Cedar

Healthcare Technology Research Centre

Additional information

Sherlock 3CG TCS

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Additional economic analysis

1 Model structure

The model is limited by the lack of evidence available. This is exacerbated by the large variations in clinical practice, different patient groups and settings that are included.

No evidence was available to the sponsors on the impact of identified malpositions, it was unknown if they were adjusted or replaced as a result. No comparative evidence was available on the rate of complications or adverse events.

2 Nurse time for insertion

One of the key changes made by the EAC was to the differences in nurse times for different insertion methods. The values used in the sponsor model were taken from unrelated studies in different locations. Given that the variation in practice is large, it is unlikely that these studies were appropriate to use comparatively. There was no comparative data available for the length of time taken by a nurse for blind PICC insertion, or insertion with Sherlock 3CG TCS.

The EAC used an alternative hypothesis that the actual insertion time would be similar for each method, and that the nurse would not be involved in any x-ray.

Expert advice for procedure length varied between 20 to 40 minutes for Sherlock and 15 to 60 minutes for blind PICC placement. Some experts felt that Sherlock 3CG TCS would take a little longer, and some felt that it would be slightly quicker.

Expert advisors were asked if nurses would be involved in the x-ray process, and the advice was that nurses would not normally accompany patients to x-ray, but that they may be responsible for interpreting the x-ray. There may therefore be some additional nurse time involved in PICC placement that uses x-ray confirmation, however there is no firm evidence to the amount of this, or the extent of different practices.

Walker et al.(2013) was used extensively for model inputs by the sponsor, and detailed information on the insertion times and staffing for different PICC teams in one hospital is found in the full thesis (Walker 2013), summarised in table 1. Procedures were either fluoroscopy (radiology team) or blind PICC placement. Times for obtaining x-ray confirmation are not included. For the same procedure, in the same hospital there are differences greater than the variations used in either version of the model.

The sponsor's sensitivity analysis did not look at nurse time in isolation, but only as a component of the whole procedure cost. The difference between nurse times for each procedure was not included in the sponsor's sensitivity analysis.

Table 1: PICC insertion times, Walker 2013.

Department	Trained staff	Typical staff involvement	Number of observations	Mean time for insertion (mins)
Radiology	3	1 consultant radiologist, 1 scrub nurse, 1 floor nurse, 1 radiographer (all for full duration of procedure)	48	40.125
ICU	2	1 doctor (for full duration of procedure) and 1 nurse assistant (for 5 min)	2	18
Macmillan	2	1 nurse: band 5-8 (for full duration), 1 assistant band 2-5 (for 5 min)	49	50.612
OPAT	2	2 nurses: band 6 (for full duration)	32	89.375
Ward 2C	3	2 nurses: band 5-8 (for full duration)	10	47.5
Nurse time average (not weighted)			91	62.49

(OPAT: Outpatient Parenteral Antibiotic Therapy, includes time travelling to patient on ward)

The EAC completed an additional sensitivity analysis where different nurse times (30 and 80 min) were chosen for blind PICC insertion, and the impact of varying the Sherlock 3CG TCS insertion time by ±20 min was explored, figure 1. It can be seen that the difference between nurse times has more impact than the actual length of the procedure, and also that 10 minutes can make the difference between a theoretical cost saving or cost incursion. There is no evidence available that can give this degree of certainty for the inputs, and hence the results.

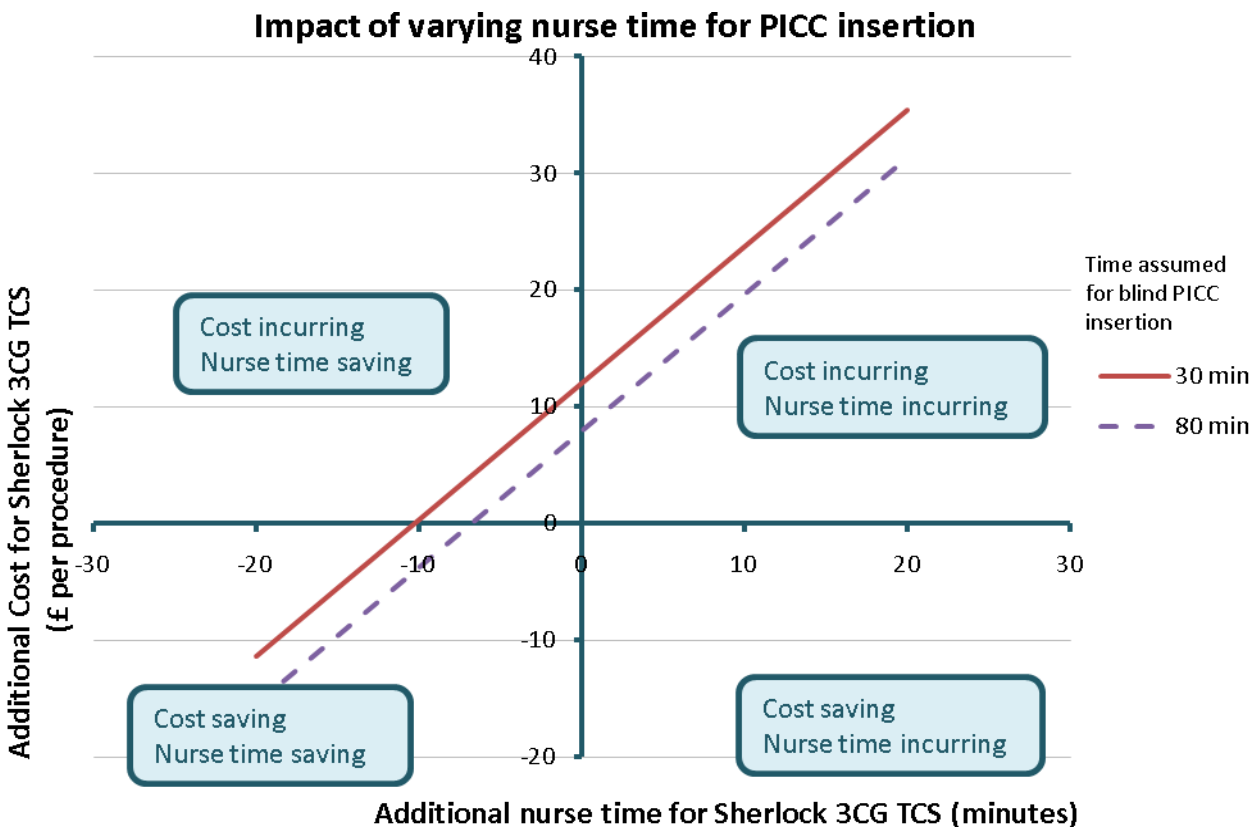

Figure 1: Impact of varying nurse time for PICC insertion

3 Accuracy of placement

There is considerable uncertainty over the realistic accuracy of placement in different patient populations and in different settings, both for Sherlock 3CG TCS and blind PICC placement. Figure 2 explores the impact on cost when different accuracy rates are modelled.

Using the scenario where Sherlock 3CG TCS was used with chest –rays, figure 2 shows that if Sherlock 3CG TCS achieved accurate placement of the PICC in 60% of cases, then it would be cost incurring if blind PICC placement was accurate in over 42% of cases.

If Sherlock 3CG TCS achieved accurate placement of the PICC in 100% of cases, then it would be cost incurring if blind PICC placement was accurate in just over 87% of cases.

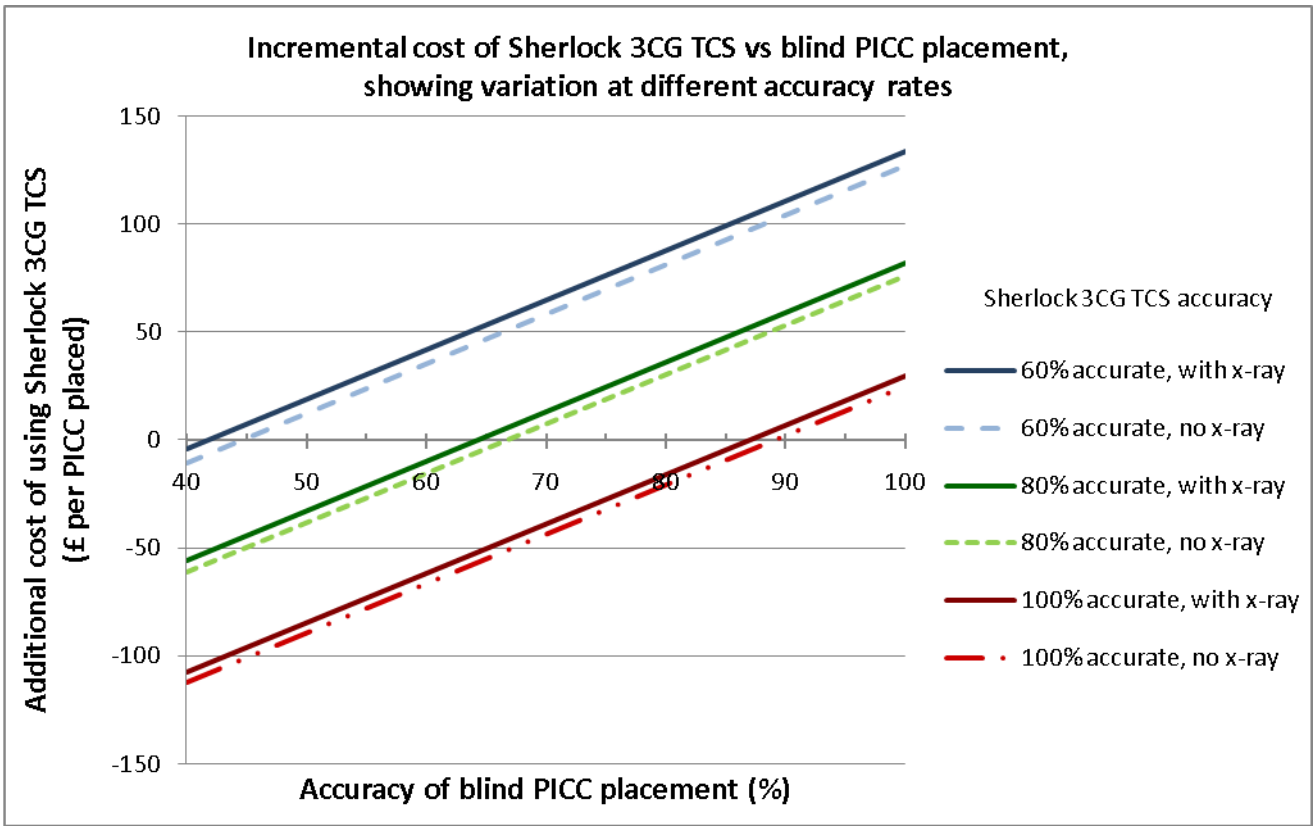

Figure 2. Incremental cost of Sherlock 3CG TCS vs blind PICC placement, showing variation at different accuracy rates

4 Correction to ICU scenario analysis

During this additional analysis the EAC identified an error in one formula in the economic model. This meant that when Sherlock 3CG TCS was unsuccessful, and reinsertion was carried out at the bedside by the original method, the full procedure cost was not included in the total.

There is no impact on the sponsor's base case since all re-insertions were by fluoroscopy. There is also no impact on the EAC base case as Sherlock 3CG TCS (no x-ray) was assumed to be successful in all placements.

When ICU data from Johnston et al (2014) was used there was a greater impact, due to the high rates of malposition, although the overall conclusions remain unchanged. The corrected total cost saving from using Sherlock 3CG TCS is £41.35 rather than £97.72 previously calculated.

Table 2 Results of the EAC scenario for ICU patients. Corrected.

	Blind PICC insertion with x-ray confirmation	PICC insertion with Sherlock 3CG TCS with x-ray	Cost difference	EAC comment
Total cost	£413.69	£372.35	-£41.35	Based on sponsor base case model with ICU accuracy rates.

There are also very minor changes for EAC scenarios where Sherlock 3CG TCS was used with chest x-ray.

5 Impact

There are numerous uncertainties in the model structure and inputs that are due to the lack of data available. The EAC analysis presents an alternative set of assumptions, but the lack of information does not allow absolute certainty over which is correct.

Given current information, the use of Sherlock 3CG TCS compared to blind PICC insertion using a chest x-ray appears to hover around cost neutral. If evidence became available for longer term outcomes, such as replacement, complications and adverse events, the cost implications may change, however the direction of the change is not known.

References

Walker G, Todd A. (2013) Nurse-led PICC insertion: is it cost effective? British Journal of Nursing 13;22(19):S9-15.
Walker G. (2013) Investigation of the health economics of peripherally inserted central catheter (PICC) placement by different staff groups in a district general hospital. University of Aberdeen, Thesis, BMedSci.