



Day case paediatric tonsillectomy: a quality improvement project

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Abstract

Tonsillectomy is one of the commonest ENT paediatric procedures. Recovery is best achieved at home, and cost-effectiveness of the day case pathway is significant in tonsillectomy. This project scrutinised the local practice regarding the effectiveness of day case pathway in paediatric tonsillectomy in a large regional teaching hospital. The project aimed to improve the rates of day case tonsillectomy discharges, to increase compliance of postoperative care with guidelines, and to assess long-term sustainability of the new practice. The project looked prospectively at the pre-existing paediatric tonsillectomy day case practice (cycle 1) prior to implementing a multifaceted intervention. The intervention consisted of an evidence-based change to local day case tonsillectomy guidelines, improved lists' planning/management, and clinicians' education. Thereafter, the outcomes were measured in the short term (cycle 2—prospective data collection) and in the long term (cycle 3—retrospective data collection). The gathered data revealed an improvement in post-tonsillectomy day case discharge rates (both short and long term), without an increase in postoperative complications. Moreover, our intervention had effectively reduced sleep study requests and resulted in a significant increase in list profitability.

Conclusion: The departmental practice in paediatric day case tonsillectomy was improved via evidence-based relaxation of day case criteria, improved list management, and clinicians' education. The interventions resulted also in a positive significant financial impact with no increase in postoperative complications.

What is Known:

- Tonsillectomy is a common paediatric ENT procedure, with significant applicability and cost-effectiveness of the day case pathway.
- There is a lack of a clear general consensus on criteria for patients' suitability for day case tonsillectomy.

What is New:

- This quality improvement project carried out a methodical relaxation of day case criteria of day case tonsillectomy.
- The new criteria along with enhanced list management and clinician education had safely improved the local post-tonsillectomy day case care.

Keywords Tonsillectomy · Adenotonsillectomy · Paediatric · Day case · Quality improvement

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Abbreviations

CME	Continuous medical education
ENT	Ear, nose, and throat surgery
HDU	High dependency unit
Kg	Kilogramme
NHS	National Health Service
OSA	Obstructive sleep apnoea
SMART	Specific, measurable, achievable, relevant, and time-bound

Introduction

Tonsillectomy is one of the commonest ENT paediatric procedures; in 2003/2004, around 50,000 adult and paediatric

elective tonsillectomies were carried out in NHS England [5], whilst in 2014/2015, a total of 25,259 paediatric tonsillectomies were performed [3]. In most patients, post-tonsillectomy recovery is best achieved as a day case, provided careful pre-operative patient selection, suitable anaesthetic techniques, and postoperative analgesia [1]. However, in some patients, recovery for the first 24 h should take place on a paediatric ward or in a high dependency (HDU) environment [6]. The cost-effectiveness of a well-maintained day case tonsillectomy pathway is of great significance to the healthcare organisation; an effective tonsillectomy day case pathway allows for improvement in bed capacity and increase in theatre performance. It is recommended that a tonsillectomy should be carried out as a day case unless in young children, in severe obstructive sleep apnoea (OSA), or in children with significant co-morbidities [3].

Aims and objectives

The aim of this quality improvement project was to improve the effectiveness of the day case paediatric tonsillectomy pathway in order to optimise clinical outcomes and efficiently utilise resources.

The objectives were:

1. To increase our day case tonsillectomy rates to $\geq 50\%$
2. To reduce the rates of failed day case tonsillectomy discharges (i.e. patients who should be managed as a day case but were admitted postoperatively) to $\leq 20\%$
3. To reduce the non-compliance of postoperative care with new guidelines to $\leq 10\%$
4. To assess the safety and long-term sustainability of this new practice

Methods

We collected data on children undergoing tonsillectomy (\pm other ENT procedure) in our children's surgical unit at a university teaching hospital. We used a three-cycle data collection design: a pre-intervention prospective cycle (1), a short-term prospective post-intervention cycle (2), and a long-term retrospective post-intervention cycle (3). The following primary outcome measures were measured weekly via three run charts:

- A. Rates of successful patient day case discharges after a tonsillectomy (Chart 1)
- B. Rates of failed day case discharges after a tonsillectomy (Chart 2)
- C. Rates of non-compliance in post-tonsillectomy care with the existing guidelines (Chart 3)

The surgical techniques of all surgeons were not altered for the purposes of this project in order for the outcomes to be reflective of true outcomes. Although the specifics of the technique were not formally collected, the two techniques used in our department during the study period were tonsillectomy with cold steel or bipolar diathermy. We also collected data on readmission rates for bleeding or infection to identify postoperative complications in each cycle.

Cycle 1

This was a prospective, pre-intervention cycle with weekly data collection between November 2014 and March 2015 ($n = 121$ patients) on all paediatric patients who had a tonsillectomy at Derriford Hospital, Plymouth Hospitals NHS Trust. The outcomes were assigned to run charts in order to allow a clear demonstration and analysis of data.

Intervention

We carried out a multi-step intervention in order to safely and systematically improve the unit's postoperative recovery and day case management. The intervention consisted of the following steps:

- A. An evidence-based relaxation of sleep study requests criteria:

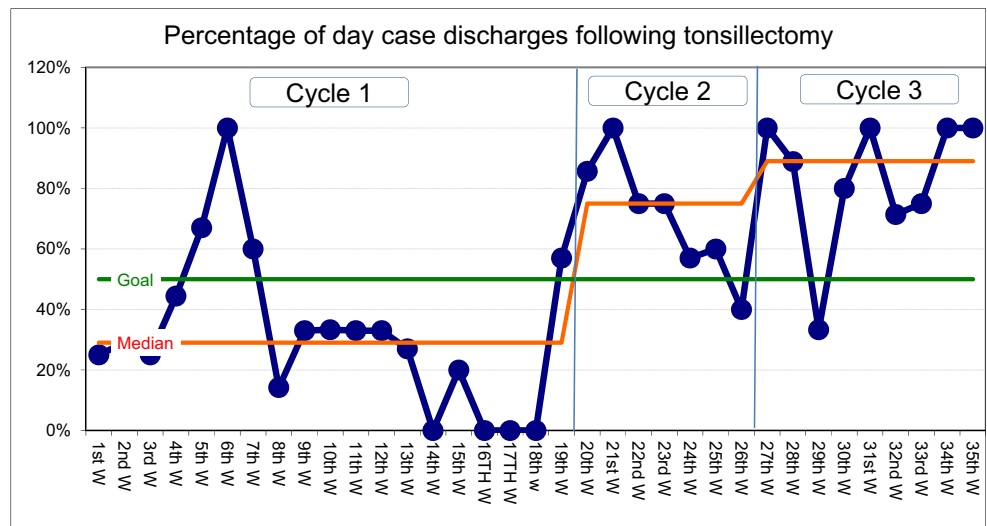
The Royal College of Surgeons of England and a UK Multidisciplinary Working Party [6] had outlined in 2009 the indications for respiratory investigations such as sleep studies in children with sleep-related breathing disorders who are to undergo adenoidectomy and tonsillectomy. Therefore, we have, at the beginning of this project, changed our sleep study request criteria to be in keeping with these recommendations.
- B. An evidence-based relaxation of post-tonsillectomy day case criteria:

We carried out an evidence-based change to our local day case post-tonsillectomy guidelines by reviewing the relevant literature and guidelines, and by contacting tertiary paediatric ENT departments across the UK.

Evidence [7, 8] suggests that children younger than 2 years of age (hence a weight of $(\text{age} + 4) \times 2 = 12$ kg) are at higher risk of postoperative respiratory and airway compromise. This multi-factorial increase in postoperative risk is due to age-related airway calibre, neuromuscular maturity, thoracic maturity, and pulmonary physiology [8].

A large cohort retrospective study [4] over 5 years showed that most postoperative bleeding following a tonsillectomy/adenoidectomy occurs within the first 6 postoperative hours. A meta-analysis of 16 trials comparing the postoperative incidence of bleeding between 0–8 and 9–24 h following a tonsillectomy revealed that late

Chart 1 Percentage of day case discharges



bleeding risk (after 8 h) is $\leq 0.1\%$ [2]. Data from this meta-analysis show that by reducing the postoperative time of discharge from 6 h (our current practice) to 4 h, only 7/10167 postoperative haemorrhages would be missed. Therefore, a pragmatic approach was taken and the cut-off for discharge set at 4 h.

Finally, and in order to benchmark our suggested changes, we sought expert opinion from British paediatric ENT centres. Nine out of all UK paediatric tertiary ENT departments responded to our communication and advised us of their day case post-tonsillectomy criteria (Table 1).

Therefore, and as a result of the available evidence, guidelines, and peer expert opinion, we changed our day case post-tonsillectomy criteria as follows:

- 1) The minimum patient weight for a day case discharge was decreased from 20 to 15 kg

- 2) The minimum patient age for a day case discharge was decreased from 5 to 3 years
- 3) The observed period of recovery postoperatively was decreased from 6 to 4 h
- 4) Otherwise, healthy children who have a mild symptomatic sleep apnoea that does not meet the criteria [6] for a sleep study should have their tonsillectomy as day case. Otherwise, healthy children with mild or no OSA on overnight pulse oximetry should be treated as a day case. Children with moderate or severe OSA on pulse oximetry should be managed postoperatively on the ward or children’s High Dependency Unit, respectively.

- C. We improved our lists’ planning and management to ensure that all day case tonsillectomy patients would have their procedure and be moved from theatres into recovery by 1500 h. This is to allow a 4-h recovery period prior to

Chart 2 Percentage of failed day case discharges

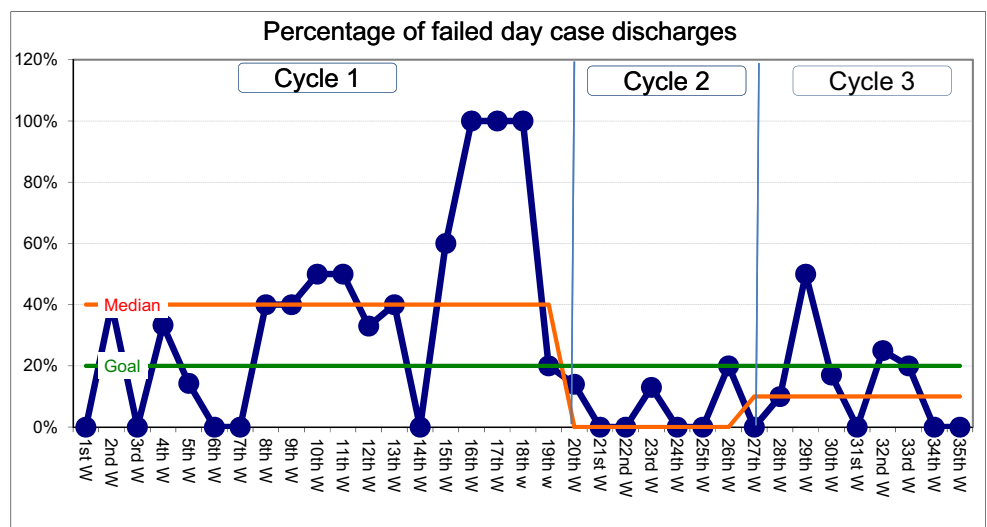
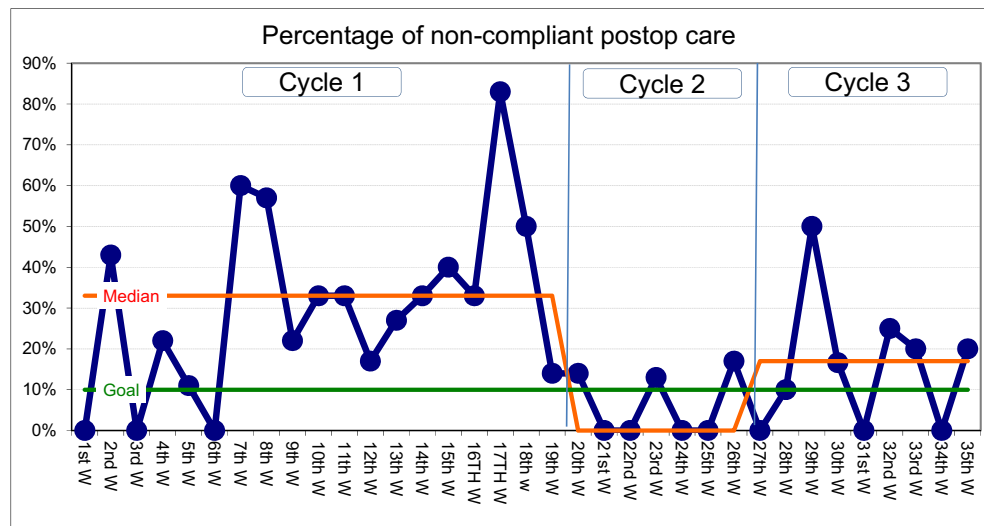


Chart 3 Percentage of non-compliant postoperative care



discharging patients by 1900 h, the time by which the children’s day case unit closes.

- D. We also had reemphasised our clinicians’ education through continuous medical education (CME) activities, email correspondence, and the provision of all relevant guidelines in clinical areas.

retrospective nature of data collection in cycle 3 was used in order to allow an unbiased long-term examination of our practice when unsupervised. As per previous cycles, the outcomes of the third cycle were assigned to comparable run charts.

Cycle 2

This was a prospective weekly data collection from patients who had tonsillectomy surgery between March and August 2015 (*n* = 47 patients). The outcomes of cycle 2 were assigned to parallel run charts to those used in cycle 1 to allow further examination and comparison of our performance.

Cycle 3

Finally, and in order to evaluate the long-term impact of the implemented changes, we carried out a retrospective data collection between May and June 2017 (*n* = 50 patients). The

Results

The median rate of successful day case discharges post-tonsillectomy was 29% in cycle 1, 75% in cycle 2, and 89% in cycle 3 (Chart 1). This phenomenon was mirrored in a fall in the median of rates of failed day case discharges from 40% in cycle 1 to 0% in cycle 2, although this had increased to 10% in cycle 3 (Chart 2). Moreover, the median of rates of non-compliance with the post-tonsillectomy pathway had fallen from 33% in cycle 1 to 0% in cycle 2, with a slight increase to 17% in cycle 3 (Chart 3).

In cycle 1, the commonest reasons for delays (Table 2) in post-tonsillectomy discharges were surgeon’s decision (40%) and list planning and management (19%). In cycle 3, the commonest causes of delayed discharges were mainly surgeon’s decision (88%) and, to a lesser extent, poor postoperative

Table 1 Tonsillectomy day case criteria in responding paediatric ENT UK centres

Centre	Time to discharge (hour)	Age (year)	Weight limit (kg)
Bristol Royal Hospital for Children	4	-	15
Birmingham Children’s Hospital	4	-	15
Alder Hey Children’s Hospital	4	3	-
Evelina London Children’s Hospital	4	-	15
Southampton Children’s Hospital	6	-	15
Leeds Children’s Hospital	6	3	15
The Great North Children’s Hospital	6	4	20
Great Ormond Street Hospital for Children	No day case		
Royal Hospital for Sick Children, Edinburgh	No day case		

Table 2 Causes of incorrect postoperative care

Cause of incorrect postoperative care	Cycle 1	Cycle 2	Cycle 3	Total
Surgeon decision	40%	0	88%	46%
Postoperative surgical complication	3%	30%	0	4%
Poor recovery/nausea/vomiting	8%	0	12%	8%
No identifiable cause	19%	0	0	15%
Afternoon listing	30%	70%	0	27%

recovery (12%). There was no increase in postoperative complication rates between the three project cycles.

The mean patient age was 7.2 ± 4.4 years, and the mean weight was 32.4 ± 21.2 kg. The commonest procedures carried out were tonsillectomy and adenotonsillectomy (Table 3). The main two indications for a tonsillectomy were recurrent tonsillitis and obstructive sleep apnoea (Table 4).

The surgical technique consisted of cold steel or bipolar diathermy for dissection, and of silk ties or for haemostasis, according to the surgeon's preference.

The prevalence of postoperative nausea and vomiting (during recovery) was 2.5% in cycle 1, 2.1% in cycle 2, and 2% in cycle 3. There was one primary postoperative haemorrhage in each of the first two cycles (0.8% and 2.1% respectively) in comparison to no primary haemorrhages in the third cycle. Secondary postoperative haemorrhages occurred only in patients in the first two cycles (8% and 2% respectively) with no cases of postoperative bleeding in the third cycle.

Discussion

The intervention we carried out during this project had successfully improved, both in the short and long term, the day case pathway efficiency, patients' management, and list profitability. The day case discharge rates following a tonsillectomy had increased from under a third in the first cycle to around 90% of patients in the third. Moreover, our list management, compliance with guidelines, and profitability had all improved following our intervention in a sustainable fashion. Most importantly, these changes were proven to be safe as they resulted in no increase of postoperative complications rates.

Table 3 Procedures performed

Procedure	Cycle 1	Cycle 2	Cycle 3	Total
Tonsillectomy	44%	55%	32%	43%
Adenotonsillectomy	34%	24%	40%	33%
Adenotonsillectomy + grommets	15%	17%	26%	19%
Adenotonsillectomy + other	5%	4%	1%	4%
Tonsillectomy + other	2%	0	1%	1%

Table 4 Indications for tonsillectomies

Indications	Cycle 1	Cycle 2	Cycle 3	Total
Tonsillitis	33.06%	55.32%	30.00%	37.16%
Obstructive sleep apnoea	24.79%	19.15%	44.00%	27.98%
Snoring without OSA	13.22%	12.77%	12.00%	12.84%
Tonsillitis + snoring	15.70%	6.38%	4.00%	11.01%
Tonsillitis + OSA	6.61%	4.26%	10.00%	6.88%
Tonsillar asymmetry	4.96%	2.13%	0.00%	3.21%
Tonsilloliths	0.83%	0.00%	0.00%	0.46%
No identifiable cause	0.83%	0.00%	0.00%	0.46%

In this project, we followed a "SMART" framework where we identified specific primary outcomes that were measurable, achievable, realistic, and timely. The systematic approach allowed a firm foundation for the safe implementation of our guidelines on patients' management. Nevertheless, the strategic data collection manner (prospective vs. retrospective) allowed the minimisation of bias between the three cycles. According to our knowledge, this is the first study of its kind in the UK and therefore we cannot compare our outcomes to other national studies. We, however, anticipate that similar quality improvement projects will be carried out in other centres in the UK and will inform further the applicability of our work to other units. Ultimately, the implementation of a national/regional guideline similar to our new guideline will provide a wider consensus and will allow a wider gaze at the outcomes and complications on a much wider cohort of patients.

Whilst the robust strategy in this project had resulted in significant improvements in our patient care, there is an indication of a partial decrease in our performance in the long term. The results of the project revealed a slight increase in our rates of failed day case discharges and in non-compliance with the adopted changes. The sole causative factor in this according to our data is the surgeon's decision. This could be explained by the practice of newly joined surgeons such as locum doctors and newly appointed junior doctors, and will be assessed in future cycles following a programme of education when each new intake of doctors starts.

Conclusion

This project had safely improved our post-tonsillectomy day case care via the means of an evidence-based relaxation of day case criteria, improved list management, and enhanced clinician education. The improvement in our unit's day case tonsillectomy rates was followed up through this project in order to ensure sustainability. However, the management of tonsillectomy listing should continue to be supervised periodically through future audits to ensure continued high quality of care

and productivity. Finally, national or regional cooperative work can build on our findings and outcomes in order to create an agreed consensus on the day case post-tonsillectomy care pathway.

Authors' contributions The contributors to this project are:

- Mr. Mihir Atfeh (data collection—all cycles and manuscript main writing up and editing).
- Dr. James Richardson-May (data collection—cycle 3 and manuscript writing up—results section).
- Mr. James Rainsbury (project planning and supervision and manuscript final editing and reviewing).
- Dr. Nikoletta Pocsí (data collection—cycles 1 and 2).

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Informed consent During this project, the formal local ethical procedures were followed and patients' data were anonymised throughout the project. A formal application to the local clinical audit and Service Improvement departments was submitted and approved prior to initiating the project data collection. Regular feedback to the clinical audit department was provided throughout the progress of the project. No patient-identifying data was retained during data collection. All patients had their procedures as per the department's agreed practice. The hospital's standard formal paediatric preoperative consent forms were completed and signed by the legal guardians/parents/patients.

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