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About the cover:

A new workforce study, conducted by NHIF, shows that home infusion nurses come to the industry with solid educational backgrounds, advanced skills and certifications, and years of experience across multiple clinical disciplines including **emergency rooms** and **intensive care units**. This first-of-its-kind study documents a critical aspect of this rapidly evolving site of care.

Association Between Years of Nursing Experience and Clinical Background Among Home Infusion Nurses: A Descriptive Workforce Assessment

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Innovative, Multidisciplinary Management of Home Parenteral Nutrition Patients

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A Descriptive Study of Vascular Access Devices Among Adult and Pediatric Home Infusion Patients

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From the Editor

The Importance of Original Research: Why it's essential to study the characteristics of home infusion nurses

Michelle C. Simpson, PharmD, BCSCP, MWC
Editor-in-Chief, *Infusion Journal*



In this issue of *Infusion Journal*, Haines et al. report on the results of a national survey of home infusion nurses. It is the first published study of the education and experience of home infusion nurses, specifically collecting nurse demographics and years of nursing experience. Understanding the experience, education, and credentials specific to home infusion nurses who actively provide direct patient care in the home setting is essential for preparing for shifts in the industry.

The authors surveyed over 500 home infusion nurses and found that home infusion nurses have more years of experience than nurses working in other settings. The article reported a third of home infusion nurses had 11-20 years of nursing experience, and another quarter of the respondents had 21-30 years of experience. Based on the authors' findings, nurses are choosing a career in home infusion. The surveyed nurses made the transition from more than 20 different types of prior nursing experience working in various clinical settings. Furthermore, half the nurses surveyed transitioned to home infusion in the last 5 years, with one-third responding they made the change during the past 1-3 years. Taken together, there is an obvious trend of highly experienced nurses seeking employment opportunities in home infusion.

Notably, the authors shared an impactful statistic that slightly more than 60% of the respondents were between the ages of 45 and 64 years, showing an upcoming movement in staffing as nurses age out of

providing patient care. This information gives some possible assumptions that home infusion nursing may offer a workload that is less physically taxing than other work locations and, therefore, potentially appeals more to nurses over the age of 40. Even though a high percentage of nurses surveyed have worked for many years, nurses early in their careers also responded to the survey, meaning they, too, chose to transition to home infusion. Patients choose home infusion for the flexibility of treatment plans and nursing schedules, and the study's findings suggest that nurses may also choose home infusion to optimize the flexible scheduling with their lifestyle. Since workload affects the quality of work, supporting nurses in maintaining their physical, emotional, and mental well-being improves their ability to support the patients and families they care for.

Original research papers are distinguished by their primary focus on presenting new findings. Being the first to research the qualifications of home infusion nurses, the authors did an outstanding job designing and administering the survey, as evidenced by the generous sample size. Their analysis

of the study's findings will provide *Infusion Journal* readers with insight into the current characteristics of the home infusion nursing population. Original research contributes unique information in a particular field. It is the foundation of scientific progress, and the results presented by Haines et al, can serve as a foundation for future studies and evaluating trends with home infusion nurses. The originality of the authors' research filled a knowledge gap that can assist nursing leaders with preparing for changes in their staffing needs in the next decade and using the levels of education and credentialing to direct the standards or expectations for experience when hiring a nurse for home infusion.

An abundance of research is being performed and published, but a tiny fraction of it applies to home infusion. *Infusion Journal* wants to encourage our readers to conduct research related to home infusion, and we were grateful for the opportunity to share the authors' findings emphasizing the expansive qualifications of home infusion nurses. The absence of prior studies makes it even more compelling to publish. The study's results were representative of

what I have experienced during my career working in collaboration with home infusion nurses. The nurses I know consistently deliver high-quality, professional, compassionate care, and I greatly respect how they do their jobs. I appreciated the evidence-based research supporting what many of us in this industry see daily.

Infusion Journal is interested in publishing original research that recognizes and documents the positive impact of infusion nurses on reducing or eliminating complications and improving patient outcomes and satisfaction. We welcome submissions from authors on topics relevant to infusion therapy administered in the home, clinic, suite, or other outpatient setting. *Infusion Journal* maintains a list of suggestions for research in relevant areas of interest in home infusion and includes numerous ideas specific to infusion nursing.¹

References

1. National Home Infusion Foundation (NHIF). Infusion Journal Research Topics. National Home Infusion Association. <https://nhia.org/nhif/infusion-journal/infusion-journal-research-topics/> (Accessed June 23, 2024).



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Association Between Years of Nursing Experience and Clinical Background Among Home Infusion Nurses: A Descriptive Workforce Assessment

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ABSTRACT

Introduction

Home infusion nursing involves caring for complex patients, thus incorporates clinical training from a variety of practice settings and requires skills and competence often recognized through certifications and past nursing experience. There is a void in research that describes the experience, education, and credentials specific to home infusion nurses. Therefore, the objective of this research was to determine the educational training and certifications that home infusion nurses possess. The secondary objective was to determine the demographics, years of nursing and home infusion experience, and future professional plans as a home infusion nurse. This information is needed to inform the health care professional and industry about the credentials, training, and experience needed to be a home infusion nurse.

Methodology

Survey methodology was used in this descriptive study. A questionnaire was developed by a committee of experienced home infusion nurses. The online non-incentivized survey was administered to home infusion nurses across the U.S. using the NHIA membership database and through other professional organizations that include home infusion nurses. Convenience sampling, a non-probability sampling method was used in this research.

Results

The mean age of the 524 home infusion nurses that completed the survey was 50.02 (SD=11.04). Females and males represented 90.65% and 7.06% of the respondents respectively. Of the nurses, 52.86% had a bachelor's degree in nursing whereas 32.25% had an associate degree in nursing. Nurses had a total of 199 certifications among them with the most common being a Certified Registered Nurse Infusion held by 13.55% of the nurses. A home infusion nurse averages 22.38 (SD=11.61) years of nursing experience with 9.55 (SD=8.92) of the years coming from home infusion. Almost half of the nurses were medical surgical nurses prior to moving to home infusion nursing while 34.54% were intensive care unit (ICU) nurses. 47.14% of the nurses have either ED or ICU experience while 15.27% have both. Most (61.45%) of the nurses were not planning to leave the home infusion profession while 15.84% were planning to leave, primarily due to retirement.

Discussion

Home infusion nurses have strong educational foundations, come to home infusion from a variety of health care sectors, and have years of experience. More than half of home infusion nurses entered the field with experience in either medical-surgical, ICU, or ED. Most have 6 years or more of total nursing experience while 31.92% had 11-20 years of nursing experience. Once nurses enter the field, a large percentage of them remain in the industry for 10 years or more, and many nurses make home infusion a career choice. The home infusion nursing workforce is relatively stable with only 15.84% reporting they plan to leave the profession in the next 5 years and 65.60% of those indicating they plan to retire.

Conclusions

Home infusion nurses are prepared clinically and educationally to meet the challenges of complex patients in the home infusion setting. Furthermore, they have more years of experience than nurses working in other settings. Of the home infusion nurses surveyed, most have greater than 6 years of clinical nursing experience with backgrounds in ICU, ED, and medical surgical care in addition to numerous certifications. Nurses appear to be satisfied in their roles, given the small percentage of those who reported intentions of leaving. This durability—along with depth and breadth of experience—should benefit the industry into the future.

Introduction

The home infusion industry relies on nurses to independently visit patients at home, care for vascular access devices, provide patient education, administer medications, teach patients to self-administer, and provide status updates to the pharmacist and physician. Home infusion nurses must be prepared clinically and educationally to meet the challenges of complex patients in this setting, where the nurses are the front-line advocates for patients as they have the unique ability to observe patients in their home environments. Studies have recognized the link between nurses' educational background and patient care quality and safety. For example, data suggests health care education, training, and credentialing improved direct patient care by improving job-specific knowledge and skills.¹ In one study of 13,735 home infusion patients, patient satisfaction with their nurse's teaching instructions received the highest ratings. 98.69% of patients responded yes to questions about their understanding of how to self-administer their infusion medications and care for their vascular access device.² Studies of success rates of home infusion treatments can be used to support the impact of infusion nurses' competence. In a study of 5,216 outpatient parenteral antibiotic therapy (OPAT) patients, 92.98% completed the infusion therapy prescribed, and in an earlier study of 2,106 OPAT patients, 90.84% completed infusion therapy successfully.^{3,4} Although firm support for nurse education associated with quality patient care exists, there is a need to describe the experience, education, and credentials specific to home infusion nurses actively providing direct patient care in the home setting.

Home infusion nursing incorporates clinical experience from a variety of practice settings because the environment often requires the nurse to work independently and without close assistance. Accordingly, home infusion nursing combines knowledge and skills with an awareness of risks and how those can be minimized, all requiring additional education and experience. For example, home infusion nurses are prepared to manage adverse drug reactions in the home. Two studies researching home infusion patients reported a low rate of 0.37% (n=5,395) and 0.22% (n=6,842) for drug discontinuation due to adverse drug events.^{3,5} Home infusion therapy relies on nurses visiting patients at home to insert and care for vascular access devices.⁶ Vascular access device

insertion is a specialized skill requiring competency, and according to a survey of home infusion providers, patient care services of directly employed nurses included catheter insertion for short-term infusions. Of the respondents (n=221), 85.2% of home infusion providers employ nurses skilled at inserting peripheral catheters in the patient's home and 20.4% of respondents employed nurses able to perform midline insertions in the home.⁶

Infusion nursing is a specialization requiring skills and competence often recognized through certifications acknowledging proficient achievement and competent practice.⁷ One national provider of home infusion services reported 20% of the infusion nurses employed with their company earned the Certified Registered Nurse Infusion (CRNI®) credential, and the Infusion Nurses Certification Corporation has certified nearly 3,000 active CRNI®s worldwide.^{7,8} Home and specialty infusion therapy reported substantial growth between 2010-2020, and the expansion of the infusion therapy market was impacted by an increase in the prevalence of chronic diseases, the emergence of novel treatments such as biologics, and patient demand for more flexibility and control over their health care.^{6,9} As a result, the need for highly skilled infusion nurses in various infusion care settings will increase to meet growing demand, and advancements in the treatment of acute and chronic diseases will require the administration of injectable or infused medications to treat patients who already have complex medical needs. This requires ongoing education to stay knowledgeable on standards of practice and medication administration guidelines.⁹

As described, research has demonstrated the association between nurses' experience and education and quality of patient care, but published research has yet to address the education and experience of home infusion nurses, specifically nurse demographics, years of nursing experience, and years of home infusion experience. Therefore, the objective of this research is to describe the education and experience home infusion nurses possess. The secondary objective was to determine the demographics, years of nursing and home infusion experience, and future professional plans as a home infusion nurse. Collectively, this information is needed to adequately inform the health care professional and industry about the credentials, education, and experience needed to be a home infusion nurse.

Methodology

This research is descriptive in nature and was administered by the National Home Infusion Foundation (NHIF). Survey methodology was selected as most appropriate for this study since the primary ends sought were to describe the qualifications and experiences of home infusion nurses. A questionnaire was developed by a National Home Infusion Association (NHIA) committee of experienced home infusion nurses. The online non-incentivized “Home Infusion Qualifications Survey” was administered to home infusion nurses across the United States using the NHIA membership database and through other professional organizations that include home infusion nurses. Convenience sampling, a non-probability sampling method was used in this research.

The questionnaire began with the qualifying question, “Do you currently practice home infusion nursing defined as visiting patients who are prescribed infused medications in their homes to provide education, administration of medication, assessment, catheter care or other duties directly to support their infused medications.” If the respondent answered “yes” to this question, they were invited to complete the remaining sections of the questionnaire. To complete the survey a NHIA membership was not required. Section 1 of the questionnaire included demographic questions while the remaining sections focused on home infusion nurses’ education, training, experience, and future nursing plans. The questionnaire assured the respondent’s anonymity, and that the data would be de-identified. Additionally, the respondent was not required to complete the questionnaire and could stop answering questions at any time.

Analysis

Data was analyzed using IBM SPSS Statistics. Frequency and the percentage for each response option was calculated for each of the survey questions. Mean and standard deviation were calculated for respondent age and years of nursing and home infusion experience. This data was also recoded into categories.

Results

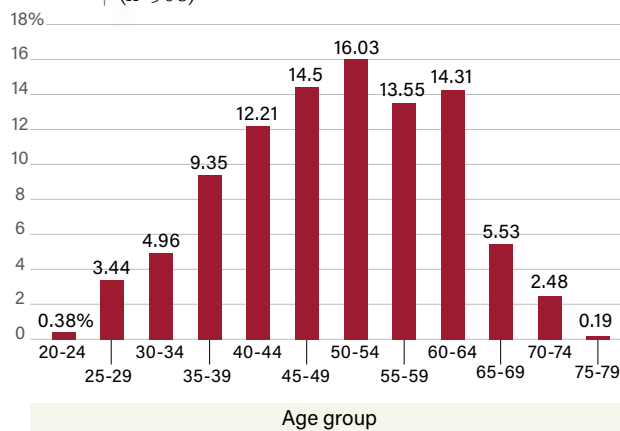
The NHIF Home Infusion Nursing Qualifications Survey was administered online between October and December 2023. There were 546 total respondents of which 525 met the qualifying question. One

respondent did not answer any of the questions, thus the total sample size of survey respondents was 524. Not all respondents answered every question as noted by the inconsistent sample sizes in the data tables.

Demographics

The mean age of the respondent was 50.02 (SD=11.04) years with a range of 23 to 76 years. Slightly more than 60% of the respondents were between the ages of 45 and 64 years. As shown in Figure 1, the largest age group, with 16.03% of the nurses, were the 50–54-year-olds. Females and males represented 90.65% and 7.06% respectively of the nurses while 2.10% preferred not to answer the question and 1 nurse indicated they were gender non-conforming. White/Non-Hispanics represented 79.96% of the sample while Blacks/African Americans, Hispanics, and Asians were 4.77%, 4.39%, and 4.20% respectively.

FIGURE 1 | Percentage of Respondents Within Each Age Group (n=508)



Higher Education and Certifications

When asked about the highest nursing or nursing-related educational attainment, 52.86% (n=277) of the nurses had a bachelor’s degree in nursing, 32.25% (n=169) had an associate degree in nursing, 10.11% (n=53) had a master’s degree in nursing, 3.82% (n=20) had a diploma, and 0.95% (n=5) had a doctorate. In addition to having various nursing degrees, the group of 524 home infusion nurses had a total of 199 certifications among them, as shown in Table 1. The most common certification, held by 13.55% of the nurses is a Certified Registered Nurse Infusion (CRNI®), while 7.63% have an immunoglobulin certification (IgCN®) and 4.58%

have an oncology certification (OCN®). Table 1 shows the variety of certifications home infusion nurses currently possess.

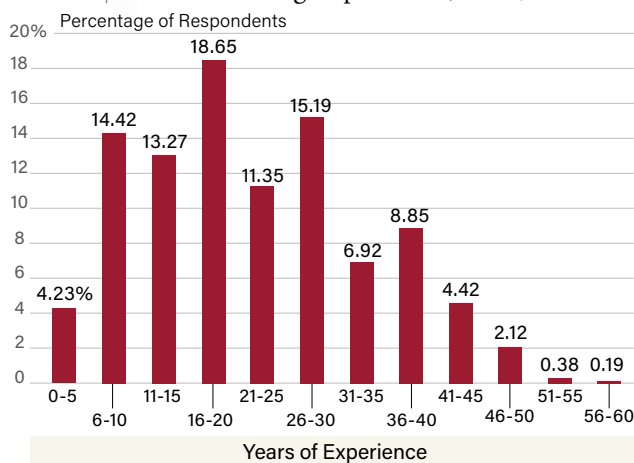
TABLE 1 | Percentage of Nurses with Each Certification

Certification	Frequency	Percent
Certified Registered Nurse Infusion (CRNI®)	71	13.55%
Immunoglobulin Certified Nurse (IgCN®)	40	7.63%
Other	35	6.68%
Oncology Certified Nurse (OCN®)	24	4.58%
Vascular Access Board Certification (VA-BC™)	13	2.48%
Certified Nurse Educator (CNE®)	3	0.57%
Cardiovascular Nursing Board Certification (CV-BC™)	3	0.57%
Certified Nutrition Support Clinician (CNSC®)	2	0.38%
Pediatric Nursing Board Certification (PED-BC™)	2	0.38%
Gerontological Nursing Board Certification (GERO-BC™)	1	0.19%
TOTAL	199	

Health Care Experiences

The typical home infusion nurse has 22.38 (SD=11.61) years of various nursing experience. The highest percentage of nurses (18.65%) have between 16 and 20 years of nursing experience, as shown in Figure 2. The mean number of years of home infusion nursing

FIGURE 2 | Years of Nursing Experience (n=520)



experience is 9.55 (SD=8.92) years. As shown in Figure 3, almost half of the home infusion nurses have 5 or less years of experience specific to home infusion while almost one-third of the nurses have between 1 and 3 years. One home infusion nurse had 40 years of home infusion experience while another had 56. Figure 4 compares the total years of nursing experience across the home infusion group contrasted with a national survey of nurses working in the United States.

FIGURE 3 | Years of Home Infusion Nursing Experience (n=511)

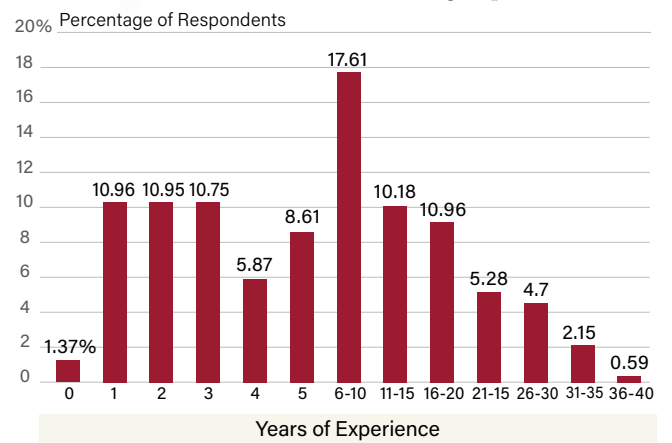
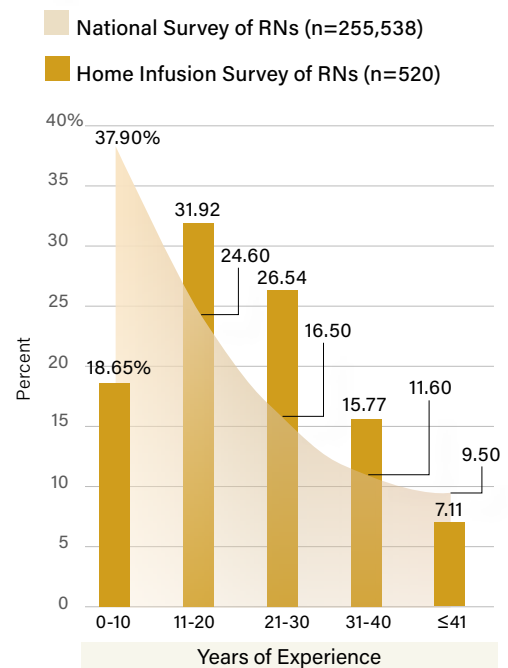


FIGURE 4 | Nursing Experience of Home Infusion Nurses Surveyed Compared to a National Nursing Survey^{10,11}



Nurses gravitate to home infusion nursing from a variety of other nursing specialties. On average, home infusion nurses have experience from 3 different nursing disciplines prior to becoming a home infusion nurse. Almost half (49.62%) of the home infusion nurses were medical surgical nurses prior to moving to home infusion nursing while 34.54% were intensive care unit (ICU) nurses, 28.05% were home care nurses, and 25.95% were emergency department (ED) nurses, as shown in Table 2. After additional analysis of the data, it was noted that slightly less than half (47.14%) of the nurses have either ED or ICU experience, while 15.27% have both. Only 4 of the home infusion nurses have exclusive experience in home infusion nursing.

TABLE 2 | Nursing/Health Care Experience Prior to Becoming a Home Infusion Nurse

Previous Experience	Frequency	Percent
Medical Surgical	260	49.62%
Intensive Care Unit	181	34.54%
Homecare	147	28.05%
Emergency Department	136	25.95%
Oncology	106	20.23%
Cardiac Step Down	93	17.75%
Case Management	76	14.50%
Long Term Care	69	13.17%
Physician Office Infusion Suite	63	12.02%
Nursing Educator	56	10.69%
Surgical Outpatient	55	10.50%
Surgical Inpatient	54	10.31%
Administration	49	9.35%
Primary Care	44	8.40%
Vascular Access Device Team	39	7.44%
PICC Insertion Team	34	6.49%
Licensed Practical Nurse	32	6.11%
Quality	17	3.24%
Emergency Medical Technician	9	1.72%
Paramedic	5	0.95%
All nursing experiences has been in home infusion	4	0.76%
Accreditation	2	0.38%
Total	1,531	

Future Home Infusion Nursing Plans

When asked about future nursing plans within the next 5 years, 61.45% of the nurses indicated they were not planning to leave the home infusion profession while 22.71% were unsure and 15.84% were planning to leave. Of those planning to leave, 65.60% indicated they were retiring while 16.87% and 8.43% were planning to pursue another opportunity in nursing and health care respectively.

Study Limitations

As with most studies using survey methodology, this study had limitations. Convenience sampling is a non-probability sampling method commonly used in survey methodology even though it has limited external validity. As a result, the study findings might not be generalizable to the population of home infusion nurses. For this reason, some demographic subsets may have been excluded from the results. With survey methodology there is also the possibility of non-response error. Specifically, it is not known if the respondents' results would be similar to the non-respondents'. Survey methodology provides self-report data which may be erroneous when the respondent does not answer truthfully or may not understand the question. Lastly, since the survey was administered electronically, there is the likelihood of respondent data entry errors. Even though survey methodology has deficiencies, it is commonly used in descriptive research.

Discussion

Home infusion nurses have strong educational foundations, come to home infusion from a variety of health care sectors, and bring with them years of experience. The type of experience nurses cultivate before entering home infusion reflects a knowledge base that is both broad and deep. In this study, high numbers of home infusion nurses entered the field with experience in either medical surgical (49.62%), ICU (34.54%), or ED (25.95%), indicating these clinicians are familiar with many disease states and treatments across multiple patient populations. More than 95% of home infusion nurses have 6 years or more of total nursing experience. In addition, the results found a significant proportion of nurses transitioned into home infusion during the past 5 years. The study data provided key details related to the home infusion nursing workforce and added to the understanding of the education and expertise of home infusion nurses.

Home infusion nurses have more years of experience than nurses working in other settings (Figure 4).^{10,11} In this study, 31.92% of home infusion nurses had 11-20 years of nursing experience, and 26.54% of the respondents had 21-30 years of experience. According to a national survey completed by nurses working across multiple areas of health care, nurses reported 24.6% had 11-20 years of experience, and 16.5% had 21-30 years of nursing experience.^{10,11} This study found almost half the nurses surveyed transitioned to home infusion in the last 5 years, with one-third responding they made the change during the past 1-3 years. Based on the survey results, home infusion has a growing interest among experienced nurses, which is taking them down this career path. Accordingly, once nurses enter the field, our study found a large percentage of them remain in the industry for 10 years or more, and many nurses made home infusion a career choice. The longevity of nurses in the home infusion industry indicates a level of fulfillment. Nurses stay where they feel valued in environments with sustainable working conditions and effective leadership.¹²

After entering the field, many home infusion nurses continue to engage in education and skills-building in areas relevant to their practice. For example, of the home infusion nurses surveyed, 13.55% achieved CRNI®, the specialty certification for infusion nursing. The percentage of CRNI® of the nurses surveyed might have been higher if the survey had included responses from management-level nurses who may be more likely to achieve and maintain certifications to support career advancement. As the field expands and an increasing number of specialty therapies are deemed appropriate for alternate site administration, home infusion nurses responded as having achieved certification in additional specialized clinical areas, such as managing and administering immunoglobulin (Ig) therapy (7.63%) and oncology (4.58%). The comprehensive nature of infusion therapy should incorporate evidence-based training and certification to support the clinicians who are responsible for patient outcomes.

In addition to having nursing experience, home infusion nurses enter the field with strong educational backgrounds. More than half (52.86%) have a bachelor's degree, the newest nursing education standard. This is on par with national statistics showing the percentage of bachelor-degreed nurses steadily increasing from 43.4% in 2015 to 51.1%

in 2022.^{10,11} There are more home infusion nurses with associates degrees than the national average (32.25% compared to 24.3%) and fewer with master's degrees (10.11% compared to 17.9%).^{10,11} This could be attributable to home infusion nurses being older (majority in the 50-54 age group compared to 30-34 nationally) and entering the field after gaining experience in other sectors.

The home infusion nursing workforce appears to be relatively stable with only 15.84% reporting they plan to leave the profession in the next 5 years and 65.60% of those indicating they plan to retire. This stands in stark contrast to a recent exodus of nurses from the workforce. As newer nurses—those in school and their early careers—reach the home infusion workforce, it is likely they will be more racially and ethnically diverse than today's home infusion nurses who are not as diverse as the national nursing workforce. For example, 73.3% of the general population of nurses and 79.96% of the home infusion nurses are White non-Hispanic. Due to the difference, the general population of nurses has a larger percentage of nurses representing each ethnic group than the home infusion nurses, with the largest disparity among the Black non-Hispanic nurses. Black non-Hispanics represent 4.70% of the home infusion nurses, while 7.8% represent the general population of nurses. When gender is compared, the general population of nurses is represented by 9.6% male nurses, while home infusion has 7.06%.^{10,11}

Conclusion

Of the home infusion nurses surveyed, most have greater than 6 years of clinical nursing experience with backgrounds in ICU, ED, and medical surgical care. The type and background experiences of the surveyed nurses indicate they are seeking and finding a clinically challenging work environment in home infusion. Home infusion nurses appear to be satisfied in their roles, given the small percentage of those who reported intentions of leaving. This durability—along with depth and breadth of experience—should benefit the industry going forward. However, a projected national nursing shortage is likely to create a more competitive landscape among health care sectors recruiting nurses into their respective workforces. In this context, the aging of the current home infusion nursing workforce and accelerated expansion of the field overall indicate the need for future recruitment and education.

Disclosures

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References

1. Kleiner MM, Krueger AB. The Prevalence and Effects of Occupational Licensing. *British Journal of Industrial Relations* [Internet]. 2010;48(4):676–87. Available from: <https://dx.doi.org/10.1111/j.1467-8543.2010.00807.x>
2. Haines D, Garst R, Sullivan C, et al. A Two-Year Assessment of Home Infusion Patient Satisfaction. *INFUSION Magazine*,(2021). (March/April),27-33.
3. Haines D. Reasons for Discontinuation of Home Infusion Services. *INFUSION Magazine*,(2023). (May/June),22-25.
4. Haines D, Garst R, Sullivan C, et al. Discharge Reasons of Patients Receiving Home Based Outpatient Antimicrobial Therapy. *INFUSION Magazine*,(2021). (March/April),1-5.
5. Haines D, Simpson M. Rate of Discontinuation from Home Infusion Therapy Due to Adverse Drug Reactions and Unplanned Hospitalization. *INFUSION Magazine*,(2021). (Sept/Oct),2-7.
6. NHIA. *Infusion Industry Trends 2020*. National Home Infusion Association. 2021; Alexandria, VA.
7. INS Certification information. (<https://www.ins1.org/crni/exam/results/>). Accessed June 2024.
8. Option Care Nurses Earn Elite Certified Registered Nurse Infusion (CRNI®) Credential. Option Care. May 30, 2018. <https://optioncarehealth.com/news/option-care-nurses-earn-elite-certified-registered-nurse-infusion-crni-credential> (accessed May 21, 2024).
9. Vizcarra C. Trends, challenges, rewards, and pathways in infusion nursing: Navigating the current landscape. *Health*; Feb 2024. <https://www.wolterskluwer.com/en/expert-insights/trends-challenges-rewards-and-pathways-in-infusion-nursing> (accessed May 20, 2024)
10. U.S. Department of Health and Human Services, Health Resources and Services Administration, National Center for Health Workforce Analysis. 2019. Brief Summary Results from the 2018 National Sample Survey of Registered Nurses, Rockville, Maryland.
11. Smiley RA, Allgeyer RL, Shobo Y, Lyons KC, Letourneau R, Zhong E, et al. The 2022 National Nursing Workforce Survey. *Journal of Nursing Regulation*. 2023;14(1):S1–90. doi: 10.1016/S2155-8256(23)00047-9
12. Nurse Retention Strategies: How to Combat Nurse Turnover. American Nurses Association. Accessed June 6, 2024. <https://www.nursingworld.org/content-hub/resources/nursing-leadership/nurse-retention-strategies/>

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ABSTRACT

Background

The total number of home parenteral nutrition patients in the United States grew steadily from 2011-2015 based on data from the American Society for Parenteral and Enteral Nutrition National Patient Registry for Nutrition Care. In the absence of an active national registry, some sources estimate 40,000 patients in the U.S. are prescribed home parenteral nutrition. The role and necessity of pharmacists within multidisciplinary nutrition support teams is described in numerous domestic and international studies, yet outpatient-based nutritional care for home patients is underrepresented in the literature. This descriptive analysis investigated the value of specially trained home infusion pharmacists and their roles in the management of home parenteral nutrition. The clinical initiative we describe introduces a unique partnership and shared service between 2 practice sites within an integrated health delivery system.

Implementation

A board-certified nutrition support pharmacist from the health-system home infusion pharmacy was embedded within the hospital-based clinic for approximately 30 hours a week. Pharmacist activities occurred under the oversight of the ordering physicians and included adjustment of fluid, electrolyte, macronutrient, and micronutrient content for intravenous therapies; general laboratory result monitoring and ordering; nutritional assessment; medication reconciliation; and patient education. In the scope of the agreement, pharmacists provided direct patient care without the participating providers' written or oral consent based on practice guidelines, patient-specific factors, and clinical judgment. Drug therapy management duties included adjustment of the drug regimen, strength, frequency, and route.

Conclusion

After a pilot program, pharmacists from a health-system home infusion pharmacy worked within a hospital-based clinic, managing a large home parenteral nutrition patient population. While the pharmacists are employed by the health-system home infusion pharmacy, they continue to interact with patients as an extension of the physician office. The success of the position resulted in the development of a collaborative practice agreement.

Background

Home infusion therapy in the United States has grown over 300% since 2010 and the market is valued to reach \$33.2 billion by 2030.¹ Site of care optimization, cost-containment, and trends in the wake of the COVID-19 pandemic continue to shift home infusion pharmacists to the forefront of therapy initiation, clinical assessment, and care management. While specialty infusion therapies have gained prevalence in the home setting, “traditional” medications such as intravenous anti-infectives, pain management, and parenteral nutrition remain pillars of this practice area.

The total number of home parenteral nutrition (HPN) patients in the United States grew steadily from 2011-2015 based on data from the American Society for Parenteral and Enteral Nutrition (ASPEN) National Patient Registry for Nutrition Care.² In the absence of an active national registry, some sources estimate 40,000 patients in the U.S. are prescribed HPN.³ Home parenteral nutrition remains a complex and high-risk therapy requiring competency and expertise for sustainable management, although access to a specialized care team may not be available upon discharge.⁴ The role and necessity of pharmacists within multidisciplinary nutrition support teams is described in numerous domestic and international studies, yet outpatient-based nutritional care for home patients is underrepresented in the literature.⁵ The need for experienced nutrition teams throughout transitions of care remains critical to optimizing HPN.⁴

Salman et al. note that the use of HPN warrants pharmacists to be competent in related skillsets by graduation, however the Doctor of Pharmacy curriculum does not prioritize enteral and parenteral nutrition-specific learning.⁶ This deficit, coupled with the sunsetting of postgraduate year 2 (PGY2) nutrition support training for pharmacists and projected physician shortages, including within the gastroenterology subspecialty, highlights the need for continued advocacy, mentorship, research, and engagement among clinicians in this niche of patient care.⁷ External factors such as health care staffing shortages, cost constraints, and the consolidation and closure of numerous home infusion pharmacies could put strain on nutrition support teams managing high-acuity patients. Strategies to maintain safe and effective parenteral nutrition therapy throughout the continuum of care must be identified.

A Digestive Disorders Center (DDC) services a large university medical center's flagship facility comprising an integrated health delivery system with over 40 academic, community, and specialty hospitals and 800 outpatient sites servicing Pennsylvania, New York, Maryland, and multiple international campuses. The DDC's Inflammatory Bowel Disease Center supports complex patients from around the world requiring surgical, medical, and innovative disease-state management. This hospital-based clinic has an active census of approximately 100 patients receiving HPN and custom intravenous fluids. Physicians, advanced practice providers, nurses, and a registered dietitian comprise the team-based management of nutrition support patients throughout their continuity of care. Pharmacists engage in inpatient, multidisciplinary nutrition support services, but are not involved in home management with regard to DDC patients. Upon discharge, nursing and dietitian staff spearhead clinical management of outpatient care and follow-up.

Numerous studies describe the significance of pharmacists within the multidisciplinary nutrition support team specifically in the hospital setting. However, there is a gap in literature investigating the value of specially trained pharmacists in home infusion and their roles with the management of HPN. The clinical initiative we describe introduces a unique partnership and shared service between 2 practice sites within an integrated health delivery system. The aim of this descriptive analysis is to identify areas of quality improvement while also guiding future practice recommendations for HPN.

Implementation

In Spring 2019, an opportunity was presented to diversify clinic-based management of the DDC HPN population. Based on an established history of care collaboration, a board-certified nutrition support pharmacist (BCNSP) from the health-system home infusion pharmacy (HSIP) was embedded within the hospital-based clinic for approximately 30 hours a week beginning in April 2019. This established a hybrid, shared role between the HSIP and DDC clinic, while maintaining existing employment structure for the pharmacist. The scope of pharmacist care and interventions was cabined to patients actively on service with the HSIP for intravenous therapies. This model optimized continuity of care

for existing patients who were familiar with the HSIP's services and clinical team. Management of non-HSIP patients was maintained by advanced practice providers and dietitians per standard protocol. Pharmacist activities occurred under the oversight of the ordering physicians and included: adjustment of fluid, electrolyte, macronutrient, and micronutrient content for intravenous therapies; general laboratory result monitoring and ordering; nutritional assessment; medication reconciliation; and patient education.

Orders completed by the pharmacist and co-signed by the provider were relayed to the HSIP utilizing electronic workflows. The university medical center extends medication access via a health-system infusion and specialty pharmacy. The infusion and specialty pharmacy has multiple branches to support health-system initiatives in multiple regions. In contrast to an external provider, pharmacy services integrated within a system's care model enable clinical staff access to the patient's full electronic health record (EHR). On-demand insight into pertinent clinical data such as active laboratory values, medication profiles, and hospital visits is invaluable to clinical decision-making and care coordination. In addition, pharmacist access to the EHR and proprietary electronic prescribing workflows promote safety and efficacy during HPN prescription order entry and processing. Electronic workflows shared between DDC clinicians and pharmacists at the HSIP allow for simultaneous insight and collaboration within the patient record. The pharmacists collaborate with the DDC nutrition support team on a range of activities including but not limited to clinical monitoring and troubleshooting, patient education, and final coordination of drug compounding and delivery. Pharmacist participation as an extension of the clinic office bridged patient care needs while minimizing workflow disruption to either practice site. The pharmacists continue to fill an essential role within the hospital-based nutrition clinic team and are responsible for management of an estimated 15-20 HPN patients weekly.

After 3 years, the developed rapport between the pharmacists and DDC providers led to a collaborative practice agreement (CPA). Implementing a CPA allowed for further optimization of workflow, such as avoiding unnecessary interruptions to DDC providers. Both the HSIP team and DDC providers were receptive to sustaining the relationship and

supported the initiation of the CPA. In accordance with the Pennsylvania State Board of Pharmacy Code and Regulations, the HSIP pharmacy team drafted the CPA document. Legal and administrative staff from both parties reviewed and vetted the contract until a final draft was shared with all stakeholders. A meeting was conducted with the DDC providers and the pharmacists to review and approve the final document. All participating individuals accepted and signed the CPA, which became effective on September 1, 2022. Subsequently, the CPA has also been renewed for a second year through 2024.

In the scope of the CPA, the pharmacists may provide direct patient care without the participating providers' written or oral consent based on practice guidelines, patient-specific factors, and clinical judgment. Drug therapy management duties include adjustment of the drug regimen, strength, frequency, and route. For example, the pharmacists may independently modify the HPN formula including the doses of macronutrients, micronutrients, and additives. HPN and intravenous fluid orders can be altered in terms of volume, frequency, and rate. To guide therapy management, the pharmacists regularly monitor and order required laboratory tests. Lastly, the pharmacists counsel patients, caregivers, and interprofessional team members on HPN and the management of medication therapies.

Discussion

Parenteral nutrition is a complex, high-touch, high-dollar infusion therapy that requires the involvement of experts from a multidisciplinary team. Skilled, experienced nutrition support teams in both the inpatient and outpatient settings can ensure smooth transitions of care and provide comprehensive, specialized management for HPN patients. The pharmacists included in the CPA have a background in traditional home infusion, postgraduate residency training, and board certification in nutrition support pharmacy. HPN patients requiring holistic care, combined with physician champions, created a unique opportunity in the home infusion setting to expand this clinical program. Pharmacist participation as an extension of the clinic office bridged patient care needs while minimizing workflow disruption to either practice site. In turn, the long-standing partnership with the DDC and HSIP led to the creation of the CPA.

Multiple factors aided in the success of this program. First, the unique relationship that exists between the health-system-home infusion pharmacy and clinic allowed for easier sharing of information and documentation. Agreement upon common policies and institutional standards also created a more stable transition of care into the outpatient setting. Additionally, the background and training of the pharmacists involved allowed for easy integration into multidisciplinary team and clinical management role. While no formal training process has been developed to date, the achievement of recognized board certification in nutrition support pharmacy and the experience required to achieve it permitted an initial foundation of trust with patient care.

Further research is needed to evaluate the impact of this nutrition support service model for patient care and to ensure that the goals of the CPA are being met. As a result of this symbiotic relationship, we expect the HSIP, clinic staff, and patients benefited from streamlined communication and continuity of care. Additional studies to identify, quantify and characterize pharmacist-led interventions are currently underway.

Conclusion

After a pilot program, a full-time clinic-embedded BCNSP employed by an HSIP was instilled in a hospital-based clinic with a large HPN patient population. While the health-system home infusion pharmacy employs the pharmacists, they continue to interact with patients as an extension of the physician office. The success of the position resulted in the development of a CPA, further cementing the role of pharmacists in the care of HPN patients. Currently, 2 board-certified nutrition support pharmacists rotate coverage of this shared service. Future research will be directed at quantifying and describing the interventions made and their impact on patient care and outcomes.

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References

1. U.S. Home Infusion Therapy Market Size, Trends | Report [2030] ([fortunebusinessinsights.com](https://www.fortunebusinessinsights.com))
2. SustainTM, LLC: A.S.P.E.N.'s National Patient Registry for Nutrition Care: Final Report. April 2015.
3. Children's Hospital of Pittsburgh. Total parenteral nutrition (Tpn) after intestinal transplant. Accessed September 1, 2022. Life After Intestinal Transplant | Children's Hospital Pittsburgh (chp.edu)
4. Kumpf VJ, Tillman EM. Home parenteral nutrition: safe transition from hospital to home. *Nutr Clin Pract.* 2012;27(6):749-57. Epub 20121022. doi: 10.1177/0884533612464888. PubMed PMID: 23090654.
5. Katoue MG. Role of pharmacists in providing parenteral nutrition support: current insights and future directions. *Integr Pharm Res Pract.* 2018;7:125-40. Epub 20181002. doi: 10.2147/IPRP.S117118. PubMed PMID: 30324089; PubMed Central PMCID: PMC6173269.
6. Salman G, Boullata JI, Sacks GS, Tellez-Corrales E. Call to action: the need for enhanced nutrition support education and training in pharmacy schools and postgraduate programs. *Journal of the American College of Clinical Pharmacy.* 2021;4(5):612-5. doi:10.1002/jac5.1401
7. Hatton R. (2022). Gastroenterology Expected to Be Down 1630 Physicians by 2025. *Becker's GI & Endoscopy.* Retrieved 09/01/2022, from <https://www.beckersasc.com/gastroenterology-and-endoscopy/gastroenterologyexpected-to-be-down-1-630-physicians-by-2025.html>

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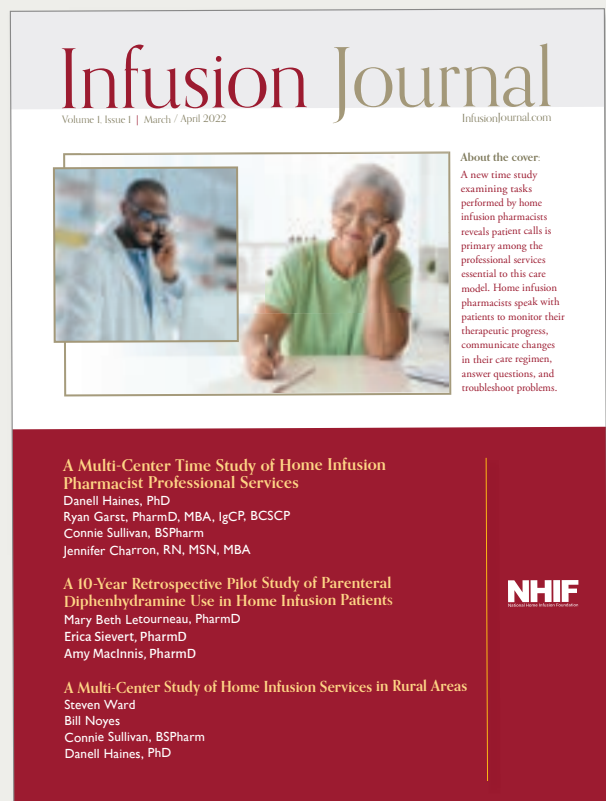
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A Descriptive Study of Vascular Access Devices Among Adult and Pediatric Home Infusion Patients

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ABSTRACT

Introduction

The Infusion Nurses Society recommends selecting the optimal vascular access device (VAD) for the therapy plan. These recommendations are primarily driven to identify peripheral vs. central vascular access based on infusate properties, the frequency and duration of infusions, unique patient features, and resources available. The objectives of this study are to describe the utilization of VADs in the home infusion setting and identify trends in specific medication treatments and patient populations.

Methods

This study is a descriptive, retrospective review of patient data collected by the National Home Infusion Foundation for its benchmarking program. Throughout 2021 and 2022, 12,968 patient cases were de-identified and submitted using a formatted Excel® file. The patient cases were to include status at discharge, age, type of VAD, and if applicable adverse drug reaction. For the patient case to be eligible for this study, VAD, patient age, and therapy type data had to be included. The data was analyzed using IBM Analytics Software, Statistical Product and Service Solutions. Frequency and percentages were determined for patient age group and therapy type while cross tabulation analysis was used to gain an in-depth understanding of the VAD usage for the different home infusion therapies.

Results

The final data set included 10,967 patient cases and was analyzed to determine the patient demographics, most common type of home infusion VAD, and the type of devices used with the different therapy types. In almost two-thirds (n=7,193) of the patient cases, a peripherally inserted central catheter (PICC) was used as the therapy access device. A midline was used as the VAD in 13.12% of the cases, and a peripheral access device in 8.59% of the cases.

Conclusion

In this study of VAD utilization in the home infusion setting, PICC was reported in two-thirds of all patients included. When analyzed by therapy type, PICC was reported as the primary VAD for the administration of parenteral nutrition, anti-infectives, and inotrope therapies. The high utilization of PICCs in this study validates its selection for medication administration in the home site of care.

Introduction

The home setting is well established as a safe, clinically effective, and cost-saving alternative for infusion therapy administration.¹ Patient outcomes confirm no increase in adverse events, and clinical outcomes are equally as good as those of other sites of care.² Additionally, patients report home as the preferred site of care due to improved well-being and better quality of life.¹ Home infusion organizations facilitate these optimal outcomes through the utilization of best practices, therapy standards of care, guidance from pertinent professional organizations, and outcome monitoring. Recognizing the need for standardized data, the National Home Infusion Foundation (NHIF) created an industry-wide quality data program to assess current practices and to establish a national reference point for performance and clinical metrics to improve the quality and efficiency of patient care.³

Within the ever-expanding array of infusion therapies provided in the home, one common denominator is that most patients require a vascular access device (VAD) for therapy administration. Home infusion clinicians' knowledge regarding the considerations evaluated in selecting the most appropriate VAD makes them ideal contributors to this process. However, this contribution is limited when the VAD is placed prior to a patient's admission to home infusion services or the finalization of the infusion therapy plan. As VADs should not be replaced unless clinically indicated, it is possible that changes in treatment plans may require extended use of an existing VAD that had not been anticipated.⁴

The Infusion Nurses Society (INS) recommends selecting the optimal VAD for the therapy plan.⁴ These recommendations are primarily driven to identify peripheral vs. central vascular access based on infusate properties, the frequency and duration of infusions, unique patient features, and resources available. The goal of selection is to use the least invasive and smallest device that lasts for the duration of therapy while prioritizing the preservation of vessel health.⁴ Per the *Infusion Therapy Standards of Practice*, therapies administered via the peripheral route are to be evaluated for irritant or vesicant properties, be physiologically similar to blood (to reduce vessel damage), and have dextrose concentrations $\leq 10\%$, and protein limited to 5% .⁴ Although the *Standards* do not provide definitive limits on pH or osmolarity for peripheral administration, researchers identify the highest risk of vessel damage occurring with solutions >600 mOsm/L and pH <4 or >9 , and osmolarities as low as 450 mOsm/L have a moderate risk of vessel damage.⁵ Unless clinically indicated, VADs should not be routinely replaced due to changes in therapy unless the new therapy requires central infusion compared to using an existing peripheral VAD.⁴ Table 1 provides the INS recommendations for types of VAD based on solution properties and anticipated duration of treatment.

In order to optimize patient outcomes, home infusion providers rely on outcome studies. Currently, there is a dearth of information on outcomes associated

TABLE 1 | Vascular Access Devices Used in Home Infusion

Vascular Access Device Type	Recommendations for Use
Short and long peripheral vascular access device	For administration of solutions that are isotonic with a physiologically similar pH and osmolarity with an anticipated duration of ≤ 4 days. A peripheral access device may remain appropriate for longer durations if clinically indicated and free from complications. Avoid infusions with extremes in pH and/or osmolarity to reduce vascular damage.
Midline peripheral vascular access device	For solutions appropriate for peripheral administration with an anticipated duration of 5-14 days. A midline may remain appropriate for longer durations if clinically indicated and free from complications. Continuous vesicants are not administered via a midline.
Central vascular access device	For therapies with durations >14 days, solutions not appropriate for peripheral administration, complex infusion regimens, and for insufficient peripheral venous access for planned intermittent or periodic treatment.

Reference: Nickel B, Gorski LA, Kleidon T, Kyes A et al. *Infusion Therapy Standards of Practice*, 9th Edition. J Infus Nurs.(2024). 47(1S),S1-S291.

with VAD type and utilization specific to the type of individual therapies in the home infusion populations. This descriptive study of current VAD practices provides information into current practices and helps identify opportunities to improve processes that facilitate best practices to realize the best patient outcomes. Accordingly, the objectives of this study are to describe the utilization of VADs in the home infusion setting and identify VAD trends in specific patient populations.

Methodology

This study was a descriptive, retrospective review of patient data collected by NHIF for its benchmarking program. Patient VAD data has been collected by the NHIF and stored in its data repository since 2021 as part of an industry-wide benchmarking initiative. All home infusion provider locations are invited to participate in NHIF data programs, which collect and report data quarterly. Throughout 2021 and 2022, 12,968 patient cases were de-identified and submitted to the NHIF Benchmarking Program using a formatted Excel® file and an instruction manual that included how to code the data and definitions of terms. The patient cases were to include status at discharge, age, type of venous access device, and adverse drug reaction if applicable. However, not all cases included the entire requested information. For the patient case to be eligible for this study, VAD, patient age, and therapy type data had to be included.

The data was analyzed using IBM Analytics Software, SPSS. Frequency and percentages were determined for patient age group and therapy type while cross tabulation analysis was used to gain an in-depth understanding of the VAD usage for the different home infusion therapies.

Results

The 2021 and 2022 NHIF benchmarking program provided 12,968 home infusion patient cases representing 26 unique home infusion providers across the United States. Of these cases, 11,265 included therapy type, VAD, and age data. After a review of the data set, the research team determined that enteral and subcutaneous infusions are not administered using a VAD. As a result, these patient cases (n=298) were deleted from the data set. The

final data set included 10,967 patient cases and was analyzed to determine the patient demographics, most common type of home infusion VAD, and the type of VADs that are used with the different therapy types.

Patient Demographics

In this study, the mean home infusion patient age was 59.26 (SD=17.36) with a range of 0-100 years.

In almost two-thirds (n=7,193) of the patient cases a peripherally inserted central catheter (PICC) was used as the therapy access device. A midline was used in 13.12% of the cases, and a short peripheral intravenous catheter (short PIVC) in 8.59% of the cases. As shown in Figure 1 and Table 2, there are other access devices that are used in home infusion setting.

FIGURE 1 | Home Infusion Vascular Access Devices (n=10,967)

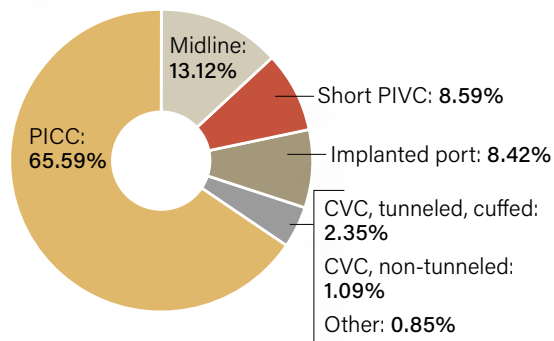


TABLE 2 | Home Infusion Vascular Access Devices (n=10,967)

	Frequency	Percent
PICC	7,193	65.59
Midline	1,439	13.12
Short PIVC	942	8.59
Implanted port	923	8.42
CVC, tunneled, cuffed	258	2.35
CVC, non-tunneled	119	1.09
Other	93	0.85
Total	10,967	100.00

To gain a more in-depth understanding of the types of home infusion VADs that are used for the various therapy types and to show the relationship between therapy type and VAD, cross tabulation analysis was conducted. The most common anti-infective VAD was a PICC and was used by 72.69% of the patients. A PICC was also the most common for the parenteral nutrition patients with 68.88% using this type of VAD. An implanted port was used 87.74% of the time for the administration of anti-neoplastic chemotherapy and 37.57% of the time for hydration therapy, while a short PIVC was predominately (91.82%) used for biologics administration.

Discussion

These results show PICC was the primary VAD utilized in the home infusion setting for a variety of intravenous medication therapies. A PICC was reported in 65.69% of all patients included in this study, followed by midline, short PIVC, and implanted port at 13.12%, 8.59%, and 8.42%, respectively. The INS standards provided recommendations for types of medications administered to the level of central venous or peripheral venous access.⁴ The results of this research added an analysis of medication therapy type divided by central and peripheral VADs and further described the prevalence by types of central VAD and peripheral VAD for each medication therapy. Providing data on the prevalence of specific central and peripheral VADs by therapy or treatment shows details of actual utilization that supports the current standards of practice.

The research in this study reported data on utilization that highlighted which VADs were selected for each home infusion therapy. The results showed evidence of following recognized standards and guidelines.^{6,7} Published guidelines for selecting VAD for administering parenteral nutrition focused on complications and VAD infection rates in a variety of central VADs. The safety profile of PICC VADs was addressed, and the selection of a PICC for parenteral nutrition was emphasized.⁵ The study findings reported here found PICC was the most common VAD used for administering parenteral nutrition in home infusion patients, followed by implanted port. Additionally, our research showed PICC was the most common VAD for anti-infective home infusion

therapy. Even though guidelines from the Infectious Diseases Society of America (IDSA) make no recommendation for the choice of VAD for outpatient anti-infective therapy (OPAT), they acknowledged the need for central VADs and accepted midlines for use in shorter courses of OPAT.⁶ This study found the primary therapy associated with midline VAD was anti-infective therapy.

Previous studies that published data on VAD by therapy type reported variables related to outcomes, such as safety and complication rates between 2 or more types of central VADs, but did not include prevalence data for individual VADs by therapy type.⁶⁻¹¹ Prior research showed implanted ports being preferred for the administration of chemotherapy.^{7,9} In our research, an implanted port was the most commonly reported for anti-neoplastic chemotherapy and hydration therapy. Many studies reported on variables to use in decision-making for the selection of VAD, and our study provided patient-level detail reinforcing that clinical judgments were aligned with best practices and current evidence.

Study limitations included a low sample size for immune globulin and pain therapies. Strong VAD conclusions and inferences should not be made for these 2 therapy types. The second limitation was the possibility of data entry errors made by the provider locations submitting data to the benchmarking initiative. Since data errors are a well-documented part of medical datasets, prior to conducting the data analysis, the data was checked for entries that were not consistent with the data entry guide. If an unacceptable code was used, the data cell was deleted. If the data entry error involved using an acceptable code, the error would be difficult to recognize and remediate.

Conclusions

In this study of VAD utilization in the home infusion setting, PICC was reported in two-thirds of all patients included. When analyzed by therapy type, PICC was reported as the primary VAD for the administration of parenteral nutrition, anti-infectives, and inotrope therapies. The high utilization of PICC VADs in this study validates its selection for medication administration in the home site of care.

References

1. Polinski JM, Kowal MK, Gagnon M, Brennan TA, Shrank WH. Home infusion: Safe, clinically effective, patient preferred, and cost saving. *Healthc (Amst)*. 2017;5(1-2):68-80. Epub 20160429. doi: 10.1016/j.hjdsi.2016.04.004. PubMed PMID: 28668202.
2. Haines DJ, Simpson M. Rate of discontinuation from home infusion therapy due to adverse drug reactions and unplanned hospitalization – A pilot study. *INFUSION NHIF Research Supplement*, September/October 2021; 2-7.
3. Sullivan C, Haines DJ. Setting the bar – Establishing industry standards through benchmarking. *INFUSION*, July/August 2018; 23(4):26-33.
4. Nickel B, Gorski L, Kleidon T, Kyes A, DeVries M, Keogh S, et al. Infusion Therapy Standards of Practice, 9th Edition. *J Infus Nurs*. 2024;47(1S Suppl 1):S1-S285. doi: 10.1097/NAN.0000000000000532. PubMed PMID: 38211609.
5. Manrique-Rodriguez S, Heras-Hidalgo I, Pernia-Lopez MS, Herranz-Alonso A, Del Rio Pisabarro MC, Suarez-Mier MB, et al. Standardization and Chemical Characterization of Intravenous Therapy in Adult Patients: A Step Further in Medication Safety. *Drugs R D*. 2021;21(1):39-64. Epub 20201221. doi: 10.1007/s40268-020-00329-w. PubMed PMID: 33346878; PubMed Central PMCID: PMC7937591.
6. Kovacevich DS, Corrigan M, Ross VM, McKeever L, Hall AM, Braunschweig C. American Society for Parenteral and Enteral Nutrition Guidelines for the Selection and Care of Central Venous Access Devices for Adult Home Parenteral Nutrition Administration. *JPEN J Parenter Enteral Nutr*. 2019;43(1):15-31. Epub 20181019. doi: 10.1002/jpen.1455. PubMed PMID: 30339287.
7. Norris AH, Shrestha NK, Allison GM, Keller SC, Bhavan KP, Zurlo JJ, et al. 2018 Infectious Diseases Society of America Clinical Practice Guideline for the Management of Outpatient Parenteral Antimicrobial Therapy. *Clin Infect Dis*. 2019;68(1):e1-e35. doi: 10.1093/cid/ciy745. PubMed PMID: 30423035.
8. van den Bosch CH, Spijkerman J, Wijnen M, Hovinga I, Meyer-Wentrup FAG, van der Steeg AFW, et al. Central venous catheter-associated complications in pediatric patients diagnosed with Hodgkin lymphoma: implications for catheter choice. *Support Care Cancer*. 2022;30(10):8069-79. Epub 20220701. doi: 10.1007/s00520-022-07256-3. PubMed PMID: 35776186; PubMed Central PMCID: PMC9512752.
9. Yeow M, Soh S, Yap R, Tay D, Low YF, Goh SSN, et al. A systematic review and network meta-analysis of randomized controlled trials on choice of central venous access device for delivery of chemotherapy. *J Vasc Surg Venous Lymphat Disord*. 2022;10(5):1184-91 e8. Epub 20220330. doi: 10.1016/j.jvsv.2022.03.007. PubMed PMID: 35367407.
10. Capozzi VA, Monfardini L, Sozzi G, Armano G, Butera D, Scarpelli E, et al. Peripherally Inserted Central Venous Catheters (PICC) versus totally implantable venous access device (PORT) for chemotherapy administration: a meta-analysis on gynecological cancer patients. *Acta Biomed*. 2021;92(5):e2021257. Epub 20211103. doi: 10.23750/abm.v92i5.11844. PubMed PMID: 34738565; PubMed Central PMCID: PMC8689318.
11. Christensen LD, Holst M, Bech LF, Drustrup L, Nygaard L, Skallerup A, et al. Comparison of complications associated with peripherally inserted central catheters and Hickman catheters in patients with intestinal failure receiving home parenteral nutrition. Six-year follow up study. *Clin Nutr*. 2016;35(4):912-7. Epub 20150728. doi: 10.1016/j.clnu.2015.06.009. PubMed PMID: 26269383.

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