Health economics: Cost-consequence model for an innovative device for prevention of accidentally retain surgical items(swabs)

Dr Aditi Desai[1], Samuel Harper [2],Dr Kiran Desai[1] & Joyce Craig [2]

1. Eureka Inventions- Med IC4, University of Keele, ST5 5NL, UK.

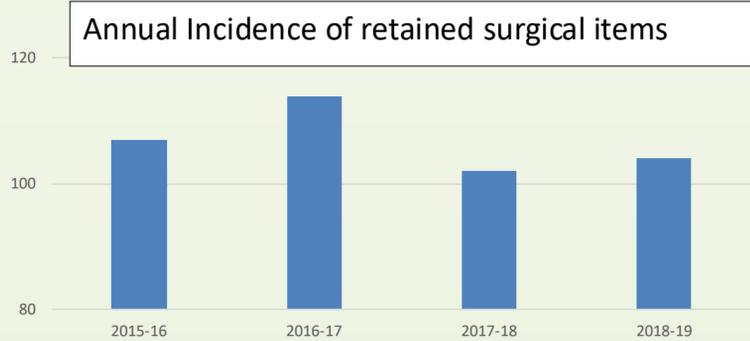2. York Health Economics Consortium, University of York, YO10 5NQ

Background of problem and intervention developed

In UK, retained swabs after vaginal birth and perineal suturing are classed as "Never events.1 Retained vaginal swabs have accounted for around 30% of retained foreign object -'never events' reported on an annual basis for a number of years.2 Retained vaginal swab post delivery could cause significant morbidity .The patient may experience serious physical and psychological complications including infection, secondary post-partum haemorrhage, sepsis, depression, lack of bonding with their baby and loss of trust in the healthcare system.3

Although it is a rare event, there has been a case report of a maternal death from it. A retained swab is a 'Never event' under the DOH

Policy (Department of Health, 2013) .

Annual Incidence of retained surgical items

According to never event data published by NHS improvement (2019) retained foreign object is the second most commonly reported never event. Vaginal swabs are the most common retained foreign object reported and the surgical swabs, the second most common.

Swabs are anchored by their tapes into the device before and after procedures, creating a visible, countable array. The docking mechanism supports manual counting and complements standard protocols, reinforcing count fidelity with a 'physical checklist'. The aim is to ensure that all swabs are returned and not retained in the patient. iCount is a docking device anchoring all the swabs, thereby making it extremely unlikely to leave a swab behind.

Cost Consequence Analysis(CCA)

Cost consequence analysis (CCA) is a type of economic evaluation which assesses a wide range of costs and consequences of the intervention. It includes all types of effects including health non-health negative and positive effects of patients and other parties giving decision-makers a comprehensive summary of the costs and effects.
Advantages:
Simple broken-down (disaggregated) summary of costs and effects of the device. Includes a broader range of effects than other analyses, such as user experience and convenience of care
Disadvantage:
may be less generalizable because the choice of relevant costs and effects and the weighting attached to them is often context-specific

References

1. NHS England. Never Events List 2018/2019.
2. NHS Improvement. Never Events reported as occurring between 1 April 2017 and 31 March 2018 – final update. 2019.
3. Mahran, M. A., Toeima, E. & Morris, E. P. (2013) The recurring problem of retained swabs and instrument . Best Practice and Research: Clinical Obstetrics and Gynaecology, 27 (4): 489-495.
4. Health and Safety Executive. (2019) Frequently asked questions- what is the hierarchy of control? [Online] Available at: http://www.hse.gov.uk/risk/faq.htm#hierarchy
5. NIHR article on Cost consequence analysis

Decision Problem, Model structure and pathways

Population Women undergoing vaginal birth, Alternative population of people undergoing abdominal surgery available in the model
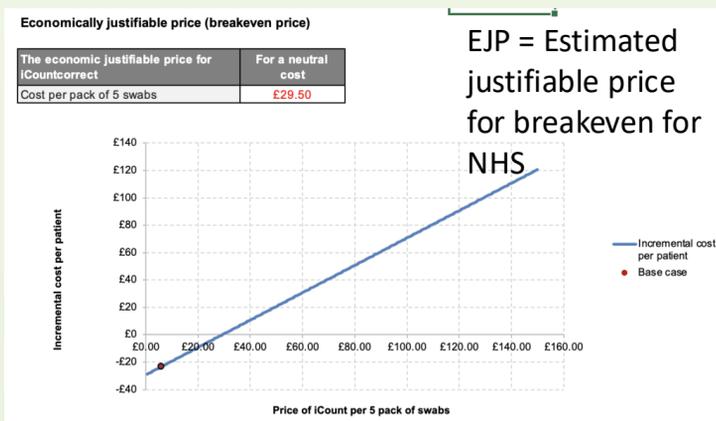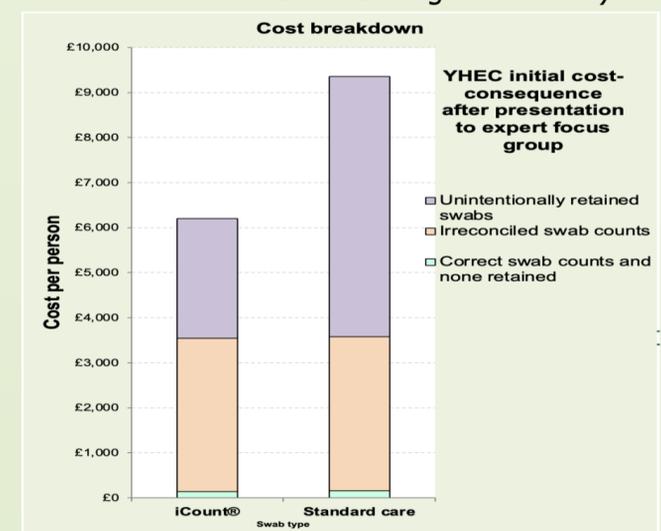**Intervention** iCount device system with surgical swabs/surgical tampon
Comparator Standard care comprising of standard 5 surgical swabs
Perspective NHS. **Outcomes** Costs, Economically justifiable price of the device   (break-even price)

Results		Population:	100,000
Summary table	**iCount®**	**Standard care**	**Incremental**
Total cost	£13,626,906	£15,958,330	-£2,331,424
Cost per person	£136.27	£159.58	-£23
Cost breakdown per person	**iCount®**	**Standard care**	**Incremental**
Correct swab counts and none retained	£136	£158	-£22
Irreconciled swab counts	£3,401	£3,420	-£18
Unintentionally retained swabs	£2,659	£5,778	-£3,119
Clinical breakdown per person	**iCount®**	**Standard care**	**Incremental**
Correct swab counts and none retained	99,994	99,944	50
Irreconciled swab counts	5	50	-55
Unintentionally retained swabs	1	6	-7

This table displays the cost breakdown per person. iCountcorrect costs less per person in each situation

This table displays the clinical breakdown. iCountcorrect has more instances of correct swab counts, whilst standard care has more irreconciled counts and unintentionally retained swabs.

Economically justifiable price (breakeven price)

The economic justifiable price for iCountcorrect	For a neutral cost
Cost per pack of 5 swabs	£29.50

EJP = Estimated justifiable price for breakeven for NHS

The EJP is £29.50

▪The unit costs included within the model were taken from national databases, including:
- PSSRU for the costs of contact with various healthcare providers
- National Schedule of NHS costs for appointments in secondary care
- BNF for the costs of drugs

▪Litigation costs are based on data provided in response to a freedom of information request (FOI reference number 3352 NHSLA litigation claims)

This model was presented in a focus group of Obstetricians , Midwives and Nurses. The data was modified to represent some probabilities more realistically and a graph was plotted: **This never event leads to Total Direct costs per person shown in the table and graph**

Cost breakdown

YHEC initial cost-consequence after presentation to expert focus group
- Unintentionally retained swabs
- Irreconciled swab counts
- Correct swab counts and none retained

Limitations: this model uses many inputs which have values based on assumptions(usual with an early model). The model takes an NHS perspective and does not capture cost borne by the patients i.e. personal legal costs. It also assumes that there are no longer term impacts such as mental health disorders. Successful litigation claims may increase hospital payments to NHS resolution which have not been accounted for.

Conclusion

CCA helps decision maker understand how iCount compares to standard care for each individual cost and effect component by understanding incremental differences. **EJP(estimated justifiable price for NHS is at least £29.50. As iCount would likely cost lesser, it offers significant cost savings.** The CCA helps to refine economic methods, identify relevant costs, outcomes and generate hypotheses for definitive cost-effectiveness studies. It will help to focus further health economic evaluation.