

# HOW CHANGES IN ELECTROCARDIOGRAPHY MONITORING AND REIMBURSEMENT PRACTICES COULD IMPACT ON SURGICAL SITE INFECTIONS AFTER CORONARY ARTERY BYPASS GRAFT SURGERY

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## Background:

- Coronary artery bypass graft (CABG) surgery patients receive electrocardiograph (ECG) monitoring
- Reusable ECG lead wires (rECG) are standard, but a single-patient-use cable and lead system (spECG) has been shown to decrease surgical site infection (SSI)<sup>1</sup> and "leads off" ECG alarms<sup>2</sup>
- SSIs are an NHS England care quality indicator and avoidable SSIs within 30 days of CABG are not reimbursed<sup>6,7</sup>

## The rECG Lead Problem:



**33-77%**<sup>3-5</sup> of rECG are contaminated, placing patients at risk of surgical site infections (SSI)



**41.8%**<sup>2</sup> of ECG alarms are clinically irrelevant "leads off" alarms

## spECG Cable & Lead System Impact:

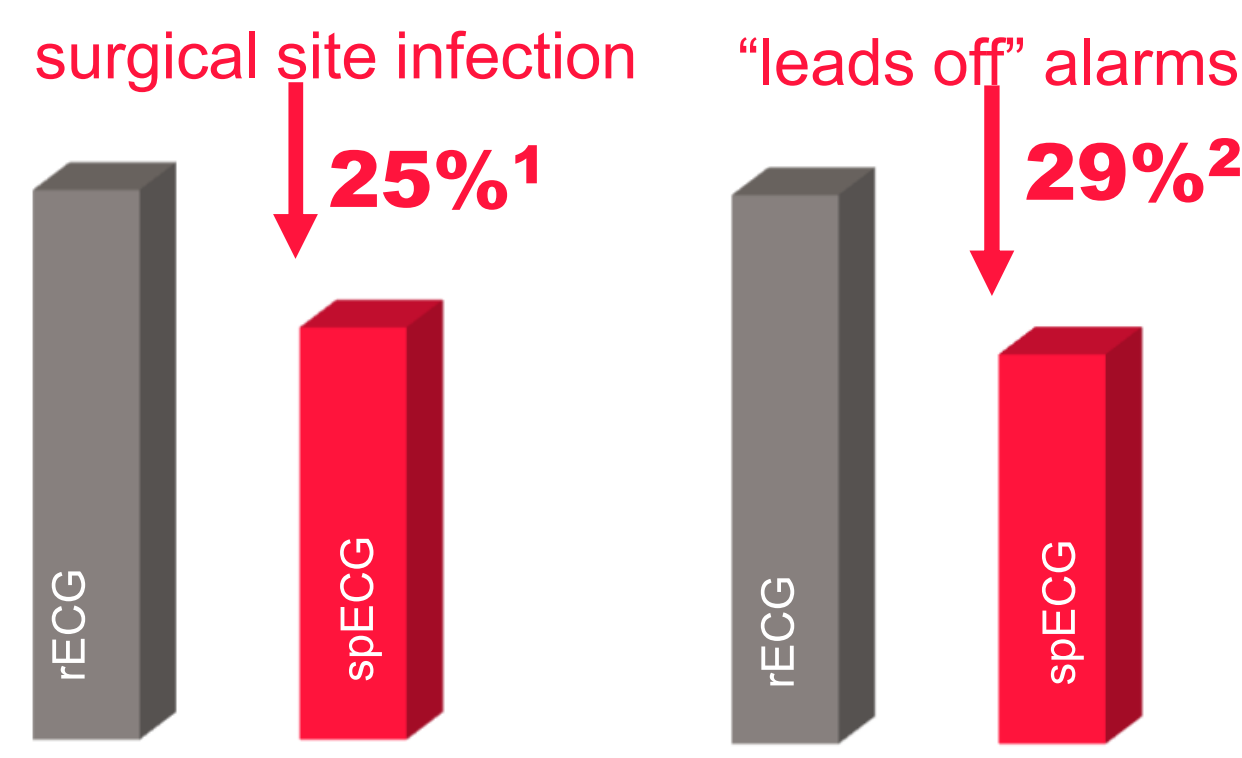
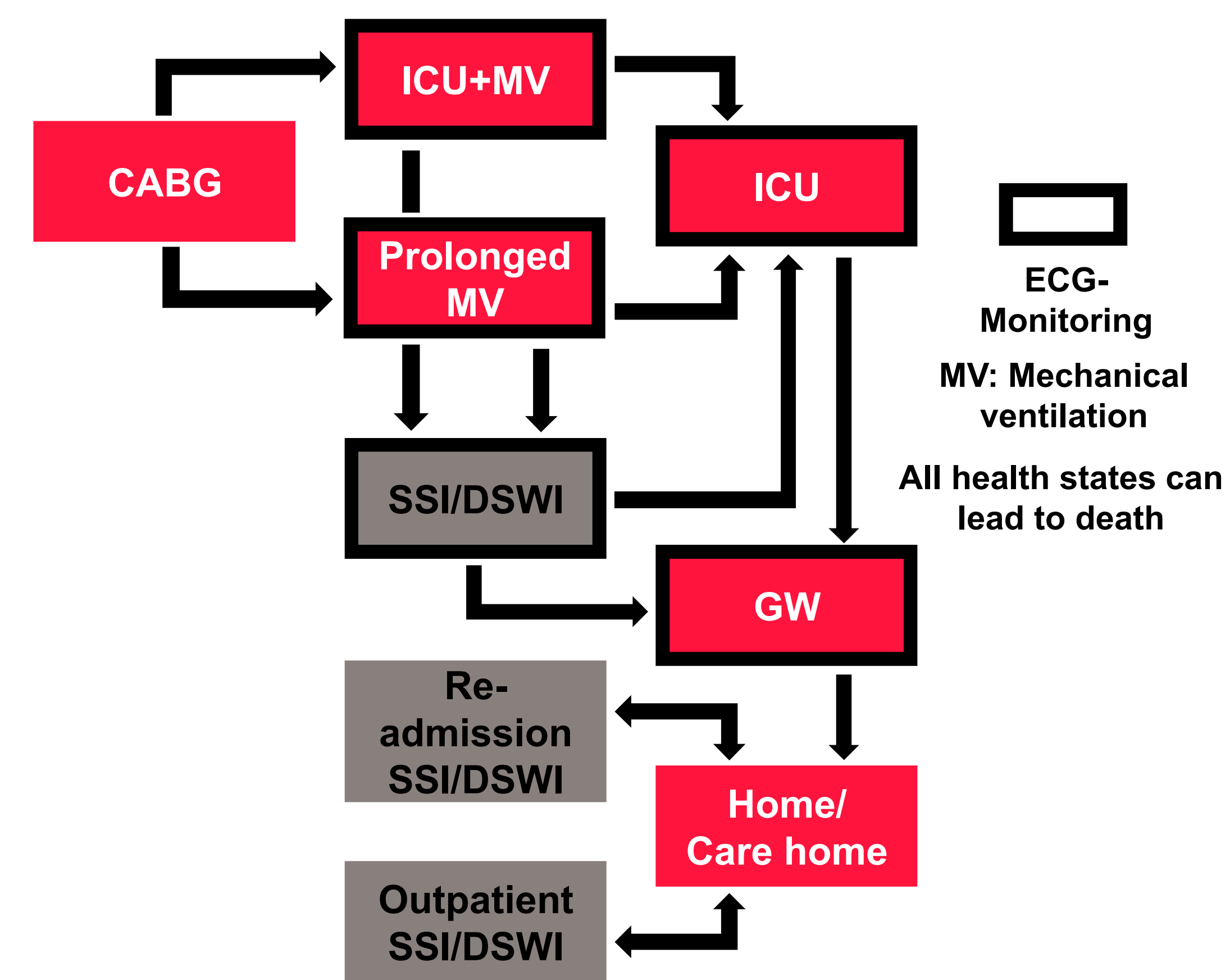


Fig.1 Cohort Markov model flow



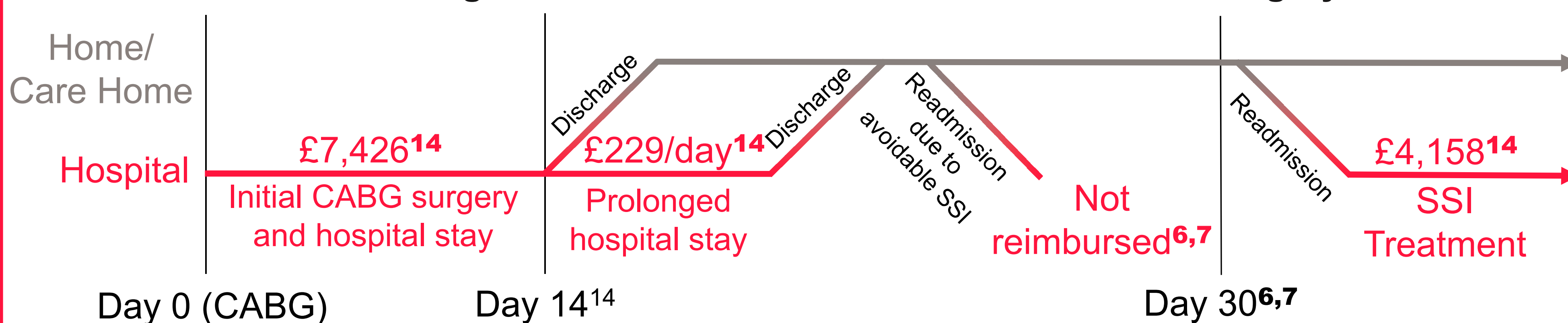
## Research Question:

Do improved clinical outcomes with spECG translate into cost and bed day benefits for healthcare providers?

## Methods:

- A 1-year cohort Markov model (Fig.1) considers the complete transition from rECG (£5 per patient) to spECG (£11 per patient) for a facility performing 200 CABG procedures annually
- All costs in 2017 GBP
- Mean CABG population : 67.5 years<sup>8</sup>, 19% female<sup>8</sup>, 28% obese<sup>9</sup> (>30 kg/m<sup>2</sup>), 28.3% diabetes<sup>10</sup> and 7 days in the hospital<sup>11</sup> if no SSI or deep sternal wound infection (DSWI) occurs
- After CABG, patients recover in the ICU, then transfer to the general ward (GW) before discharge to a care facility (25.5%)<sup>12</sup> or home (74.5%)<sup>12</sup>
- In-hospital, ECG monitoring is used for ≤4 days
- At 11-days post-operation, 2.15%<sup>13</sup> of rECG patients have developed an SSI (x% of which are DSWI)
- SSI results in increased length of stay (+11 days), readmission, or outpatient care
- The initial CABG and up to 14 days of hospital stay are reimbursed with a set sum (£7,426<sup>14</sup>), a longer stay is reimbursed with £ 229/day<sup>14</sup> (Fig.2)
- Readmissions due to avoidable SSIs up until 30 days after the initial surgery are not reimbursed, readmissions after that period are reimbursed with £4,158<sup>14</sup> (Fig.2)

Fig.2 NICE reimbursement scheme for CABG surgery



## Conclusions:

- spECG may significantly reduce care costs associated with CABG surgery by lowering the incidence of SSI
- Hospitals may lose revenue through fewer SSI readmissions, but this is offset by savings on the cost of care
- By not reimbursing costs for avoidable SSI care episodes within 30-days of a CABG procedure, NHS England may promote hospitals to adopt spECG

Tab.1 Benefits across all major outcomes

Parameter	rECG	spECG
Costs, £	1,470,496	1,455,921
Revenue, £	1,513,251	1,506,206
Profit, £	42,754	50,286
ICU days	339.2	331.7
Readmissions, N	11.27	8.27

## Results

- Across 200 CABG patients, the annual cost of care with rECG was £1.47 mil (£7,352 per patient)
- Transitioning to spECG reduced care costs to £1.46 million (£7,280 per patient)
- Care cost savings when using spECG derived from:
  - 7.5 fewer ICU days
  - 3.0 fewer readmission
- Hospital profits would be expected to increase with use of spECG. The mean increase would be an additional £7,531 (Tab.1)

- Readmissions due to DSWIs were key outcome drivers (Fig.3)
- Cost savings increase linearly with higher SSI rates (Fig.4)

## Probabilistic sensitivity analysis

- 2,000 iterations showed significant differences (median, 95% credible interval):
  - Profits £8,469 (£2,156 to £17,917)
  - ICU bed days -9.6 (-14.7 to -4.6)

Fig.3 One way sensitivity analysis: Readmissions are the key cost driver

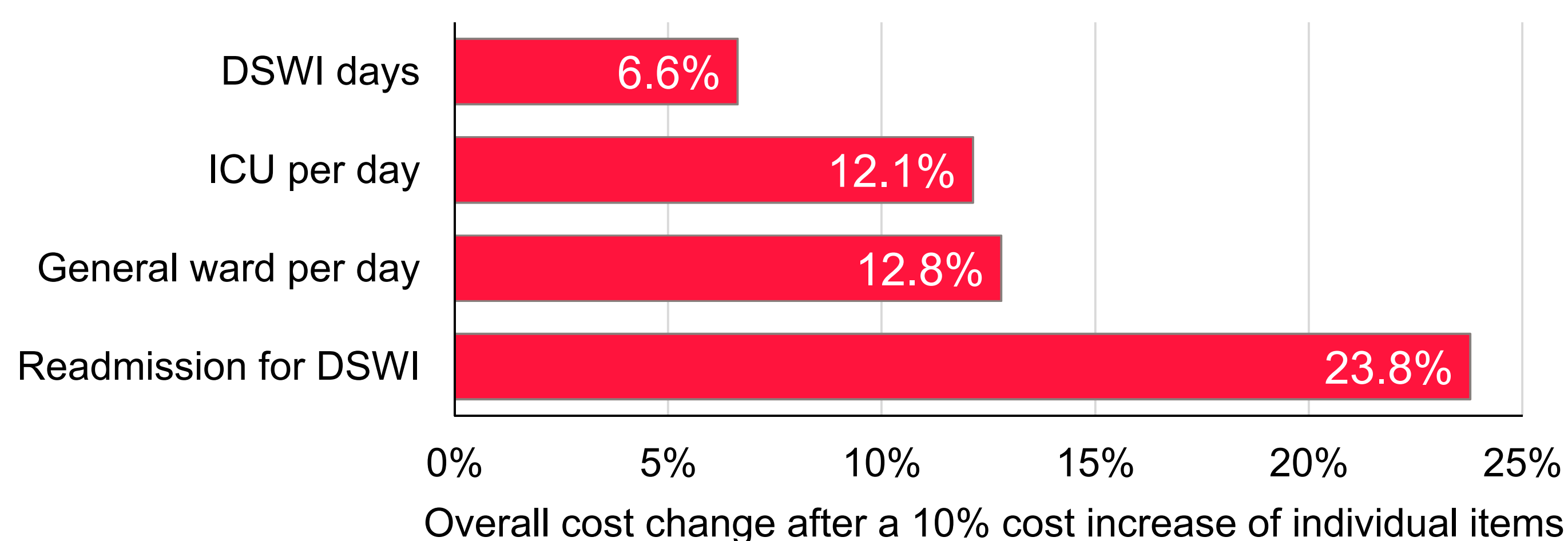
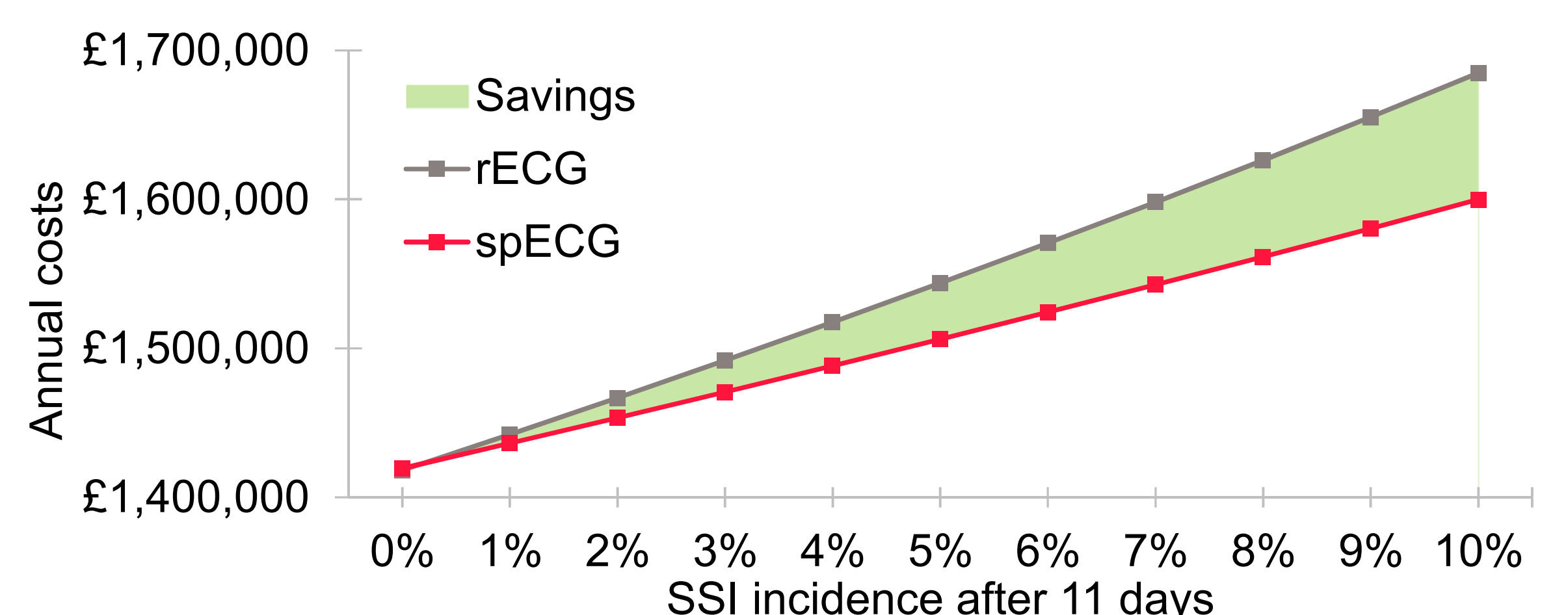


Fig.4 Cost benefits depend on the SSI rate



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