ANNEXES TO CHAPTER 6

Clinical Question XXVII. Should ultrasound be used as a reference standard for the placement of central venous catheters?

A significant proportion of patients starting dialysis do so with a temporary or tunnelled haemodialysis catheter. The insertion of these catheters can be achieved either by using the anatomical reference points of the veins in which they are inserted or with the aid of ultrasound guidance. It has been suggested that the use of ultrasound guidance reduces immediate complications of haemodialysis catheter insertion such as pneumothorax or arterial puncture.

We found two recently published systematic reviews with meta-analysis which examine this issue; both were carried out by the same group (Rabindranath 2011; 2012).

As the closure date for the literature search in the 2012 publication, Cochrane review, is more recent (January 2011) and it presents the data in more detail, the results of that review are shown below.

Ultrasound-guided catheter placement vs insertion based only on anatomical reference points

The Cochrane review with meta-analysis by Rabindranath (2012) identified seven RCT which included 767 patients with 830 catheter insertions. Three of the seven trials reported the method for generating the random sequence, none described the blinding of the allocation, and blinding of the participants and personnel was not possible. The main findings are presented below. For all the variables analysed, they show that ultrasound-guided placement is technically and clinically better than insertion based only on anatomical reference points, with the differences being statistically significant in all cases except for the risk of pneumothorax/haemothorax. - overall risk of failure in catheter placement: Relative Risk (RR) 0.11, 95% CI: 0.03 to 0.35 (seven studies, 830 catheters). - risk of failure in catheter placement at the first attempt: RR 0.40, 95% CI: 0.30 to 0.52 (five studies, 705 catheters). - risk of arterial puncture: RR 0.22, 95% CI: 0.06 to 0.81 (six studies, 785 catheters). - risk of haematomas: RR 0.27, 95% CI: 0.08 to 0.88 (four studies, 323 catheters). - risk of pneumothorax or haemothorax: RR 0.23, 95% CI: 0.04 to 1.38 (five studies, 675 catheters). - time needed for successful cannulation: Difference in means -1.40 minutes, 95% CI: -2,17 to -0,63 (one study, 73 catheters). - catheter insertion attempts: Difference in means -0.35, 95% CI: -0.54 to -0.16 (one study, 110 catheters). Note: data taken from the section *Data and analyses* in the review (page 21 and after) are in some cases slightly different from those in the abstract.	**High quality**

Summary of evidence	
A meta-analysis of seven RCT found that ultrasound-guided placement had better outcomes than insertion based only on anatomical reference points, in terms of the number of catheters inserted successfully at the first attempt, reduction in the risk of arterial puncture and haematomas, and less time needed for successful puncture of the vein.	**High quality**
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]	
Strong	We recommend that insertion of catheters for haemodialysis should be guided by ultrasound.
References	
Rabindranath KS, Kumar E, Shail R, Vaux EC. Ultrasound use for the placement of haemodialysis catheters. Cochrane Database of Systematic Reviews 2011, Issue 11. Art. No.: CD005279. DOI: 10.1002/14651858.CD005279.pub4. Rabindranath KS, Kumar E, Shail R, Vaux E. Use of real-time ultrasound guidance for the placement of hemodialysis catheters: a systematic review and meta-analysis of randomized controlled trials. Am J Kidney Dis. 2011 Dec; 58(6):964-70.	

GRADE TABLES

Date: 2014-01-17
Question: Should placement of ultrasound guided catheter vs placement based only on anatomical reference points be used in haemodialysis?
Bibliography: Rabindranath KS, Kumar E, Shail R, Vaux EC. Ultrasound use for the placement of haemodialysis catheters. Cochrane Database of Systematic Reviews 2011, Issue 11. Art. No.: CD005279. DOI: 10.1002/14651858.CD005279.pub4.

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Placement of ultrasound guided catheter**	**Placement based only on anatomical reference points**	**Relative (95% CI)**	**Absolute**		
Total risk of failure in the placement of the catheter:												
7	randomised trials	no serious risk of bias[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	1/450 (0.22%)	31/380 (8.2%)	RR 0.11 (0.03 to 0.35)	73 fewer per 1000 (from 53 fewer to 79 fewer)	⨁⨁⨁⨁ HIGH	CRITICAL
								0%		-		
Risk of failure in placing the catheter at the first attempt												
5	randomised trials	no serious risk of bias[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	66/385 (17.1%)	142/320 (44.4%)	RR 0.40 (0.30 to 0.52)	266 fewer per 1000 (from 213 fewer to 311 fewer)	⨁⨁⨁⨁ HIGH	CRITICAL
								0%		-		

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Placement of ultrasound-guided catheter	Placement based only on anatomical reference points	Relative (95% CI)	Absolute		
Risk of arterial puncture												
6	randomised trials	no serious risk of bias[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	7/425 (1.6%)	33/360 (9.2%)	RR 0.22 (0.06 to 0.81)	72 fewer per 1000 (from 17 fewer to 86 fewer)	⨁⨁⨁⨁ HIGH	CRITICAL
								0%		-		
Risk of haematoma												
4	randomised trials	no serious risk of bias[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	3/161 (1.9%)	14/162 (8.6%)	RR 0.27 (0.08 to 0.88)	63 fewer per 1000 (from 10 fewer to 80 fewer)	⨁⨁⨁⨁ HIGH	CRITICAL
								0%		-		
Risk of pneumothorax or haemothorax												
5	randomised trials	no serious risk of bias[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	0/370 (0%)	4/305 (1.3%)	RR 0.23 (0.04 to 1.38)	10 fewer per 1000 (from 13 fewer to 5 more)	⨁⨁⨁⨁ HIGH	CRITICAL
								0%		-		

Quality assessment							No of patients				Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Placement of ultrasound-guided catheter	Placement based only on anatomical reference points			Relative (95% CI)	Absolute		
Time required for successful cannulation (Better indicated by lower values)														
1	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	no serious imprecision	none	36	37			-	MD 1.40 lower (2.17 to 0.63 lower)	⨁⨁⨁⨁ HIGH	IMPORTANT
Placement/catheter attempts (Better indicated by lower values)														
1	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	no serious imprecision	none	55	55			-	MD 0.35 lower (0.54 to 0.16 lower)	⨁⨁⨁⨁ HIGH	IMPORTANT

[1] Three of the seven studies describe the generation method of the random sequence; none described the allocation concealment and the blinding of the participants and staff was not possible.