Clinical and cost-effectiveness of Hickman line insertions in adult cancer patients

A randomised controlled trial to evaluate the clinical and cost-effectiveness of Hickman line insertions in adult cancer patients by nurses

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Executive summary

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Executive summary

Objectives

To examine the clinical and cost-effectiveness of image-guided Hickman line insertions versus blind Hickman line insertions undertaken by nurses in adult cancer patients at Christie Hospital NHS Trust. To explore whether or not experienced nurses can transfer skills to trainee operators via a short but intensive training programme.

Design

A cost-effectiveness analysis was carried out alongside a randomised controlled trial.

Setting

Christie Hospital NHS Trust (CHNT), a large acute cancer centre in Manchester, UK

Subjects

A total of 470 adult cancer patients were randomised to receive either blind or image-guided Hickman line insertions. Patients were eligible for the study if they were due to have a Hickman line insertion at Christie Hospital NHS Trust, were over 18 years of age and were clinically and physically compliant with specified protocols.

Interventions

The aim of both interventions was to obtain central venous access for the patient. The two interventions under investigation were (i) blind insertion of a Hickman line and (ii) image-guided insertion of a Hickman line. In the trial, blind insertion of a Hickman line took place at the patient's bedside whereas the image-guided insertion of a Hickman line took place in the interventional X-ray suite. Both interventions involved blind venipuncture of the subclavian vein. In the blind arm, the Hickman line was routinely inserted without the use of image guidance at any point in the procedure. Transfer to the interventional X-ray suite and use of image guidance were options immediately available to the operator during the procedure if required. In the image-guided arm, the position of the guidewire was checked before the Hickman line was introduced and later the Hickman line was positioned with the use of X-ray fluoroscopy.

Main outcomes measures

When comparing image-guided versus blind Hickman line insertions, the primary clinical outcome measure was catheter tip misplacement and this was expected to be higher in the blind arm. When comparing the skill level of the trainer and the trainees, pneumothorax was the primary clinical outcome measure. Other outcomes measures included arterial puncture, haematoma, infection, failed insertion and assistance from other healthcare professionals.

Results

When comparing image-guided with blind Hickman line insertions, no statistically significant difference was found between the mean cost per patient (£464.57 versus £440.40, respectively) in the two arms of the trial. The only statistically significant difference in clinical outcomes was the frequency of catheter tip misplacement; this was higher in the blind arm of the trial. In the blind arm, 14% of patients had misplaced catheter tips whereas in the image-guided arm only 1% of patients had misplaced catheter tips. Consequently, incremental cost-effectiveness analysis was undertaken and the incremental cost per misplaced catheter tip avoided was £183.22. Sensitivity analysis demonstrated that the cost of the interventional X-ray suite charge might have an impact on the preferred method of insertion. At very low costs, the image-guided approach dominates the blind approach as fewer costs and greater benefits are incurred. Based on the clinical evidence from the trial, it is evident that nurses previously inexperienced in the procedure can be trained to insert Hickman lines successfully both at the bedside and under image guidance within a 3-month period. The only statistically significant

difference identified when comparing the skill level of the three nurses was that the trainer was less likely to call for assistance from another healthcare professional during the procedure than the trainees.

Conclusions

This report indicates that nurse insertion of Hickman lines in the majority of adult cancer patients at CHNT is both safe and effective. However, there are a select group of patients for whom image-guided insertion may be preferred. The results reveal that skills and expertise can be transferred from trainer to trainee through a relatively short but intensive training course. From the patient satisfaction evidence available, it is evident that patients support nurse insertion. Nurse insertions can free up clinical resources in a safe and effective manner at a time of unprecedented pressure within the NHS.

Recommendations for future research

Reliable estimates of the clinical and cost-effectiveness of Hickman line insertions in adult cancer patients can only be calculated if further research to compare the safety and efficacy of nurse versus doctor insertions in particular subgroups of patients is carried out. It is also recommended that future studies be conducted to assess the quantity and quality of current service provision in order to inform NHS decision-making in this area.

Publication

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