

# SPINES CLINICAL REVIEW REPORT

**Report Prepared by:**

**With the support of the Department of Paediatric Anaesthesia, Department of  
Paediatric Orthopaedic Surgery, and colleagues at CHI Temple Street**

**May 2023**

<b>Signed &amp; Adopted by:</b>	<b>Signature</b>

## Executive Summary:

### Rational:

This review was conducted to look objectively at the frequency and severity of complications, and gross indicators of outcomes in Spina Bifida patients who have undergoing complex spinal surgery at CHI Temple Street over recent years. We sought to better appreciate likely complications and positive/negative outcomes to fully inform patients and their families/carers, to plan resources and to manage expectations of the multi-disciplinary medical teams. This data could be then used to continuously monitor internal practice, and modified to be shared externally with responsibility (GDPR compliance) - it would not be a suitable format to conduct direct external comparisons in the first instance.

With the support of the Chief Medical Officer and Clinical Director, and the departments of paediatric orthopaedic surgery and paediatric anaesthesiology at CHI Temple Street, a consultant anaesthesiologist and a consultant orthopaedic surgeon conducted a retrospective data review of complex spinal surgery over the past 5 years (2018-2022), focused on spinal surgery in patients with Spina Bifida (SB).

### Method:

#### How the review was carried out:

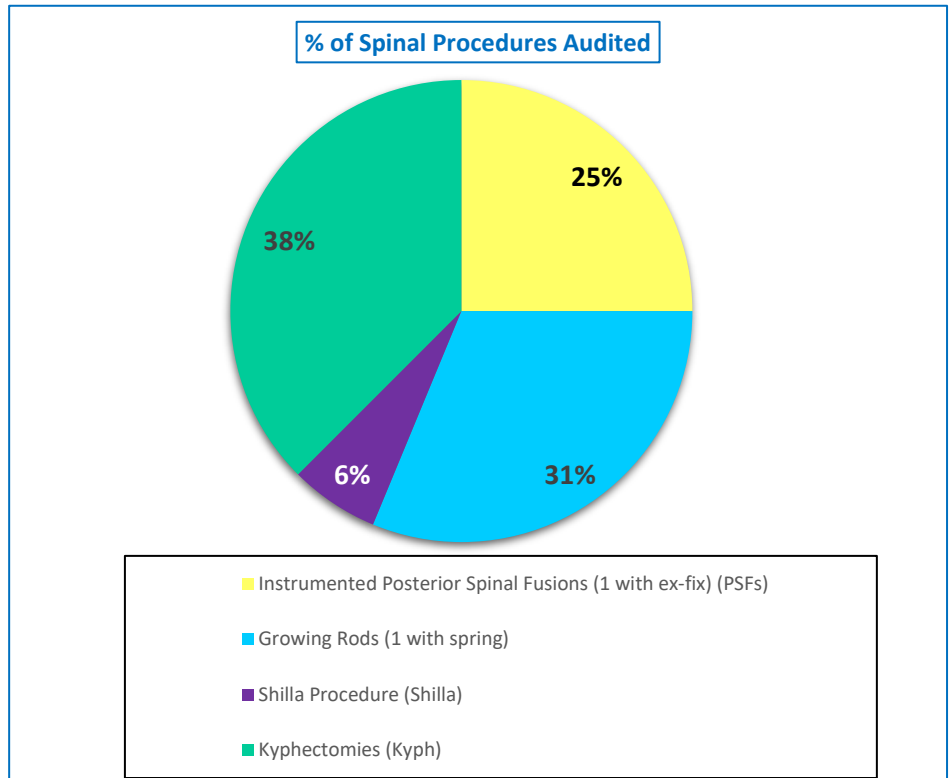
A list of Spina Bifida patients who have undergone complex spinal surgery has been kept and updated by the specialist orthopaedic nursing and administrative team. This list of 16 patients, going back to 2018, was provided to the reviewers. A thorough case note review was conducted, along with;

- radiology review (NIMIS)
- data from Paediatric Intensive Care (ICCA system),
- data from Theatre management system (ORMIS),
- microbiology lab results (via Clinical Portal)
- Blood bank transfusion records (forwarded by Haematology department)

Pertinent data, agreed between the reviewers in advance, was recorded in an excel spreadsheet. This data could not be anonymised to maintain accuracy in collection. Listed in appendix 1.

The 16 reviewed cases were categorised as:

- 4 Instrumented Posterior Spinal Fusions (1 with ex-fix) (PSFs).
- 5 Growing Rods (1 with spring) (Rods).
- 1 Shilla Procedure (Shilla).
- 6 Kyphectomies (Kyph).

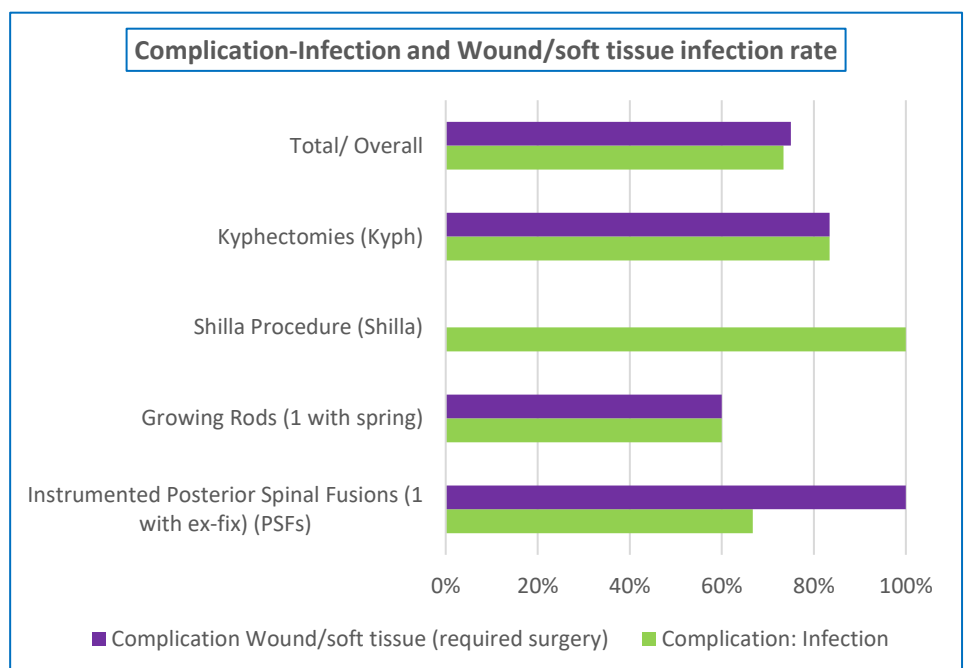


**A. Complications**

The analysis showed that 13/16 patients (81.2%) required further unexpected surgery. One of these patients had multiple procedures and unfortunately died while in the hospital. Patient with minor complications that did not need further surgery had superficial wound problems that were managed with oral antibiotics or nurse-lead wound care in the out-patient department.

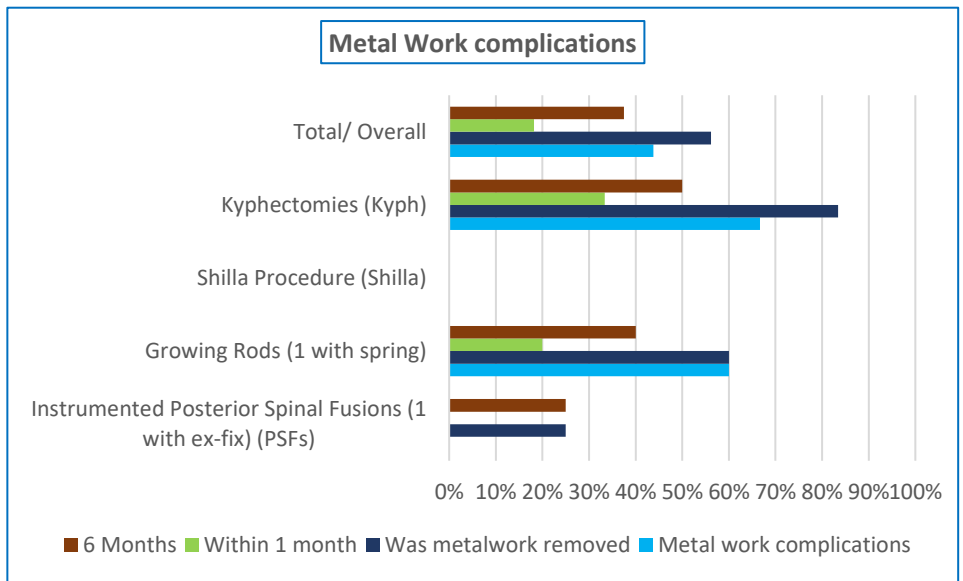
**B. Infection complications:**

The analysis showed the overall infection rate for these cases was 73.4% based on microbiology and clinical findings; and the overall rate of wound complication requiring further surgery was 75%.



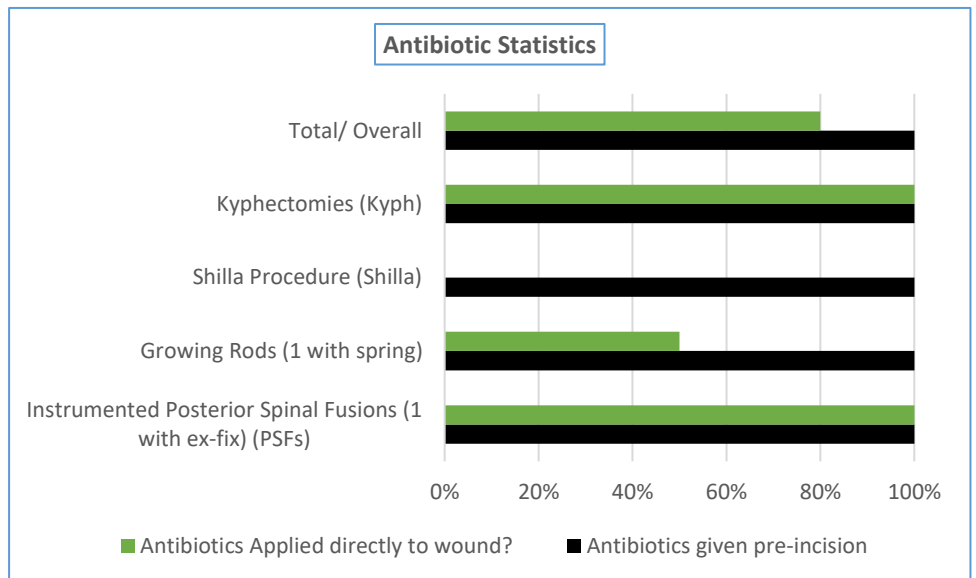
**C. Metal work complications:**

The analysis showed that a total of 44% had non-infective metalwork complications. Overall, 56% of cases required the removal of metalwork; 18% had metalwork removed within one month, and 37% had metalwork removed within six months.



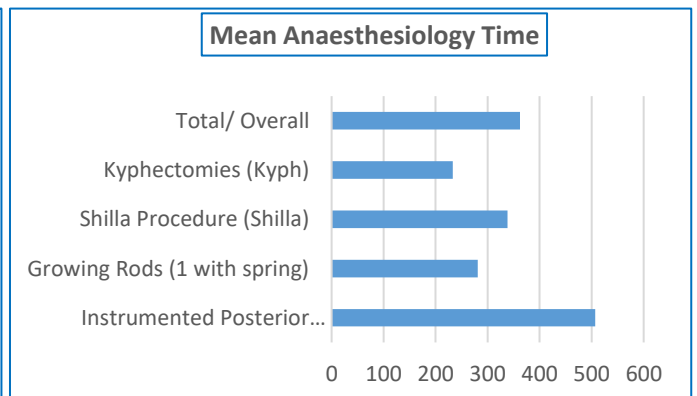
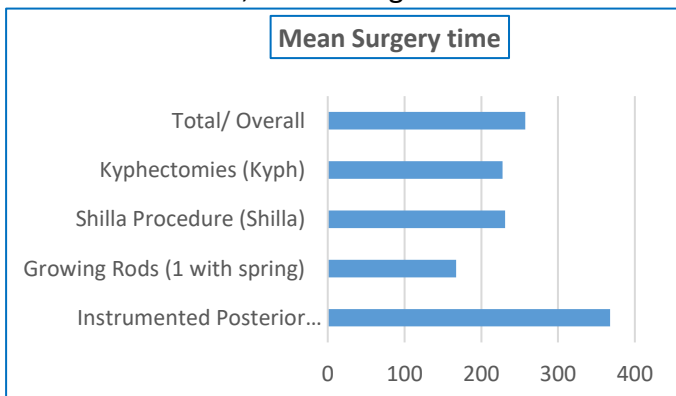
**D. Antibiotic Statistics:**

The analysis showed that the antibiotic compliance pre-incision was 100%. The direct application of antibiotics to wounds was 80%.



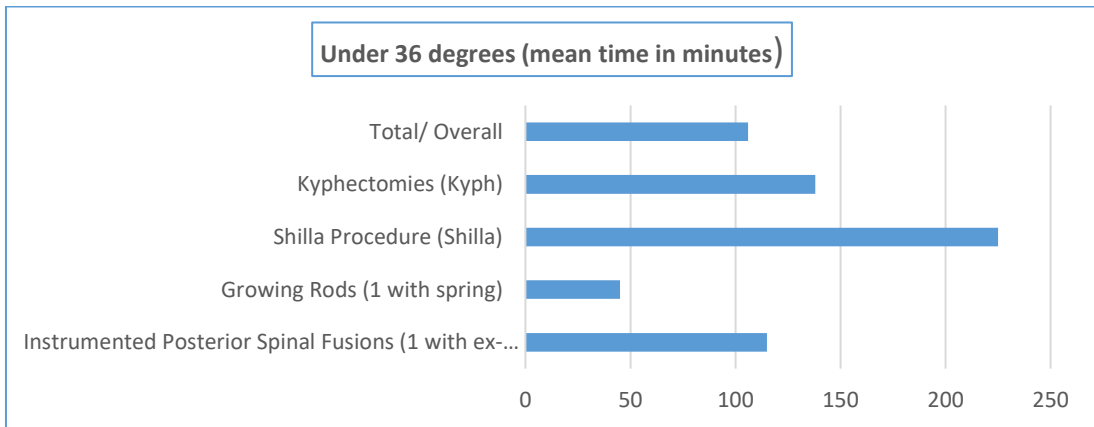
**E. Theatres times**

- The surgery analysis showed that the mean primary (first major) surgery time was 257 minutes, and the highest surgery time was 523 minutes.
- The anaesthesiology analysis showed that the mean time for anaesthesia in all primary cases was 362 minutes, and the highest anaesthesia time was 650 minutes.



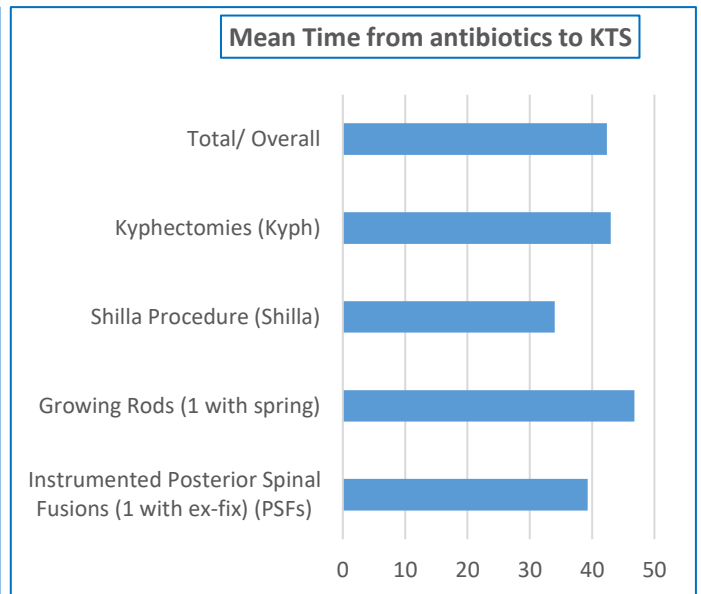
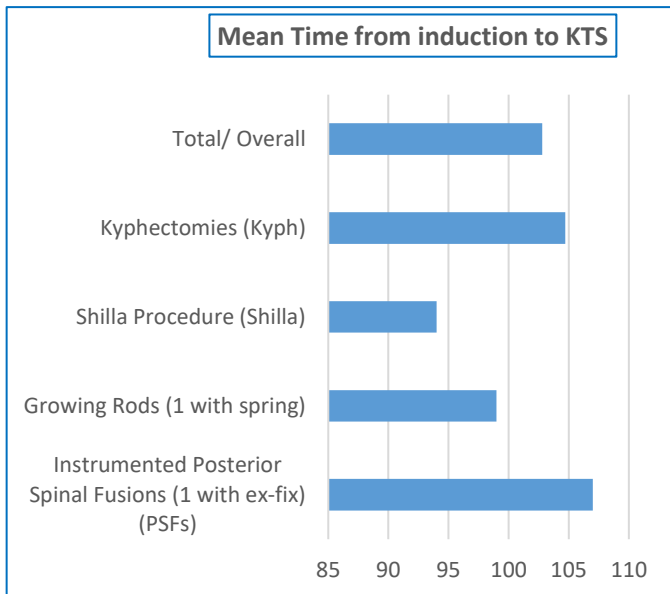
**F. Hypothermia:**

- For primary surgery, the analysis showed that the mean for 'Under 36 degrees' was 106 minutes, and the highest time under 36 degrees was 300 minutes.
- The analysis also found that although only 3 out of 16 patients recorded temperatures under 35 degrees, the mean for these three cases was 180 minutes - skewed by the highest time of 360minutes under 35 degrees in a single case.



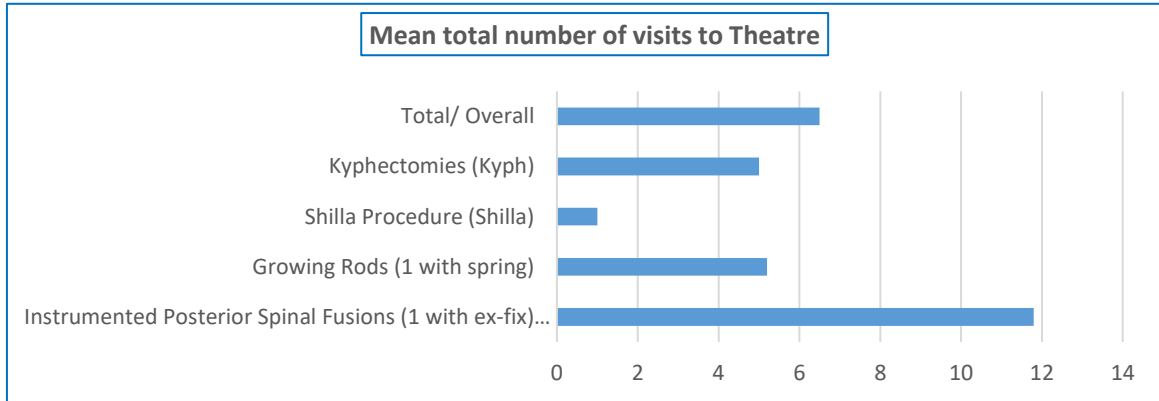
**G. Time to KTS:**

- The analysis showed that the mean for "time from induction to KTS' for all primary cases was 102 minutes, and the highest time was 149 minutes.
- The mean for "time from antibiotics to KTS' was 42 minutes, and the highest time was 150 minutes.



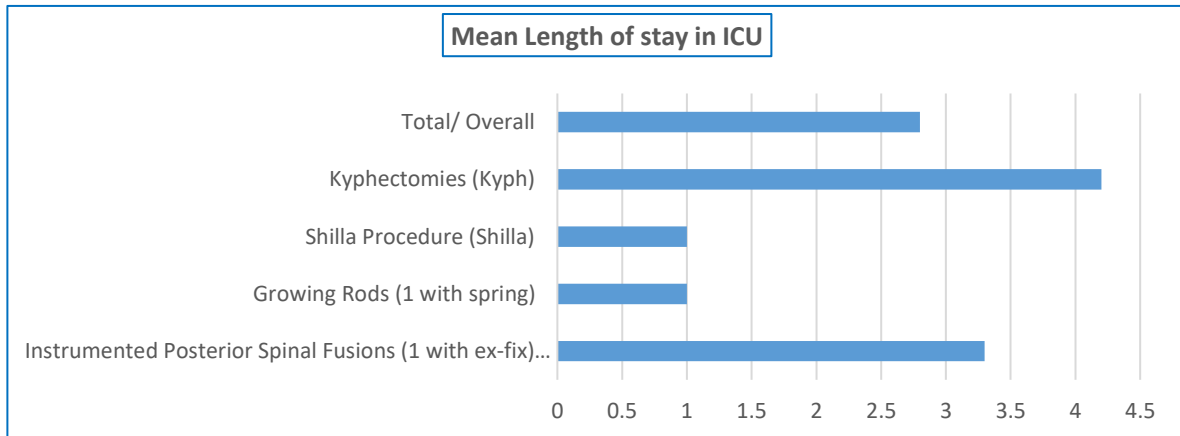
**H. Theatre visits:**

The analysis showed that the mean total visits to theatre for all reviewed cases (including their primary visit) was 6.5 times, and the highest number of visits was 34.



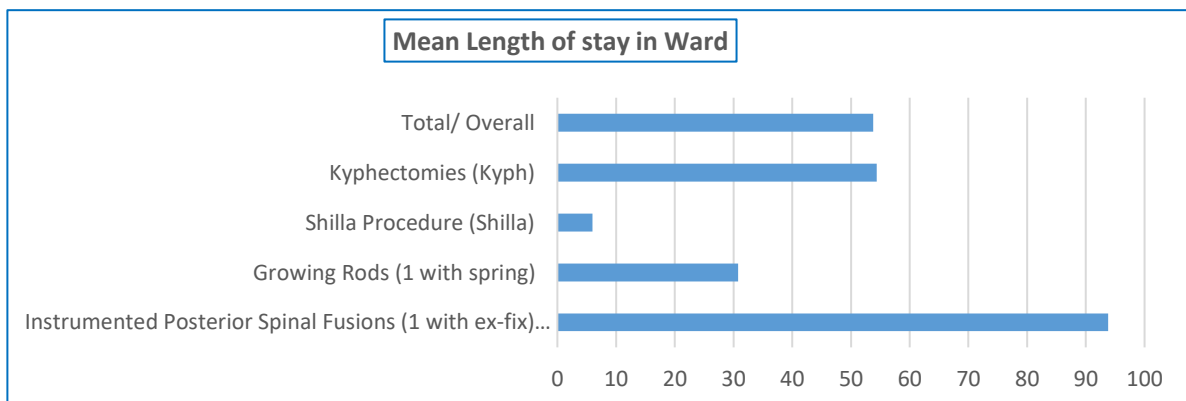
**I. Length of stay in ICU:**

The analysis showed the mean total length of stay in the ICU throughout the surgeries was 2.8 days, and the highest length of stay was 11 days. (This includes readmission days for the 7 patients who had <1 admission episode.)



**J. Length of stay in ward:**

The analysis showed the mean for length of stay in the ward was 53.8 days, and the highest length of stay was 223 days.



Criteria	Instrumented Posterior Spinal Fusions (1 with ex-fix) (PSFs)	Growing Rods (1 with spring)	Shilla Procedure (Shilla)	Kyphectomies (Kyph)	Total/ Overall	Comments
<b>Total Procedure</b>	4 Instrumented Posterior Spinal Fusions (1 with ex-fix) (PSFs)	5 Growing Rods (1 with spring) (Rods)	1 Shilla Procedure (Shilla)	6 Kyphectomies (Kyph)	<b>16</b>	
<b>Blood Transfusion</b>	<p><b>PRCs:</b> Range 12, Mean 13.7</p> <p><b>Octaplex:</b> Range and Mean are 10</p> <p><b>Fibrinogen:</b> Range and Mean are 3g</p> <p><b>Platelets:</b> Range and Mean are 6</p>	<p><b>PRCs:</b> Range 2, Mean 2.7</p> <p><b>Riastap:</b> Range and Mean are 2</p>	<b>Not Application</b> (No blood transfused)	<p><b>PRCs:</b> Range 15, Mean 5.5</p> <p><b>Plasma:</b> Range and Mean are 15</p> <p><b>Platelets:</b> Range and Mean are 2 pool</p> <p><b>Pedipacks:</b> Range and Mean are 2</p>	<p><b>PRCs:</b> Range 19, Mean 6.9</p> <p><b>Octaplex:</b> Range and Mean 10</p> <p><b>Fibrinogen:</b> Range and Mean are 3g</p> <p><b>Pool Platelets:</b> Range and Mean are 4</p> <p><b>Riastap:</b> Range and Mean are 1</p> <p><b>Pedipacks:</b> Range and Mean are 2</p> <p><b>Plasma:</b> Range and Mean are 15</p>	
<b>Infection complications</b>						
Complication: Infection	<b>66.7 %</b> (2 out of 3 patients got infection) No information available for one pt., excluded from the calculation.	<b>60 %</b> (3 out of 5 patients got infection)	<b>100 %</b> (1 out of 1 patient got infection)	<b>83.4 %</b> (5 out of 6 patients got infection)	<b>73.4 %</b> (11 out of 15 patients got infection)	
Complication Wound/soft tissue (required surgery)	<b>100%</b> (4 out of 4 patients - wound/soft tissue complication)	<b>60 %</b> (3 out of 5 patients - wound/soft tissue complication)	<b>0 %</b> 0 out of 1 patient	<b>83.4 %</b> (5 out of 6 patients )	<b>75 %</b> (12 out of 16 patients got infection)	

Wound Microbiology	Candida albicans: <b>9+ve</b> Enterococcus faecalis: <b>1+ve</b> Lactocaseibacillus rhamnosus: <b>1+ve</b> Pseudomonas aeruginosa: <b>8+ve</b> Staph aureus: <b>1+ve</b> Staph epidermidis: <b>2+ve</b> Strep mitis/oralis: <b>1+ve</b>	Enterobacter cloacae: <b>2+ve</b> E-coli: <b>2+ve</b> Coagulase negative staph: <b>1+ve</b> Staph epidermis: <b>5+ve</b> Staph aureus: <b>1+ve</b> Staph hominis: <b>1+ve</b>	Bacteroides Fragilis: <b>1+ve</b> E-Coli: <b>1+ve</b>	Candida albicans: <b>5+ve</b> Candida glabrata: <b>3+ve</b> Candida parapsilosis: <b>3+ve</b> Citro freundii: <b>2+ve</b> Citrobacter youngae: <b>1+ve</b> Coagulase negative staph: <b>2+ve</b> Enterobacter cloacae: <b>7+ve</b> Enterococcus faecalis: <b>3+ve</b> Klebsiella pnemoniae: <b>9+ve</b> Kocuria Rosea: <b>1+ve</b> Lodderomyces elongisporus: <b>1+ve</b> MRSA: <b>1+ve</b> Pseudomonas aeruginosa: <b>8+ve</b> Staph Aureus: <b>6+ve</b> Staph epidermis: <b>4+ve</b> Staph hominis: <b>1+ve</b> Sterp anginosus, lactobacillus sp and (and aspergillus gracilis of doubtful significance): <b>1+ve</b> Sterp mitis/oralis: <b>2+ve</b> Strep viridans: <b>1+ve</b>	Bacteroides Fragilis: <b>1</b> Candida albicans: <b>14</b> Candida glabrata: <b>3</b> Candida parapsilosis: <b>3</b> Citrobacter freundii: <b>1</b> Citrobacter youngae: <b>1</b> Coagulase negative staph: <b>3</b> E-coli: <b>3</b> Enterococcus faecalis: <b>4</b> Enterobacter cloacae: <b>9</b> Klebsiella pnemoniae: <b>9</b> Kocuria Rosea: <b>1</b> Lactocaseibacillus rhamnosus: <b>1</b> Lodderomyces elongisporus: <b>1</b> MRSA: <b>1</b> Pseudomonas aeruginosa: <b>16</b> Staph aureus: <b>8</b> Staph epidermidis: <b>11</b> Staph hominis: <b>2</b> Sterp anginosus, lactobacillus sp and (and aspergillus gracilis of doubtful significance): <b>1</b> Sterp mitis/oralis: <b>3</b> Strep viridans: <b>1</b> <b>Total: 97</b>	
<b>Metal Work complications</b>						
Metal Work Failure complications	<b>0 %</b> 0 out of 4 patients	<b>60%</b> 3 out of 5 patients	<b>0 %</b> 0 out of 1 patient	<b>66.7%</b> 4 out of 6 patients	<b>43.8 %</b> 7 out of 16 patients	
Was metalwork removed	<b>25 %</b> 1 out of 4 patients	<b>60 %</b> 3 out of 5 patients	<b>0 %</b> 0 out of 1 patient	<b>83.4 %</b> 5 out of 6 patients	<b>56.2 %</b> 9 out of 16 patients	



Within 1 month	NA	20% 1 out of 5 patients	NA	33.4% 2 out of 6 patients	18.2 %	
6 Months	25 % 1 out of 4 patients	40% 2 out of 5 patients	NA	50% 3 out of 6 patients	37.5 %	
12 Months	NA	NA	NA	NA	NA	
<b>Surgical time-frame</b>						
Anaesthesiology Time	<b>Highest:</b> 650 Minutes <b>Mean:</b> 506.8 Minutes	<b>Highest:</b> 413 Minutes <b>Mean:</b> 280.8 Mints.	<b>Highest:</b> 338 Mints. <b>Mean:</b> 338 Mints.	<b>Highest:</b> 443 Minutes <b>Mean:</b> 233 Minutes	<b>Highest:</b> 650 Minutes <b>Mean:</b> 362.3 Minutes	
<b>Hypothermia</b>						
Under 35 minutes (Average time)	<b>Highest:</b> 360 Minutes <b>Mean:</b> 247.5 Minutes	NA	<b>Highest:</b> 45 Minutes <b>Mean:</b> 45 Minutes	NA	<b>Highest:</b> 360 Minutes <b>Mean:</b> 180 Minutes	
Under 36 minutes (Average time)	<b>Highest:</b> 150 Minutes <b>Mean:</b> 115 Minutes	<b>Highest:</b> 90 Minutes <b>Mean:</b> 45 Minutes	<b>Highest:</b> 225 Minutes <b>Mean:</b> 225 Minutes	<b>Highest:</b> 300 Minutes <b>Mean:</b> 138 Minutes	<b>Highest:</b> 300 Minutes <b>Mean:</b> 106 Minutes	
<b>Intra OP Procedure</b>						
Anaesthesiology Time	<b>Highest:</b> 650 Minutes <b>Mean:</b> 506.8 Minutes	<b>Highest:</b> 413 Minutes <b>Mean:</b> 280.8 Mints.	<b>Highest:</b> 338 Mints. <b>Mean:</b> 338 Mints.	<b>Highest:</b> 443 Minutes <b>Mean:</b> 233 Minutes	<b>Highest:</b> 650 Minutes <b>Mean:</b> 362.3 Minutes	
Surgery time	<b>Highest:</b> 523 Minutes <b>Mean:</b> 367.8 Minutes	<b>Highest:</b> 284 Minutes <b>Mean:</b> 167.4 Minutes	<b>Highest:</b> 231 Mints <b>Mean:</b> 231 Mints.	<b>Highest:</b> 305 Minutes <b>Mean:</b> 227.8 Minutes	<b>Highest:</b> 523 Minutes <b>Mean:</b> 257.2 Minutes	

Antibiotics given pre-incision	<b>100 %</b>	<b>100 %</b>	<b>100 %</b>	<b>100 %</b>	<b>100 %</b>	
Time from induction to KTS	<b>Highest:</b> 149 Minutes <b>Mean:</b> 107 Minutes	<b>Highest:</b> 109 Minutes <b>Mean:</b> 99 Minutes	<b>Highest:</b> 94 Mints. <b>Mean:</b> 94 Minutes	<b>Highest:</b> 146 Minutes <b>Mean:</b> 104.7 Minutes	<b>Highest:</b> 149 Minutes <b>Mean:</b> 102.8 Minutes	
Time from antibiotics to KTS	<b>Highest:</b> 70 Minutes <b>Mean:</b> 39.3 Minutes	<b>Highest:</b> 99 Minutes <b>Mean:</b> 46.8 Minutes	<b>Highest:</b> 34 Mints. <b>Mean:</b> 34 Minutes	<b>Highest:</b> 150 Minutes <b>Mean:</b> 43 Minutes	<b>Highest:</b> 150 Minutes <b>Mean:</b> 42.4 Minutes	
Antibiotics Applied directly to wound?	<b>100 %</b> (on 3 out of 3 patients, No data for one pt.)	<b>50 %</b> (on 2 out of 4 patients, No data for one pt. )	<b>NA</b> (No data for the pt.)	<b>100%</b> (on 3 out of 3 patient, No data for 3 pts)	<b>80%</b> (on 8 out of 10 patients, No data for 6 pts.)	
<b>Length of stay and Theatre visits</b>						
Total number of visit to Theatre	<b>Highest:</b> 34 <b>Mean:</b> 11.8	<b>Highest:</b> 8 <b>Mean:</b> 5.2	<b>Highest:</b> 1 <b>Mean:</b> 1	<b>Highest:</b> 7 <b>Mean:</b> 5	<b>Highest:</b> 34 <b>Mean:</b> 6.5	
Number of returns to Theatre	<b>Highest:</b> 33 <b>Mean:</b> 11	<b>Highest:</b> 7 <b>Mean:</b> 4.2	<b>Highest:</b> 0 <b>Mean:</b> 0	<b>Highest:</b> 6 <b>Mean:</b> 4	<b>Highest:</b> 33 <b>Mean:</b> 5.5	
In ICU (from OT to ICU)	<b>Highest:</b> 7 <b>Mean:</b> 3.3	<b>Highest:</b> 2 <b>Mean:</b> 1	<b>Highest:</b> 1 <b>Mean:</b> 1	<b>Highest:</b> 11 <b>Mean:</b> 4.2	<b>Highest:</b> 11 <b>Mean:</b> 2.8	
In ward (from ICU to ward to discharge)	<b>Highest:</b> 223 <b>Mean:</b> 93.8	<b>Highest:</b> 50 <b>Mean:</b> 30.8	<b>Highest:</b> 6 <b>Mean:</b> 6	<b>Highest:</b> 125 <b>Mean:</b> 54.4	<b>Highest:</b> 223 <b>Mean:</b> 53.8	

**How compliance was calculated:**

- All calculations were performed using available data; unavailable data was excluded from the calculation.

**Areas for improvement/Recommendations:**

- Not all information was available, there should be widespread encouragement across all specialties to improve documentation after this review.
- Data retrieved from this review can and should be used in the consent process, when counselling these patients and their families for surgery.

## Appendix-1:

1. Patient Name
2. Current inpatient
3. Patient Id
4. Clinician
5. Primary Comorbidity (spinal related)
6. Secondary Comorbidities
7. Date of Birth
8. Previous Surgeries (highlighting spinal surgeries)
9. Date of Pre-operative assessment
10. Age at initial operation
11. Sex
12. First Spinal correction surgery
13. Theatre number
14. Procedure description
15. Primary surgeon and speciality
16. Second surgeon and speciality
17. Third Surgeon and Speciality
18. Surgery time
19. Skin Closure and dressings used
20. Estimated Blood Loss
21. Antibiotics applied directly to wound?
22. First anaesthesiologist
23. Second anaesthesiologist
24. Anaesthesia time
25. Time from induction to KTS
26. Invasive monitoring sited
27. Antibiotics given pre-incision
28. Time from antibiotics to KTS
29. Transfusion of blood products in theatre (Cell salvage used?)
30. Intra operative inotropes required and when?

31. Hypothermia? (Time spent below 36 degrees, time spent below 35 degrees)
32. Intra operative complication of note
33. Length of stay in PICU
34. Length of days stay in wards (not including PICU)
35. Number of returns to theatre and dates
36. Inotropes post op
37. Positive microbiology during inpatient stay
38. Antibiotics post op
39. Mortality at 30 days
40. Mortality at 1 year
41. Complication: Metal work failure
42. Complication: Infection
43. Complication Wound/soft tissue
44. Other complications
45. Was metalwork removed
46. When and if/when replaced
47. Transfusion history
48. Time from primary surgery to discharge home

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