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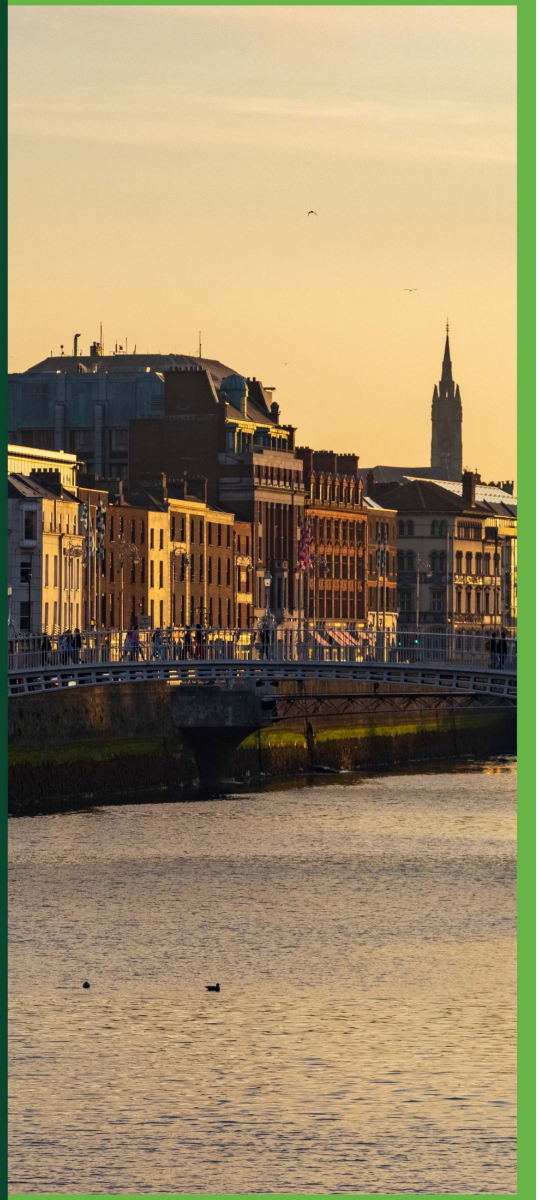

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Budget impact analysis of glove change during caesarean section to reduce surgical site infections

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Introduction

- overall birth rates falling but CS rates increasing significantly: 41.4% in 2023-24 [1]
- SSI one of most common risks
- incidence rates in literature range from 3% – 18% [2]
- … but many estimates fail to account for majority of post-CS SSIs occurring after hospital discharge
- Narice et al (2021) systematic review and meta-analysis of 7 RCTs with 1,948 women found glove change during CS associated with significantly lower risk of SSI
- RR 0.41, 95% CI 0.26 – 0.65, p < 0.0001, GRADE moderate quality evidence [3]

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Objective

This study analyses the impact glove change during CS would have on the budget and capacity of a typical NHS maternity service, and on the English NHS as a whole, if it was adopted as a standard practice.

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Methods

Analytic framework	• budget impact analysis [4]
Perspective	• provider (NHS maternity service)
Patient population	• women giving birth by CS (from NHS Hospital Episode Statistics) [1]
Time horizon	• 5 years
Intervention mix	• no glove change • glove change after placental delivery, before wound closure
Cost data	• unit costs of health and social care [5] • NHS Supply Chain [6] • NHS England National Cost Data [7] • NHS Business Services Authority [8]
SSI incidence	• real-world evidence of SSI rates at Royal United Hospitals Bath NHS Foundation Trust (RUHB) • Narice et al, 2021 [3]
Uncertainty	• deterministic one-way sensitivity analysis • scenario analysis

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Methods: Patient population

Table 1: RUHB maternity statistics 2018-24 [1]

Year	Total births	% change on previous year	Elective caesarean	Emergency caesarean	Total caesarean sections	Caesareans as % total births	% change on previous year
2018-19	4,155		410	650	1,060	25.5%	
2019-20	4,440	+ 6.9%	515	710	1,225	27.6%	+ 2.1%
2020-21	4,235	- 4.6%	565	735	1,300	30.7%	+ 3.1%
2021-22	4,320	+ 2.0%	645	820	1,465	33.9%	+ 3.2%
2022-23	4,020	- 6.9%	635	775	1,410	35.1%	+ 1.2%
2023-24	4,035	+ 0.4%	735	855	1,590	39.4%	+ 4.3%

Mean annual change in total births over last five years = -0.5%. Mean annual change in % of caesarean sections over last five years = +2.8%

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Methods: Costs of pre-closure glove change

Table 2: Costs of pre-closure glove change

Team member	Time to change gloves (mins) [a]	Capacity Cost Rate (£/min) [5]	Time cost (£)	Glove cost (£) [6]	Total cost (£)
Consultant obstetrician	1:00	£2.36	£2.36	£0.80	£3.16
Obstetric registrar	1:00	£1.20	£1.20	£0.80	£2.00
Scrub nurse	1:00	£0.81	£0.81	£0.80	£1.61
Circulating nurse	1:00	£0.81	£0.81	£0.80	£1.61
Theatre technician	1:00	£0.66	£0.66	£0.80	£1.61
			£5.83	**£4.00**	**£9.83**

[a] Source: Opinion of RUHB obstetrics team

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Methods: SSI treatment pathway costs

Table 3: Post-CS SSI treatment pathway costs 2023-24

Treatment pathway	Total cost (£)	Source(s)
SSIs treated during the initial inpatient stay	**£ 1,206.87**	NHS England (2024) [7], NHS Business Services Authority (2024) [8]
SSIs treated upon readmission (antibiotics only)	**£ 3,559.87**	NHS England (2024) [7], NHS Business Services Authority (2024) [8]
SSIs treated upon readmission (antibiotics + surgery)	**£ 4,562.87**	NHS England (2024) [7], NHS Business Services Authority (2024) [8]
SSIs treated by community midwife + GP	**£ 356.03**	Jones et al (2024) [5], NHS England (2024) [7], NHS Business Services Authority (2024) [8]
SSIs treated by GP only	**£ 112.03**	Jones et al (2024) [5], NHS England (2024) [7], NHS Business Services Authority (2024) [8]

Methods: SSI incidence

Table 4: RUHB post-CS SSI incidence 2023-24

	Treated during initial inpatient stay	Treated upon readmission (antibiotics only)	Treated upon readmission (antibiotics + surgery	Treated by community midwife + GP	Treated by GP only	Total
Current SSI incidence [a]	0.00%	0.75%	0.06%	14.19%	0.00%	**15.00%**
Relative risk (RR) glove change (95% CI 0.26 – 0.65) [3]	0.41	0.41	0.41	0.41	0.41	**0.41**
Assumed future incidence after glove change adopted	0.00%	0.31%	0.03%	5.82%	0.00%	**6.15%**

[a] Source: RUHB 30-day post-discharge SSI survey

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Results: Base case budget impact

Table 5: RUHB base case budget impact results

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Patient population						
Total births	4,035	4,035	4,035	4,035	4,035	20,175
Caesarean section rate	39.4%	42.2%	45.0%	47.8%	50.6%	45.0%
Total caesarean sections:	**1,590**	**1,703**	**1,816**	**1,929**	**2,042**	**9,080**
Overall costs to RUHB						
No glove change	£102,028	£109,277	£116,527	£123,777	£131,027	£582,636
Glove change	£57,460	£61,543	£65,626	£69,709	£73,791	£328,128
Net budget impact:	**(£44,568)**	**(£47,735)**	**(£50,901)**	**(£54,068)**	**(£57,235)**	**(£254,507)**
Overall costs to GP						
No glove change	£25,272	£27,068	£28,863	£30,659	£32,455	£144,317
Glove change	£10,361	£11,098	£11,834	£12,570	£13,306	£59,170
Net budget impact:	**(£14,911)**	**(£15,970)**	**(£17,029)**	**(£18,089)**	**(£19,149)**	**(£85,147)**

Results: Base case capacity impact

Table 6: RUHB base case capacity impact results

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Community midwife post-natal visits						
No glove change	451	483	515	547	579	2,576
Glove change	185	198	211	224	238	1,056
Total avoided visits:	**266**	**285**	**304**	**323**	**342**	**1,520**
GP appointments						
No glove change	451	483	515	547	579	2,576
Glove change	185	198	211	224	238	1,056
Total appointments released:	**266**	**285**	**304**	**323**	**342**	**1,520**
Inpatient bed days						
No glove change	32	35	37	39	41	184
Glove change	13	14	15	16	17	76
Inpatient bed days released:	**19**	**20**	**22**	**23**	**24**	**109**

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Results: One-way sensitivity analysis

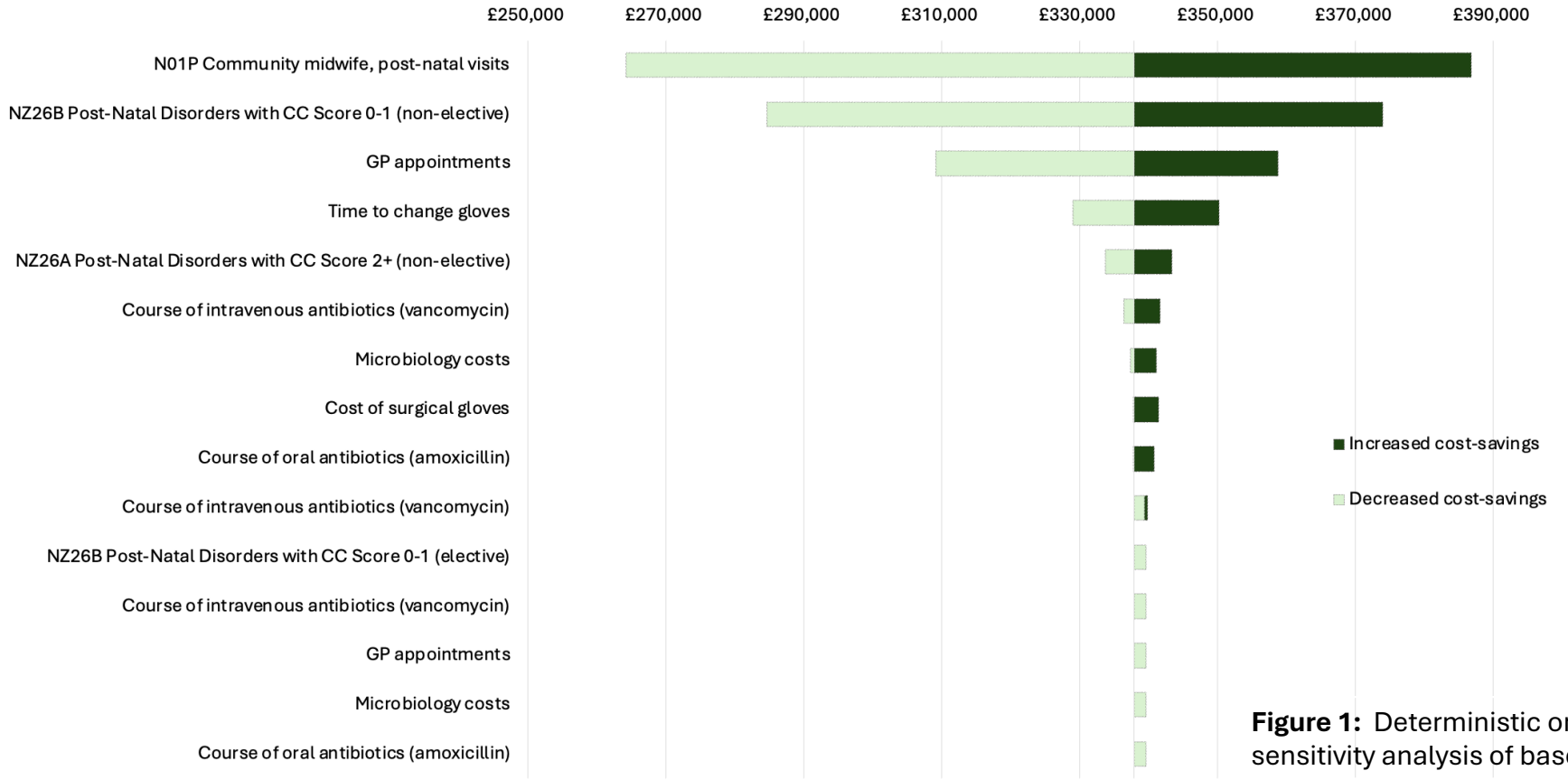

Figure 1: Deterministic one-way sensitivity analysis of base case results

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Results: Scenario analyses

Table 7: Results of the scenario analysis

Scenario	Total CS over 5 year time horizon	Current mean LOS for post-CS SSI	Current SSI incidence rates					
			Treated during inpatient stay	Treated on readmission (antibiotics only)	Treated on readmission (antibiotics + surgery)	Treated by community midwife + GP	Treated by GP only	Total SSI incidence
RUHB base case	9,080	2.5	0.00%	0.75%	0.06%	14.19%	0.00%	**15.00%**
NHS England [1]	1,204,816	2.5	0.00%	0.75%	0.06%	14.19%	0.00%	**15.00%**
Wloch et al (2020) [9]	4,000	2.6	0.51%	0.56%	0.00%	5.31%	3.21%	**9.59%**
Magro (2023) [10]	13,310	3.1	0.00%	1.03%	0.25%	4.83%	0.00%	**6.10%**

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Results: Scenario analyses

Table 7: Results of the scenario analysis

Scenario	Total CS over 5 year time horizon	Current mean LOS for post-CS SSI	Results (over 5-year time horizon)					
			Total budget impact over 5-year time horizon	Budget impact on maternity service	Budget impact on general practice	Community midwife post-natal visits avoided	GP appointments released	Inpatient bed days saved
RUHB base case	9,080	2.5	**(£339,654)**	(£254,507)	(£85,147)	1,520	1,520	109
NHS England [1]	1,204,816	2.5	**(£45,069,335)**	(£33,771,039)	(£11,298,296)	201,701	201,701	14,439
Wloch et al (2020) [9]	4,000	2.6	**(£75,359)**	(£52,833)	(£22,526)	251	251	66
Magro (2023) [10]	13,310	3.1	**(£379,175)**	(£336,683)	(£42,492)	759	759	310

This is the equivalent of 25 full-time community midwives per year

and this is the equivalent of 4 full-time GPs per year

... gives the English NHS back 8 inpatient beds per year

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Discussion, Limitations, Conclusions

- if adopted as standard practice, glove change could deliver significant cost-savings and free-up physical and human resources
- these impacts are maintained across both sensitivity and scenario analysis
- glove change is not presently a WHO or NICE recommendation, but should this change?
- ChEETah study saw clinical- and cost-benefits from instrument and glove change in low- and middle-income settings [11, 12]
- workforce capacity has been a factor in NHS maternity unit failings [13] – glove change could help address this

Study strengths
CS not currently included in UKHSA SSI surveillance. Our study contributes accurate data based on post-discharge questionnaire with a very good response rate.
We have provided more granular calculations of cost of post-CS SSI than previous studies – eg, Jenks et al (2014) [14]
Study limitations
Considerable opacity around true post-CS SSI incidence in English NHS so not possible to perform scenario analyses with real-world data.
RR derived from meta-analysis is subject to limitations from heterogeneity and risk of bias of included studies.

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References

1 NHS England (2024). *NHS Maternity Statistics, England, 2023-24*. Published: 12 December 2024.

2 Zuarez-Easton S, Zafran N, Garmi G, Salim R. Postcesarean wound infection: prevalence, impact, prevention, and management challenges. *Int J Womens Health* 2017; 9: 81 – 883

3 Narice B, Almeida J, Farrell T, et al. Impact of changing gloves during caesarean section on postoperative infective complications: A systematic review and meta-analysis. *Acta Obstet Gynecol Scand* 2021; 100(9): 1581 – 1594.

4 Sullivan S, Mauskopf J, Augustovski F, et al. Budget impact analysis-principles of good practice: report of the ISPOR 2012 Budget Impact Analysis Good Practice II Task Force. *Value in Health* 2014; 17(1): 5 – 14.

5 Jones K, Weatherly H, Birch S, Castelli A, Chalkley M, Dargan A, et al (2023). *Unit Costs of Health and Social Care 2023 Manual. Technical report*. Personal Social Services Research Unit (University of Kent) and Centre for Health Economics (University of York), Kent, UK.

6 NHS Supply Chain (2024)

7 NHS England (2024). 2023/24 National Cost Collection Data Publication: National Schedule of NHS Costs.

8 NHS Business Services Authority (2024). Prescription Cost Analysis - England 2023/24

9 Wloch C, Van Hoek A, Green N, et al. Cost-benefit analysis of surveillance for surgical site infection following caesarean section. *BMJ Open* 2020; 10(7): e036919.

10 Magro M. Reducing Surgical Site Infections Post-Caesarean Section. *Int J Womens Health* 2023; 15: 1811 – 1819.

11 NIHR Global Research Health Unit on Global Surgery. Routine sterile glove and instrument change at the time of abdominal wound closure to prevent surgical site infection (ChEETAh): a pragmatic, cluster-randomised trial in seven low-income and middle-income countries. *Lancet* 2022; 400(10365): 1767 – 1776.

12 NIHR Global Health Research Unit on Global Surgery. Routine sterile glove and instrument change at the time of abdominal wound closure to prevent surgical site infection (ChEETAh): a model-based cost-effectiveness analysis of a pragmatic, cluster-randomised trial in seven low-income and middle-income countries. *Lancet Global Health* 2024; 12(2): e235 – e242.

13 Care Quality Commission. *National Review of Maternity Services in England 2022-24*. CQC: 19 September 2024.

14 Jenks P, Laurent M, McQuarry S, et al. Clinical and economic burden of surgical site infection (SSI) and predicted financial consequences of elimination of SSI from an English hospital. *Journal of Hospital Infection* 2014; 86(1): 24 – 33.

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