANNT Journal* to reflect on how well we have captured the climate of the past year in nephrology nursing and technological practice, and express our gratitude for the privilege of serving the nephrology community, through publication. Although other parts of the world are experiencing great societal and humanitarian crises as we write this, we are fortunate there have not been recent upheavals where we are. We end on a good note at the heels of a great CANNT Conference in Ottawa. Great credit goes to the organizing and program planning committees for an outstanding conference. If there is one theme that runs through the final issue of the year, it is one of *connectivity*. The conference provided all attendees the chance to connect with their peers across the nation. We connected with our social work colleagues who are such a vital cog in the kidney care wheel. The presentations from all different branches of nephrology practice represented at the conference were relevant and stellar. There is, indeed, an air of optimism at CANNT and at *CANNT Journal* as we look toward a promising new year. At *CANNT Journal*, we have always maintained there are many talented nephrology writers and storytellers across this vast land of ours and across the many sub-specialty areas in our field of practice—we just need to unearth this talent to preserve the legacy of nephrology nurses and technologists for the generation of practitioners to come.

Along the theme of connectivity, we present two articles that connect us to nephrology nurse practitioners and pediatric nephrology nursing—disciplines that we hope will feature more prominently at the annual conference and in the *CANNT Journal*. We are very fortunate in having a strong partnership with the American Nephrology Nurses Association (ANNA) and *Nephrology Nursing Journal*. Thanks to this collaboration, we are able to share the article by Payongayong et al. (2022) titled "Effects of End-of-Life Communication Knowledge, Attitudes, and Perceived Behavioural Control on End-of-Life Communication Behaviours Among Nephrology Nurse Practitioners" on a subject that perfectly aligns with the topics of Medical Assistance in Dying (MAID), goals of care conversation, and palliative care during the panel discussions in Ottawa that intersect the collective practice of medical, nursing, and allied health practitioners. Although the nurse practitioner (NP) participants in Payongayong et al.'s study had a moderate level of engagement in end-of-life (EOL) communication with patients and a moderately high level of comfort and confidence in their ability to engage in such communication, they had low knowledge of EOL communication. Although this study was conducted in the United States, it would not be outside the realm of possibility that the findings can be similarly extrapolated to the Canadian setting, which has serious implications for conducting research into this practice area.

For our Continuing Education (CE) segment, we present the article by Brittany Woodman titled "Pediatric Hemodialysis: An Education Module for Registered Nurses," which is an extension of her literature review that we published on the subject in Fall 2023. This article presents a learning module that is suitable for any learner in pediatric or adult nephrology nursing. We feel privileged that the author entrusted this monumental work to *CANNT Journal,* so that we may all benefit from this shared knowledge.

Although it is only in the last issue of the year that we acknowledge the village of individuals and collectives who help us to ensure that every issue of *CANNT Journal* showcases quality work showcasing excellence in nephrology and technological writing, they are indeed the *sine qua non* in the publication of the journal—without them, there would be no *CANNT Journal*. 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*. We are indebted to the authors and contributors—most notably, Dr. Marisa Battistella and her team of writers—for their time and generosity in sharing their research and practice interests in the *CANNT Journal*. Similarly, we extend our gratitude to the core group of manuscript peer reviewers who expertly critique the manuscripts without fail, and to Pappin Communications (publisher) and Lemieux Bédard (translator) for helping to ensure the delivery of a quality publication. Last, we dedicate each issue to our loyal readers who serve as our inspiration in our quest for excellence in nephrology nursing and technological writing.

On behalf of the team at *CANNT Journal*, we wish you and yours a joyous holiday season and a prosperous new year!

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

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

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

Le *Journal ACITN* est la publication officielle de l'Association canadienne des infirmiers/infirmières et technologues en néphrologie. 4, rue Cataraqui, bureau 310, Kingston (Ontario) K7K 1Z7.

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Message des rédactrices

Salutations à tous! C'est le moment de l'année où l'équipe de rédaction de la *Revue de l'ACITN* fait le point sur l'année qui vient de s'écouler pour se demander si elle a su brosser un portrait juste de la pratique infirmière et technologique en néphrologie. C'est aussi le moment pour nous d'exprimer notre gratitude pour avoir eu le privilège de servir la communauté de la néphrologie par le biais de cette publication. Si d'autres régions du monde connaissent de graves crises sociétales et humanitaires au moment où nous écrivons ces lignes, nous avons la chance d'avoir été épargnés ici au pays. Nous terminons l'année sur une note positive dans la foulée du congrès de l'ACITN à Ottawa. Le congrès a été une grande réussite et le mérite revient certainement au comité organisateur et au comité de planification du programme. Si un thème est omniprésent dans le dernier numéro de l'année, c'est celui de la *connectivité*. Le congrès a donné à tous les participants l'occasion d'entrer en contact avec leurs pairs de partout au pays. Nous avons tissé des liens avec nos collègues en travail social, qui jouent un rôle essentiel dans les soins aux personnes atteintes de maladies rénales. Les présentations des différentes branches de la néphrologie représentées au congrès étaient pertinentes et remarquables. Un vent d'optimisme souffle sur l'ACITN et sur l'équipe de rédaction de la *Revue de l'ACITN* à l'aube d'une nouvelle année prometteuse. À la *Revue de l'ACITN*, nous avons toujours soutenu que sur notre immense territoire et dans les nombreuses sous-spécialités de notre domaine de pratique se cachent des talents en rédaction et en communication; il nous suffit de dénicher ces talents pour préserver l'héritage des infirmières et infirmiers et des technologues en néphrologie pour la prochaine génération de praticiens.

Sur le thème de la connectivité, nous présentons deux articles sur la pratique infirmière en néphrologie et les soins infirmiers pédiatriques en néphrologie : des disciplines qui, nous l'espérons, occuperont une place plus importante au congrès annuel et dans la *Revue de l'ACITN*. Nous avons la chance d'avoir un partenariat solide avec l'American Nephrology Nurses Association (ANNA) et avec le *Nephrology Nursing Journal*, ce qui nous permet de vous relayer l'article de Payongayong et de son équipe (2022) intitulé « Effects of End-of-Life Communication Knowledge, Attitudes, and Perceived Behavioural Control on End-of-Life Communication Behaviours Among Nephrology Nurse Practitioners » (Effets des connaissances, des attitudes et du contrôle comportemental perçu sur l'engagement des infirmières praticiennes et infirmiers praticiens en néphrologie dans la communication de fin de vie). Le sujet s'harmonise parfaitement avec les thèmes abordés lors des tables rondes à Ottawa, qui sont communs aux médecins, au personnel infirmier et aux professionnels paramédicaux, soit : l'aide médicale à mourir (AMM), la conversation sur les objectifs de soins et les soins palliatifs. Bien que les infirmières praticiennes (IP) participant à l'étude de Payongayong et de son équipe aient un niveau modéré d'engagement dans la communication de fin de vie avec les patients et un niveau modérément élevé d'aisance et de confiance dans leur capacité à s'engager dans une telle communication, leurs connaissances de la communication de fin de vie étaient limitées. Si cette étude a été menée aux États-Unis, il n'est pas exclu que les conclusions puissent être transposées au contexte canadien, ce qui a de sérieuses implications pour la recherche dans ce domaine.

Dans notre segment de formation continue, nous présentons l'article de Brittany Woodman intitulé : « Pediatric Hemodialysis: An Education Module for Registered Nurses », qui est un prolongement de sa revue de littérature sur le même sujet publiée à l'automne 2023. Cet article présente un module d'apprentissage qui convient à tout apprenant en soins infirmiers néphrologiques auprès d'une clientèle pédiatrique ou adulte. L'auteure a bien voulu confier ce travail monumental

à la *Revue de l'ACITN* pour en faire bénéficier le plus grand nombre et nous lui en sommes infiniment reconnaissantes.

C'est toujours dans le dernier numéro de l'année que nous exprimons notre gratitude envers les personnes et les collectifs qui mettent la main à la pâte pour que chaque numéro de la Revue de l'ACITN soit d'une qualité impeccable, ils en sont pourtant les piliers – sans eux, il n'y aurait pas de Revue de l'ACITN. Nous tenons à remercier Events Management Plus (le bureau national de l'ACITN) pour son professionnalisme, son efficacité et son engagement inégalés envers l'ACITN et la Revue de l'ACITN. Nous sommes reconnaissantes envers les auteur.e.s et les collaborateurs et collaboratrices, en particulier la Dre Marisa Battistella et son équipe de rédaction, pour le temps et la générosité qu'elles ont consacrés à partager leurs intérêts de recherche et de pratique dans la Revue de l'ACITN. De même, nous tenons à exprimer notre gratitude envers le groupe de pairs réviseurs de manuscrits qui ont révisé de main de maître les manuscrits, ainsi qu'à Pappin Communications (pour l'édition) et Lemieux Bédard (pour la traduction) qui nous ont aidées à assurer la livraison d'une publication de qualité. Enfin, nous dédions chaque numéro à nos fidèles lecteurs qui sont notre source d'inspiration dans notre quête d'excellence en matière de soins infirmiers en néphrologie et de rédaction technologique.

Au nom de l'équipe de la *Revue de l'ACITN*, nous vous souhaitons, à vous et à vos proches, de joyeuses fêtes de fin d'année et une nouvelle année prospère!

Cordialement, vos co-rédactrices en chef de la *Revue de l'ACITN*,

Jovina Bachynski
Ph. D., MN-NP Adultes, RN(EC), CNéph(C)

Rosa M. Marticorena
NS, CNéph(C), DClinEpi, Ph. D.

NOTICE BOARD

- Canadian Nurses Association (CNA) Exam Timeline. **https://www.cna-aiic.ca/en/certification/about-certification**

	Spring 2025	Fall 2025
Initial exam or renewal by exam application window	January 15–March 31, 2025	June 16–September 30, 2025
Certification exam window	May 1–15, 2025	November 1–15, 2025
Renewal by continuous learning application window	January 15–December 15, 2025	

- **February 6–9, 2025.** World Congress of Nephrology 2025 (WCN) hosted by the Indian Society of Nephrology | Yashobhoomi (India International Convention and Expo Centre), New Delhi, India | **https://www.theisn.org/wcn25**
- **March 13–16, 2025.** Annual Dialysis Conference, 45th Year Anniversary | Mandalay Bay, Las Vegas, Nevada | **https://www.annualdialysisconference.org/about/**
- **March 13, 2025.** World Kidney Day – *Are your kidneys ok? Detect early, protect kidney health* | **https://www.worldkidneyday.org/2025-campaign/**
- **April 10–13, 2025.** National Kidney Foundation Spring Clinical Meetings (SCM25) | John B. Hynes Veterans Memorial Convention Center Austin Convention Center, Boston, Massachusetts | **https://www.kidney.org/spring-clinical**
- **May 1–4, 2025.** American Nephrology Nurses' Association National Symposium | Hyatt Regency Portland & Oregon Convention Center, Portland, Oregon | **https://www.annanurse.org/education-events/events/national-symposium**
- **June 11–13, 2025.** Renal Society of Australasia Annual Conference | Melbourne Pullman Albert Park, Victoria, Australia | **https://www.renalsociety.org/eventdetails/24332/rsa-conference-2025**
- **October 16–18, 2025.** CANNT National Conference | Victoria Conference Centre, Victoria, British Columbia | **https://cannt-acitn.ca/**
- **November 5–9, 2025.** American Society of Nephrology 2025 Kidney Week | George R. Brown Convention Center, Houston, Texas | **https://www.asn-online.org/education/kidneyweek/archives/future.aspx**

CANADIAN NURSES ASSOCIATION

Nephrology Certification Registration Status Report 2024

Initial and Renewal by Exam to Renew in 2024	Renewal by Continuous Learning (CL) Hours	Total of Initials and Renewals	Due to Renew in 2024
36	26	62	183

2025 CNA Certification

Commit to excellence

The **CNA Certification Program** offers the only bilingual, nationally recognized nursing specialty credential. Being CNA certified shows that you're committed to an advanced standard of professional competence and have a comprehensive understanding of your nursing specialty.

Important Dates

SPRING 2025

January 15 – March 31
Application window to **write or renew by exam**

May 1 – 15
Certification **exam window**

FALL 2025

June 16 – September 30
Application window to **write or renew by exam**

November 1 – 15
Certification **exam window**

YEAR ROUND

January 15 – December 15
Application window to **renew by continuous learning**

CURRENT SPECIALTIES

- CARDIOVASCULAR
- COMMUNITY HEALTH
- CRITICAL CARE
- CRITICAL CARE PEDIATRICS
- EMERGENCY
- GERONTOLOGY — for registered nurses and registered psychiatric nurses
- GERONTOLOGY — for licensed/registered practical nurses
- HOSPICE PALLIATIVE CARE
- MEDICAL-SURGICAL — for registered nurses
- MEDICAL-SURGICAL — for licensed/registered practical nurses
- NEONATAL
- NEPHROLOGY
- OCCUPATIONAL HEALTH
- ONCOLOGY
- PEDIATRICS
- PERINATAL
- PERIOPERATIVE
- PSYCHIATRIC AND MENTAL HEALTH — for registered nurses and registered psychiatric nurses
- WOUND, OSTOMY AND CONTINENCE

RENEWAL BY CONTINUOUS LEARNING ONLY

- GASTROENTEROLOGY
- NEUROSCIENCE
- ORTHOPAEDIC
- PERIANESTHESIA
- REHABILITATION

Since 2019, exams to obtain or renew a certification in any of these specialties are no longer offered. Certified nurses can renew by submitting CL hours.

cna-aiic.ca/certificationprogram
1-800-361-8404 • certification@cna-aiic.ca

Canadian Nurses Association

President's Message

As we approach the end of 2024, I want to express my gratitude while reflecting on all we have accomplished together and looking forward with optimism to CANNT-ACITN 2025. This year has brought wonderful moments, but it has also presented its share of challenges. I am so proud of the contributions made by our CANNT-ACITN members, colleagues, and industry partners in the field of nephrology at local, provincial, and national levels. Your commitment and resilience have been truly inspiring, as has your engagement with one another, providing mutual support during both difficult times and moments of celebration.

Throughout 2024, we aimed to develop and strengthen partnerships with other nephrology organizations. I am pleased to report that we collaborated with the Canadian Association of Nephrology Social Workers (CANSW), Kidney Foundation of Canada, Canadian Nurses Association (CNA), the American Nephrology Nurses Association (ANNA), and the Elevate Nursing Academy. These partnerships have allowed CANNT-ACITN to provide more evidence-based, accessible education to our members. We successfully hosted five well-attended webinars this year. Additionally, we partnered with the Elevate Nursing Academy to offer preparation resources for the CNA nephrology certification exam, thus aiming to support nephrology nurses in advancing their expertise through best practices and establishing competency in specialized nephrology areas. CANNT-ACITN members can take advantage of a 50% discount on exam prep for nephrology certification until December 31, 2024. I encourage you to seize this opportunity.

A huge "THANK YOU" to everyone who attended the CANNT-ACITN National Conference 2024, themed "Capitalizing on Excellence: Transforming Nephrology Care." This year marked our first collaborative conference with CANSW, which is the beginning of stronger connections with our nephrology colleagues and an enhancement in patient care.

We have reached a milestone by successfully increasing our membership to 396 members as of October 2024. I encourage you to invite others to be part of something innovative, influential, and vibrant while staying updated on developments in health and healthcare. Please continue to take advantage of our open-access *CANNT Journal*, nephrology guidelines, webinars, networking opportunities, CANNT awards, bursaries, and research grants at https://cannt-acitn.ca/

CANNT-ACITN is also working to update and redesign our website to enhance its credibility, improve online visibility, and strengthen brand recognition while enhancing the customer experience. We hope the new website will be user-friendly and available in multiple languages to support our members. This project will continue into 2025, so stay tuned for updates.

As we reflect on a year filled with hard work and achievements, we are reminded of the importance of teamwork and dedication. Thank you to the Board of Directors, our Events Management Plus team, and all CANNT members for your unwavering commitment. As we approach the holiday season, let us embrace this time for joy, reflection, and planning for the future.

I am immensely grateful for your continued dedication. I hope you have the chance to connect with friends and loved ones during the holidays and enjoy the activities you cherish. I wish you a restful break and a joyful season that recharges you for the exciting year ahead. I look forward to all we will achieve together in the coming year.

Merry Christmas and Happy Holidays to everyone! God bless you all!

Regards,

Alicia Moonesar

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

Message de la présidente

Alors que l'année 2024 tire à sa fin, je tiens à vous exprimer toute ma gratitude et à profiter de cette tribune pour faire le bilan de tout ce que nous avons accompli ensemble et qui m'amène à entrevoir l'année 2025 de l'ACITN avec optimisme. Cette année a été ponctuée de moments merveilleux, mais nous avons aussi eu notre lot de défis. Je suis très fière des contributions apportées par nos membres, collègues et partenaires sectoriels de l'ACITN dans le domaine de la néphrologie à l'échelle locale, provinciale et nationale. Votre dévouement et votre résilience ont été une véritable source d'inspiration, tout comme votre solidarité envers vos collègues. Vous vous êtes serré les coudes dans les moments difficiles et avez célébré ensemble les moments de réjouissances.

Tout au long de l'année 2024, nous avons cherché à développer et à renforcer les partenariats avec d'autres organisations de néphrologie. Nous avons ainsi collaboré avec l'Association canadienne des travailleurs sociaux et des travailleuses sociales en néphrologie (ACTSN), la Fondation du rein du Canada, l'Association des infirmières et infirmiers du Canada (AIIC), l'American Nephrology Nurses Association (ANNA) et l'Elevate Nursing Academy. Ces partenariats ont permis l'ACITN d'offrir à ses membres une formation accessible et fondée sur des données probantes. Cette année, nous avons organisé cinq webinaires qui ont attiré de nombreux participants. En outre, nous nous sommes associés à l'Elevate Nursing Academy pour offrir des ressources de préparation à l'examen de certification en néphrologie de l'AIIC, afin d'aider le personnel infirmier en néphrologie à améliorer son expertise par l'acquisition des pratiques exemplaires et à se doter de compétences dans des domaines spécialisés de la néphrologie. Les membres de l'ACITN peuvent bénéficier d'une réduction de 50 % sur la préparation à l'examen de certification en néphrologie jusqu'au 31 décembre 2024. Ne manquez pas cette chance!

Un immense MERCI à tous ceux et à toutes celles qui ont participé au congrès national de 2024 de l'ACITN, dont le thème était « Miser sur l'excellence, transformer les soins en néphrologie » (Capitalizing on Excellence : Transforming Nephrology Care). Cette année, nous avons organisé notre premier congrès en collaboration avec l'ACTSN, ce qui marque le début d'un partenariat solide avec nos collègues en néphrologie et l'espoir de meilleurs soins aux patients.

Nous avons franchi une étape importante en augmentant le nombre d'adhésions. Nous comptions, en octobre 2024, 396 membres. Je vous encourage à inviter d'autres personnes à joindre cette association innovante, influente et dynamique, pour être informées des derniers développements en santé et en soins de santé. Vous avez accès à une foule de ressources comme la *Revue de l'ACITN* en libre accès, les lignes directrices sur la néphrologie, les webinaires, des occasions de réseautage, les prix de l'ACITN, les bourses et les subventions de recherche en visitant le site Web à l'adresse https://cannt-acitn.ca/

L'ACITN travaille également à la mise à jour et à la refonte de son site Web afin de renforcer sa crédibilité, d'améliorer sa visibilité en ligne et d'accroître la reconnaissance de la marque tout en améliorant l'expérience client. Nous espérons que le nouveau site Web sera convivial et offert en plusieurs langues afin d'aider nos membres. Ce projet se poursuivra jusqu'en 2025 : surveillez les mises à jour.

Nous avons eu une année bien remplie et nous avons travaillé fort pour arriver où nous sommes, ce qui nous rappelle l'importance du travail d'équipe et du dévouement. Merci au conseil d'administration, à notre équipe Events Management Plus et à tous les membres de l'ACITN pour leur engagement sans faille. À l'approche des fêtes de fin d'année, profitons de cette période pour nous réjouir, réfléchir et préparer l'avenir.

Je vous suis immensément reconnaissante pour votre dévouement constant. J'espère que vous aurez l'occasion de vous rapprocher de vos amis et de vos proches pendant les fêtes et de profiter des activités qui vous sont chères. Je vous souhaite un repos bien mérité et des festivités qui vous donneront l'élan nécessaire pour entamer la nouvelle année. Je me réjouis à l'avance de tout ce que nous allons réaliser ensemble dans la prochaine année.

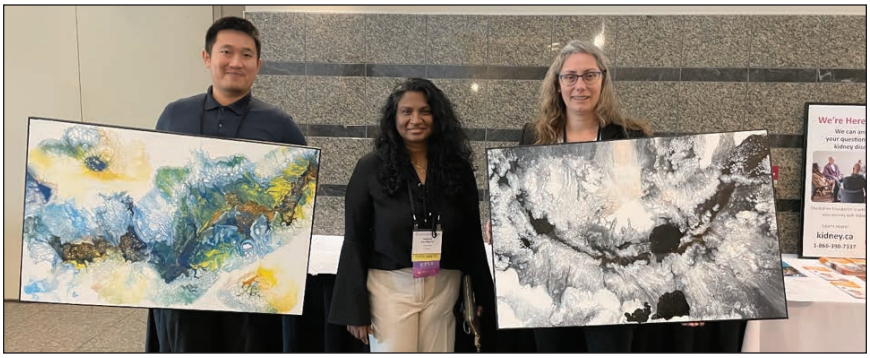
Joyeux Noël et bonnes fêtes de fin d'année à tous! Que Dieu vous bénisse!

Alicia Moonesar

Dre Alicia Moonesar
DNP, MScN, BScN, NP-PHC (elle)
Présidente, CANNT-ACITN

CANNT in Action

The last quarter of the year is always an exciting time for the Canadian Association of Nephrology Nurses and Technologists (CANNT) as it hosts its annual conference. This year's event was a resounding success, marking CANNT's first conference collaboration with the Canadian Association of Nephrology Social Workers (CANSW). Approximately 30 CANSW delegates participated, hosting their own dedicated stream with thought-provoking topics, such as navigating challenging conversations, addressing the impact of the COVID-19 pandemic on nephrology social work, and exploring advocacy strategies through new communities of practice.



Winners of the silent auction: The Hoang, RSW (left), Shyalini Jeevakaran, APNE (artist, centre), Tricia Hutton, RSW (right)

With more than 300 delegates in attendance, the CANNT Conference featured a rich variety of sessions on advancing dialysis education, improving patient adherence, addressing transplantation challenges, enhancing nephrology supportive care, and fostering innovation in home dialysis. This diversity highlighted the shared commitment of CANNT members to improving patient care. Slide decks from speakers who granted permission to share their content are now available online for CANNT members. The conference also featured poster presentations that sparked engaging discussions and highlighted valuable research. Thank you to all the sponsors and exhibitors for your generous support—without you, this event would not have been possible.

A takeaway from this year's conference is the need to expand programming for technologists, and CANNT is committed to addressing this in the upcoming year. Special thanks to CANNT's dedicated planning committee members—Sarah Reid, Lisa Robertson, Melinda Daamon, Billie Hilborn, Shyalini Jeevakaran, Theresa Krepelka, Amanda Ross, Sharon Sheard, and Aman Sandhu—whose hard work made this event a success. We also want to acknowledge the CANSW Planning Committee—Corinne MacNab, Nadia Lauzon, Brigitte Boudreau, Jose Medeiros, Tricia Hutton, Meg Gorosh, Sadia Baig, and Elisa Tomasi—for their invaluable collaboration.

This year, CANNT introduced a silent auction at the conference, with all proceeds donated to the Kidney Foundation of Canada – Ottawa Chapter. A special thank-you goes to planning committee member Shyalini Jeevakaran for painting and donating her beautiful artwork. Pictures are now available in the CANNT Conference Gallery on the CANNT website.

Another highlight at the conference was the Transplant Ambassador Program (TAP) panel. This session featured donors and recipients who shared their personal transplant journeys, offering valuable insights and inspiring stories. CANNT looks forward to continuing its support for TAP by sharing information about their programs and upcoming webinars.

At the conference, CANNT officially announced its new partnership with Elevate Nursing Academy, founded by long-time CANNT member Janett Black, to support members pursuing their Canadian Nurses Association (CNA) Certified in Nephrology (Canada) credential (CNeph[C]). Elevate Nursing Academy provides exam preparation modules designed to help nephrology nurses prepare for the CNA CNeph(C) exam. CANNT members can take advantage of exclusive discounts for these resources, including 50% off of Elevate Nursing Academy registration fees until December 31, 2024, and 30% off after December 31, 2024. For more details, contact CANNT National Office at **cannt@cannt.ca**.

Another exciting milestone this year was the endorsement of CANNT's *Nursing Recommendations for the Management of Vascular Access in Adult Hemodialysis Patients 2023 Update* as a consensus statement by the Canadian Society of Nephrology/Société canadienne de néphrologie (CSN/SCN). These nursing recommendations are now open access and available online. We encourage you to share these with your network.

On a personal note, shortly after the conference, I ran my first 10K race, which was in support of the Diabetes Education and Management Centre. Being surrounded by the passion and dedication of CANNT members at the conference made it especially meaningful to participate in an event that gives back to the renal community.

As CANNT looks to the new year, members can expect the launch of the new website in 2025. The new website will make it easier for regions and special interest groups to connect while offering a more user-friendly experience. Additionally, CANNT is meeting one of its long-term goals: providing content in multiple languages. The site will utilize Google Translate, and CANNT will monitor translations to ensure accuracy.

Save the date for the annual CANNT Conference in 2025! CANNT is excited to gather in beautiful Victoria, British Columbia, from October 16–18, 2025. The call for abstracts will launch in early January, so start preparing your submissions.

Megan Howes
CAE, CMP
Executive Director, CANNT

L'ACITN en action

Le dernier trimestre de l'année est toujours une période fébrile pour l'Association canadienne des infirmières et infirmiers et des technologues de néphrologie (ACITN), puisqu'il coïncide avec la tenue de son congrès annuel. L'événement de cette année a connu un succès retentissant, marquant la première collaboration de l'ACITN avec l'Association canadienne des travailleurs sociaux et travailleuses sociales en néphrologie (ACTSN). Environ 30 délégués de l'ACTSN étaient présents et ont organisé leur propre volet avec des sujets de réflexion tels que la gestion de conversations difficiles, les répercussions de la pandémie de COVID-19 sur le travail social en néphrologie, et l'exploration de stratégies de défense des intérêts par le biais de nouvelles communautés de pratique.

Le congrès de l'ACITN n'a pas déçu les plus de 300 délégués présents avec un programme riche et diversifié : l'avancement de l'éducation en dialyse, l'amélioration de l'adhésion des patients, les défis de la greffe, l'amélioration des soins de soutien en néphrologie et l'innovation en matière de dialyse à domicile. Cette diversité a mis en évidence l'engagement commun des membres de l'ACITN en faveur de l'amélioration des soins aux patients. Les présentations des conférenciers qui ont accepté de partager leur contenu sont maintenant accessibles en ligne pour les membres de l'ACITN. Des présentations par affiches ont suscité des discussions intéressantes et mis en lumière des travaux de recherche de grande valeur. Merci à tous les commanditaires et exposants pour leur généreux soutien; sans eux, cet événement n'aurait pas été possible.

L'un des points à retenir du congrès de cette année est la nécessité d'élargir la programmation destinée aux technologues, et l'ACITN s'engage à s'y atteler au cours de l'année à venir. Nous tenons à remercier les membres dévoués du comité de planification de l'ACITN : Sarah Reid, Lisa Robertson, Melinda Daamon, Billie Hilborn, Shyalini Jeevakaran, Theresa Krepelka, Amanda Ross, Sharon Sheard et Aman Sandhu, dont le travail acharné a permis de faire de cet événement un succès. Nous souhaitons également remercier le comité de planification de l'ACTSN — Corinne MacNab, Nadia Lauzon, Brigitte Boudreau, Jose Medeiros, Tricia Hutton, Meg Gorosh, Sadia Baig et Elisa Tomasi — pour leur précieuse collaboration.

Cette année, l'ACITN a organisé lors du congrès un encan silencieux dont tous les profits ont été versés à la Fondation canadienne du rein – section d'Ottawa. Un merci spécial à Shyalini Jeevakaran, membre du comité de planification, qui a peint et donné ses œuvres magnifiques. Vous pouvez maintenant voir les photos dans la galerie du congrès de l'ACITN sur le site Web de l'association.

Un autre moment fort du congrès a été la table ronde du Transplant Ambassador Program (TAP). Des donneurs et des receveurs étaient réunis pour raconter leur expérience personnelle de la greffe et nous ont offert des informations précieuses et des témoignages inspirants. L'ACITN se réjouit de continuer à soutenir le TAP en partageant des informations sur ses programmes et ses prochains webinaires.

Lors du congrès, l'ACITN a officiellement annoncé son nouveau partenariat avec Elevate Nursing Academy, fondée par Janett Black, membre de longue date de l'ACITN, afin d'aider les membres à obtenir la certification en néphrologie (Canada) CNéph(C) de l'Association des infirmières et infirmiers du Canada (AIIC). Elevate Nursing Academy propose des modules de préparation à l'examen conçus pour aider les infirmières et infirmiers en néphrologie à se préparer à l'examen d'obtention du titre de CNéph(C) de l'AIIC. Les membres de l'ACITN peuvent profiter de réductions exclusives sur ces ressources, notamment 50 % de réduction sur les frais d'inscription à l'Elevate Nursing Academy jusqu'au 31 décembre 2024 et 30 % de réduction après le 31 décembre 2024. Pour un complément d'information, contactez le Bureau national de l'ACITN à l'adresse cannt@cannt.ca.

Un autre événement marquant de l'année a été l'approbation de la mise à jour de 2023 des recommandations en soins infirmiers pour la gestion de l'accès vasculaire chez les patients adultes en hémodialyse de 2023 (« Nursing Recommendations for the Management of Vascular Access in Adult Hemodialysis Patients 2023 Update ») de l'ACITN, en tant qu'énoncé de consensus par la Canadian Society of Nephrology/Société canadienne de néphrologie (CSN/SCN). Ces recommandations sont désormais disponibles en ligne en libre accès. Nous vous encourageons à les partager avec votre réseau.

Voici les gagnants de l'encan silencieux : The Hoang, travailleur social en santé rénale (à gauche), Shyalini Jeevakaran, M.N. (artiste, au centre), Tricia Hutton, travailleuse sociale en santé rénale (à droite)

Sur une note personnelle, peu après le congrès, j'ai participé à ma première course de 10 km, au profit du Centre de gestion et d'éducation en matière de diabète. J'ai été galvanisée par la passion et le dévouement des membres de l'ACITN au congrès et il était particulièrement important pour moi de participer à cet événement pour redonner à la communauté des maladies rénales.

Alors que l'ACITN est sur le point d'entamer la nouvelle année, les membres peuvent s'attendre au lancement du nouveau site Web en 2025. Le nouveau site Web permettra aux régions et aux groupes d'intérêt de communiquer plus facilement entre eux en plus de leur offrir une expérience plus conviviale. De plus, l'ACITN a atteint l'un de ses objectifs à long terme : fournir du contenu dans plusieurs langues. Le site utilisera Google Translate et l'ACITN s'assurera de l'exactitude des traductions.

Réservez la date du congrès de l'ACITN en 2025! L'ACITN est ravie de se réunir dans la belle ville de Victoria, en Colombie-Britannique, du 16 au 18 octobre 2025. L'appel de résumés sera lancé au début janvier; préparez vos soumissions!

Megan Howes
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Effects of End-of-Life Communication Knowledge, Attitudes, and Perceived Behavioural Control on End-of-Life Communication Behaviours Among Nephrology Nurse Practitioners

Joanne V. Payongayong, Charlotte Thomas-Hawkins, Olga F. Jarrin, Judith Barberio, and Debra J. Hain

ABSTRACT

The scope of end-of-life communication is not well known among nephrology advanced practice nurses (APNs). Guided by the Theory of Planned Behaviour, the study aimed to examine the independent effects of knowledge, attitude, and perceived behavioural control on the engagement of APNs in end-of-life communication, and the mediating and moderating effects of attitude and perceived behavioural control on the relationships between knowledge and end-of-life communication. A theoretically derived 17-item survey measuring the concepts was administered to a convenience sample of 127 APNs. Descriptive statistics, Pearson's correlation, and multiple linear regression were employed. Attitudes and perceived behavioural control on end-of-life communication mediated and moderated the relationship between knowledge of end-of-life communication and engagement in end-of-life communication among nephrology APNs.

Keywords: Theory of Planned Behaviour, end-of-life communication, advance care planning, end stage kidney disease, advanced practice nurse

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The Institute of Medicine's (IOM, 2015) consensus report, *Dying in America,* found that improving the quality and availability of medical and social services for patients and families could, not only enhance quality of life but, also contribute to a more sustainable care system. End stage kidney disease (ESKD) is a terminal condition requiring regular dialysis or kidney transplantation for survival. Life expectancy for adults under age 80 years living with ESKD on dialysis is about one-third as long as persons without ESKD, and among adults aged 85 years and older on dialysis, life expectancy is about half as long compared to counterparts without ESKD (United States Renal Data System [USRDS], 2021). Despite improvements in predialysis care and dialysis technology, persons with ESKD experience a high symptom burden, such as pain, fatigue, nausea, loss of libido, and anxiety, as well as multiple comorbidities that affect their physical, emotional, and spiritual quality of life (Moss, 2017; Senanayake et al., 2017). At the initiation of dialysis, the goal is to prolong life and improve the quality of life. For older adults who experience a decline in quality of life, the burden becomes even more, as dying is prolonged (Schmidt & Moss, 2014).

Although the *Shared Decision-Making in the Appropriate Initiation and Withdrawal from Dialysis* clinical practice guidelines (Renal Physician Association [RPA] & American Society of Nephrology [ASN], 2000, 2010), which provide standards of care and a framework for end-of-life (EOL) communication between nephrologists and persons with ESKD,

have not been updated, there is emerging evidence supporting the importance of palliative and EOL care (Davison et al., 2016). Yet, studies have revealed adults with chronic kidney disease (CKD) who progressed to the need for initiation of chronic dialysis therapy reported receiving insufficient information on palliative care and disease outcomes (Chen et al., 2018; Davison, 2010; Goff et al., 2015). Most adults reported disappointment after initiating hemodialysis, and less than 10% reported engaging in EOL conversations with their nephrologists within the past 12 months (Davison, 2010; Saeed et al., 2020; Song et al., 2013; Tan et al., 2019). The empirical evidence regarding inadequate EOL care and communication between nephrologists and their patients suggests that insufficient knowledge among healthcare professionals about advance care planning and EOL communication, their attitudes about the value of engaging in EOL discussions, and their level of confidence in actively discussing EOL and advance care planning with their patients are likely associated with the extent to which they engage in EOL communications (Ajzen, 2005).

In one study, one out of three (33%) nephrologist participants reported feeling only a little or somewhat prepared to engage in EOL discussions, and 44% reported only rarely or sometimes recommending withdrawal from dialysis for patients with poor prognoses (Fung et al., 2016). Moreover, nephrologists reported patient resistance, fear of taking away hope from patients, and poor continuity of care across the healthcare system as the biggest barriers to discussing EOL with their patients. Similarly, a literature review that explored potential barriers to nephrology nurses' engagement in advance care planning revealed the following barriers: perceptions this was not a scope of their practice, and a lack of comfort and confidence in engaging in these discussions with patients (Haras et al., 2015). Across healthcare settings, advanced practice nurses (APNs) can be pivotal in bridging the existing gap in effective engagement in EOL communications between the provider and patient with ESKD (Montoya, 2017). However, nephrology APNs' knowledge about advance care planning and EOL communications, their attitudes about the value of EOL communication with patients, their level of confidence related to engaging in EOL communication, and their related practice behaviours are unknown.

THEORETICAL FRAMEWORK

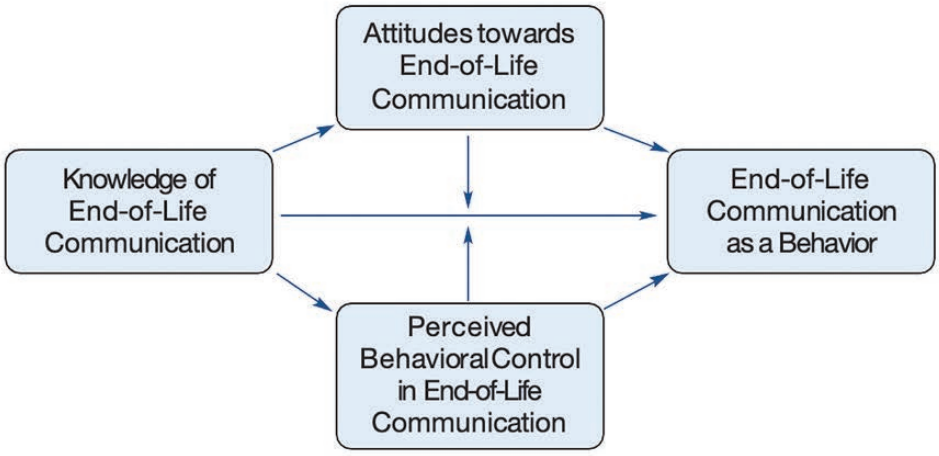
The Theory of Planned Behaviour was used as a framework for understanding how the relationship among nephrology APNs' EOL communication knowledge, attitudes about EOL communication, and confidence in EOL communication engagement are associated with their actual engagement in EOL discussions with their patients with ESKD (Ajzen, 2005). According to the Theory of Planned Behaviour, one's intention to perform a behaviour is the most immediate determinant of performing the behaviour. The theory also proposes that intentions are functions of three factors: 1) one's attitude about the behaviour, 2) subjective norms about the behaviour, and 3) perceived behavioural control over the behaviour. Generally, the stronger and more positive the attitude and subjective norms are about the desired behaviour, and the greater the perceived behavioural control, the stronger an individual will intend to execute the desired behaviour. The Theory of Planned Behaviour also postulates that behavioural, normative, and control beliefs are direct determinants of attitudes, subjective norms, and perceived behavioural control, respectively. An individual's knowledge about a particular behaviour is postulated in the Theory of Planned Behaviour as a background factor, which may be related to the beliefs one holds about a behaviour and, therefore, influences the behaviour. In this study, guided by the Theory of Planned Behaviour informed model depicted in Figure 1, the relationships among APNs' EOL communication knowledge, attitudes, perceived behavioural control, and behaviour were examined.

STUDY PURPOSE

The purpose of this study was to examine the effects of EOL communication knowledge, attitude about professional responsibility for EOL communication, attitude about meeting patient and family EOL communication needs, and

Figure 1

Modified Theory of Planned Behaviour Applied to End-of-Life Communication



perceived behavioural control over EOL communication on nephrology APNs' reports of their engagement in EOL communication.

DESIGN AND METHODS

To ensure the protection of subjects, this study, while employing a cross-sectional, correlational, survey design, was approved by the Rutgers University Institutional Review Board before data collection. Eligibility to participate was limited to masters- or doctorally prepared APNs working in nephrology settings, including inpatient and/or outpatient dialysis units and nephrology ambulatory care practices. Participants were recruited from three sources: 1) the membership list of APNs who belonged to the American Nephrology Nurses Association (ANNA), 2) the National Kidney Foundation's Council of Advanced Practitioners (NKF CAP) listserv, and 3) a publicly available mailing list of actively licensed APNs in New Jersey (NJ) obtained from the NJ Board of Nursing.

To ensure a participant only took the survey once and prevent duplicate responses from participants who belonged to more than one listserv, the survey software tool *Qualtrics* included a feature called, *Prevent Ballot Box Stuffing,* which prevented participants from retaking the survey by placing a cookie in the participants' browser that restricted them from retaking the survey on that browser. An electronic email invitation with a link to the consent form and *Qualtrics* electronic survey was distributed by an ANNA office staff member to APN members of ANNA over one week in Summer 2020. The sample for the study consisted of the membership list of nephrology APNs from the ANNA (n = 595), the listserv of nephrology advanced practice providers from the NKF's CAP (n = 437), and the listserv of actively licensed APNs in NJ regardless of specialty (n = 5967). In Fall 2020, the first two authors distributed the electronic, anonymous invitation with the consent form and survey link to the listservs of NKF and licensed APNs from NJ, followed by three follow-up emails at scheduled intervals over four weeks. Only responses from APNs who worked in nephrology settings were used in the study. Respondents who read the consent form and agreed to participate, but who did not meet inclusion criteria, were not allowed to proceed with the survey.

Sample

A total of 127 eligible APNs agreed to participate and completed the survey. This sample size exceeded the minimum of 105 needed for adequate power (0.80) to detect a medium effect (f^2 = 0.15) of APNs' knowledge, attitudes, and perceived behavioural control about EOL communication on EOL communication behaviours, at a significance level of 0.05 (Cohen, 1988).

Measures

Knowledge, Attitudes, and Practice Behaviours Questionnaire

The Knowledge, Attitudes, and Advance Care Planning Practice Behaviours Questionnaire (Zhou et al., 2010) is composed of 28 items related to EOL communication grouped by the core domains of the Theory of Planned Behaviour: knowledge (12 items), attitudes about meeting patient and family needs (four items), attitudes about professional responsibility (three items), perceived behavioural control (four items), and practice behaviours (five items). The reliability and initial construct validity of this survey instrument were established in a sample of oncology APNs (Zhou et al., 2010).

Knowledge About Advance Care Planning. The *Knowledge about Advance Care Planning* scale is composed of 12 knowledge statements (Zhou et al., 2010). For each statement, respondents select one out of three responses for which two response choices are "wrong" and one is "correct." Correct responses are summed, with a score reflecting a higher level of EOL communication knowledge.

Attitude About Advance Care Planning. Attitudes about EOL communication were measured using the three-item *Attitudes About One's Professional Responsibility in Discussing Advance Care Planning* scale and the four-item *Attitudes About Meeting Patient and Family Needs with Advance Care Planning* scale (Zhou et al., 2010). Item responses are arranged on a five-point Likert scale ranging from 1 = strongly agree to 5 = strongly disagree. Items were reverse-coded before data analyses, and mean scores were computed, with higher scores reflecting a more positive attitude toward EOL communication.

Perceived Behavioural Control in Advance Care Planning. Perceived behavioural control over EOL communication was measured with the *Comfort and Confidence in Discussing Advance Care Planning* scale was composed of four items. Item responses are arranged on a five-point Likert scale ranging from 1 = strongly agree to 5 = strongly disagree. Items were reverse-coded before data analyses, and mean scores were computed, with higher scores reflecting a more positive perceived behavioural control of EOL communication (Zhou et al., 2010).

Practice Behaviours in Discussing Advance Care Planning. APNs' self-reported engagement in EOL communication was measured with the *Practice Behaviour in Discussing Advance Care Planning* scale (Zhou et al., 2010). The scale is composed of five practice behaviour items arranged on a five-point Likert scale ranging from 1 = strongly agree to 5 = strongly disagree. Items were reverse-coded before data analyses, and mean scores were computed, with higher scores reflecting a higher engagement in EOL communication practice behaviours.

Demographic Questionnaire

The demographic questionnaire included APN specialty type, EOL communication continuing education requirements, state-specific policy to give APNs authority to sign a Provider Order for Life-Sustaining Treatment (POLST) form, health care institution-specific authority for APNs to request a palliative care consult, the number of years working, work status, gender, and age.

Data Analysis Plan

Frequency distributions and descriptive statistics for study variables were computed and examined. Unadjusted

and adjusted linear regression models were estimated to determine individual and independent effects of knowledge, attitudes, and perceived behavioural control on EOL communication behaviours. Any demographic variable significantly related to EOL communication behaviours (i.e., $p < 0.05$) in bivariate analyses were controlled in regression models. In the unadjusted models, the three predictor variables were entered individually. In the adjusted model, all predictors and covariates were entered simultaneously. To examine the role of the two attitudes' variables and perceived behavioural control as mediators of indirect effects of knowledge on APNs' EOL communication behaviour, a series of three simple mediation models with 10,000 bootstrap samples using ordinary least squares regression via the PROCESS macro for SPSS (Hayes, 2018) were examined. PROCESS macro for SPSS is a computational tool that estimates mediation and moderation models, calculates the effects, generates bootstrap sampling distributions of indirect and interactive effects, and constructs bootstrap confidence intervals (Hayes, 2018). For moderation testing, three simple moderation models, using ordinary least squares regression analyses via the PROCESS macro, were constructed to examine the effects of two-way interactions between 1) knowledge and professional responsibility for EOL communication attitudes, 2) knowledge and attitudes about meeting patient and family EOL communication needs, and 3) knowledge and perceived behavioural control on APNs' EOL communication behaviours. For significant interactions, a simple slope analysis was conducted to model the interaction of knowledge at a standard deviation below and above the moderator mean to determine the conditional effects of knowledge on APNs' EOL communication behaviour (Hayes, 2018). The determination of significant mediation and moderation effects was based on 95% bias-corrected bootstrap confidence intervals that were either completely above or below zero (Hayes, 2018).

Missing Data Analysis

To determine the degree of missing data in the variables of attitude, perceived behavioural control, and EOL as a practice behaviour, the missing data pattern was evaluated using the Multiple Imputation function in SPSS. Overall, 17% of items derived from the Theory of Planned Behaviour had incomplete data. Little's (1988) missing completely at random (MCAR) test was non-significant ($X^2 = 177.41$, $df = 189$, $p = 0.717$), indicating the missingness of the data was completely at random (MCAR) (Little, 1988; Newman, 2014). Regression weights from models, including items for EOL communication attitudes, perceived behavioural control, and knowledge, were used to predict and replace the missing values (Little, 1988).

RESULTS

Descriptive Statistics of the Sample

Overall sample demographics are shown in Table 1. Respondents from the ANNA and NKF, in addition to the licensed APNs who worked in nephrology settings in NJ, comprised the sample of nephrology APNs for the study. Out of a total of 6,999 email invitations with survey links sent to nephrology APNs, a total of 127 respondents identified themselves as APNs, met study inclusion criteria and comprised the analytic sample. The percentage of licensed NJ APNs who worked in nephrology settings was unknown from the listserv, but respondents of the survey identified themselves as APNs who worked in nephrology settings. A total of 25 respondents were received from ANNA, 24 respondents from NKF, and 78 respondents from the NJ APN listservs. The mean age of study participants was 50 years, and a majority

Table 1

Socio-Demographic Characteristics, Frequency (%) or Mean (SD) (n = 127)

Variable	Frequency (%) Mean (SD)	
Type of professional nursing role		
Advanced practice nurse	55	(43.30)
Clinical nurse specialist	5	(3.90)
Number of years working in		
Current position	6.5	(7.77)
Current employer	6.77	(8.60)
Nephrology nursing	6.56	(10.80)
Dialysis care	6.27	(10.24)
State requirement for completion of continuing education units for end-of-life care issues		
Yes	27	(21.30)
No	46	(36.20)
No response	54	(42.50)
Permission for APNs to sign a physician order for life-sustaining treatment (POLST) form		
Yes	56	(44.10)
No	5	(3.90)
No response	66	(52.00)
Ability to request a palliative care consult without additional physician orders		
Yes	73	(57.50)
No	3	(2.40)
No response	51	(40.20)
Work status		
Full-time	75	(59.10)
Part-time	6	(4.70)
Per diem	2	(1.60)
No response	44	(34.60)
Gender		
Male	6	(4.70)
Female	79	(62.20)
No response	42	(33.10)
Race/ethnicity		
White, non-Hispanic	70	(55.10)
Latino/Hispanic	3	(2.40)
Middle Eastern	4	(3.10)
Black/African American	2	(1.60)
No response	47	(37.00)
Age in years	50.40	(11.10)

were female, White, and worked full-time.

Descriptive Statistics for Theory of Planned Behaviour Constructs

Descriptive statistics were computed for all study variables and are presented in Table 2. The dependent variable was EOL communication as a practice behaviour, and the mean level of APNs' engagement in this behaviour was moderate. The mean level of EOL communication knowledge among study participants was low. On average, APNs' attitudes about professional responsibility for EOL communication and meeting patient and family EOL communication needs were moderately high. Perceived behavioural control over EOL communication was also rated moderately high. In this study, the reliability of the scales for knowledge, perceived behavioural control, and practice behaviours were acceptable (Cronbach's alpha range 0.72 to 0.78). However, the reliabilities of the attitude scales were marginal (Cronbach's alpha = 0.62 to 0.70).

Correlation Between Constructs

Attitude about professional responsibility for EOL communication, attitude about meeting patient and family needs for EOL communication, and perceived behavioural control were significantly correlated with EOL communication behaviour (see Table 3). Knowledge about EOL communication as measured using the 12-item scale was not significantly correlated with EOL communication behaviour. However, EOL communication behaviours were correlated with having practice authority to sign POLST orders ($r = 0.23$, $p < 0.05$) and a requirement for EOL care communication continuing education ($r = 0.19$, $p < 0.05$).

Linear Regression Analyses

Unadjusted and adjusted linear regression models were

Table 2

Descriptive Statistics of Theory of Planned Behaviour Model Constructs

Variable	Mean (SD)	Range	Cronbach's alpha
Attitude about EOL Communication Professional Responsibility	4.36 (0.601)	1 to 5	0.62
Attitude about Meeting Patient and Family EOL Communication Needs	4.52 (0.430)	1 to 5	0.70
Perceived Behavioural Control over EOL Communication	4.05 (0.710)	1 to 5	0.77
Knowledge about EOL Communication	2.93 (2.350)	1 to 12	0.78
EOL Communication Behaviours	3.89 (0.672)	1 to 5	0.72

Note: EOL = end of life.

Table 3

Pearson Correlation Coefficients for Bivariate Relationships Among Study Variables

	1	2	3	4	5	6	7
EOL Communication Practice Behaviours	—						
Perceived Behavioural Control over EOL Communication	0.59**	—					
Attitude about EOL Communication Profession.al Responsibility	0.41**	0.49**	—				
Attitude about Meeting Patient and Family EOL Communication Needs	0.30**	0.46**	0.28**	—			
Knowledge about EOL Communication	0.06	0.11	0.14	0.29**	—		
POLST Implementation	0.23*	0.27**	0.32**	0.31**	0.71**	—	
EOL Continuing Education Mandate	0.19*	0.25**	0.17	0.30**	0.73**	0.59**	—

*Correlation is significant at the 0.01 level.

**Correlation is significant at the 0.05 level.

Note. EOL = end of life, POLST = Provider Order for Life-Sustaining Treatment.

examined to determine the individual and independent effects of attitude about professional responsibility for EOL communication, attitude about meeting patient and family needs for EOL communication, and perceived behavioural control of EOL communication on practice behaviour (see Table 4). Knowledge was the only predictor in the unadjusted model that had no significant effect on EOL communication behaviour. In the adjusted model, only perceived behavioural control had a significant independent effect on EOL communication behaviour.

Mediation Analyses

As shown in Table 5, all mediation models were significant, as evidenced by bias-corrected 95% bootstrap confidence intervals completely above zero. In the first mediation model, attitude about one's professional responsibility for EOL communication mediated a significant indirect relationship between knowledge and EOL communication behaviours. Similarly, attitude about meeting patient and family EOL communication mediated a significant indirect relationship between EOL communication knowledge and behaviours. Lastly, perceived behavioural control was also a significant mediator of an indirect effect of knowledge on EOL communication behaviours.

Moderation Analyses

As evidenced by bias-corrected 95% bootstrap confidence intervals completely above zero for the three moderation models (see Table 5), significant two-way interactive effects on EOL communication behaviours were found between knowledge and attitude about one's professional responsibility for EOL communication; knowledge and attitude about meeting patient and family EOL communication needs; and knowledge and perceived behavioural control over EOL communication. Simple slope analyses of these interactions indicated the effects of a high level of knowledge on engagement in EOL behaviours were significant when APNs' attitude about their EOL communication professional responsibility were positive (see Figure 2), their attitude about meeting patient and families' EOL communication needs were positive (see Figure 3), and their perceived behavioural control over EOL communication was high (see Figure 4). On the other hand, slope analyses also revealed APNs' engagement in EOL communication behaviours decreased significantly when knowledge was high, but 1) their attitude about their EOL communication professional responsibility was negative (see Figure 2), 2) their attitude about meeting patients' and families' EOL communication needs was negative (see Figure 3), and/or 3) their perceived behavioural control over EOL communication was low (see Figure 4).

DISCUSSION

The overarching purpose of this study was to examine the interrelationships among EOL communication knowledge, attitudes, perceived behavioural control, and engagement in EOL communication of APNs who cared for adults with ESKD. On average, participants' level of engagement in EOL communication with their patients was moderate, including routinely initiating advance care planning discussions with patients, providing follow-up to these discussions, and discussing palliative care and hospice options with patients, when appropriate. These findings are consistent with reports that indicate, despite practice guidelines for EOL care, the

Table 4

Unadjusted and Adjusted Effects of End-of-Life Communication Practice Behaviour

Predictors	**Unadjusted Model** *(Individual Predictors and Covariates on the Outcome)*		**Adjusted Model** *(All Four Predictors and Two Covariates on the Outcome)*	
	β **(95% CI)**	**Sig.**	β **(95% CI)**	**Sig.**
Attitude about Meeting Patient and Family EOL Communication Needs	0.304 (0.212, 0.739)	0.001	0.022 (-0.227, 0.297)	0.791
Attitude about EOL Communication Professional Responsibility	0.413 (0.282, 0.642)	0.000	0.150 (-0.021, 0.356)	0.081
Perceived Behavioural Control over EOL Communication	0.587 (0.420, 0.691)	0.000	0.488 (0.291, 0.632)	0.000
Knowledge about EOL Communication	0.061 (-0.033, 0.068)	0.497	—	—
Covariates				
POLST Implementation	0.253 (0.110, 0.571)	0.004	0.058 (-0.146, 0.303)	0.490
EOL Continuing Education Mandate	0.204 (0.051, 0.616)	0.021	-0.010 (-0.285, 0.253)	0.906

Note. EOL = end of life, POLST = Provider Order for Life-Sustaining Treatment.

Table 5

Mediating and Moderating Effects of Attitudes and Perceived Behavioural Control

Mediator	β	95% Confidence Interval	
		Lower	Upper
Attitude about EOL Communication Professional Responsibility			
Model 1			
Total effect	0.025	0.003	0.046
Direct effect	0.007	-0.012	0.027
Indirect effect	**0.018**	**0.009**	**0.027**
Attitude about Meeting Patient and Family EOL Communication Needs			
Model 2			
Total effect	0.025	0.003	0.047
Direct effect	0.004	-0.018	0.026
Indirect effect	**0.021**	**0.015**	**0.029**
Perceived Behavioural Control over EOL Communication			
Model 3			
Total effect	0.025	0.003	0.047
Direct effect	0.012	-0.005	0.029
Indirect effect	**0.013**	**0.001**	**0.025**
Moderator			
Attitude about EOL Communication Professional Responsibility x Knowledge	**0.087**	**0.048**	**0.127**
Attitude about Meeting Patient and Family EOL Communication Needs x Knowledge	**0.149**	**0.088**	**0.210**
Perceived Behavioural Control over EOL Communication x Knowledge	**0.084**	**0.054**	**0.114**

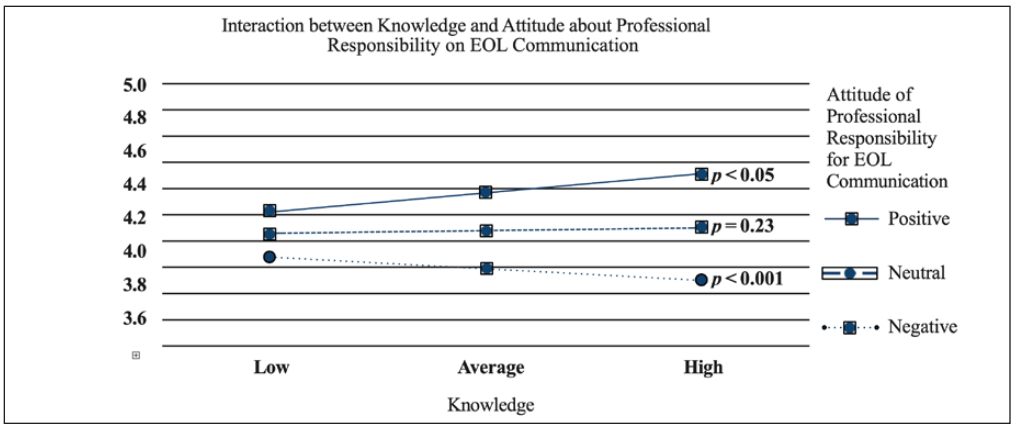
Note. 95% bias-corrected Confidence Interval (CI) for indirect effects was calculated based on 10,000 sample bootstrapping. A 95% bias-corrected CI that does not cross zero represents a statistically significant indirect effect as represented in bold font. EOL = end of life.

uptake of these recommendations by healthcare professionals has been far from pervasive (Davison, 2010; IOM, 2015; Scheinberg-Andrews & Ganz, 2020; Sutherland, 2019; Tung et al., 2014). The level of EOL communication engagement by nephrology APNs in this study is consistent with prior literature finding of non-nephrology APNs reported moderate levels of engagement in advance care planning with their patients (Dube et al., 2015; Sagara et al., 2021; Tyree et al., 2005; Zhou et al., 2010). The level of engagement in EOL communication by APNs in our sample underscores the need to target modifiable factors that impede their practice behaviours in this area.

In this study, perceived behavioural control over EOL communication, assessed as APNs' comfort and confidence in engaging in EOL communication with their patients, was moderately high despite research findings, indicating that many health professionals lack confidence in their ability to engage in EOL discussions with patients (Croxon et al., 2018; Pieters et al., 2019; Price et al., 2017). As hypothesized, we found high perceived behavioural control over EOL communication associated with APNs' engagement in EOL communication with their patients, consistent with prior research findings that high self-efficacy in advance care planning was most likely to ensure completion of advance care planning (Baughman et al., 2021; Ludwick et al., 2018; Millstein et al., 2020). For example, an evidence-based workshop designed to facilitate oncology nurses' comfort with a facilitated discussion about death and dying led to increased confidence in addressing patients'

Figure 2

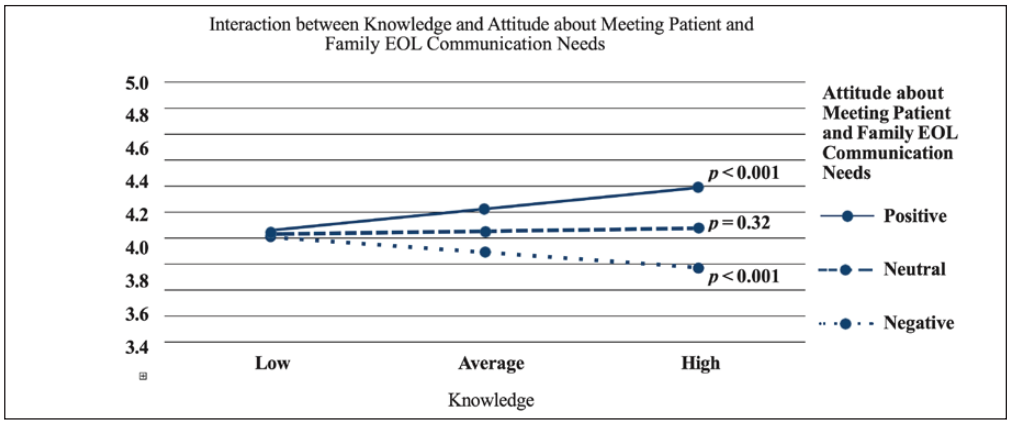
Moderating Role of Attitude about Professional Responsibility for End-of-Life (EOL) Communication



Note. A low knowledge score corresponds to 1 standard deviation below the mean (-1SD = .78). An average knowledge score corresponds to a mean of 3.08. A high knowledge score corresponds to 1 standard deviation above the mean (+1SD = 5.37).

Figure 3

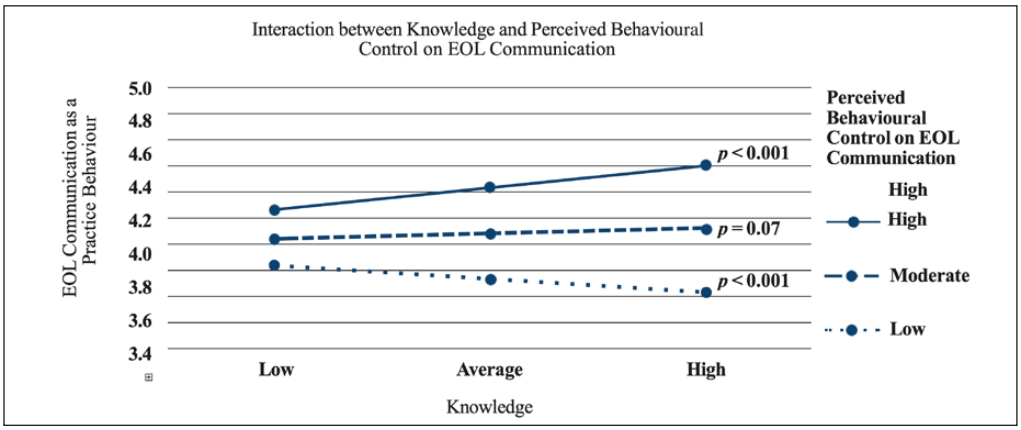
Moderating Role of Attitude about Meeting Patient and Family End-of-Life (EOL) Communication Needs



Note. A low knowledge score corresponds to 1 standard deviation below the mean (-1SD = .78). An average knowledge score corresponds to a mean of 3.08. A high knowledge score corresponds to 1 standard deviation above the mean (+1SD = 5.37).

Figure 4

Moderating Role of Perceived Behavioural Control on End-of-Life (EOL) Communication



Note. A low knowledge score corresponds to 1 standard deviation below the mean (-1SD = .78). An average knowledge score corresponds to a mean of 3.08. A high knowledge score corresponds to 1 standard deviation above the mean (+1SD = 5.37).

needs related to EOL (Harrington et al., 2019). Moreover, providers who received training related to advance care planning reported a high level of confidence when discussing EOL with patients (Chan et al., 2020). Thus, our findings are consistent with the literature and point to the importance of fostering APNs' level of confidence in their ability to effectively discuss EOL planning with their patients.

Attitudes of APNs about their professional responsibility to engage in EOL discussions, as well as their attitudes about meeting patient and family EOL communication needs, were not significant independent predictors of EOL communication practice behaviours. These findings suggest APNs' confidence in their ability to engage in EOL communication may be a more important driver of their actual engagement in this behaviour than their attitudes. Future research that tests these theorized relationships is needed in larger APN samples.

We also examined APNs' knowledge of EOL communication. Surprisingly, study participants' knowledge about advance care planning, including EOL communication, was low. On average, participants responded correctly to only three out of 12 EOL communication knowledge survey items. Many incorrect responses were related to questions about advance directives and the APN's role in EOL communication. For example, a majority of respondents mistakenly believed that all competent individuals must sign an advance directive, that most Americans have signed one, that an advance directive is the best way individuals have EOL communications with patients, and that the APN role in EOL communications is skillfully asking a patient to sign an advance directive. The low level of knowledge among APN participants mirrors findings in a recent study in which 90% of APNs rated themselves as not knowledgeable in EOL communication (Shi et al., 2019). On the other hand, knowledge about advance care planning and EOL communication among oncology nurses and other providers was moderate to high in other studies (AlFayyad et al., 2019; Scheinberg-Andrews & Ganz, 2020; Zhou et al., 2010). In addition, continuing education courses related to advance care planning and awareness of the federal mandate related to the Patient Self-Determination Act increased the engagement and frequency of advance care planning discussions among APNs (Dube et al., 2015). Health care provider training is considered to be essential to increasing knowledge, promoting positive patient outcomes through the clarification of preferences, and reducing the burden on families (Miller et al., 2019; Yang et al., 2021). In fact, a state mandate for EOL continuing education units among participants was highly correlated with higher levels of EOL knowledge in our study ($r = 0.73$, $p < 0.01$). Given the overall low level of EOL communication knowledge among study participants, our findings illuminate an important need for EOL communication and advance care planning training for nephrology APNs.

We also hypothesized that EOL communication knowledge would be directly associated with APNs' EOL communication behaviours, but this hypothesis was not supported. The lack of a direct association between knowledge and engagement in EOL communication behaviours found in our study is consistent with recent research in APN and RN samples that found no relationship between knowledge of advance care planning, including EOL communication, and action toward engaging these behaviours (Hsieh et al., 2019). For example, despite increasing the amount of knowledge related to advance care planning after completion of a quality improvement program, project outcomes revealed no increase in the frequency of advance care planning completion among APNs and other providers (Copley & Ingram, 2020). These findings indicate that increasing knowledge alone may not be sufficient to increase APNs' active engagement in EOL communication with their patients and that operant pathways through which knowledge influences behaviours should be considered and targeted. In our study, findings of indirect effects of high knowledge on their EOL communication behaviours through its positive effects on attitudes support and extend recent reports that revealed that even though APNs' knowledge of advance care planning was not significantly correlated with action towards engaging in advance care planning, as knowledge of advance care planning increased, attitude towards advance care planning became more positive (Hsieh et al., 2019; Kim et al., 2020).

We found combined effects between higher levels of knowledge and 1) positive attitudes and 2) perceived behavioural control on APN engagement in EOL communication behaviours. That is, EOL communication behaviours increased among APNs when their knowledge was high and their attitudes about this behaviour were positive or their perceived behavioural control was high. On the other hand, the effect of high knowledge on behaviour was the opposite when attitudes were negative and perceived behavioural control was low. Specifically, APNs with higher levels of EOL communication knowledge but also negative EOL communication attitudes and/or low perceived behavioural control had lower levels of engagement in EOL communication practice behaviours. These findings suggest that EOL communication knowledge overlaps with EOL communication attitudes and perceived behavioural control, and their combined effects explain, in part, the level of nephrology APNs' engagement in EOL communication with their patients. Thus, interventions to improve APNs' EOL communication with patients should focus on improving EOL communication knowledge, attitudes, and perceived behavioural control.

Limitations

The study had limitations to be considered. First, the sample size was small, despite multiple participant recruitment modes. The invitation for APNs to respond to our electronic survey was distributed during the COVID-19 pandemic and was likely not a priority for them. In addition, email invitations with links to the electronic survey might have been directed to some potential participants' spam and junk folders, and were unlikely opened and completed. Second, different states and institutions have varying mandates about APNs' scope of practice, the presence and role of palliative care programs for adults with nephrology problems, and competency requirements related to EOL. Because of missing data for the primary location (state) of the APN nephrology practice survey item, it is unknown if nurses were clustered in one region or if the sample was representative of all 50 states. Third,

given the electronic nature of the survey, biases related to social desirability and self-reporting are likely inherent in this study and cannot be verified. Fourth, APNs who declined to respond electronically may have unique characteristics compared to study respondents. The study was anonymous and did not collect participants' identification. Thus, the collection of data that characterized respondents who did not respond electronically could not be determined. Fifth, data collected from a cross-sectional study only captures a fraction of the target population at a particular time; therefore, the causality of study variables could not be determined.

Implications

Our study findings point to the need for targeted strategies to increase APNs' knowledge about EOL communication, foster their positive attitudes about this behaviour, and increase APNs' comfort and confidence in engaging in EOL discussions with their patients. Among our study participants, those who reported a requirement for EOL continuing education also reported higher levels of engagement in EOL communication behaviours, a finding that underscores the need for EOL care training and education. Overall, this study highlights the essential need for EOL communication and advance care planning training for nephrology APNs to enable them to actively engage in EOL discussions with their patients. Ideally, training for EOL communication and advance care planning should be integrated in advanced practice programs within academic dedicated settings. Educational programs that increase APNs' knowledge about legal and ethical issues about advance directives and EOL communication skills, as well as provide ongoing continuing education in this area, are an important need. Different modes of instruction that employ online technologies, face-to-face instruction, and targeted communication skills training for one-to-one discussions with patients produce meaningful impacts on health care professionals' EOL communication attitudes, knowledge, confidence, and acquirement of appropriate communication skills (Chan et al., 2019; Cheung et al., 2021; Rawlings et al., 2020). Additionally, the End-of-Life Nursing Education Consortium (ELNEC) project, which is a collaboration between City of Hope, Duarte, California, and the American Association of Colleges of Nursing (AACN), is a national and international education initiative to improve palliative care, provides comprehensive education modules for nurses on care at the EOL, symptom management, ethical and legal issues, and communication (AACN, 2021).

Nephrology APNs have an instrumental role in influencing policy that empowers and allows them to take a more active role in EOL communication with patients. The finding in our study of a significant relationship between APNs' ability to sign a POLST form and their active engagement in EOL communication behaviours suggests that increasing institutional and state-level POLST order policies and regulations for APNs may facilitate their active role in EOL discussions with patients.

Finally, more research is needed to explore facilitators and barriers to EOL communication by APNs in their work setting. Furthermore, additional research to determine appropriate content for EOL discussions and the communication style of the provider is warranted (Dube et al., 2015). Additionally, research that examines the extent to which nephrology APN workload, time for EOL discussions, reimbursement schedules for EOL discussions, leadership support, and other system factors that have a measurable impact on the level of their EOL communication engagement is needed.

CONCLUSION

Nephrology APNs are ideally positioned to be leaders in EOL communication with patients with CKD and ESKD. The Theory of Planned Behaviour provides a useful framework for understanding the complex interrelationships among APNs' EOL communication knowledge, attitudes, perceived behavioural control, and practice behaviours. Our study findings and implications are consistent with the recommendations in the *Dying in America* report, which highlights the need for provider training and engagement in EOL discussions (IOM, 2015). To increase APNs' active engagement in EOL discussions with patients, this study supports a need to increase nephrology APNs' EOL communication knowledge, facilitate positive attitudes about their EOL communications with patients, and build APNs' comfort and confidence (i.e., perceived behavioural control, for engaging in these discussions).

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CONTINUING EDUCATION SERIES

CONTACT HOUR: 2.0 HRS

Pediatric Hemodialysis: An Education Module for Registered Nurses

Brittany Woodman

ABSTRACT

Pediatric hemodialysis has historically been an area within nephrology with limited research and publication in Canada. Through an extensive literature review and environmental scan, the background, nursing assessment, and procedures relating to pediatric hemodialysis were identified. The purpose of this education module is to provide an educational resource for registered nurses to perform pediatric hemodialysis. The module will address the psychosocial and physical components of treating a pediatric patient, common nephrological conditions among the pediatric population, the child's experience of hemodialysis, vascular access, and nursing assessment of the pediatric patient including procedures specific to hemodialysis.

LEARNING OBJECTIVES

After completing this self-directed education module, the registered nurse will be able to:

1. recognise the stages of growth and development in children from birth to adolescence;
2. demonstrate an understanding of the principles of working with children in the healthcare setting;
3. identify the role of nutrition in the growth and development of children with kidney disease;
4. identify the parameters and recommended means of measurement of vital signs in children;
5. describe common nephrological conditions that may occur among children;
6. discuss the patient, family, and nurse experience of caring for a child receiving hemodialysis (HD);
7. demonstrate understanding of vascular access in children with central venous catheter (CVC), such as location, size, and maintenance, and with arteriovenous fistula (AVF);
8. identify the signs and symptoms of CVC infection and prevention methods;
9. discuss nursing assessment of the child receiving HD including fluid, dialysis prescription, medications; and
10. identify differences in HD machine set up between children and adults.

AUTHOR NOTE

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Historically, kidney disease among the pediatric population has been rare, ranging from 6.9 to 21.8 per million in the zero to 19-year-old age group, compared to 71,900 per million adults over age 19 (Canadian Institute for Health Information [CIHI], 2020). With the global COVID-19 pandemic, renal failure caused by multi-system inflammatory syndrome in children (MIS-C) secondary to COVID-19 has risen among the pediatric population (Centers for Disease Control and Prevention [CDC], 2020). Multi-system inflammatory syndrome in children causes the inflammation of several organs including the heart, lungs, kidneys, brain, skin, eyes, and gastrointestinal system, causing children to present with rare symptoms including rash, neck pain, and bloodshot eyes (CDC, 2020). According to the Canadian Pediatric Society (2021), the incidence of emergency pediatric hemodialysis (HD) due to acute kidney injury (AKI) secondary to MIS-C has increased across Canada. In the United States, over 4,000 children were diagnosed with MIS-C in 2020, making it a significant contributor to the morbidity and mortality of critically ill infants and children (CDC, 2020).

In 2019, Newfoundland and Labrador (NL) had the highest rate of new adult patients starting renal replacement therapy (RRT) in Canada with 249 patients per million population (CIHI, 2020). However, the occurrence of pediatric hemodialysis (HD) in the province is rare, with approximately one case every three years. When a pediatric patient requires HD in NL, the registered nurses (RNs) in the adult dialysis program at the Health Science Centre (HSC) in St. John's are required to dialyze the patient as it is connected to the Janeway Children's Hospital, which is the only pediatric hospital in the province. Currently, there is no pediatric-specific HD policy in NL. This is also the case in other provinces and territories in Canada. With the increased incidence of pediatric HD across Canada and the unpredictable weather preventing patient transfer to larger pediatric hospitals, there

is an increased necessity for pediatric HD in Canada. This education module will provide information to increase the knowledge and understanding of pediatric HD and, ultimately, improve patient and family outcomes.

SECTION ONE: INTRODUCTION TO PEDIATRICS

Part One: Caring for a Child with Kidney Disease

Growth and Development

Knowledge of normal growth and development and the ability to assess the child's developmental level is crucial to working effectively with children and parents in any healthcare setting (Mullen & Pate, 2018). Measurement of physical growth in children is a key element in evaluating their health status. Physical growth parameters include weight, height, arm circumference, and head circumference (Hockenberry & Wilson, 2018). Values for these growth parameters are plotted on percentile charts. The child's measurements in percentiles are compared with the general population (CDC, 2020). Children whose growth may be questionable include:

1. children whose height and weight percentiles are widely disparate (e.g., height in the 10th percentile and weight in the 90th percentile);
2. children who fail to follow the expected growth velocity in height and weight, especially during the rapid growth periods of infancy and adolescence; and
3. children who show a sudden increase, decrease, or no change in a previously steady growth pattern (Hockenberry & Wilson, 2018).

Children with kidney disease often meet all of the criteria for questionable growth. They grow and develop slower than other children their age. About one-third of all children with kidney disease have a height below the third percentile (National Institute of Diabetes and Digestive and Kidney Diseases [NIDDK], 2015). The risk for the greatest growth impairment occurs if kidney disease begins in early childhood. If it begins in infancy, this results in profound growth restriction, with a severe loss in relative height. After infancy, growth closely correlates with glomerular filtration rate (GFR) and is most pronounced once the GFR falls below 25 mL/min (Silverstein, 2018). These children go through puberty two years later than the rest of the population (American Kidney Fund, 2024).

Multiple factors contribute to growth failure in children with kidney disease, including malnutrition, mineral and bone disorder, metabolic acidosis, fluid and electrolyte imbalance, growth hormone resistance, and delayed puberty (NIDDK, 2015). Growth charts are used by healthcare professionals to monitor how well a child with kidney disease is growing. The child's height and weight measurements are used to track growth over time and compare with other children of the same sex and height. To treat growth failure in children with kidney disease, healthcare professionals can implement changes in diet and nutrition, medications, and growth hormone therapy.

Nutrition. Nutrition is a major contributor to growth in children with kidney disease. Inadequate nutrition is common in children receiving HD and is associated with an increased risk of poor growth and death (Shroff, 2024). Ensuring adequate caloric intake is of major importance in preventing growth failure. This requires the patients and families to be advised by a renal dietitian, especially when supplementing feeding via nasogastric or gastrostomy tube (Haffner, 2020). Knowledge of the child's dietary intake is an essential component of a nutritional assessment. The dietary reference intakes (DRIs) are a set of four nutrient-based reference values that provide quantitative estimates of nutrient intake for use in assessing and planning dietary intake. These include:

- estimated average requirement: nutrient intake required to meet the requirement of half the healthy individuals for a specific age group;
- recommended dietary allowance: average daily dietary intake sufficient to meet the nutrient requirement of nearly all individuals for the age group;
- adequate intake: recommended intake level based on estimates of nutrient intake by healthy groups of individuals; and
- tolerable upper intake level: highest average intake level likely to pose no risk of adverse health effects (Government of Canada, 2021a; Hockenberry & Wilson, 2018).

Nutritional Needs. Children with kidney disease experience reductions in protein, energy (also termed protein-energy wasting), and nutrient intake at all stages of the disease. In children receiving renal replacement therapy, there is a strong relationship between energy intake and growth. The causes of reduced intake include recurrent vomiting, anorexia, and feeding problems (Silverstein, 2018).

The renal diet is often referenced, but this can be misleading as the diet must be optimized and adapted for each patient. Factors that need to be considered include the patient age and gender, the current nutritional and growth parameters, the stage of CKD, and the rate of progression of CKD. The major components of the diet include calories, protein, sodium, potassium, calcium, phosphorus, and iron. It is important to begin the evaluation by assessing the patient's current growth status, including height, weight, head circumference (in children up to 36 months of age), and body mass index while comparing those values to available norms and adjusting for prematurity in infants less than two years of age (Silverstein, 2018).

The required caloric intake should be similar to that of other children of the same age. For children less than two years of age, there is a vital need for adequate nutritional intake with special attention to an aggressive nutritional plan to optimize growth in the early years. Treating growth failure early is important, as one-third of a child's total growth occurs in the first two years of life (NIDDK, 2015).

Clinical Examination of Nutrition. A significant amount of information regarding nutritional deficiencies comes from clinical examination of the skin, hair, teeth, gums, lips, tongue, and eyes. Signs of nutritional deficiencies in children may include:

- less than 5th or greater than 95th percentile for growth
- poor weight gain, absence or delay of growth
- hard and scaling skin with poor turgor; pruritus
- stringy, dull, dry, and thin hair; alopecia

- softening of cranial bones, delayed fusion of sutures; headache
- enlarged thyroid
- burning and itchy sensation in eyes, photophobia
- hearing loss
- irritation and cracks at nasal angle
- fissures and inflammation of mouth corners
- teeth browning, defective enamel
- depressed rib cage, sharp protrusion of sternum
- heart palpitations, rapid pulse, increased/decreased blood pressure
- distended and flabby abdomen
- constipation or diarrhea
- muscle weakness, pain, cramps
- joint swelling and pain
- irritability, lethargy, apathy, listlessness
- diminished or absent tendon reflexes (Hockenberry & Wilson, 2018)

Principles of Working with Children

The approach to caring for a child with kidney disease requires specialized attention. In this section, the ideal approach is discussed.

1. *Introduce yourself to the child and family*: Include the child in conversation even if the child does not seem to be responding. Children may not respond verbally but will listen to everything that is said and decide how much comfort or danger the situation holds for them. Assure the child that it is alright to talk or not to talk.
2. *Honesty is vital to establishing a trusting relationship with children*: Be honest with the child if the procedure will hurt. To deny that something will hurt and then do something that causes the child pain could destroy the possibility of establishing a trusting, cooperative relationship with that child. Admit that you do not know the answer if the child asks a question you cannot answer. Promise to try to find the answer.
3. *Make eye contact and address the child by name*: The child may not return eye contact, but they can still be listening intently.
4. *Stoop or bend to communicate at the child's eye level when possible*: Show that you are giving the child your full attention, which helps them feel safe and in control.
5. *Allow the child to see your hands and any instruments you will use*: If possible, allow the child to touch and examine the instruments because this will tap into his or her curiosity. Most children are cooperative if they know you are not planning a painful procedure.
6. *Allow the child to make choices whenever possible but avoid giving the child artificial choices*: For example, do not ask permission to measure the child's blood pressure unless you are prepared to respect his or her choice if the child refuses. Simply state what you need to do in a gentle but matter-of fact manner and do it. Examples of realistic choices include desired Popsicle flavour and choice of video game to play.
7. *Allow the parents to participate in the child's care whenever possible*: Some procedures can be accomplished with the child sitting on a parent's lap or in a position of comfort, such as a hug. This allows the child to feel safe.
8. *Use a calm, soothing voice*: Get the child's attention in a non-threatening tone to ensure they are listening to what you are saying. This helps them to understand and respond in a positive way.
9. *Encourage the family to bring the child's favorite articles from home*: This gives the child a sense of safety through familiarity and aids as a visual stimulus during examination to distract the child, e.g., when giving a vaccination (Mullen & Pate, 2018).

Part Two: Physiologic Measurements in Pediatrics

Physiologic measurements are key elements in evaluating the physical status of vital functions and include temperature, pulse, respiration, and blood pressure. For the child undergoing hemodialysis (HD), vitals are measured frequently to prevent intradialytic complications, such as hypotension. For those children receiving HD in the critical care environment, vital sign measurement is constant using an arterial line with real-time blood pressure measurements. For the child receiving HD in the dialysis unit, vital measurements would include temperature pre- and post-HD, and blood pressure and heart rate measurements based on the RN's assessment.

Temperature

Temperature can be measured at several body sites in children via oral, rectal, axillary, ear canal, tympanic membrane, temporal artery, or skin. Temperatures in children younger than 18 years range from 36.6°C to 37.5°C. Children aged three months to one year have a higher baseline temperature at around 37.5°C (Hockenberry & Wilson, 2018). Monitoring temperature via the tympanic membrane, oral cavity, or axilla pre- and post-HD allows the practitioner to make decisions regarding the dialysate temperature prescription, as small changes in dialysate temperature can have a large impact on the cardiovascular status. Recommendations for temperature screening routes in infants and children are in Table 1. For example, a dialysate temperature that is equal to the patient's body temperature can lead to vasodilation and the potential for hypotension. Lowering the dialysate temperature has proven to increase cardiovascular stability (Pergola et al., 2004).

Table 1

Recommended Temperature Screening Routes in Infants and Children

Age	Recommended Route
Birth to 2 years	Axillary, rectal (most accurate)
2 to 5 years	Axillary, rectal, tympanic, oral
Over 5 years	Axillary, tympanic, oral

Note. Adapted from Hockenberry & Wilson (2018).

Heart Rate

Pulse can be taken radially in children older than two years of age. In infants and young children, auscultation of the apical pulse is more reliable. Count the pulse for one full minute in infants and young children due to possible irregularities in rhythm (Hockenberry & Wilson, 2018). During HD, heart rate is measured frequently to monitor cardiovascular status. Common heart rate changes that may occur include tachycardia or bradycardia (Ashby et al., 2019). Tachycardia can often be an indicator of a more severe HD complication, such as dialysis disequilibrium or other arrhythmias. Bradycardia may be an indicator of hypotension. The range of heart rates in children is outlined in Table 2.

Table 2

Heart Rate Ranges in Children

Age	Heart Rate (Beats per Minute)
Newborn	100–180
1 week to 5 months	100–120
6 to 12 months	80–150
1 to 2 years	80–130
3 to 5 years	80–120
6 to 10 years	70–100
11 to 14 years	60–105
15 years or older	60–100

Note. Adapted from CDC (2020) and Hockenberry & Wilson (2018).

Respiration

Count the respiratory rate in children in the same manner as the adult patient; however, in infants, observe abdominal movements since respirations are primarily diaphragmatic. Count for one full minute for accuracy, as respirations may be irregular (Hockenberry & Wilson, 2018). Respiratory rates for children are listed in Table 3. Fluid volume overload causes pulmonary edema and is indicated on physical exam with dyspnea, orthopnea, hypertension, and course crackles on auscultation (Hockenberry & Wilson, 2018).

Blood Pressure

The most important factor in accurately measuring blood pressure (BP) is the use of an appropriately sized cuff. A technique to establish an appropriate cuff size is to choose a cuff with a bladder width that is approximately 40% of the arm circumference midway between the olecranon and the acromion (Hockenberry & Wilson, 2018), as illustrated in Figure 1. Cuffs that are too narrow or too wide affect the accuracy of BP measurements. If it is too small, the reading is falsely high; if it is too large, the reading is falsely low (CDC, 2020; Hockenberry & Wilson, 2018). To prevent intradialytic complications such as hypotension, the correct cuff size must be used to prevent inaccurate readings. Blood pressure measurements vary depending on the child's age as shown in Table 4.

Table 3

Respiratory Rates for Children

Age	Respiratory Rate (Breaths/Min)
Newborn	35
1 to 11 months	30
2 years	25
3 to 4 years	23
5 to 6 years	21
7 to 8 years	20
9 to 12 years	19
13 to 18 years	16–18

Note. Adapted from CDC (2021) and Hockenberry & Wilson (2018).

Figure 1

Blood Pressure Cuff Measurement in Pediatrics

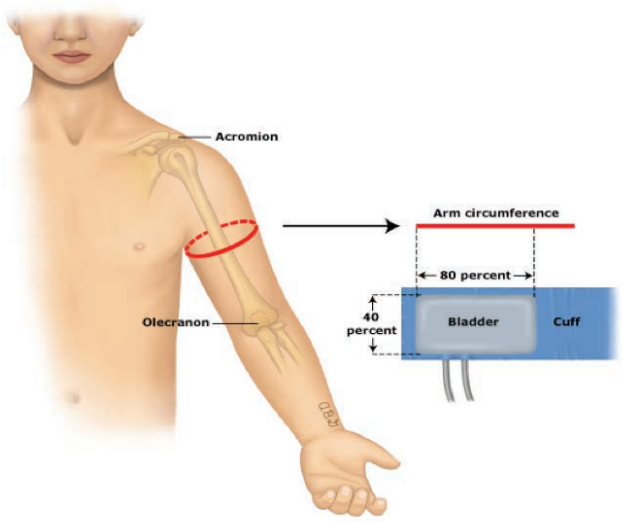

Table 4

Blood Pressure Values in Pediatrics

Age	Mean	90th Percentile	95th Percentile
Newborn (1 to 3 days)	65/41	75/49	78/52
1 month to 2 years	95/58	106/68	110/71
2 to 5 years	101/57	112/56	115/68
6 to 12 years	112/57	117/60	118/62
12 to 18 years	120/70	115/68	125/73

Note. Adapted from Hockenberry & Wilson (2018).

SECTION TWO: NEPHROLOGICAL CONDITIONS

Common Renal Diseases in Pediatrics

Chronic Kidney Disease

Pediatric chronic kidney disease (CKD) is a prolonged, progressive disorder. Staging for CKD is dependent on the age of the child. For children ages two and older, the severity of CKD is categorized into stages based on the estimated glomerular filtration rate (GFR). End-stage kidney disease (ESKD) is categorized as stage G5 with a GFR below 15mL/min per 1.73m^2. Children under the age of two do not fit within this classification system because they normally have a low GFR even when corrected for body surface area. In these patients, GFR based on serum creatinine can be compared with normative age-appropriate values to detect kidney impairment. The most common cause of pediatric ESKD requiring RRT is congenital anomalies of the kidney and urinary tract (Warady & Shroff, 2024). An example of this is dysplastic kidneys.

Dysplastic Kidneys. In dysplastic kidneys, the internal structure of one or both of a fetus' kidneys do not develop normally. During development, the tubules fail to connect to the ureters; therefore, the urine has nowhere to go. The urine collects inside the kidney and forms cysts that prevent the kidney from functioning (NIDDK, 2015). Genetic factors typically cause kidney dysplasia. Medications taken during pregnancy, such as those used to treat seizures and high blood pressure, or illegal drugs can also cause dysplastic kidneys (NIDDK, 2015). About one in 4,000 babies are diagnosed with this condition. Half of these babies also have other urinary tract defects such as hypospadias and polycystic kidneys (NIDDK, 2015). Babies who survive birth will require dialysis or a kidney transplant. If both kidneys are affected, the child is likely to develop CKD requiring HD (NIDDK, 2015).

Acute Kidney Injury

Acute kidney injury (AKI) is the sudden loss of renal capacity for filtration and tubular reabsorption, resulting in the accumulation of wastes, fluid and electrolyte imbalance, and acid-base imbalances (Dokas, 2018). For pediatric patients with AKI, the selection of dialysis modality is typically chosen based on local expertise and availability of staff and equipment. Intermittent HD provides the most efficient solute clearance and ultrafiltration compared to other modalities. Critically ill children should be managed by a team including the nephrologist, intensive care team, and dialysis nurse with expertise in administering HD to children, because of specific pediatric issues regarding obtaining vascular access and dialysis prescription. Centres should have policies for utilizing HD equipment, as the majority of HD machines are only approved for patients greater than 15 to 20 kg (Muff-Luett & Devarajan, 2024).

Clinically, AKI is manifested as an increase in serum creatinine, a reduction in urine output (less than 0.5 to 1mL/kg/hr) that may be refractory to diuretic therapy, or a combination of both. Indications for RRT in patients with AKI include fluid overload with evidence of escalating ventilatory support; presence of uremic complications, such as pericarditis, uremic encephalopathy or unexplained change in mental status; metabolic derangements, such as hyperkalemia with electrocardiographic changes and severe metabolic acidosis; removal of toxins or drugs; tumour lysis syndrome; and hyperammonaemia (Muff-Luett & Devarajan, 2024). Common causes of AKI include multi-organ inflammatory syndrome and toxin ingestion.

Multi-System Inflammatory Syndrome in Children (MIS-C). Recognized in early 2020 in the United States and the United Kingdom, MIS-C is related to COVID-19 infection. Most children who become infected with the COVID-19 virus have only a mild illness, but in children who go on to develop MIS-C, some organs and tissues—heart, lungs, kidneys, digestive system, brain, skin, or eyes—become severely inflamed (Government of Canada, 2021b). Clinical manifestations differ from adults (Son & Freidman, 2021). Most MIS-C cases (greater than 70%) have occurred in children who were previously healthy. In children with a known history of COVID-19, the duration between acute infection and onset of MIS-C symptoms is two to six weeks (Son & Friedman, 2021). Symptoms of MIS-C include:

- Kawasaki disease-like features: conjunctivitis, red or swollen hands or feet, rash on the face, red cracked lips, and swollen glands;
- gastrointestinal symptoms: abdominal pain, diarrhea, nausea/vomiting;
- toxic shock-like signs: hemodynamic instability and poor cardiac function;
- AKI; and
- shortness of breath (Government of Canada, 2021b; Son & Friedman, 2021).

Common laboratory findings include:

- an abnormal level of inflammatory markers including elevated erythrocyte sedimentation rate (ESR), c-reactive protein (CRP), ferritin, and lactate dehydrogenase;
- lymphopenia, thrombocytopenia, neutrophilia; and
- elevated B-type natriuretic peptide (BNP), hyponatremia, elevated D-dimer (Government of Canada, 2021b).

In children presenting with a persistent fever (greater than or equal to three days) who are moderately to severely ill with clinical signs of organ dysfunction (e.g., gastrointestinal, respiratory, cardiac, skin, or neurologic), the diagnosis of MIS-C should be considered (Government of Canada, 2021b). If MIS-C progresses to AKI, HD may be indicated to sustain life, specifically to maintain respiratory status through fluid removal and prevent cardiac arrest through electrolyte balance (CDC, 2020).

Toxin Ingestion. AKI can be caused by the ingestion of poisonous or primarily nephrotoxic substances. This can occur when a child ingests a substance, such as medication or a toxin. When this occurs, emergency HD is required to remove the toxin and prevent irreversible damage to the kidneys and/or liver.

Medication Ingestion. Up to 25% of toxin ingestion cases are the result of pharmacotherapy, and occur between eight percent and 30% of the children in the intensive care unit

(ICU; Faught et al., 2015). There are three common classes of drugs that cause AKI in children if ingested: cancer chemotherapeutics, non-steroidal anti-inflammatory (ibuprofen, aspirin), and antimicrobials (cephalexin, metronidazole, ciprofloxacin). Other medications may include lithium, salicylate, theophylline, and phenobarbital (Faught et al., 2015; McGregor et al., 2009). Symptoms of medication ingestion may include dizziness, disorientation, drowsiness, nausea, vomiting, diarrhea, abdominal pain, respiratory distress, tachycardia/bradycardia, and hypoventilation (Faught et al., 2015). An elevation in serum creatinine continues to be the most widely used laboratory finding in the diagnosis of AKI in children (Devarajan, 2013).

Chemical Ingestion. Some chemicals are highly toxic to children and may be lethal in small doses. Examples include ethylene glycol (antifreeze), methanol (windshield wiper fluid), acids (toilet and oven cleaners), and acetone (nail products; McGregor et al., 2009). Symptoms differ depending on the toxin ingested. Respiratory, circulatory, and neurologic symptoms are the main indications of toxin ingestion. However, other symptoms such as gastrointestinal may occur. A child who ingests a chemical substance may experience respiratory depression, seizures, hypotension, and hypoglycemia (McGregor et al., 2009).

Treatment is dependent on the toxin ingested and its effects:

- To remove ingested toxins or prevent their absorption, activated charcoal and gastric lavage may be used.
- An antidote may be available, as in the case of many medications.
- HD may be appropriate for lithium, salicylate, theophylline, methanol, atenolol, phenobarbital, or valproic acid toxicity.
- HD provides more efficient solute clearance and ultrafiltration compared to other RRTs; therefore, it is important in the pediatric population for ingestions and drug toxicity (Brophy & Jetton, 2020; McGregor et al., 2009).

Hemolytic Uremic Syndrome. Hemolytic uremic syndrome (HUS) is an acute kidney disease characterized by a triad of manifestations: AKI, hemolytic anemia, and thrombocytopenia. Hemolytic uremic syndrome occurs primarily in infants and small children between the ages of six months and three years (Hockenberry & Wilson, 2018).

Cause. In the majority of cases of HUS, no causative agents have been identified. The appearance of the disease has been associated with Rickettsia, E. coli, pneumococci, Shigella, and Salmonella, as well as viruses such as coxsackievirus, echovirus, and adenovirus, and may represent an unusual response to these infections (Hockenberry & Wilson, 2018). The disease occurs after a prodromal period during which there is an episode of diarrhea and vomiting. Less often, the preceding illness is an upper respiratory tract infection or, occasionally, varicella, measles, or a urinary tract infection. The hemolytic process persists for several days to two weeks. During this time, the child is anorexic, irritable, and lethargic. There is a rapid onset of pallor accompanied by hemorrhagic manifestations, such as bruising, purpura, or rectal bleeding. Severely affected patients are often anuric (i.e., no urine output) and hypertensive (Hockenberry & Wilson, 2018; NIDDK, 2015).

Diagnostics and Treatment. Proteinuria, hematuria, and urinary casts are evidence of renal involvement; blood urea nitrogen (BUN) and creatinine levels are elevated. A low hemoglobin and hematocrit with a high reticulocyte count confirm the hemolytic nature of the anemia (Hockenberry & Wilson, 2018; NIDDK, 2015). Treatment is directed to control complications and hematologic manifestations of renal failure. The initial supportive measures are to manage renal failure and include fluid replacement, treatment of hypertension, and correction of acidosis and electrolyte imbalance. The most consistently effective treatment is HD, which is instituted when the child is anuric or oliguric for 24 hours. The urine output range for infants up to one year is 2 mL/kg/hr, 1.5 mL/kg/hr for toddler ages one to three, and 1 mL/kg/hr for older children aged three to adolescence (Hockenberry & Wilson, 2018). With prompt treatment, the recovery rate is approximately 95%. However, residual renal impairment ranges from 10% to 50% (Hockenberry & Wilson; NIDDK, 2015).

SECTION THREE: CHILDREN ON HD—THE PATIENT/FAMILY AND NURSE EXPERIENCES

The Child and Family Experience

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 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).

Physical and Social Difficulties of the Child

Alterations in their physical appearance, particularly related to vascular access, may cause feelings of embarrassment. Socially, children feel isolated and alone with a sense of everyday confinement and constraints having an impact on their lives outside of HD. Children feel HD limits their social time due to the amount of time taken for preparation, duration, and completion of the treatments (El-Gamsay & Eldeeb, 2017; Kilis-Pstrusinska, et al., 2013; Zitzelsberger et al., 2019).

Rego et al. (2019) found that adolescents on HD had difficulties adapting to diet and fluid restrictions, often leading to non-adherence to treatment. Physiologic changes were also reported, such as tiredness, pain, dizziness, weakness, and trouble sleeping after HD sessions, causing them to choose rest over participation in social activities that they had previously performed. In some cases, the interruption in school attendance resulted in dropping out of school and having to change their plans for the future, such as going to college.

Family Difficulties

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; Ong et al., 2021; Wightman et al., 2019). Parents experience feelings of guilt, grief, and powerlessness, as a result 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 strict dietary 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. In particular, parents experience uncertainty about how their other children may be affected in the future (Cimete 2002; Ong et al., 2021; Wightman et al., 2019). They also experience strain on their intimate relationships because of frequent absences from each other and having arguments relating to their child's medical care (Wightman et al., 2019).

Families have feelings of fear, despair, and concern. The activities of the family are now focused on treating the disease. Changes in routine and reorganization of life occur. Both children and their families often fear HD itself and the complications that can occur, causing significant anxiety and tension in the family. Children are often exposed to the feelings of other family members, causing internal conflict and negative feelings of being a burden. The family plays the role of responsible caregiver, trying to ensure the well-being of their child in this new world where this disease exists, causing significant stress. (Rego et al. 2019).

The Nurses' Experience

The dialysis nurse plays a vital role in providing information, care, support, understanding, and therapeutic counseling to the pediatric patient and their family throughout the HD process (Ibrahim, 2019).

Nurse Competencies

Nurse competencies are driven by the needs of the patient and family. These competencies reflect the integration of nursing knowledge, skills, and experiences that are required to meet the patient's and family's needs and to optimize their outcomes. Each competency has different levels of experience ranging along a continuum from novice to competent to expert practitioner (Benner, 1984). Although the competencies listed below, as a whole, reflect the entirety of nursing practice, each competency becomes more or less important depending on the patient's needs at the time.

1. *Clinical judgment*: clinical reasoning and critical thinking skills;
2. *Caring practices*: creating a therapeutic environment based on the unique needs of the patient and family;
3. *Advocacy/moral agency*: working on another's behalf, resolving ethical concerns;
4. *Collaboration*: working with others in a way that encourages each person's contribution toward the patient's goals;
5. *Systems thinking*: recognizing the interrelationship within and across healthcare systems;
6. *Response to diversity*: recognizing and incorporating differences into care;
7. *Clinical inquiry*: ongoing questioning and evaluation of practice; and
8. *Facilitator of learning*: facilitating patient and family learning (Mullen & Pate, 2018).

Nurse Burnout

High-quality nursing care is imperative to contribute to positive patient and family outcomes. However, the many responsibilities of the nurse during the care of the pediatric patient undergoing HD can cause exhaustion, especially with a heavy workload and lack of resources. Providing care for patients with chronic diseases, such as ESKD, working in an environment with complex HD machines demanding attention, and coping with the increased expectations of patients is stressful (Kavurmaci et al., 2014). Ibrahim et al. (2019), Kavurmaci et al. (2014), 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 can lead to a depletion in the nurses' physical and emotional resources.

Nursing Needs

Increasing nurses' knowledge and experience with pediatric HD patients is necessary to resolve the challenges in the care of these patients, as well as improve the quality of nursing care provided and prevent burnout (Shahdadi & Rahnama, 2018; Kavurmaci et al., 2014). Acute kidney injury among pediatric HD patients can be very complex, as seen in MIS-C, highlighting the increased need for nursing education to improve patient and family outcomes. Keeping nurses updated on new information and procedures relating to HD will aid their ability to adapt to change, thus ensuring best practice and, ultimately, enhanced patient and family outcomes (Shahdadi & Rahnama, 2018). Emphasis needs to be placed on the importance of continuous training based on ongoing needs assessments, where gaps in nursing knowledge and skills for those caring for children undergoing HD are identified (Ibrahim et al., 2019).

SECTION FOUR: VASCULAR ACCESS

Good vascular access is one of the most important factors for successful HD. The three forms of vascular access in children are subcutaneously tunneled central venous catheter (CVC; used when temporary access is needed), arteriovenous fistulas (preferred for chronic access if feasible), and synthetic arteriovenous grafts (used when other access[es] have failed; Shroff, 2024).

Central Venous Catheter (CVC)

The CVC represents the sole initial vascular access for HD in small children (Cho, 2020). It is typically used in children when HD access is required for a short time (e.g. child awaiting living donor kidney transplantation; Shroff, 2024). Central venous catheter infection rates are high among the pediatric HD population (Chand et al., 2009; O'Grady et al.,

2017; Paglialonga et al., 2016). For incident patients with an unplanned dialysis initiation and who desire HD, a CVC will be necessary irrespective of age, body habitus, venous anatomy, or comorbidities (Lok et al., 2020).

CVC Insertion and Locations/Sizes

The National Kidney Foundation/Kidney Disease Outcome Quality Initiative guidelines by Lok et al. (2020) recommend that the order of CVC placement be sequential: right internal jugular vein, right external jugular vein, left internal and external jugular veins, subclavian veins, femoral veins, or trans lumbar access to the inferior vena cava. This order is based on complication rates from lowest to highest. Central venous catheters are most commonly placed in the internal jugular vein and tunneled superficially to exit on the upper anterior chest. The catheter tip should be located at the junction of the superior vena cava and right atrium, or in the right atrium, to provide adequate blood flow for dialysis. In a small child, positioning of a CVC can be difficult due to their size and is best undertaken using ultrasound guidance by a skilled operator. In neonates, the femoral vein can be used as temporary access, but this should be avoided, as damage to the inferior vena cava may cause future kidney transplantation more difficult (Shroff, 2024).

Catheter sizes range from 6.5- to14-French and are chosen according to the vessel size based on the weight of the child. In small children (weighing between 5–10 kg), the distance between the arterial and venous ends of the catheter in double-lumen catheters may be too far apart to allow for successful positioning in both lumens. In this case, split catheters (two catheters of equal length joined proximally, but separated distally), or the use of two separate single-lumen catheter systems (inserted in the same vein with different exit sites or in different veins altogether) can be used (Rees, 2021). In infants weighing less than 5 kg, single lumen catheters may be more appropriate, because a larger catheter can be inserted. To obtain two directional flows with a single lumen line, single needle HD without an expansion chamber is used (Shroff, 2024).

Infection

The most common reason for cuffed CVC removal is infection, which can range from exit site infection to tunnel infection to bacteremia (Miller et al., 2016). The United States Renal Data System (2020) indicated that of 332,442 incidents involving patients receiving HD with a CVC, the cumulative annual incidence of infection-related hospitalization was 26% for children and 31% for adults. The annual mortality rate secondary to sepsis was 100- to 300-fold higher in patients receiving HD than the general population.

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). Comparing adults and children, rates of CRBSI in patients in pediatric ICUs are higher than those in patients in adult ICUs (Paglialonga et al. 2004). Infection causes subsequent vessel damage and stenosis (Shroff, 2024). The Public Health Agency of Canada (2020) reported the number of CRBSIs that occurred in 40 Canadian hospitals between 2008–2018: Pediatric ICUs reported a higher infection rate at 1,450 CRBSIs compared to adult ICUs at 1,331. Therefore, 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).

Infection Prevention

The CVC can be colonized with organisms by either of two main routes. The first route is the 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 the extraluminal colonization that originates from the skin at the insertion site and migrates along the external surface of the line.

Intraluminal: Antimicrobial Locks. Catheter lock is a technique by which an antimicrobial solution is used to fill a catheter lumen and then allowed to dwell for some time while the catheter is idle (i.e., not in use; O'Grady et al., 2011). 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. Antimicrobial lock solutions may include taurolidine, 30% citrate, or ethanol. Nephrologists may also choose to lock the catheter with antibiotic solutions, such as gentamycin or vancomycin, if the patient is at very high risk for CVC infection. However, antibiotic locks may create antibiotic resistance; therefore, antimicrobial locks are suggested first (Lok et al., 2020).

Extraluminal: CVC Site Maintenance. External CVC site maintenance includes dressing changes and physical examination of the CVC exit site. Strict catheter management using a rigorous protocol of handwashing and sterile technique by staff decreases the risk of infection (Shroff, 2024). Both 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 include swelling, erythema, fluctuance, and tenderness over the CVC tunnel, central or proximal to the cuff. If there is a suspected exit-site infection, dressing changes should be completed at every HD session with topical antibiotic ointment for two weeks or until symptoms resolve.

Arteriovenous Fistula (AVF)

AVF is the preferred vascular access for chronic HD as fistulas are the most reliable long-term HD access; they are also associated with a lower mortality rate and fewer complications when compared to CVCs. The patency rate of AVFs compared to CVCs is significant as over two-thirds of AVFs remain functional after five years compared to 30%–85% in one year for CVCs (Lok et al., 2020). Nevertheless, there

are challenges to using AVFs at the time of HD initiation. Early planning of the AVF is required, as it takes several weeks to mature and will not be ready for use immediately. Creating an AVF in small children (weighing less than 15 kg) is technically difficult, often requiring the use of microsurgical techniques that cannot be performed in many hospitals. Patient preparation is also required for needling of the access.

Arteriovenous fistulas, typically, are constructed with an end-to-side, vein-to-artery anastomosis. The preferred site is anastomosis of the radial artery and cephalic vein (radiocephalic), so that the vessels further up the arm are available in the event of AVF failure. In smaller children, anastomosis of the brachial artery and cephalic vein may be a better option due to size constraints (Shroff, 2024).

SECTION FIVE: 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 (Rees, 2021).

Fluid Assessment

There are vast differences in the assessment of fluid removal between pediatric and adult populations (Fischbach et al., 2005; Rees 2021; Souza et al., 2008). Children tolerate significantly less percentage of body weight removal in one session compared to an adult (5% in children versus 15% in adults). Target or dry weight assessment in children and adolescents is particularly challenging, as it needs frequent adjustment in line with growth or periods of illness.

Dry Weight

Dry weight is the ideal body weight of a patient without any excessive fluid (Nemec, 2021). The amount of fluid removal per session is dependent on the difference between the pre-dialytic weight and the dry weight of the patient, and whether the child has residual kidney function (Shroff, 2024). It is difficult to determine the dry weight in pediatric patients due to changes in body composition with age, catabolic malnourished state, failure to thrive, as well as the child's oliguric, anuric, or polyuric status. Because of growth, estimation of dry weight requires ongoing assessment with monitoring frequency dependent on age. For example, an infant should gain 200 grams per week; therefore, assessment is needed every week, whereas a school-age child will have an assessment once per month. Dry weight is also assessed every two weeks for children with nourishment issues and if they have hypotension/cramping on HD or at home. For children in critical care, it is important to determine with the parents what their last weight was before their illness (Nemec, 2021).

Attainment of dry weight can be challenging, especially for infants who are maintained on a liquid diet and children who have difficulty adhering to interdialytic fluid restriction. In these patients, high interdialytic weight gains due to excess fluid retention require large ultrafiltration (UF) volumes during each HD, resulting in symptomatic hypovolemia. As a result, more frequent HD sessions may be needed. At the end of each HD session, the child should be at their target or dry weight. Dry weight can only be determined by careful but persistent fluid removal to achieve normal blood pressure for age after HD. The child who is always hypertensive is likely to be above their dry weight, and antihypertensive medications are usually unnecessary when optimum weight is achieved (Shroff, 2024).

Ultrafiltration

The amount of UF (fluid removal) that a child can tolerate losing per hour varies, but a generally safe starting point is approximately 10 mL/kg per hour. Removal of more than five percent of body weight in one session, or 0.2 mL/kg per minute (12 mL/kg per hour), is very likely to result in symptomatic hypovolemia leading to intradialytic hypotension. In children who weigh more than 40 kg, typically 600 mL/hour can be removed without significant symptoms in patients who are consistently volume overloaded (Rees, 2020; Shroff, 2024). In some cases, children with adequate residual kidney function and adequate urine volume will not need fluid removal during HD (Shroff, 2024).

As an example, maximum UF standards for the SickKids Hemodialysis Program in Toronto, Ontario include:

- In a two-hour treatment, a maximum of 4% of the patient's weight may be removed in fluid.
- In a three-hour treatment, a maximum of 6% of the patient's weight may be removed in fluid.
- In a four-hour treatment, a maximum of 7% of the patient's weight may be removed in fluid.

These UF standards may change based on the nephrologist's discretion and patient status. For example, a patient weighing 12 kg is to have a four-hour treatment; therefore, the maximum UF will be 12 kg multiplied by 7%=0.84 L=840 mL (Nemec, 2021).

Dialysis Prescription

There are significant differences between the pediatric 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 adult and children. For each patient, a nephrologist develops an individual dialysis prescription to ensure adequate solute clearance and the removal of excess fluid (Rees, 2021).

Dialyzer

The type of dialyzer used depends on the patient's residual renal function (Ashby et al., 2019; Cho, 2020; Rees, 2021; Fischbach et al., 2005). The dialyzer acts as the artificial kidney, removing fluid and solutes or toxins through convection and diffusion. The type of dialyzer generally used in children is a hollow fiber design that minimizes blood volume and provides reliable and predictable solute clearance and UF coefficients (Shroff, 2024). 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 in which solutes are removed at a high rate. If the patient has a little residual kidney function, a high-flux membrane is recommended, as

they improve permeability for middle and larger molecules. For pediatric patients, the size of the dialyzer is much smaller compared to adults, as the surface area is similar to that of the patient's body and is selected according to the patient's size (Cho, 2020; Souza et al., 2008). The surface area should be as large as possible to optimize clearances, but should not exceed that of the child's body surface. At present, most centres have dialyzers with surface areas ranging from 0.25m^2 up to 1.7m^2 and above (Shroff, 2024). Table 5 lists the dialyzer size and priming volume specifications.

Table 5

Dialyzer Sizes and Priming Volume

Dialyzer	Priming Volume (mL)	Surface Area (m2)	kUF† (mL/hr/ mmHg TMP)	Material
FX 40	32	0.6	20	Helixone (polysulfone)
FX 50	53	1.0	33	Helixone (polysulfone)
FX 60	74	1.4	46	Helixone (polysulfone)
FX 600	97	1.5	52	Helixone (polysulfone)
FX 800	118	1.8	63	Helixone (polysulfone)
FX 1000	138	2.2	75	Helixone (polysulfone)

Note. Adapted from Nemec (2021).
†kUF refers to hydraulic permeability or ultrafiltration coefficient. It is reported by the dialyzer manufacturer as a single value that drives and limits fluid removal. The higher the kUF, the higher the solute and fluid removal (Ficheux et al., 2011).

Tubing

The extracorporeal circuit includes the arterial (inflow) and venous (outflow) lines (tubing), and the dialyzer. The selection of tubing for the pediatric patient is dependent on the priming volume. The tubing used for pediatric HD patients is much smaller than that used for adult patients—it contains between 100–200 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 percent of their total blood volume (TBV) in the circuit, 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, 2021; Souza et al., 2008). Tubing available for pediatric patients varies between 20–70 mL with internal diameters from 1.5 mL to 3 mL (Souza et al., 2008). Commercially available tubing that varies in volume should be matched to the size of the patient based on the upper safe limit of extracorporeal blood volume.

In some infants, even the smallest circuit may exceed the safe limit of extracorporeal volume. In this setting, the circuit must be primed with donated blood. However, this increases the risk of human leukocyte antigen sensitization, with its consequent difficulties for transplantation and one reason for choosing PD for infants over HD. If the lines are primed with donated blood, the blood is not given back to the infant at the end of HD unless a transfusion is required, because this would be the equivalent of giving additional blood equal to the volume of the tubing to the child (Shroff, 2024).

Total Blood Volume

A child can tolerate up to a maximum of ten percent of their TBV in the extracorporeal circuit (dialyzer and tubing), and a safe volume of the circuit is targeted at 8% of TBV of the child (Rees, 2021). To determine the TBV that you can remove from a child, you can do the following calculation as used by SickKids:

- Zero to one month: weight (kg) multiplied by 100 mL/kg = TBV (mL)
- One month to 16 years: weight (kg) multiplied by 80 mL/kg = TBV (mL)
- Greater than 16 years: weight (kg) multiplied by 70 mL/kg = TBV (mL).

Calculation should also account for the dialyzer and tubing priming volume (e.g., tubing=108 mL and dialyzer=32 mL), which is added to the total, as shown in the following example involving a two-year-old weighing 12 kg:

- multiply weight (12 kg) by TBV determined by weight (80 mL) = 960 mL
- remove ten percent of the TBV = 96 mL
- calculate priming volume: 108 mL (tubing) plus 32 mL (dialyzer) = 139 mL
- combine TBV (96 mL) and priming volume (139 mL) to calculate a total of 235 mL TBV that can be removed from the child safely (Nemec, 2021).

Blood Flow and Clearance

The speed at which the blood is pumped out of the child and around the circuit is an important determinant of solute clearance (Rees, 2021). Clearance of the blood is known as the removal of urea from the blood in mL/min (Nemec, 2021).

Speed. The speed at which the blood is pumped out of the child and around the circuit is an important determinant of solute clearance (Shroff, 2024). Blood flow speed has to be adjusted to the size of the child and should not exceed their maximum extracorporeal volume in mL/min (i.e., up to body weight multiplied by 8 mL/min) to maintain their cardiovascular status safely and prevent dialysis disequilibrium (Rees, 2021). In acutely ill patients with AKI, the risks of a higher blood flow and increased clearance must be weighed against instability of the patient's hemodynamic status and their ability to tolerate a higher blood flow rate (Muff-Luett & Devarajan, 2024). A blood flow rate of 150–200 mL/min or 3–7 mL/minis recommended. This flow is much smaller than that of an adult, which is typically 300–400mL/min (Rees, 2021).

Session Duration

For children, the session duration is similar to that of an adult as it is dependent on the predetermined amount and rate of solute clearance and fluid removal (Ashby et al., 2019; Fischbach et al., 2005; Rees, 2021; Souza et al., 2008). Sessions typically range from three to four hours, rarely being shorter than four hours, three times per week. For most infants and children weighing less than ten kilograms, the need for more than three sessions a week may be required, as their diet consists of fluid (milk), hence four to five 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.

Solute clearance is greater with increasing dialysis time, and data have suggested that in children, the longer the dialysis time, the better the outcomes. This results in better phosphate and blood pressure control, improved appetite and growth, and improved quality of life. Schedules for intensified dialysis sessions include intermittent sessions a week with longer dialysis time, including a nocturnal schedule (ranging from six hours to overnight), more frequent short daytime sessions (two to three hours, five to seven times per week), or daily nocturnal (Shroff, 2024).

Dialysate Flow and Temperature

The standard prescription for the dialysate is at 36.5° C and can go as low as 36°C. The temperature can be lowered to help with vasoconstriction of the vessels, thus helping to reduce hypotension. The temperature should also not be too high to prevent hemolysis (Nemec, 2021). The dialysate flow is also important in determining clearance, but to a lesser extent than blood flow. The dialysate flow should be set at a rate of at least 1.5 to 2 times the blood flow rate to maximize bidirectional flow between the blood and dialysate (Muff-Luett & Devarajan, 2024). Dialysate flow can go as low as 300 mL/min and as high as 800 mL/min. The nephrologist will order the flow based on the patient's needs.

Medications

Heparinization of the Circuit. To prevent clotting in the extracorporeal circuit, it is important to use anticoagulation. Losing the circuit due to clotting can be detrimental to pediatric patients, as it can cause hypovolemic shock due to their already low blood volumes (Rees, 2021). Heparin can be infused slowly and continuously throughout the session to prevent clotting within the circuit. It is administered at a rate of five to 50 units/kg/hr through the arterial side of the circuit. Some units use low molecular weight heparin as a bolus at the beginning of the HD session (Shroff, 2024):

- patients weighing less than 25 kg use 100 units/mL
- patients weighing more than 26 kg use 1,000 units/mL.

The dosage is 15–20 units/kg bolus and hourly dose. For example, a patient weighing 12 kg would use 100 units/mL. To calculate the dosage, multiply 12 kg by 20 units—therefore, the patient would receive 240 units/bolus and 240 units/hour. The total heparin in the syringe would be 1,100 units or 11 mL (Nemec, 2021).

Heparin may be contraindicated during HD if the patient is experiencing active bleeding. During short HD sessions, treatments can be successful with no anticoagulation or with the administration of frequent saline flushes into the circuit (Muff-Luett & Devarajan, 2024).

Potassium. Potassium is a main component of the dialysate wherein serum potassium balance is achieved through supplementation in hypokalemia or removal in hyperkalemia (Rees, 2021). The amount of potassium the patient requires is dependent on the patient's serum potassium according to the nephrologist's order. The following is used as a guideline as per SickKids in Toronto, Ontario:

- serum potassium 5.0 and greater: use 0 K bath (serum potassium greater than 5.5 requires cardiac monitoring);
- serum potassium 4.0 to 4.9: use 1 K bath;
- serum potassium 3.5 to 3.9: use 2 K bath;
- serum potassium 2.0 to 3.4: use 3 K bath; and
- serum potassium less than 2.0: use 4 K bath (Nemec, 2021).

SECTION SIX: MACHINE SET-UP

Priming

Machine set-up and priming for a pediatric patient are very similar to that of an adult with a few differences for consideration:

- The dialyzer and tubing size are smaller. Supplies are located in a dedicated area in the storage room of the dialysis unit and/or pediatric ICU.
- The nephrologist's orders and patient weight should be considered when calculating heparin dosages for set-up during priming.
- A pediatric blood pressure cuff is required.

Pediatric Software

Some machines will have a pediatric software option. This software has pre-programmed alarm limits specific to pediatrics such as priming volumes of the tubing and dialyzer, heparin dosing, and blood pressure limits. The screen will look a little different than the adult software, but the programming will be similar.

Adult Versus Pediatric Machine Set-Up

The differences between adult and pediatric machine set-up are significant and include the dialyzer, tubing priming volume, pump speed, dialysate flow, and anticoagulation as depicted in Table 6.

CONCLUSION

The module addressed areas specific to pediatric HD including the psychosocial and physical components of treating a pediatric patient, common nephrological conditions among the pediatric population, the child's experience of HD, vascular access, and nursing assessment of the pediatric HD patient. Although an extensive literature review and environment scan were completed, there remain gaps in the literature about subject areas specific to pediatric HD that require further research. Nephrology RNs are encouraged to do their own research to identify and close any knowledge gaps—the information provided in the module provides a knowledge base to build upon for any nephrology RN who is performing HD on a pediatric patient. This knowledge is also valuable in the care of adult individuals receiving hemodialysis, as children with kidney disease eventually become adults and transition into adult care.

Table 6

Differences Between Adult and Pediatric Machine Set-Up

	Adult	Pediatric
Dialyzer	• Large membrane and priming volume greater than 100 mL • Typically high-flux	• Small membrane and priming volume less than 100 mL • Typically low-flux
Tubing priming volume	100–200 mL	20–100 mL
Pump Speed (QB)	• Limited restrictions based on patient status • 200–400 mL/min	• Typically restricted to 30–200 mL/min based on patient status
Dialysate Flow (QD)	500–800 mL/min	200–500 mL/min
Anticoagulation	25–75 units/kg	15–20 units/kg

Note. Adapted from Ashby et al. (2019), Cho (2020), Rees (2021), Fischbach et al. (2005), and Nemec (2021).

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CONTINUING EDUCATION STUDY QUESTIONS **CONTACT HOUR: 2.0 HRS**

Pediatric Hemodialysis: An Education Module for Registered Nurses

Brittany Woodman

SCENARIO ONE

It's 3:00 a.m. and your phone rings. The nephrologist is on the line about a patient in the pediatric intensive care unit (PICU) who requires emergency hemodialysis (HD) following ingestion of a medication. You arrive at the PICU and receive a report from the nurse. It is as follows: The patient is a five-year-old female with acute kidney injury (AKI) secondary to the ingestion of a high dose of aspirin. The aspirin was ingested approximately eight hours ago. The child's symptoms began with vomiting and diarrhea, confusion, and difficulty breathing. Symptoms then progressed to seizures, hypotension, and tachycardia. She is ventilated and sedated. She requires HD to remove the medication quickly and avoid multi-organ failure.

Current vital signs: blood pressure 85/45, pulse 155 bpm, oral temperature 36.9°C, respiration rate 16. The patient weighs 20 kg.

Current bloodwork: potassium 3.0 mmol/L, hemoglobin 1.58 mmol/L (105g/L), creatinine 512 mmol/L, BUN 9.4 mmol/L

HD orders include:

- 4-hour HD
- FX 600 dialyzer
- No ultrafiltration (UF, fluid removal)
- Heparin 1,000 units per hour
- Heparin 1,000-unit bolus
- QD 500 (dialysate flow)
- QB 200 (blood flow)
- Temperature 36.5°C
- Sodium 138 mmol/L
- Potassium 2.0 mmol/L, Calcium 1.25 mmol/L

Knowledge Check

1. After reviewing the orders along with the bloodwork and nurse's report, what orders would you need to clarify with the nephrologist?
   a) Temperature of 36.5° C and calcium 1.25 mmol/L
   b) Heparin dosage of 1,000-unit bolus and 10,000 units per hour and potassium of 2.0 mmol/L
   c) Blood flow of 200 and dialysate flow of 500
   d) Dialyzer FX 600 and treatment time 4 hours
2. Why would you need to clarify the order?
   a) The temperature and calcium are too high
   b) The heparin dosing is too high and potassium too low
   c) Blood flow and dialysate flow are too high
   d) Dialyzer is not indicated for pediatric patients and treatment time is too low
3. What are three components of the machine set-up that you ensure are specific to a pediatric patient versus an adult?
   a) Dialyzer, tubing, blood pressure cuff size
   b) Acid bath, bicarbonate, sodium
   c) Temperature, UF profiling, treatment time
   d) Calcium, sodium, temperature
4. After one hour of treatment, the patient's oxygen requirements have increased, and the chest x-ray shows pulmonary edema. You call the nephrologist who orders one liter (1,000 ml) fluid removal. According to your maximum UF calculation, is this fluid removal safe?
   a) No, it is not safe as it is greater than 4% of the patient's body weight or 800 mL.
   b) Yes, it is safe as it is less than 7% of the patient's body weight or 1,400 mL.
   c) No, it is not safe as it is greater than 10% of the patient's body weight or 2,000 mL.
   d) Yes, it is safe as it is less than 10% of the patient's body weight or 2,000 mL.

SCENARIO TWO

You are working in the dialysis unit and receive a call from the nephrologist. There is a child in the PICU who had exposure to COVID-19 eight days ago and is presenting with symptoms of multisystem inflammatory syndrome in children (MIS-C). Due to the current snowstorm, he is unable to be transferred to Toronto. His condition is worsening, and he is requiring HD for life-sustaining treatment. The patient is transferred to the PICU. The child is 10 years old and presented to emergency eight days ago with symptoms including fever for six days, abdominal pain and vomiting, rash on both legs, conjunctivitis, lethargy, and confusion. He swabbed positive for COVID-19. His condition has worsened since this morning, and he is presently in shock including respiratory failure and AKI. He is intubated, ventilated, sedated, and in a prone position to improve oxygenation. His chest x-ray shows bilateral pleural effusions and there is 3+ pitting edema to bilateral extremities.

Current vital signs: blood pressure 110/62, pulse 90 beats per minute, respiration rate 26, temperature 37.2 °C. Weight is 33 kg.

Current bloodwork: potassium 5.0 mmo/L, BUN 10.4 mmol/L, creatinine 550 mmol/L, calcium 1.70 mmol/L, hemoglobin 1.80 mmol/L (119g/L).

HD orders include:

- 4-hour HD
- FX 800 dialyzer
- 2L UF
- Heparin 500 bolus
- Heparin 500 infusion per hour
- QD 300 (dialysate flow)
- QB 300 (blood flow)
- Temperature 35.5°C
- Sodium 140 mmol/L
- Potassium 4.0 mmol/L
- Calcium 1.25 mmol/L

Knowledge Check

5. Your assessment of fluid removal involves calculating the maximum UF the patient can tolerate. Based on your calculation, is the nephrologist's order safe?
   a) No, the fluid removal is greater than the 5% maximum UF for the patient's weight or 1,650 mL.
   b) Yes, the fluid removal is less than the 7% maximum UF for the patient's weight or 2,300 mL.
   c) Yes, the fluid removal is less than the 10% maximum UF for the patient's weight or 3,300 mL.
   d) No, the fluid removal is greater than the 4% maximum UF for the patient's weight or 1,300 mL.

6. How much total blood volume (mL) can be removed from the patient safely based on the total blood volume calculation? The tubing priming volume is 107 ml and the dialyzer 118 ml.
   a) 518 mL
   b) 489 mL
   c) 385 mL
   d) 400 mL

7. After reviewing the orders and bloodwork, what would you clarify with the nephrologist?
   a) Calcium and fluid removal
   b) Temperature
   c) Heparin dosage
   d) Blood flow (QB) and potassium

8. Why would you need to clarify the order?
   a) The calcium and fluid removal are too high.
   b) The blood flow and calcium are high.
   c) The heparin dosage is high.
   d) The blood flow and potassium are too high.

9. The patient's family is very upset and want to know what is happening during the dialysis. How would you respond?
   a) Explain what dialysis is and tell the family that the child is very sick, and you are not sure what the outcome will be
   b) Provide information, support, understanding, and therapeutic counselling to the family throughout the HD process
   c) Provide information but tell them that they need to speak to the nephrologist again

SCENARIO THREE

An 8-year-old chronic HD patient arrives for their scheduled treatment. The patient's mother states the patient has been scratching at the dressing on his CVC for the last two days and the patient states it is itchy. The patient's mother also states the patient persistently removes his dressing while at home and has had difficulty ensuring the dressing is covering the CVC. Before you connect the patient to the machine for treatment, you assess the patient's CVC and notice the following: erythema, swelling, tenderness, and purulent drainage around the CVC exit site. You also look in the patient's chart and realize that the patient has had four CVC infections within the last eight months that have been treated with IV antibiotics.

Knowledge Check

10. Based on the signs and symptoms the patient is experiencing, what type of infection is occurring at the CVC?
    a) Tunneled infection
    b) Blood stream infection
    c) Exit-site infection
    d) Staph-aureus infection

11. As a nurse, what intervention would you immediately put into place to treat the suspected infection?
    a) No intervention
    b) Begin dressing changes every HD session with application of topical antibiotic ointment to the exit-site for two weeks or until symptoms resolve
    c) Tell the patient to stop scratching the exit site immediately
    d) Immediately cover the exit site with a foam dressing

12. When speaking to the nephrologist, they order IV antibiotics. What suggestions for CVC infection prevention would you make based on the patient's risk for infection?
    a) Suggest no dressing as the patient continues to remove it at home and the patient is low risk for infection
    b) Suggest intralumenal antimicrobial locks as the patient is high risk for infection
    c) Suggest no change in the current treatment plan as the patient is low risk for infection
    d) Suggest prophylactic antibiotics as the patient is high risk for infection

CONTINUING EDUCATION STUDY ANSWER FORM

CE: 2.0 HRS CONTINUING EDUCATION

Pediatric Hemodialysis: An Education Module for Registered Nurses

Brittany Woodman

Volume 34, Number 4

Post-test instructions

CANNT members:

This quiz is complimentary to CANNT members. Complete this test on your Course Dashboard on the CANNT website **https://cannt-acitn.ca/course-dashboard/**. You must be logged in to access. Please contact **info@cannt-acitn.ca** if you have issues accessing your Course Dashboard.

Non-Members:

- Select the best answer and circle the appropriate letter on the answer grid below
- Complete the evaluation
- Send a copy of the answer form by email only to info@cannt-acitn.ca
- Post-tests must be emailed by September 30, 2025.
- You will receive a credit card invoice for $15.00 + HST.
- If you receive a passing score of 80% or better, a certificate for 2.0 contact hours will be awarded by CANNT.
- Please allow six to eight weeks for processing. You may submit multiple answer forms in one email and will be invoiced for each; however, you may not receive all certificates at one time.

POST-TEST ANSWER GRID

Please circle your answer choice:

1.	a	b	c	d
2.	a	b	c	d
3.	a	b	c	d
4.	a	b	c	d
5.	a	b	c	d
6.	a	b	c	d
7.	a	b	c	d
8.	a	b	c	d
9.	a	b	c	
10.	a	b	c	d
11.	a	b	c	d
12.	a	b	c	d

EVALUATION

	Strongly disagree				Strongly agree
1. The offering met the stated objectives.	1	2	3	4	5
2. The content was related to the objectives.	1	2	3	4	5
3. This study format was effective for the content.	1	2	3	4	5
4. Minutes required to read and complete:	50	75	100	125	150

Comments: _____

_____

_____

_____

COMPLETE THE FOLLOWING:

Name: _____

Address: _____

_____

CANNT member? ❑ Yes ❑ No

CANNT Award Winners

2024 CANNT AWARD OF EXCELLENCE, EDUCATION

Billie Adele Hilborn, PhD, MHSc (Bioethics), RN (Retired), CNeph(C)

Billie Hilborn has been a registered nurse in Ontario since graduating with her diploma in 1970. Her early nursing career included work in various settings, primarily acute adult hospital units, with some time spent in long-term care and research. Her career in nephrology began in 1999 when she joined the hemodialysis nursing staff of a large urban regional nephrology program. After returning to school to earn a BScN followed by an MHSc in Bioethics, and earning her CNeph(C), she became the clinical educator, and held that position until her retirement in 2018 at the age of 69. Her certification has been maintained since 2003, and she has participated in several sessions of the examination preparation. She has been a member of CANNT for several years and enjoyed her term as Vice-President for Ontario. As a member of the inaugural class of PhD in Nursing at York University, she successfully defended her dissertation on "Patient-Centred Hemodialysis Nursing Care" on May 6, 2024, the first day of National Nursing Week.

2024 *CANNT JOURNAL* AWARD

A look within: Program-level barriers and strategies to growing home dialysis programs in Canada: A literature review

(*CANNT Journal*, 2024, *34*[1], 10–17)
Shawna Khan, MN, RN
Clinical Services Manager, Critical Care Program
William Osler Health System, Etobicoke General Hospital
(Etobicoke, Ontario)

Shawnna Khan is a nurse leader with over 15 years of experience in clinical practice, education, and healthcare leadership. She currently serves as a Clinical Services Manager for Critical Care Services at William Osler Health System and was previously the Assistant Clinical Services Manager for the Hemodialysis program. Shawnna holds a Master of Nursing with a leadership focus and is certified in Lean Six Sigma Green Belt. She has a diverse background in critical care, organ and tissue donation, nephrology, and quality improvement, and has led numerous initiatives aimed at improving patient outcomes and healthcare processes. Shawnna has a particular interest is ultrasound-guided cannulation and home dialysis modalities.

CANNT 2024 – Capitalizing on Excellence: Transforming Nephrology Care

This year's conference was from October 24–26, hosted in Ottawa, Ontario, and promised the opportunity to reconnect, learn, share ideas, and socialize together.

Abstracts

Some of the key strategic goals of CANNT are to disseminate educational materials to CANNT members, profile scientific research, and provide opportunities for nephrology colleagues to network. CANNT's national conference provides an excellent venue for accomplishing these goals of CANNT. However, only a portion of CANNT members is able to attend the national conference annually. Cognizant of this, CANNT is pleased to be printing the abstracts presented at this year's annual conference in this issue of the *CANNT Journal*. The following abstracts celebrated the diversity of nephrology topics being investigated and discussed across Canada.

Please contact **cannt@cannt.ca** to receive information on how to connect the authors about their work.

Oral Presentations

1. HOW CSA STANDARDS CAN SUPPORT RENAL PROVIDERS

Taimur Qasim, [a] **PMP**
Jason Maahs [b]

[a] CSA Group, Etobicoke, Ontario
[b] Baxter, Toronto, Ontario

Background: There has been an increase in planning, design, and construction of dialysis centers across Canada to address aging infrastructure and the demand for dialysis services. CSA Group has several standards on various aspects of a renal program that can be used as tools to support safe and efficient patient care.

Purpose of the Project: The purpose of this presentation is to inform the audience about the topics covered by CSA standards, how they can support the daily activities of a renal program, and the latest changes in the new editions of related CSA standards.

Description: The presentation will cover details about what the latest CSA standards are, which topics they cover, and how the updates address the latest industry trends and needs for patient care. The presentation will include real-life examples about how standards can be implemented by a dialysis program and the resulting benefits of doing so. The presentation will also cover the updated guidance in CSA Z8000 about the planning, design, and construction of dialysis centers including outpatient, inpatient, and peritoneal dialysis. Finally, information about how to engage with CSA standard development will be included with links to resources.

Evaluation/Outcomes: The primary outcome of this presentation will be an improved understanding of CSA dialysis standards, the information contained in them, and where to find them.

Implications for Nephrology Practice/Education: The implications of this presentation for nephrology practice/education are an improved understanding of which standards exist and how they can support renal providers. Additionally, audience members will have a better understanding of how to engage with CSA standards development and potentially contribute to upcoming standard development projects.

2. PRIORITIZING THE EDUCATION AND TRAINING NEEDS OF HEMODIALYSIS NURSES: A MIXED METHODS STUDY

Jacqueline Crandall, [a,b,c,d] **PhD, RN(EC), CNeph(C)**
Jose Nino Villamater, [a,b] **MN, RN**
Lori Harwood, [a,b] **PhD, RN(EC), CNeph(C)**
Paula Gaspar, [a,b] **MScN, RN**
Barbara Wilson, [a,b] **MScN, RN(EC), CNeph(C)**
Lidia Yanchuk, [a,b] **MN (Student), BScKin, RN**
Julia Petrakis, [a,b] **MN-PHCNP, RN(EC)**

[a] Renal Care Program, London Health Sciences Centre, London, Ontario
[b] Arthur Labatt Family School of Nursing, Western University, London, Ontario
[c] Bloomberg Faculty of Nursing, University of Toronto, Toronto, Ontario
[d] Department of Thanatology, King's University College, London, Ontario

Background: Providing high-quality care to patients receiving hemodialysis requires nurses with specialized knowledge and expertise. However, the demand for qualified nephrology nurses has increased dramatically, and even more so after the impact of COVID-19 and the existing shortage of nurses. To ensure high-quality care and patient outcomes for patients who have kidney disease, both new and seasoned dialysis nurses require continued education that meets their needs.

Purpose: In this mixed method study, we aimed to prioritize the top learning needs for hemodialysis nurses who are working in a large regional renal program in Ontario and to identify the optimal methods of education delivery.

Method: After an extensive process of identifying key hemodialysis competencies in 10 domains, nurses throughout the program were asked to complete an online survey, which rated each of the 81 competencies as to its perceived level of importance and the nurse's current level of ability on a five-point Likert scale ranging from 1 (*very low*) to 5 (*very high*). Top learning priorities were ranked according to Borich's needs assessment model and mapped on the locus of focus model and the importance-performance analysis. Comparisons between the three methods identified top learning priorities. Focus groups are also being conducted asking nurses about the best methods of education delivery.

Results: In total, ninety-three nurses participated in the online survey. The top learning priorities and the best learning methods identified by nurses will be shared within this presentation.

Conclusion: Hemodialysis nurses require continued education to meet their learning needs and to optimize patient care.

Implications for Nephrology Care: The priority learning needs and nurses' perceptions on how best to meet these needs will be compiled into a set of recommendations that will be used to design an integrated and sustainable hemodialysis nursing continuing education program.

3. BREAKING DOWN THE BARRIERS TO HOME HEMODIALYSIS—ADMINISTERING SODIUM THIOSULPHATE IN THE HOME

Andrea Karger, **RN, Home Hemodialysis**

Grand River Hospital, Kitchener, Ontario

Background: In the world of hemodialysis, it is well known that home is best. The ability to tailor your dialysis to both your lifestyle and your goals of care has many benefits. However, only 17% of the patients dialyzing in Ontario participate in a home program. Historically, home dialysis programs have been reserved for the "perfect" patients and many were ineligible for these programs due to perceived excluding barriers. In accordance with the Ontario Renal Network's (ORN) guidelines for safe, equitable, and patient-centered care, Grand River Hospital has put a significant focus on breaking down these barriers and encouraging more patients to participate in a home dialysis therapy.

Purpose of the Project: The purpose of this presentation is to encourage a broader look at who is an appropriate patient for the home programs. This presentation hopes to inspire other programs to also expand their criteria for admission into their home programs. Ultimately, we hope to improve the lives of our patients and ensure that we are offering inclusive care that aligns with the patient's goals for treatment.

Description: In this presentation, we will explain the common barriers that were often faced by patients and describe some of the initiatives that have been put in place to overcome these challenges. We will present a case study on one patient whom we were able to successfully train and launch home with a diagnosis of calciphylaxis. This patient was able to dialyze more frequently at home and also self-administer her own sodium thiosulphate. We will discuss what went well and also some of the challenges that we are still working through.

Evaluation/Outcomes: This patient was able to remain in her home for an additional year of her life before she became unwell. This patient lived a significant distance from the hospital and did not drive. Normally, she would not have been considered a candidate for a home program due to her calciphylaxis. Being able to dialyze in her home, however, provided her with a greater quality of life. It also took some burden off of her family as they no longer needed to drive long distances to the dialysis centre. It was challenging to secure a pump and tubing for the administration of sodium thiosulphate. This pump needed to have hard limits to ensure that the medication was not given too quickly. Grand River hospital fostered a working relationship with our community partners to rent this equipment. There were also concerns about the price of this medication. It took a considerable amount of work and research by our pharmacist to ensure that the patient did not have to pay for this medication.

Implications for Nephrology Practice/Education: At Grand River Hospital, we believe that anyone who wants a home therapy should have the opportunity to try. A strong focus as the future of our renal care will be on a move to home therapies. All patients should be given the opportunity to dialyze at home without barriers and our focus is what we need to do, as health care professionals, to ensure that this happens in a safe and inclusive way.

4. VITAMIN B12 IN CKD—IS IT AS SAFE AS THOUGHT?

Majeedah Belding, **MSC, RD, Dialysis**

Royal Victoria Regional Health Centre, Barrie, Ontario

Background: Patients affected with chronic kidney disease (CKD) experience an increased cardiovascular risk compared to those with normal renal function. High plasma homocysteine (Hcy) levels are a risk factor for mortality and vascular disease in observational studies of patients with CKD and are higher in CKD patients than the general population. Plasma levels of Hcy depend on several factors, such as genetic alteration of methionine metabolism enzymes or deficiency of vitamin B12, vitamin B6, or folic acid. Folate and vitamin B12 supplementation is recommended for people with CKD to reduce mortality and prevent progression of end–stage renal disease (ESRD). However, effective vitamin B12 supplementation dosages are not clearly established. Potential overdosage-related toxicity could result in exacerbation of ESRD in individuals with CKD. One proposed mechanism is that cyanocobalamin supplementation therapy is metabolized to active methylcobalamin, releasing small amounts of cyanide that could accumulate in CKD.

Purpose of the Project: The purpose is to evaluate the impacts of vitamin B12 supplementation on CKD patients. Although the appropriate range of B12 levels in CKD remains to be defined adequately, the author aims to determine best practices based on the consensus from the current evidence available.

Description: A systematic review to find relevant published and unpublished evidence related to safe levels of plasma vitamin B12 levels in patients with CKD providing evidence for best practices.

Evaluation/Outcome: Vitamin B12 supplementation has been shown to lower plasma total Hcy in some studies. However, over several studies, CKD participants with vitamin B12 therapy had an increased reduction in renal function, higher rate of myocardial infarction, stroke, and mortality. Vitamin B12 concentrations greater than 550 pg/mL trended towards higher risk of mortality across all levels of adjustment.

Implications for Nephrology Practice/Education: Vitamin B12 should be included in ongoing assessment in patients with CKD, which may represent a change to current practice.

5. A NEW MODEL TO SUPPORT HOME DIALYSIS PATIENTS WITH ASSISTED PERITONEAL DIALYSIS

Theresa Krepelka,[a] **MN, RN, CNeph(C)**
Brendan McCormick,[a,b] **MD, FRCPC**

[a] The Ottawa Hospital Regional Nephrology Program, Ottawa, Ontario
[b] Division of Nephrology, University of Ottawa, Ottawa, Ontario

Background: In 2018 the Ontario Renal Network (ORN) began allocating funding for community home peritoneal dialysis (PD) assistance directly to eligible regional renal programs rather than flowing funding through Homecare agencies. The Ottawa Hospital (TOH) Home Dialysis Unit (HDU) took this opportunity to revamp delivery of home PD services in the Champlain region.

Purpose of the Project: The objective was to provide assisted PD care to patients in their homes using the TOH's own staff and move to a community-based model of care. Historically, assisted PD care was provided by community agency nurses who were trained by the regional program. It was anticipated that having specialized HDU nurses visiting patients regularly would improve communication, promote timely preventive interventions, improve quality of PD assistance, improve psychosocial support to patients and their families, and allow for continuous training in the home to promote eventual independence.

Description: In June 2018, TOH HDU expanded from 12 to 18 full-time registered nurses and began 35 to 45 daily assisted PD visits. These visits would support cycler set-up, connection, disconnection, and dressing changes, among other PD-related care. In addition, for all 180 prevalent PD patients, every second clinic visit was converted to a virtual visit with the nursing assessment provided in the patient's home.

Evaluation/Outcome: The new model has been a success and, since implementation, the number of patients requiring assistance has fallen, the program's technique failure rate has decreased, and the prevalent number of patients on PD has increased. All patients starting PD at TOH are assured of home assistance if it is required, and the program is no longer dependent on agency community nursing support.

Implications for Nephrology Practice/Education: The TOH model serves as a template for other renal programs who are interested in enhancing community support for their PD patients.

6. USING HIGH-FIDELITY SIMULATION TO TEACH MANAGEMENT OF INTRADIALYTIC EMERGENCIES

Shauna M. Grant, **MN, RN, CCSNE**

Nova Scotia Health Learning Institute for Healthcare Providers, Foundations of Nephrology Nursing Program, Halifax, Nova Scotia

Background: Hemodialysis patients are at risk of experiencing serious, often life-threatening intradialytic complications such as severe hypotension, hemorrhage, anaphylaxis, and cardiac arrest. Management of these high-acuity, low occurrence (HALO) events requires a rapid, coordinated team response. Simulation-based education (SBE) has emerged as a valuable tool for training healthcare providers in managing such events.

Purpose of the Project: This project aimed to create opportunities for novice hemodialysis nurses to learn and practice management of four HALO presentations using high-fidelity simulation, thereby increasing their clinical and team role competence.

Description: As the clinical coordinator of the Nova Scotia Renal Program's orientation process, the writer developed an education day that focused on hemodialysis emergencies. The session consists of practice of micro-skills necessary for the management of intradialytic complications such as management of hypotension, use of air removal kits, establishing team roles, and use of the defibrillator. Following this, the learners participate in three to four simulated cases inclusive of a structured debrief. The scenarios include hypotension, line separation, anaphylaxis, and cardiac arrest. Over the course of one year, 17 novice dialysis nurses participated in these sessions in the simulation lab.

Evaluation/Outcome: Overall, 98% of participants stated they were "satisfied" or "very satisfied" with the experience. Evolving from this project was subsequent in-situ application in four hemodialysis units, with a mixture of both novice and more experienced staff. One satellite unit identified the need to develop a coordinated response to HALO events that enlists staff from other units in the facility, as well as the need to have an AED "live" on their unit.

Implications for Nephrology Practice/Education: This project has the potential to increase individual and team competence in responding to intradialytic HALO events; improve patient outcomes, minimizing psychological impact on dialysis co-patients. Additionally, there are many potential system implications such as optimizing the capacity of small teams in satellite units, which, in turn, can enhance patients' access to treatment that is closer to their homes. Other effects include identifying latent system weaknesses such as access to equipment, unit set-up, and suboptimal facility response.

7. SOCKS OFF! IMPLEMENTING BEST PRACTICES FOR FOOT ASSESSMENT OF IN-CENTER DIALYSIS PATIENTS

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Kim Johnston, **MN, RN**
Shiny Hilariyos, **RN, CNeph(C)**
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Background: Individuals with diabetes and end-stage renal disease (ESRD) are at high risk for developing complications of the lower limb such as ulcers and amputations. Early detection, referral, and treatment of foot ulcers in the hemodialysis patient population will improve quality of life and may consequently lower amputation rates. Preliminary findings from a Registered Nurses of Ontario (RNAO) gap analysis conducted by a renal program at a large community hospital revealed gaps in in-center hemodialysis assessment and management of patients' lower limbs. Furthermore, the RNAO gap analysis conducted revealed an absence of a standard foot care assessment tool that reflects all foot care needs of outpatient hemodialysis patients. It also identified gaps in nursing competency and lack of standardized criteria for referrals to appropriate wound and foot care services.

Purpose of the Project: The purpose of this quality improvement project is to help mitigate gaps in foot care, promote early identification of foot abnormalities, improve the referral process, and enhance patient and nursing education.

Description: To achieve project goal, a strategic approach was utilized. First, nursing competency of foot care and related complications was increased through consultation with wound care experts, educational videos, and educational reference tools. An existing nursing documentation tool was revised into an evidence-based standardized document, which reflects recommendations from the RNAO's "Assessment and Management of Foot Ulcers for People with Diabetes" clinical best practice guideline. This assessment tool was created in collaboration with our multidisciplinary team members including a professional nursing practice leader, clinical nurse specialist and nurse practitioner from the hospital's wound care clinic, clinical nurse educators, hemodialysis nurses (who completed 16 hours of RNAO best practice workshops), and nephrologists. The foot assessment tool includes components to evaluate patient skin conditions, pain, presence of ulcers, nail health, peripheral neuropathy, sensation, peripheral arterial disease, and bone deformity. Second, the use of an improved and more efficient electronic hospital wound clinic referral process was implemented to replace the previous paper-based referral system.

Evaluation/Outcomes: Pre- and post-implementation survey data were collected from 73 nursing staff to investigate the effectiveness of the foot assessment tool.

Pre-implementation, 46% of nursing staff found that the previous foot assessment tool did not consistently lead to early referrals and follow-ups. After the implementation of the foot assessment and electronic referral system, 81% of the nurses reported using this tool increased in the number of referrals. Furthermore, nurses reported having an increased knowledge of early signs and symptoms of foot abnormalities. Greater awareness of patient educational needs and increased utilization of existing patient education tools were reported by 75% of the nurses surveyed. Using electronic referrals improved the quality of communication with hospital wound clinics and increased the efficiency and timeliness of referrals.

Implications for Nephrology Practice/Education: In conclusion, the integration of this foot assessment tool, improved referrals process, and patient and staff education provided, have resulted in positive outcomes. Future strategies to be implemented include: monitoring number of lower limb abnormalities referred, and collecting data regarding amputation rates, patients and nephrologists' perspectives. For sustainability, continuously promoting patient and nurse education as well as ongoing nursing compliance audits will remain imperative.

8. BREAKING THROUGH THE GLASS CEILING—HAVING THAT CONVERSATION: EXPLORING THE EXPERIENCES OF NEPHROLOGY NURSES' PRACTICE IN KIDNEY SUPPORTIVE CARE IN CANADA

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Idevania G. Costa, [a,c] **PhD, RN, NSWOC**
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Background: Kidney supportive care (KSC) improves the quality of life for people receiving dialysis through early identification and treatment of symptoms and vital communication about what is meaningful in life and death through advance care planning (ACP). Despite the crucial role nephrology nurses have in providing quality KSC in dialysis settings, evidence indicates ACP is underused and often initiated too late in this population. This delay or lack of engagement in KSC by the nurses may result in patients receiving care that is incongruent with their values, wishes, or preferences.

Purpose of Study: The study purpose was to construct a substantive grounded theory about the experiences of nephrology nurses' practice in KSC in Canadian dialysis settings.

Methods: Using Charmaz's constructivist grounded theory method, 23 nephrology nurses working in hemodialysis and peritoneal settings from three Canadian provinces were recruited. Participants underwent two intensive semi-structured interviews. Concurrent data collection and comparative data analysis, with memo-writing and researcher reflexivity, were completed to aid the construction of codes, categories, and concepts leading to the theory.

Results: The substantive grounded theory titled "Breaking Through the Glass Ceiling—Having *That* Conversation" involves three stages of engagement (Transactional, Intentional, and Actional) to describe nurses' practice patterns in communicating with patients about their goals of care. This engagement is predicated on a boundary between nurses' professionalism and familiarity with patients, amid the influence of multi-dimensional contextual factors, notably the discomfort with having ACP-related conversations.

Conclusion: Nephrology nurses are essential in goals-of-care conversations and require a systematic training approach to improve their communication skills and level of comfort to discuss KSC with patients and families.

Implications for Nephrology Care: Increased comfort and confidence in nephrology nurses' communication skills should lead to the prioritization of KSC by normalizing ACP conversations as part of routine care in hemodialysis.

9. HEMODIALYSIS NON-ADHERENCE AS PATIENT DECISION-MAKING

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Background: Patient-centred care provides benefits for patients and nurses; however, a gap was noted about this topic in the nephrology nursing literature. Therefore, a study was undertaken to examine whether the philosophical ideals of patient-centred care consistently align with the everyday reality of hemodialysis nursing.

Purpose of Study: The study purpose was to describe the experiences and perspectives of hemodialysis nurses of their provision of patient-centred care.

Methods: A qualitative interpretive description design was used, with purposive sampling of hemodialysis nurses from hospital and satellite hemodialysis units in urban and rural Ontario. Semi-structured interviews were held, and transcripts were inductively analyzed.

Results: Ten RN participants from urban and rural in-centre and satellite hemodialysis units described experiences of providing patient-centred nursing care. One notable patient-related detour that nurses needed to navigate when providing patient-centred hemodialysis care was frequent experiences of patients not adhering to their prescribed treatment regimen, particularly not following fluid restrictions and requesting shortened hemodialysis treatments. The concepts of compliance, adherence, and concordance

were reviewed, and non-adherence was considered from the angle of patient decision-making as they self-managed their chronic illness and treatment burden. Hemodialysis nurses navigated patient non-adherence through a patient-centred approach by listening to them, providing education, respecting their choices, and being flexible.

Conclusions: Patient-centred hemodialysis nursing care can help support patients as they manage their treatment regimen burden. Reconsidering patient non-adherence as decision-making may prevent tension in the patient-nurse therapeutic relationship.

Implications for Nephrology Care: Implications for nephrology nursing education, practice, policy, and future research will be identified.

10. IMPLICATIONS AND EFFICACY OF ALTEPLASE IN MANAGING MALFUNCTIONING CATHETERS IN HEMODIALYSIS: A LITERATURE REVIEW

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Theresa Krepelka, **MN, RN, CNeph(C)**
Cheryl Tuddao, **MAN, RN, CNeph(C)**
Emma Fernando, **MSN, RN, CNeph(C)**
Janet Graham, **MHScN, RN, CNeph(C)**
Dana Foisy, **MHS, RN, CNeph(C)**

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Background: Thrombotic occlusion of central venous catheters (CVCs) poses a common challenge in nephrology practice, leading to complications such as inadequate blood flow and inability to perform dialysis. Among thrombolytic agents, Alteplase has gained prominence for its efficacy in restoring catheter function and improving patient outcomes.

Purpose of the Project: This literature review aims to examine the cumulative efficacy, rapid restoration, and first-dose efficacy of Alteplase in treating occluded catheters. Additionally, it explores the administration protocols, comparative effectiveness of various type of administration, and recommendations from key guidelines such as Kidney Disease Outcomes Quality Initiative (KDOQI). By synthesizing existing evidence, this review seeks to explore the efficacy of Alteplase in hemodialysis.

Description: This review provides an in-depth examination of research, comprising clinical trials, observational cohorts, and guideline suggestions, centering on the effectiveness and safety of Alteplase in treating dysfunctional catheters. It evaluates critical aspects such as efficacy and speed of recovery under different administration methods.

Evaluation/Outcome: Alteplase demonstrates significant efficacy in restoring catheter function, with studies reporting restoration rates ranging from 75% to 83% after one or two doses. Its efficacy in short-term and long-term dwells, and rapid restoration within 30 minutes, have been obsertved. This study is highlighting the potential for timely intervention. Adherence to recommended administration protocols contributes to successful outcomes while minimizing the risk of complications.

Implications for Nephrology Practice/Education: This review underscores the importance of integrating Alteplase into evidence-based practices for managing occluded CVCs in nephrology settings. Healthcare providers can leverage Alteplase's rapid restoration and high efficacy to minimize catheter-related complications and optimize dialysis outcomes. Additionally, education and training programs should emphasize proper Alteplase administration techniques and adherence to guideline recommendations to ensure safe and effective use in clinical practice. Quality improvement initiatives related to Alteplase use should be initiated in the clinical setting as part of evaluation of clinical learnings.

11. PLASTIC CANNULAE AND THE NEW DIALYSIS ACCESS: A SINGLE-CENTRE EXPERIENCE

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Halton Healthcare Regional Nephrology Dialysis Program, Oakville, Ontario

Background: Cannulating a new arteriovenous fistula (AVF) or graft (AVG) is fraught with challenges. New vascular accesses often present with small diameters; the fragile walls may succumb to infiltration with the use of traditional steel needles. Further, in the beginning, patients may sometimes forget to keep the affected arm immobile to prevent such infiltration.

Purpose of the Project: The purpose of the project was to find ways to reduce the number of infiltrations, thereby prolonging the life of vascular accesses.

Description: In 2023, the institutional renal program introduced plastic cannulae to the cannulation protocol for new AVF/AVG. Patients are cannulated with 16-gauge plastic cannulae for six treatments, after which they are cannulated with 15-gauge plastic cannulae for three more treatments. Thereafter, the need for a plastic cannula is evaluated for each vascular access—where possible, patients would transition to cannulation with steel needles. Patients identified as being restless were maintained on plastic cannulae.

Evaluation/Outcomes: Overall, there was a decrease in infiltration events since the new protocol was implemented in October 2023.

Implications for Nephrology Practice/Education: Use of the plastic cannula has mitigated the risk of infiltration in restless patients and those with new vascular accesses. In this single-centre experience, training and mentoring staff on plastic cannula cannulation remains vital to the success of the project.

12. DIABETES MANAGEMENT FOR IN-PATIENTS WHO ARE IN END-STAGE RENAL DISEASE

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Allie Roberts, **RN, CDE**

Diabetes Program /Nephrology/ Renal Transplant, St. Joseph's Healthcare, Hamilton, Ontario

Background: Patients are referred to the Certified Diabetes Educator (CDE) when gaps are noted in their diabetes education such as health teaching, glucose meters, insulin administration, or diabetes management during times of illness. The nephrology team may also refer inpatients for medication management, insulin adjustments, or controlling glucose spikes.

Purpose of the Project: The purpose of the project is to help fill in knowledge gaps staff may have regarding diabetes management in the inpatient nephrology program and to know the reasons for the referral to see the CDE and the services that can be provided.

Description: In the presentation, the role of the CDE and how they assist patients/staff with diabetes management will be discussed. In addition, oral antihyperglycemic agents and other medications available to patients in end-stage renal disease (ESRD) will be reviewed. We will discuss technologies available to assist patients with their diabetes management, such as insulin pumps and continuous glucose monitors. Real-life case studies from the program will be examined to facilitate discussion and learning.

Evaluation/Outcomes: We have utilized a similar presentation to our nephrology nurses, residents, and clinical clerks, and have received feedback about improved knowledge base and comfort with diabetes management.

Implications for Nephrology Practice/Education: Improved glycemic control facilitates quicker discharge home for nephrology inpatients and leads to better health outcomes in the long-term.

13. NURSING KNOWLEDGE IN HEMODIALYSIS AND DEPRESSION CARE: AN INTEGRATIVE REVIEW

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Joanne Olson,[a] **PhD, RN, FAAN**
Sofia B. Ahmed,[b] **MD, MMSc, FRCPC**
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Background: Depression prevalence rates are as high as up to 40% in individuals on hemodialysis (HD). Depression impacts health and medical therapy adherence, and leads to multiple hospital admissions for those on HD, in turn decreasing the overall quality of life (QOL). Nephrology nurses are in an ideal position to play a vital role in addressing depression and can contribute to improved health outcomes and enhanced QOL for individuals on HD. However, nephrology nursing knowledge around depression care is not well studied.

Purpose of Study: The purpose of this review was to explore the knowledge dialysis nurses utilize in the care of HD patients living with depression.

Methods: We conducted an integrative literature review guided by the research question: "What knowledge do dialysis nurses draw upon when caring for individuals with depression and receiving HD?" We performed an exploration of MEDLINE, EMBASE, PsychINFO, CINAHL, Cochrane Central Register of Controlled Trials, and Scopus to identify eligible studies.

Results: Nine studies were included, and we determined that nephrology nurse's knowledge is informed by the nursing process, primarily in assessment and intervention/management, with minimal explicit description of theory in HD and depression care.

Conclusion: There is evidence in the literature to suggest that nephrology nurses are essentially informed by the nursing process, primarily in assessment and intervention/management, with minimal explicit description of theory in HD and depression care. The knowledge derived from this study can be utilized by nephrology nurses to provide for depression care in nephrology settings.

Implications for Nephrology Care: The findings of this study highlight knowledge that informs nephrology nurses in their care of individuals on HD who also experience depression. A holistic nursing approach recognizes the physiological, psychological, spiritual, and cultural dimensions of each individual, and when addressed by nurses may significantly improve the overall QOL of individuals undergoing HD.

14. UNSUSPECTED CAUSE OF ARTERIOVENOUS GRAFT FAILURE—UNDERSTANDING AVG DELAMINATION: RISKS, CAUSES, AND MANAGEMENT

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Division of Nephrology, Unity Health, St. Michael's Hospital, Toronto, Ontario

Background: Arteriovenous graft (AVG) failures occur from various causes, often identified through careful assessment and imaging techniques. Bedside ultrasound, duplex imaging, and interventional radiology are commonly employed to identify the cause of failure. Most causes can be identified by interventional radiology alone; however, there are rare cases such as graft delamination where bedside ultrasound and duplex imaging may be superior in detecting the issue. Moreover, interventions such as angioplasty and thrombectomy performed in interventional radiology may inadvertently worsen unidentified graft delamination. Bedside ultrasound can be utilized by staff hemodialysis nurse or vascular access nurse to aid in vascular access assessment,

and knowledge of atypical causes may help with identification and treatment.

Purpose of the Project: This project aims to educate hemodialysis nurses and vascular access nurses about both common causes and rare cases contributing to AVG failure. Specifically, it seeks to raise awareness about graft delamination to prevent unnecessary procedures that may exacerbate the condition.

Description: The poster presentation will feature a flow chart guide troubleshooting of vascular access issues, notably high venous pressure, increased bleeding, and suspected graft occlusions. It will delineate the most probable cause of AVG failure while also highlighting rare scenarios that merit consideration. The flowchart will cover a list of possible causes of graft failure such as infection, occlusion, stenosis, and delamination. Additionally, there will be images illustrating what to look out for when assessing with ultrasound.

Evaluation/Outcomes: The anticipated outcome is an enhanced ability to discern the primary causes of AVG failure and employ bedside ultrasound to assist in identifying alternative causes such as graft delamination.

Implications for Nephrology Practice/Education: Providing education to hemodialysis nurses and vascular access nurses to consider graft delamination when facing graft complications.

Poster Presentations

1. IDENTIFYING BARRIERS AND MISCONCEPTIONS TO ROUTINE NURSING FOOT CARE ASSESSMENT IN THE HEMODIALYSIS UNIT

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Arti Parpia, **RD**
Charina Villar, **RN**
Nellie Cadaweng, **RN**

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Background: Providing regular foot assessments to patients during dialysis treatment plays a crucial role in the prevention and early detection of diabetic foot ulcers and infections, and lower extremity amputation. Routine foot assessments by nurses are often missed or incomplete.

Purpose of the Study: The purpose of the study is to identify the barriers and misconceptions that prevent completion of routine foot assessments by nurses in a timely manner.

Methods: We conducted a survey with hemodialysis nurses about barriers to completing routine foot care assessments, knowledge regarding benefits of routine foot care, and suggestions for improvement.

Results: Thirty-one nurses completed the survey. The most common reasons for not completing foot care assessments included patient refusal (77.4%), workload constraints (70.9%), time constraints (58.1%), and other team members are already looking at patients' feet (i.e., foot care nurse, chiropodist;38.7%). Only 67.7% of staff correctly answered the foot care knowledge question. Suggestions for improvement included having a dedicated staff for foot care assessments, providing education and case studies to nurses, addressing workload issues, and clarifying orders for foot assessments.

Implications for Nephrology Practice/Education: Patient refusal, time/workload constraints, and role expectation were highlighted as key reasons for incomplete foot care assessments. Strategies to improve foot care assessment compliance include providing educational in-services to staff, emphasizing the importance of foot care assessments to patients, and simplifying documentation and orders. In addition, staffing adjustments will be implemented to improve workload constraints. Foot care audits will be conducted to track foot care assessment completion and evaluate the implementation of strategies for improvement mentioned above.

2. IMPLEMENTATION STRATEGIES FOR EVIDENCED-BASED INTERVENTIONS IN RENAL TRANSPLANTATION CARE: A SCOPING REVIEW PROTOCOL

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Christine Cassidy, **PhD, RN**

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Background: Kidney transplantation is a pivotal time of change and presents numerous challenges for renal transplant recipients (RTRs) and their families as they adapt to life after transplantation. Evidence-based interventions (EBIs) in renal care include treatments and programs that effectively improve RTR outcomes. Implementation strategies can support EBI implementation, adoption, and sustainability into practice.

Purpose of Study: The proposed scoping review will map and synthesize all levels of evidence on implementation strategies used to implement EBIs in RTR care.

Methods: This scoping review will follow the JBI Methodology for scoping reviews. Included sources must discuss implementation strategies to support the implementation of EBIs into inpatient and outpatient RTR care. Databases and grey literature to be searched include CINAHL, EMBASE, PubMed, Google Scholar, and relevant

websites located through Google search. Two independent reviewers will screen titles, abstracts, and full texts, as well as extract data with conflict resolution through discussion and/or a third reviewer. Directed content analysis will guide the coding of implementation strategies to the Expert Recommendations for Implementing Change (ERIC) taxonomy and contextual determinants to the Consolidated Framework for Implementation Research (CFIR). Finally, the ERIC-CFIR matching tool will be employed to understand if the appropriate strategies were selected to address the identified determinants.

Results: Findings will be presented in tabular and visual format, accompanied by text.

Conclusion: The proposed scoping review will be part of a multi-phase doctoral study. The findings will provide insight for healthcare professionals caring for RTRs and guide their selection of implementation strategies to support EBI uptake.

Implications for Nephrology Care: By gaining a better understanding of the current strategies and determinants of EBI uptake in the RTR setting, healthcare professionals can choose the optimal strategies to bridge the formidable evidence-to-practice gap. Findings from this review may be transferable to other areas of renal care.

3. USE OF BEDSIDE ULTRASOUND TECHNOLOGY IN TOH SATELLITE HEMODIALYSIS UNITS

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Background: Bedside point-of-care ultrasound for cannulation has been in practice at The Ottawa Hospital for many years but only available at the main campus sites. Two of our largest outlying satellite units have just acquired a new hand-held version with its use to be implemented in June 2024. In dialysis, adequate function of the vascular access remains a very important outcome measure with significant impact on the patient's long-term health, well-being, and morbidity.

Purpose: We would like to study the patient as well as staff experience around successful cannulation comparing before the use of ultrasound and after. Using bedside ultrasound as an extra "tool," in addition to our base clinical and physical assessment, to evaluate and assess arteriovenous fistulas (AVFs)/grafts (AVGs) to hopefully aid in early detection of any complications or issues such as slow maturation or failure to mature, stenosis, thrombosis, or aneurysm versus pseudoaneurysm.

Description: We will give the patients a small survey to complete before we implement ultrasound and three months after. As well, we will survey the nurses around if they feel it has added to their skills regarding successful cannulation. For staff, having adequate training to use the bedside ultrasound in "real time" for guidance in cannulation of new or difficult/complicated AVFs/AVGs and assessment of potential problems, as well as assessment of vascular access patency, depth, size, direction, and length, will help to optimize the success of cannulation and reduce trauma, thereby leading to reduced patient stress through increasing patient satisfaction, comfort, and confidence.

Evaluation/Outcome: Evaluation will be done post initiation of ultrasound use. Our hope is to find that the use of bedside ultrasound, being an additional non-invasive tool to use, will increase both the patient and staff cannulation experience with the goals of: improving cannulation by reducing cannulation attempts, increasing accuracy of cannulation, and assisting in selecting better sites. In return, use of bedside ultrasound should improve the patients' overall cannulation experience, reduce trauma to the AVF, and therefore reduce cannulation anxiety and stress, and increase patient comfort.

Implications for Nephrology Practice/Education: Developing an education plan/session to adequately train staff on use of bedside ultrasound will improve vascular access-related outcomes. Providing adequate time, support and opportunity to develop the skills of the operator and developing local expertise to optimize the quality of images and overall success of ultrasound use will save not only time in cannulation in the long run but improve AVF/AVG health and maintenance.

4. PRIORITIZING THE EDUCATION AND TRAINING NEEDS OF HEMODIALYSIS NURSES: A MIXED METHODS STUDY

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Jose Nino Villamater, **[a,b] MN, RN**
Lori Harwood, **[a,b] PhD, RN(EC), CNeph(C)**
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Poster presented by Melissa Al-Jaishi, **MLIS, MSN Candidate, RN**

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Background: Providing high-quality care to patients receiving hemodialysis requires nurses with specialized knowledge and expertise. However, the demand for qualified nephrology nurses has increased dramatically, and even more so after the impact of COVID-19 and the existing shortage of nurses. To ensure high-quality care and patient outcomes for patients who have kidney disease, both new and seasoned dialysis nurses require continued education that meets their needs.

Purpose: In this mixed method study, we aimed to prioritize the top learning needs for hemodialysis nurses who are working in a large regional renal program in Ontario and to identify the optimal methods of education delivery.

Method: After an extensive process of identifying key hemodialysis competencies in 10 domains, nurses throughout the program were asked to complete an online survey, which rated each of the 81 competencies as to its perceived level of importance and the nurse's current level of ability on a five-point Likert scale ranging from 1 (*very low*) to 5 (*very high*). Top learning priorities were ranked according to Borich's needs assessment model and mapped on the locus of focus model and the importance-performance analysis. Comparisons between the three methods identified top learning priorities. Focus groups are also being conducted asking nurses about the best methods of education delivery.

Results: In total, ninety-three nurses participated in the online survey. The top learning priorities and the best learning methods identified by nurses will be shared within this presentation.

Conclusion: Hemodialysis nurses require continued education to meet their learning needs and to optimize patient care.

Implications for Nephrology Care: The priority learning needs and nurses' perceptions on how best to meet these needs will be compiled into a set of recommendations that will be used to design an integrated and sustainable hemodialysis nursing continuing education program.

5. NURSING-LED EDUCATION FOR NEW HEMODIALYSIS PATIENT ORIENTATION

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Wen Jin, **RN**
Arti Parpia, **RD**

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Background: Starting hemodialysis is a life-changing event, often triggering anxiety and fear. Research indicates that educating new patients can enhance care experiences and overall well-being. In the absence of a transitional care unit, we aimed to streamline orientation for new dialysis patients.

Purpose of Study: This project aims to improve patients' experiences by addressing their needs, delivering information, and fostering a supportive environment for a smooth transition onto hemodialysis.

Methods: Nurses provided written and verbal education on five topics within the first six weeks of dialysis: dialysis complications, catheter/fistula care, target weight, eating during dialysis, and Hepatitis B vaccination. Patient knowledge on these five topics was evaluated and compared to see the impact of nursing-led education and patient satisfaction level at dialysis start and six weeks after. Nurses were encouraged to regularly check in on patients' adjustment and coping.

Evaluation/Outcomes: Patients who started hemodialysis between January to March 2024 participated in the study (n = 10). Ninety percent received education on all five topics within their first six weeks. Patients received a knowledge score of 68% at the dialysis start and 57.5% after six weeks of hemodialysis. Overall satisfaction questions indicated that patients felt that 75% of the time, nurses always explained things in a way they could understand. Only 38% of patients felt the nurse always spent enough time with them.

Conclusion and Implications for Practice: Pre- and post-knowledge surveys demonstrated that patients' knowledge surrounding key hemodialysis topics did not improve with nursing-led education in the current format. Allocation of dedicated time for nurses to provide education may result in further retention of information and improve the overall care experience. Further study is required to evaluate the impact of having dedicated nursing time for new hemodialysis patients.

6. EFFICACY OF REAL-TIME KT/V MEASUREMENT, NURSING AWARENESS, AND PATIENT ADHERENCE

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Kevin Barlow, **MN, RN**
Elizabeth Poisson, **RN**

Hemodialysis Program, Unity Health, St. Michael's Hospital, Toronto, Ontario

Background: Not all hemodialysis adequacy methods are reflective of quality of care. Kt/V measurement is considered the standard of care at St. Michael's Hospital where it is recorded every treatment. The measurement is acknowledged and reported to the dialysis team if it is unusual. Similarly, the PRU (post reduction urea) is measured and reviewed every six weeks to adjust treatments accordingly. Although most patients are aware of the success of each treatment in regards to fluid removal, many patients lack knowledge of the importance of clearance. With a better understanding of Kt/V, it is hoped that patients will understand the importance of their time on dialysis, vascular access, and intradialytic health practices.

Purpose: A group of under-dialyzed patients (Kt/V less than 1.3) will be educated regarding Kt/V and PRU. During this period, the group will be assessed for their understanding of dialysis adequacy and their knowledge level. Following this assessment, the patients will be evaluated to determine if regular monitoring and reporting of Kt/V makes a difference to their care (i.e., patient experience).

Description: During our investigation, regular Kt/V monitoring and education made a difference in identifying patients who may be considered under-dialyzed (Kt/V less than 1.2). With this monitoring, we improved patient's adherence to therapy, dialysis adequacy, and patient experience. Patients are more adherent to dialysis times if they have a better understanding of the meaning of Kt/V and its direct reflection of their dialysis efficacy.

Evaluation/Outcomes: Kt/V needs to be part of standard patient teaching when on hemodialysis. Measuring, acknowledging, and sharing Kt/V to the patient population and healthcare team is effective. With more understanding and knowledge of the dialysis process, there can be improved harmony between staff and patients. Also, there will be greater trust with increased communication between nurse and patient.

Implications for Nephrology Practice: With patients and staff being better informed about the adequacy of each dialysis treatment, the team, with the patient included, timely and appropriate follow-up of treatment plans can be put in place. Thus far, patients have been able to receive extra dialysis treatments, access revisions, and prescription updates without having to wait for routine blood work.

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 subheadings, 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

There are three stages of manuscript review prior to the final decision about the article's status for publication.

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.

POST-PUBLICATION

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.

OPEN ACCESS OPTION

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. 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.

COPYRIGHT TRANSFER AGREEMENT

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

Jovina Bachynski and Rosa Marticorena, Editors
cannt.journal1@gmail.com

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

DESCRIPTION

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.

Nous encourageons également les tribunes libres sous forme de courrier des lecteurs comme moyen de promouvoir le dialogue et des perspectives de rechange aux articles publiés dans le *Journal ACITN*. Veuillez choisir « Courrier des lecteurs » dans le menu déroulant de la Section sur la page des soumissions.

DÉCLARATION RELATIVE À LA SOUMISSION

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 sa publication est approuvée par tous les auteurs et les autorités responsables où la recherche a été réalisée, et que, si elle est acceptée, elle ne sera pas publiée ailleurs sous la même forme sans le consentement écrit du titulaire du droit d'auteur. À l'acceptation du document soumis, le ou les auteurs devront transférer la propriété du droit d'auteur au *Journal ACITN*. Les déclarations et les opinions contenues dans l'œuvre demeurent la responsabilité de l'auteur ou des auteurs.

ÉVALUATION PAR LES PAIRS

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*.

Les rédactrices sont responsables de la décision définitive en ce qui a trait à l'acceptation ou au rejet du manuscrit. Les rédactrices en chef n'interviennent pas dans les décisions relatives aux articles qu'elles-mêmes ont rédigés ou que des proches ou des collègues ont écrits ou encore qui portent sur des produits ou services pour lesquels elles sont en conflit d'intérêts. Toutes les soumissions de manuscrit font l'objet du processus habituel d'évaluation par les pairs indépendants de la revue.

Les critères d'acceptation de tous les manuscrits comprennent la qualité et l'originalité de la recherche ou du matériel intellectuel, son importance ou son attrait pour le lectorat de la revue et le style d'écriture en général.

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.

Corps du texte (manuscrit, liste de référence)

Corps du texte :

- Longueur maximum de 15 à 20 pages, à double interligne
- Se servir du guide de style *Publication Manual of the American Psychological Association* (APA), 7e édition (droit d'auteur 2020) pour les lignes directrices en matière de style et de format
- Comme les manuscrits font l'objet d'une évaluation par des pairs à double insu, le corps du texte ne doit inclure aucune information pouvant servir à identifier les auteurs. Par conséquent, il ne faut pas inclure de renseignements d'identification (p. ex., noms des auteurs)
- Paginer sans interruption dans le coin supérieur droit
- Citer les tableaux ou les figures à la suite
- S'assurer d'approuver ou d'éliminer toutes les modifications de suivi de votre document Word avant le téléversement

Références :

- N'utiliser que des sources publiées dignes de foi et de qualité
- À double interligne à la fin du manuscrit
- La liste de citations et de références doit être conforme au guide de style de l'APA, 7e édition (droit d'auteur 2020)
- Fournir les adresses URL pour toutes les références, le cas échéant
- S'assurer que toutes les références citées dans le texte figurent dans la liste de référence (et vice versa)

Tableaux ou figures

- Soumettre chaque tableau ou figure dans un fichier séparé, sous forme modifiable et non sous forme d'image
- Préparer les tableaux ou les figures selon le guide de style de l'APA, 7e édition (droit d'auteur 2020)
- Citer les tableaux ou les figures à la suite dans le texte et les numéroter dans cet ordre. Ne pas incorporer les tableaux ou les figures dans le fichier texte du manuscrit
- Numéroter les tableaux et les figures à la suite selon leur apparition dans le texte et positionner le titre du tableau ou de la figure et toute note connexe sous le corps du tableau ou de la figure
- Utiliser les tableaux avec retenue et s'assurer que les données qui y sont présentées clarifient et complètent les résultats décrits dans le corps du texte, sans toutefois les reproduire. Seuls les tableaux sur 3 pages de manuscrit ou moins seront acceptés aux fins de publication dans l'article.
- Les auteurs qui utilisent des tableaux ou des figures précédemment publiés doivent inclure l'autorisation écrite de l'éditeur original. Cette autorisation doit être jointe au manuscrit soumis.

SOUMISSION DU MANUSCRIT

Après avoir préparé le matériel de soumission conformément aux directives indiquées dans la rubrique « Préparation de la soumission » ci-dessus, les manuscrits doivent être soumis en ligne à cette adresse : **https://cannt-acitn.ca/journal/ojs/index.php/canntj**

Les nouveaux utilisateurs doivent cliquer sur « Register » (S'inscrire) dans le coin supérieur droit de la page. Une fois inscrit, sélectionner « Submissions » (Soumissions) du menu déroulant « About » (À propos de).

APRÈS LA SOUMISSION

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.

Examen préliminaire

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.

Évaluation rédactionnelle par les pairs

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.

Détermination de l'admissibilité aux fins de publication

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 :

- Accepter le manuscrit sans modifications
- 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

APRÈS L'ACCEPTATION

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.

S'il est accepté, votre article ne doit pas être publié nulle part ailleurs sous une forme similaire, en toute autre langue, sans le consentement de l'éditeur. Vous ne pouvez pas publier le fichier PDF de votre article révisé ou de votre article définitif publié dans un service d'archives ou sur un site de médias sociaux en ligne.

OPTION D'ACCÈS LIBRE

Les auteurs d'articles acceptés dans le cadre d'une évaluation par les pairs peuvent choisir de payer une redevance pour permettre aux lecteurs du monde entier d'accéder en ligne à leur article publié, sans restriction et à perpétuité, dès sa publication. Cette option n'a aucune influence sur le processus d'évaluation par les pairs. Tous les manuscrits font l'objet d'un processus standard d'évaluation par les pairs à double insu et seront acceptés ou refusés en fonction de leur propre valeur.

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.

CONFLITS D'INTÉRÊTS ET SOURCE DE FINANCEMENT

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

Jovina Bachynski et Rosa Marticorena, rédactrices
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