ANNEXES TO CHAPTER 1

Clinical Question I. Does the preservation of the venous network prevent complications/facilitate the creation of the arteriovenous fistula?

Clinical Practice Guidelines (CPG)

Five CPG have been identified which give recommendations on preservation of veins in patients on haemodialysis with a VA (UK 2011[1], DOQI 2006[2], CANADA 2007[3], ERBP 2007[4], SPANISH 2004[5]). The UK 2011 CPG are the most recent and the only ones to grade the recommendations with the GRADE system.

Problems related to the VA represent the major cause of morbidity, hospitalisation and cost in patients on haemodialysis (HD). The preferred VA is the arteriovenous fistula (AVF). To successfully create an AVF, the anatomical and functional integrity of both vessels (artery and vein) is necessary, and a maturation period of at least 4 weeks to allow the vascular remodelling which will enable satisfactory cannulation. The fact that these two conditions are very often absent is one of the reasons many patients do not have a VA that has been able to mature over the final stages of chronic kidney disease (CKD). It is also one of the reasons for having to resort to placement of a central venous catheter (CVC) to commence the HD, which then increases the morbidity rates among these patients.

UK CPG[1] (Fluck R, Kumwenda 2011)

The general preferred rule for creation of AVF is to place it as distally as possible in the non-dominant arm. All pre-dialysis and dialysis patients and health professionals should be educated about the preservation of veins in the forearm and pre-dialysis care (DOQI 2000).

Recommendations: (1 strong, 2 weak, C low level of evidence, D very low level of evidence)

Preservation of the peripheral veins for the vascular access

1. We suggest that all patients who may require renal replacement therapy should have education on forearm vein preservation (2D).

2. We suggest that healthcare workers should avoid unnecessary venepunctures and peripheral venous access in the upper limb intended for creation of vascular access (2C).

ERBP CPG[2] (Tordoir 2007) These CPG do not grade the recommendations; they only clarify the grades of evidence.

A substantial part of the pre-dialysis care is the preservation of veins in both arms, favouring the use of the veins of the dorsum of the hand for blood sampling, infusions and transfusions.

Recommendations:

1. An early plan for venous preservation should be a substantial part of pre-dialysis care and education in any chronic kidney disease (CKD) patient regardless the choice of treatment modality (level of evidence IV).

2. Nurses and medical staff should be involved in vein preservation and monitoring of the vascular access. Every patient with chronic kidney disease must have a declared plan

for preserving the vascular access and the potential access sites (level of evidence IV).	
DOQI CPG, 2006[3] These CPG base their clinical recommendations on a number of observational studies and group consensus. The following recommendation is a group opinion from the DOQI 2000 CPG. **Recommendations:** Arm veins suitable for vascular access placement should be preserved; in particular, the cephalic veins of the non-dominant arm, which should not be used for venepuncture or intravenous catheters. The dorsum of the hand should be used for intravenous lines in patients with chronic kidney disease. When venepuncture of the arm veins is necessary, sites should be rotated (consensus).	
Canadian[4] (Culleton B 2006) **Recommendations** Graded according to the scheme developed by the *Canadian Hypertension Education* Program Guidelines. 1. Arm veins suitable for vascular access placement need to be preserved. Preservation should commence in patients with progressive renal disease and an estimated GFR below 30 ml/min (grade D, opinion).	
Spanish 2004 CPG[5] The necessary measures for venous preservation should form part of the strategy for future vascular access in patients with progressive chronic kidney disease (Malovrh M 2003, narrative review). The recommendations for vein preservation shall be applied to all patients with CKD who are candidates for renal replacement therapy, regardless of the initial choice of modality (Bonucchi 2002) **Recommendations for venous preservation** (Malovrh M 2003) Informing the patient of how important this is. Provide patient with a card or recommend wearing a bracelet or wristband. Recommend punctures in dorsum of hand. Use of low-plasma-consumption laboratory techniques (capillary, dry). Communication of this problem to all healthcare professionals. Avoid placement of central venous catheter in shoulder girdle, especially the subclavian vein. Femoral catheters are recommended in patients with exacerbations during the course of progressive CKD. Stimulation of muscle/vascular development by using isometric exercises or venous dilation practices. Give the same careful consideration to the veins of patients who are on peritoneal dialysis or kidney transplant recipients. In the above situations, it is essential to raise the awareness of patients and healthcare professionals of the importance of: i) rescuing an autologous or native arteriovenous fistula that has thrombosed; and ii) repairing an arteriovenous fistula of the elbow before it closes up in the absence of congestive heart failure. **Recommendations:** Note: These CPG make a recommendation with grade A and is not clear which studies it has been based on to provide this value.	

1 In patients with advanced CKD, the preservation of the superficial veins of the upper limbs should be maximised. Both should be kept free of punctures and cannulations, for which instructions need to be given to the nursing team and information to the patient. A	

No scientific evidence has been found in observational studies or randomised controlled clinical trials on whether preservation of the veins prevents complications or facilitates the creation of VA. A literature review (Malovrh 2011[6]) is shown below in which the preoperative care for the creation of an AVF, including the preservation of veins, is discussed.

Malovrh 2011.[6] Efforts to improve the vascular access experience of patients in the initial stages of haemodialysis therapy need to focus on all persons involved in pre-dialysis care, including patients, referring physicians, surgeons, and nephrologists.

An aggressive policy of early venous preservation before the beginning of any renal replacement therapy (RRT) is needed. It is important to instruct the patient on an ongoing basis and that this should provide them with the motivation to preserve their forearm veins. The puncture of a vein will leave a scar. When creating an AVF, such scars interfere with dilation and lead to turbulent flow, which then predisposes patients to VA stenosis. The rule should be: strictly avoid cannulation of the veins of both forearms proximal to the wrist. For venepuncture, the veins on the dorsum of the hand should be used as an alternative. In the event of difficulties, the hand should be heated in a hot bath. When it is unavoidable, venepuncture may be performed in the dominant arm to preserve the non-dominant arm for the AV fistula or, alternatively, with rotation of the puncture sites.

Phlebocatheters should not be placed in central veins through cephalic or basilic veins at the elbow. Central venous catheters should be inserted into the jugular veins (preferably on the right side). Insertion via subclavian veins is to be avoided because of very frequent subsequent stenosis. The same applies for inserting pacemakers. In cases where vein diameter/flow is the critical factor influencing the decision to use the central vein (as when potentially caustic/toxic solutions are to be infused), using the femoral veins should be considered.

Summary of evidence

Malovrh 2011.[6] The clinical success of AV fistulae is threatened by the high rates of early failure and non-maturation. Guidelines recommend the use of different diagnostic modalities to allow the creation of a vascular access tailored to each individual patient's needs and prevent failure or non-maturation of the vascular access. An aggressive policy of venous preservation early before the beginning of any renal replacement therapy is needed. A multidisciplinary approach, including nephrologists, surgeons, interventional radiologists and nurses should improve haemodialysis outcomes through promotion of the use of AV fistulae.

Patients' values and preferences
No relevant studies related to this aspect have been identified.

Use of resources and costs
No relevant studies related to this aspect have been identified.

Recommendations [Proposal]

We suggest maximising the preservation of the superficial veins of the upper limbs in patients with advanced CKD. Both should be kept free of punctures and cannulations, for which instructions need to be given to the medical and nursing staff and information to the patient.

References

1. Fluck R, Kumwenda M. Renal Association Clinical Practice Guideline on vascular access for haemodialysis. Nephron ClinPract. 2011;118Suppl 1:c225-40.

2. GPC DOQI 2006 Am J Kidney Dis. 2006 Jul;48Suppl 1:S248-73. Clinical practice guidelines for vascular access. Vascular Access Work Group.

3. Tordoir J, Canaud B, Haage P, Konner K, Basci A, Fouque D, Kooman J, Martin-Malo A, Pedrini L, Pizzarelli F, Tattersall J, Vennegoor M, Wanner C, terWee P, Vanholder R. EBPG on Vascular Access. Nephrol Dial Transplant. 2007 May; 22Suppl 2:ii88-117.

4. Culleton B. Introduction to the Canadian Clinical Practice Guidelines. J Am Soc Nephrol 2006;17:S1-3.

5. Rodríguez Hernández JA, González Parra E, Julián Gutiérrez JM, Segarra Medrano A, Almirante B, Martínez MT, Arrieta J, Fernández Rivera C, Galera A, Gallego Beuter J, Górriz JL, Herrero JA, López Menchero R, Ochando A, Pérez Bañasco V, Polo JR, Pueyo J, Ruiz CI, Segura Iglesias R; Sociedad Española de Nefrología. [Vascular access guidelines for hemodialysis]. Nefrologia. 2005;25 Suppl 1:3-97

6. Malovrh M. How to increase the use of native arteriovenous fistulae for haemodialysis. Prilozi. 2011 Dec;32(2):53-65.