Background

- Surgical site infections (SSI) place a large cost and care burden on service providers1.
- Sternal wound infection (SWI) following cardiac surgery can be particularly devastating.
- As reusable electrocardiogram leads and wires can hold vectors of infection after cleaning, a single-patient use cable and lead system (spECG) may help prevent cross-contamination.
- The cost-benefit of implementing spECG is investigated in this simulation study.

Methods

- NHS Digital data for cardiac surgeries taking place in January-December 2019 inclusive were assessed for SSIs occurring during the index event or associated with a readmission in the 90 days post discharge.
- Only data from 88 centres performing ≥1,000 surgeries were included.
- Combined outcomes data from these centres were used to update a published health-economic model2 of the coronary artery bypass graft care pathway.
- The modelled patient population had a mean age 68 years.
- The 1,975 SSI-related, post-discharge readmissions (0.62%) had a mean LOS of 13.9 days.
- The reported key outcomes for several relevant cities can be seen in Table 1.
- The saving was driven by fewer SSIs, resulting in reduced LOS and fewer readmissions.
- Individual hospital savings depend on the local burden caused by SSIs, varying between £63 and £274 per patient.
- The national cost-burden of SSIs was modelled at £45.8 million per year, adding £144 per surgery.
- If spECG was implemented, the cost of care was reduced to £8,094 per case.
- The saving of £33 per case reflected a 3.5-fold return on investment.
- The saving was driven by fewer SSIs, resulting in reduced LOS and fewer readmissions.
- Individual hospital savings depend on the local burden caused by SSIs, varying between £63 and £274 per patient.
- The local burden caused by SSIs varied between £63 and £274 per patient (Figure 1).
- If spECG was implemented, the cost of care was reduced to £8,094 per case.
- The saving of £33 per case reflected a 3.5-fold return on investment.
- The saving was driven by fewer SSIs, resulting in reduced LOS and fewer readmissions. Individual hospital savings depend on the SSI rate reported.

Results

- The 88 centres reported a total of 317,825 cardiac surgeries, with 1.43% affected by an SSI.
- There were 2,580 in-hospital SSIs (0.81%), increasing length of stay (LOS) from 4.4 to 29.4 days.
- The 1,975 SSI-related, post-discharge readmissions (0.62%) had a mean LOS of 13.9 days.
- The reported key outcomes for several relevant cities can be seen in Table 1.
- The model estimated cost of care was £8,127 per patient, closely aligned to the reported data of £7,830 to £8,7844.
- The national cost-burden of SSIs was modelled at £45.8 million per year, adding £144 per surgery.
- The local burden caused by SSIs varied between £63 and £274 per patient (Figure 1).
- If spECG was implemented, the cost of care was reduced to £8,094 per case.
- The saving of £33 per case reflected a 3.5-fold return on investment.
- The saving was driven by fewer SSIs, resulting in reduced LOS and fewer readmissions. Individual hospital savings depend on the SSI rate reported.

Conclusion

- Hospital reported outcomes data are a powerful tool to estimate individualized burden and potential savings of innovative technology.
- This simulation study suggests that use of spECG could provide cost-benefit by reducing the burden of SSIs related to cardiac surgery.

Discussion

- The reported NHS data does not differentiate SSI rates for superficial and deep SSIs or clarifies the severity required to be considered an SSI.
- The reported SSI rates are generally lower than reported in the literature indicating that the SSIs here may have only been more severe cases.
- The considerable variance of SSI rates between hospitals (0.2 to 3.2%) may partially be attributed to inconsistent definition of an SSI, inconsistent coding, or a different mix of cardiac surgeries.

Table 1: Surgical site infection data for several English cities based on NHS data. When multiple hospitals reported outcomes, these outcomes were combined. SSI: Surgical site infection; LoS: Length of stay.

<table>
<thead>
<tr>
<th>City</th>
<th>Cases</th>
<th>SSI rate</th>
<th>LoS due to SSI (days)</th>
<th>Readmissions</th>
<th>Readmission LoS (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>London</td>
<td>55,590</td>
<td>2.0%</td>
<td>28.8</td>
<td>480</td>
<td>15.6</td>
</tr>
<tr>
<td>Manchester</td>
<td>12,270</td>
<td>2.2%</td>
<td>31.7</td>
<td>95</td>
<td>15.2</td>
</tr>
<tr>
<td>Liverpool</td>
<td>10,930</td>
<td>1.8%</td>
<td>16.3</td>
<td>80</td>
<td>16.2</td>
</tr>
<tr>
<td>Birmingham</td>
<td>9,585</td>
<td>2.1%</td>
<td>37.3</td>
<td>75</td>
<td>20.5</td>
</tr>
<tr>
<td>Cambridge</td>
<td>6,890</td>
<td>2.5%</td>
<td>44.6</td>
<td>115</td>
<td>11.9</td>
</tr>
<tr>
<td>Bristol</td>
<td>8,905</td>
<td>2.0%</td>
<td>19.6</td>
<td>65</td>
<td>13.7</td>
</tr>
<tr>
<td>Leeds</td>
<td>7,790</td>
<td>1.3%</td>
<td>31.9</td>
<td>45</td>
<td>15.1</td>
</tr>
<tr>
<td>Middlesbrough</td>
<td>5,795</td>
<td>1.3%</td>
<td>25.3</td>
<td>25</td>
<td>8.7</td>
</tr>
<tr>
<td>Norwich</td>
<td>5,405</td>
<td>0.7%</td>
<td>15.5</td>
<td>20</td>
<td>14.1</td>
</tr>
<tr>
<td>Oxford</td>
<td>5,080</td>
<td>1.4%</td>
<td>19.9</td>
<td>35</td>
<td>10.7</td>
</tr>
<tr>
<td>Plymouth</td>
<td>4,395</td>
<td>1.8%</td>
<td>9.7</td>
<td>35</td>
<td>8.1</td>
</tr>
</tbody>
</table>

References

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