The National Kidney Foundation Singapore

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IMPLEMENTATION OF ULTRASOUND-GUIDED CANNULATION TO ENHANCE VASCULAR ACCESS SAFETY AND PATIENT OUTCOMES IN COMMUNITY-BASED DIALYSIS CENTRES IN SINGAPORE

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INTRODUCTION

Vascular access cannulation is central to haemodialysis safety and adequacy; However, complications such as repeated attempts, infiltration, and haematoma formation remain common, leading to vascular access damage, patient anxiety, and an increased risk of hospitalisation.

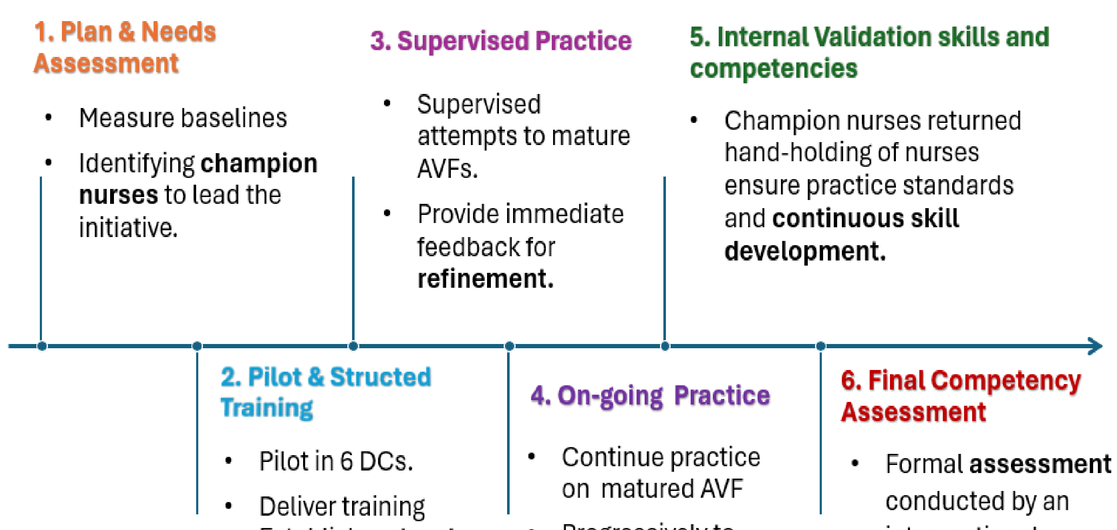
Ultrasound-Guided Cannulation (USGC) enables real-time visualisation of vascular anatomy, improving cannulation accuracy and reducing access-related complications, particularly in challenging arteriovenous fistulas (AVF). The National Kidney Foundation (NKF) Singapore integrated USGC into its Vascular Access Improvement Programme to enhance patient safety, standardise nursing practice, and support sustainable vascular access care across community Dialysis Centres (DC).

METHOD

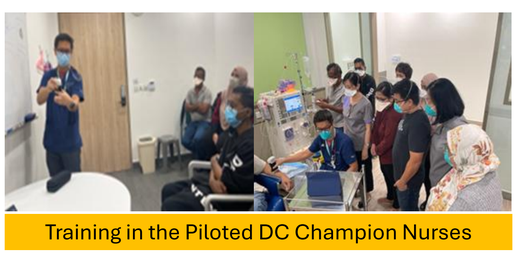
A structured, competency-driven USGC programme was implemented over 20 months (November 2023–August 2025) to enhance cannulation safety and standardisation across community DCs. A train-the-trainer model supported scalability, with nurse champions mentoring peers at their respective centres. Cannulation outcomes, including successful cannulations, missed attempts, and infiltration rates were continuously monitored on patients with new and challenge AVF. Qualitative feedback from nurses and patients was also collected to support ongoing quality improvement.

The programme comprised six phases, as shown in Figure 1.

Figure 1: Training Process for Competency Achievement

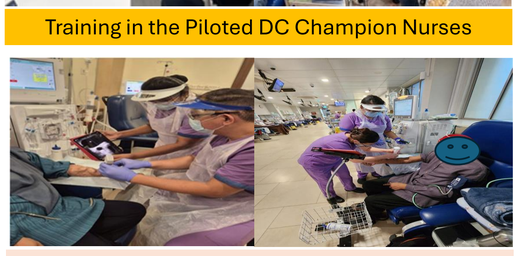


Picture 1: USGC Training and Assessment



Training in the Piloted DC Champion Nurses

Training Workshop for all DC Champion Nurses

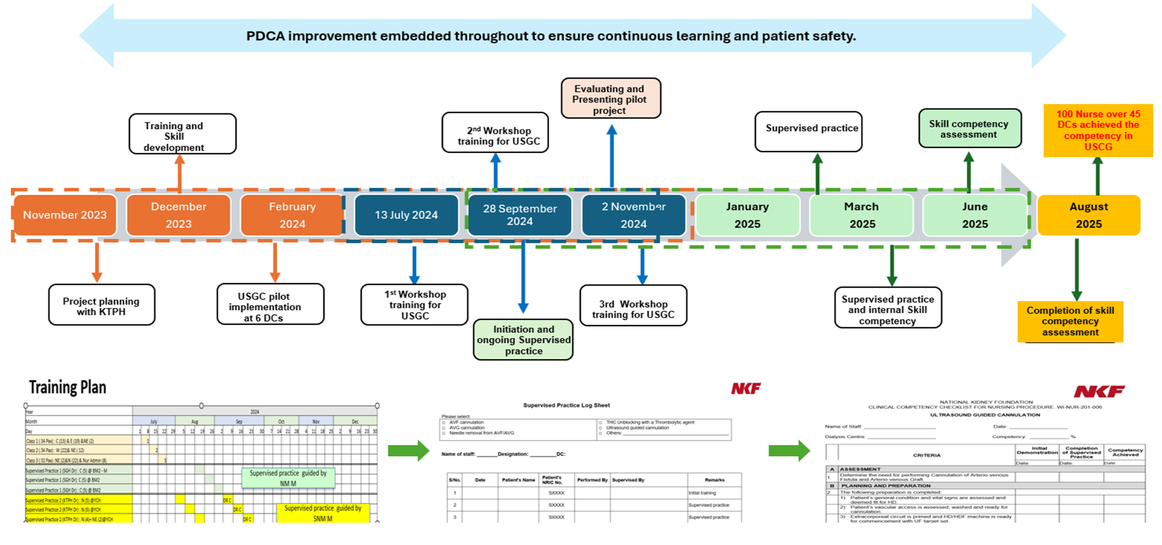


Supervised Practice to Champion Nurses

Competence Assessment for Champion Nurses

METHOD (Cont'd)

Figure 2: Training Timeline



RESULTS

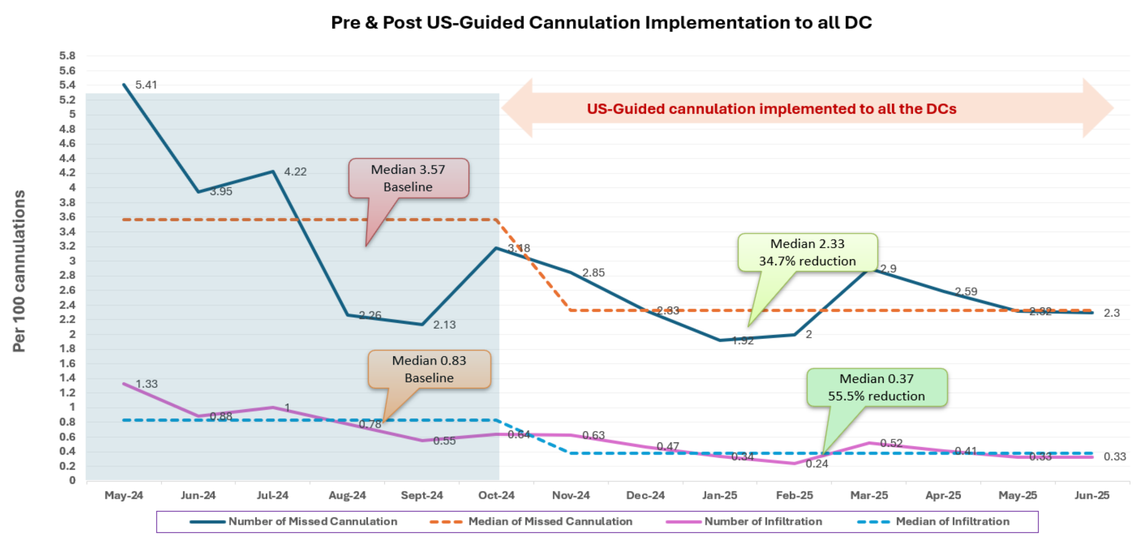
❑ Programme Outcomes (Figure 2)

- USGC was progressively rolled out to 45 DCs from October 2024, with 100 nurses attaining competency by August 2025.

❑ Clinical Outcomes (Figure 3)

- Successful cannulation rate reached 97%.
- Missed cannulation attempts reduced from 3.57 to 2.33 per 100 cannulations.
- Infiltration incidents declined by 55.5%, from 0.83 to 0.37 per 100 cannulations.

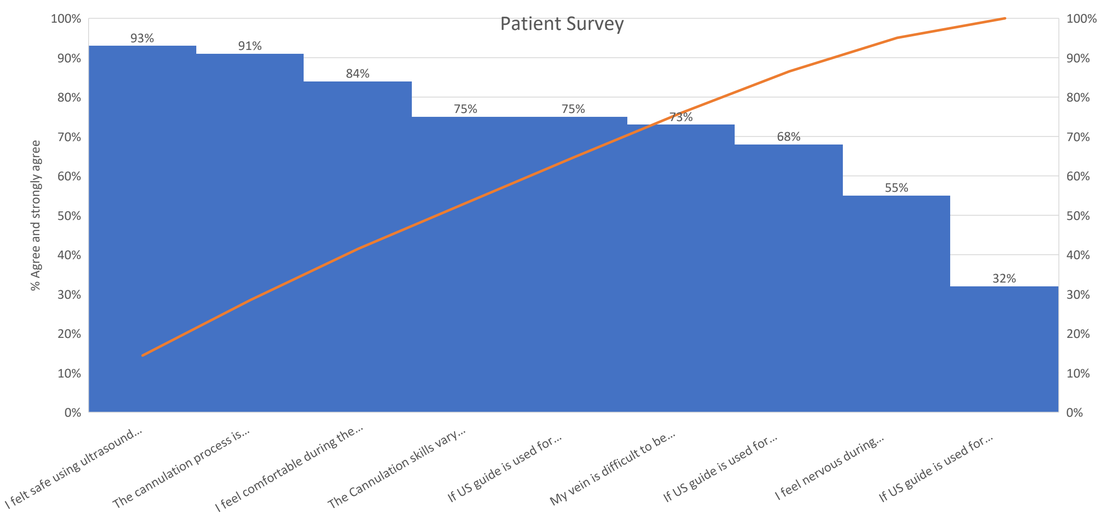
Figure 3: Clinical Outcomes



❑ Nurse and Patient Experiences (Figure 4)

- Nurses reported improved hand–eye coordination and greater confidence in managing complex AVFs.
- Patients expressed increased comfort and reduced anxiety during cannulation procedures.

Figure 4: Patient Survey



CONCLUSION

Embedding USGC within routine haemodialysis workflows, supported by a structured competency framework, enhances patient safety, reduces vascular access complications, and standardises nursing practice across community dialysis centres.

REFERENCES

1. Chen, S., Liu, J. S., Chai, C. C., Si, C., Tan, S. H., Ravindran, H. R., Martinez, M. T. P., Gao, Y., Yeap, Y. R., & Liu, A. Y. L. (2022). Handheld ultrasound-guided cannulation of difficult hemodialysis arteriovenous access: A randomized controlled trial. Hemodialysis International. https://doi.org/10.1111/hdi.13050
2. Chan, A. H. M., & Lam, A. H. Y. (2024). Effectiveness of ultrasound-guided arteriovenous fistula cannulation in difficult hemodialysis access: A meta-analysis of randomized controlled trials. Health, 16, 994–1012. https://doi.org/10.4236/health.2024.161106

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All institutions are in Singapore.

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