Trends in tonsillectomy surgery in children in Scotland 2000-2018

Haytham Kubba, Laura SDownie

Haytham Kubba

Consultant Paediatric Otolaryngologist

Royal Hospital for Children

1345 Govan Road

Glasgow

G51 4TF

Laura S Downie

Analyst

Scottish Public Health Observatory

Public Health Scotland

5 Cadogan Street

Glasgow

G2 6QE

Correspondence to: Mr Kubba at hkubba@nhs.net

Ethical considerations

This work is based on anonymised data which is routinely collected by the NHS and which is freely available on reasonable request to the Information Services Division of NHS Scotland.

Research ethics committee approval is not required for access to the data. No specific ethical considerations arise.

Author contributions

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HK designed the study, performed the analyses and wrote the paper.

LD provided the data and contributed to writing the paper.

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MR HAYTHAM KUBBA (Orcid ID : 0000-0003-3245-5117)

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Abstract

Background

Tonsillectomy is one of the most common surgical procedures in children but indications and surgical practice change over time.

Objectives

We aimed to identify trends in tonsillectomy procedures in children, in particular the number of procedures performed, the age of child undergoing tonsillectomy and the type of hospital in which the surgery was performed.

Design

Review of Scottish Morbidity Records data (SMR01) which are routinely collected after every day case procedure or overnight stay in all Scottish NHS hospitals.

Setting

All NHS hospitals in all 14 Scottish health boards.

Participants

All children (0-16 years) undergoing tonsillectomy, 2000-2018.

Main outcome measures

Number of tonsillectomy procedures; rate of tonsillectomy per 1000 children in the population; number of children aged 0-2 years and 3-4 years undergoing tonsillectomy;

health board in which the surgery occurred; diagnostic coding for these episodes; length of stay and readmission within 30 days of surgery.

Results

During 2000-2018, there were 50,208 tonsillectomies performed in children in Scotland (mean 2642/ year). The number of tonsillectomies per year remained constant ($R=0.322$, $p=0.178$) but tonsillectomies performed in children 0-2 years rose from 0.41 to 1.56 per 1000 ($R=0.912$, $p<0.001$), and 3-4 years from 3.06 to 6.93 per 1000 ($R=0.864$, $p<0.001$). The proportion of all children's tonsillectomies performed up to age 4 rose from 20.6% to 35.9%, and up to age 2 from 2.4% to 8.1%. All specialist children's hospitals showed a significant increase in surgery in very young children.

Conclusions

Tonsillectomy rates remained static between 2000 and 2018, despite a falling population. More tonsillectomies are now performed for obstructive sleep apnoea, at a young age and in regional children's hospitals. This has important implications for the workload of these specialist hospitals.

Key words

Tonsillectomy; epidemiology; obstructive sleep apnoea; tonsillitis; children

Key points

- The rate of tonsillectomy in children aged 0-16 years in Scotland has been constant between 2000 and 2018 at around 2.67 procedures per 1000 children in the population.
- Over the same time period, the rate of tonsillectomy in children aged 0-2 years has more than trebled, from 0.41 to 1.56 per 1000, and the rate in children aged 3-4 years has more than doubled from 3.06 to 6.93 per 1000. These young children now make up a much larger proportion of all paediatric tonsillectomies performed.

- Obstructive sleep apnoea is the most common reason for surgery in the younger children and the proportion of children with this as their indication for surgery has been increasing over time.
- Most large district hospitals and all specialist children's hospitals have seen an increase in the number of children aged 3-4 years undergoing tonsillectomy.
- Children 0-2 years of age only undergo surgery in hospitals with specialist paediatric anaesthetists. These hospitals have all seen a significant increase in the number of children aged 0-2 years undergoing tonsillectomy. These young children have longer hospital stays and are more likely to be readmitted within 30 days of their surgery, reflecting the increased medical complexity of this group.

Background

Tonsillectomy is one of the most common surgical procedures performed in children but there has long been an element of debate, even controversy, about the indications for the procedure. Research evidence has led to a refinement in indications over recent decades. Traditionally, the most common reason for removing the tonsils has been recurrent episodes of tonsillitis. A number of randomised controlled trials¹⁻⁴ have established the frequency and duration of recurrent tonsillitis which might justify surgical intervention and clinicians have been encouraged to follow national guidance based on this research evidence⁵. Such evidence-based guidance might be expected to lead to a reduction in the number of tonsillectomies performed.

However, research evidence has also shed light over the same period of time on the nature and potential sequelae of obstructive sleep apnoea (OSA) in children. First characterised as recently the 1980s, OSA was originally described in small case series of children with severe airway obstruction and right heart failure⁶. Increased awareness of the condition among clinicians has led to increased diagnosis, and OSA is now known to affect around 3% of children⁷. Evidence has emerged suggesting OSA is associated with serious sequelae such as systemic and pulmonary hypertension, endocrine disturbance and effects on cognition, behaviour and learning⁷. Since removal of the tonsils and adenoids is usually curative, OSA has rapidly become a very common indication for surgery. The effect of this on the overall

number of procedures performed is unknown, and in particular whether any increase in tonsillectomy for OSA has offset any reduction in tonsillectomy for tonsillitis.

The age profile of children undergoing tonsillectomy for OSA is very different to that of children undergoing tonsillectomy for tonsillitis. Children with recurrent tonsillitis have usually had the condition for some years before surgery is considered so it is uncommon for surgery to be performed before school age. In contrast, OSA occurs most commonly in pre-school children and early surgery is usually considered because of concern about the long-term sequelae. Young children are at higher risk of death or serious harm from a post-operative haemorrhage and often require the services of specialist paediatric anaesthetists in children's hospitals, so any change in the age profile of children undergoing tonsillectomy has important implications for considerations of risk and benefit, and for service pressures in children's referral centres.

We performed this study with the aim of identifying trends in tonsillectomy in children. In particular, we studied changes in the overall number of procedures performed, the proportion of very young children undergoing tonsillectomy and the type of hospital in which the surgery was performed.

Method

Data were provided by the Information Services Division (ISD) of NHS Scotland, based on Scottish Morbidity Record (SMR01) returns from NHS hospitals across the whole of Scotland. SMR01 returns are generated for any acute hospital episode, whether inpatient or daycase, and ISD report that their data is at least 99% complete⁸. For this study, data were requested for the number of tonsillectomy procedures performed in any Scottish Hospital 2000-2018, using the OPCS code F34 (and all of its sub-categories). Where multiple procedures were performed under the same anaesthetic (such as tonsillectomy, adenoidectomy or middle ear ventilation tube insertion), the procedure was included if there was a code for tonsillectomy as any of the first, second, third or fourth coded

procedures. Data extraction was done using RStudio for R programming language version 3.5.1 (RStudio, Boston, USA). The data points collected included age at surgery, length of hospital stay, and readmission to hospital within 30 days of procedure. We also collected data on the diagnostic code associated with each tonsil surgery procedure. NHS Scotland uses the World Health Organisation's International Classification of Diseases version 10 (ICD 10) codes ⁹.

Scotland has 14 health boards, each of which has only one hospital site where children's otolaryngological surgery is currently performed, allowing us to infer the type of hospital where the surgery occurred (specialist children's hospital, large general hospital or small rural hospital).

Population data for Scotland for each year 2000-2018, by year of age and by health board of residence, are freely available on the website of the National records for Scotland ¹⁰. These figures allowed us to calculate intervention rates corrected for any change in population specific for each year and each health board area, and expressed as tonsillectomies per 1000 children.

Trends over time were identified by performing simple linear regression using least squares, with the number of procedures as the dependant variable and time as the independent variable. Inspection of the data confirmed that a simple linear model was appropriate as all apparent trends were linear with no major step changes. Analysis was done using SPSS software version 26 (IBM Corporation, Armonk, New York, USA).

Results

Over the time period 2000-2018, there were 50,208 tonsillectomies performed in children aged 0-16 in Scotland. A very small number of procedures (14) were carried out on children normally resident outside Scotland (mostly in England, Wales or Northern Ireland), so we have excluded those from calculations of intervention rates. 50,194 tonsillectomies were performed in children up to age 16 who were resident in Scotland, a mean of 2642 per year.

The population of children aged 0-16 in Scotland has steadily decreased from 1,046,602 in 2000 to 972,972 in 2018. These figures allow us to express the number of tonsillectomies performed each year as the intervention rate per 1000 children in the population. This varied slightly between 1.83 and 3.12 per 1000, with a mean of 2.67 per 1000. No significant trend was apparent over time ($R=0.322$, $p=0.178$). This is shown in **Figure 1**.

The number of tonsillectomies performed is shown in **Table 1**. The tonsillectomy rate for children aged 0-2 years for each year varied between 0.41 and 1.56 procedures per 1000 children aged 0-2 in the population, with a significant increase over time ($R=0.912$, $p<0.001$). The tonsillectomy rate was much higher at all time points for the group aged 3-4 years, ranging between 3.06 and 6.93 per 1000, and this too increased significantly over time ($R=0.864$, $p<0.001$). The tonsillectomy rate for children aged 5-16 years varied between 1.94 and 3.39 per 1000, but there was no significant trend over time ($R=-0.396$, $p=0.09$). These changes are also shown in **Figure 1**. The proportion of all children's tonsillectomies performed in the very young has increased over time, with the proportion of tonsillectomies performed in children up to age 4 rising from 20.6% to 35.9%, and the proportion performed in children up to age 2 rising from 2.4% to 8.1%.

The majority of tonsillectomies in children aged 4 or under was performed in Greater Glasgow and Clyde, Lothian, Grampian and Ayrshire and Arran Health Boards. The first three of these have children's hospitals (in Glasgow, Edinburgh and Aberdeen respectively). Ayrshire and Arran has a large general hospital which hosts Scotland's national service for cochlear implantation and therefore has considerable expertise and experience in anaesthetising young children. Between them, these four services performed 76% of all tonsillectomies in children up to 4 years of age and 92% of those up to 2 years of age. The proportion of all tonsillectomy procedures performed in a specialist children's hospital (in Glasgow, Edinburgh or Aberdeen) rose from 52.2% to 61.6%. The proportion of tonsillectomies in children aged 0-4 years which were performed in a specialist children's hospital rose from 58.9% to 74.5% (from 395 to 682 cases per year), and in children aged 0-2 years the proportion rose from 77.2% to 89.4% (from 61 to 186 cases per year). Each of the major children's referral hospitals showed a significant increase in surgery in very young

children. The trends for Glasgow and Edinburgh are the largest and most informative, and these are shown in **Figures 2 and 3** respectively. In Glasgow there was no significant trend in the 0-16 figures or in the 5-16 age group but there is a significant increase over time in the 0-2 age group ($R=0.906$, $p<0.001$) and in the 3-4 age group ($R=0.735$, $p<0.001$). In Edinburgh, there was a significant increase in procedures over time in all children 0-16 years ($R=0.693$, $p=0.001$), in the 0-2 age group ($R=0.749$, $p<0.001$) and in the 3-4 age group ($R=0.838$, $p<0.001$). There is no trend over time in the children aged 5-16 years ($R=0.424$, $p=0.07$). At the Royal Aberdeen Children's Hospital, there was no significant trend in the overall 0-16 figures or the 5-16 age group, but a significant increase in the 0-2 age group ($R=0.696$, $p=0.001$) and in the 3-4 age group ($R=0.694$, $p=0.001$).

The number of tonsillectomies performed in children under 4 was very small or zero in a number of smaller health board areas, namely Orkney, Shetland, Borders and Western Isles. No significant change in rates was apparent across the time period studied in these health board areas. Health board areas with large general hospitals, namely Dumfries and Galloway, Fife, Forth Valley, Highland, Lanarkshire and Tayside, performed surgery in those aged 3-4 years but very few aged 0-2 years. There was a statistically significant increase in tonsillectomy in the 3-4 age group (expressed as the rate per 1000 children of that age living in that health board in that year) in Fife ($R=0.577$, $p=0.01$), Forth Valley ($R=0.651$, $p=0.022$), Highland ($R=0.479$, $p=0.038$), Lanarkshire ($R=0.615$, $p=0.005$) and Tayside ($R=0.528$, $p=0.02$) health boards. An example is shown in **Figure 4** which shows the tonsillectomy rates for 3-4 and 5-16 year-olds from Lanarkshire health board.

Length of hospital stay had a median of 1 day for all age groups at all time points. The mean, however, varied significantly between age groups and across time, as shown in **Figure 5**. Hospital stay was longer in children aged 0-2 years, with the mean varying between 1.54 and 6.6 days. There was no trend over time in this age group. There was a significant reduction in length of stay over time for the children aged 0-4 years and 0-16 years ($R=-0.632$, $p=0.004$ and $R=-0.882$, $p<0.001$ respectively).

The overall readmission rate within 30 days of surgery was 9.7%. There was a small but statistically significant increased risk of readmission within 30 days in those aged 0-4 years

(10.2%; Chi-squared=5.32, $p=0.02$) and 0-2 years (13.4%; Chi-squared 48.48, $p<0.00001$) compared to older children.

More than 150 distinct ICD 10 codes were associated with the tonsil surgery procedures. In 28839 cases (57.4% of the total number of 50208 procedures) these were clearly related to recurrent tonsillitis as the indication for surgery, namely J03 (variations on "acute tonsillitis") and J02 (variations on "pharyngitis"). In 11239 cases (22.4% of the total) the diagnostic codes were highly suggestive of obstructive sleep apnoea as the indication for the tonsil surgery, namely J351, J352 and J353 ("hypertrophy of tonsils and adenoids"), G473 ("disorders of sleep: sleep apnoea") and R065 ("breathing disorders: snoring"). For the remainder, the coding was not obviously related to a specific indication for tonsil surgery and we have grouped these together as "other" (10130 cases, 22% of the total). In many of these, it is clear that the coding refers to an associated condition such as otitis media, inferior turbinate hypertrophy or laryngomalacia which is not directly related to the tonsil procedure but may relate to another procedure performed under the same general anaesthetic, such as middle ear ventilation tubes, turbinate reduction or supraglottoplasty.

A much larger proportion of those aged 0-2 years are coded as having obstructive sleep apnoea (55.4%) compared with those aged 3-4 years (40.3%) or 5-16 years (14.0%), as shown in **Figure 6**. Between 2000 and 2018 there was a significant increase in diagnostic codes for obstructive sleep apnoea ($R=0.97$, $p<0.001$) and a corresponding fall in "other" ($R=-0.788$, $p<0.001$) with no change in codes for tonsillitis (**Figure 7**).

Discussion

Synopsis of new findings

Even accounting for a slight fall in the population since 2000, the number of tonsillectomies performed in children in Scottish hospitals overall has remained constant. There has been a significant change, however, in the age of the children operated upon and the location of their surgery. More surgery is being done in children under 5 years of age in many large hospitals and regional children's referral hospitals. The regional children's referral hospitals are also doing more surgery in very young children, under the age of 3. It is likely that this is

mostly because of the increasing diagnosis of obstructive sleep apnoea, which is the commonest reason for surgery in younger children.

Children under 3 stay longer in hospital than older children, for whom length of stay has been getting shorter over time. Children aged under 5 are more likely to be readmitted within 30 days of surgery than older children. It is likely that these trends reflect the increasing medical complexity of very young children undergoing surgery. These trends have important implications for the children, and the hospitals.

Strengths of the study

Scotland has a relatively stable population with low rates of inward and outward migration, and it benefits from a single, coherent, publically-funded health service with centralised data collection. This puts us in a good position to record population based trends over time. At least 99% of hospital attendances generate an SMR01 return to ISD, so the data they gather are comprehensive. Of course, neither we nor ISD can vouch for the accuracy of the coding information produced by the hospitals, particularly with regard to diagnosis codes. We have seen a very large number of codes used to describe paediatric tonsillectomy admissions, and although most can be easily mapped onto “recurrent sore throats” or “obstructive sleep apnoea” as likely indications for surgery, many cannot. We also cannot report on data which is not included in the routine hospital returns such as analgesia, corticosteroids, antiemetics, antibiotics, post-operative haemorrhage or surgical techniques such as tonsillotomy.

Comparison with other studies

Østvoll and colleagues¹¹ used data from the Swedish Tonsillectomy Register to show that tonsil surgery rates were rising overall between 1987 and 2013, with a significant increase in obstructive sleep apnoea and a corresponding fall in recurrent tonsillitis as the indication for surgery. Length of stay was falling over time but readmission rates were rising, for reasons unexplained. The data includes children and adults so it is not possible to compare our intervention rates directly with theirs. However, data from children (1-17 years) extracted from the same registry over the same time period was reported by Borgström and colleagues¹², and this report is much more comparable to ours. The incidence of

tonsillectomy in children aged 1-3 years rose from 17 to 73 per 10,000 person years over the study period, which is of the same order as the figures we report for the 0-2 and 3-4 year old children in Scotland. These younger children, like ours, have come to form a much larger proportion of those undergoing tonsillectomy, rising from 13.5% to 29.4% of the Swedish 1-17 year-old cohort. Interestingly, the overall tonsillectomy rate in children aged 1-17 years in Sweden has been rising over time while ours has remained static. It is our belief that the rising number of procedures for obstructive sleep apnoea is balanced by a reduction in procedures for recurrent tonsillitis, driven by the widespread adoption of evidence-based guidelines. We do not know why this should be different in Sweden.

The Swedish group and others have reported lower haemorrhage rates in young children compared with adolescents and adults^{13,14}. Whether this is due to a greater proportion of cases being done with tonsillotomy techniques rather than complete tonsillectomy, or whether it simply reflects easier surgical dissection in the absence of fibrosis from previous infections, is unknown.

Clinical applicability of the study

Whether or not a 2-year-old is more likely to suffer a post-operative haemorrhage than a 12-year-old, the smaller circulating blood volume of the 2-year-old puts that child at a much higher risk of death or serious injury should a bleed occur. Post-operative respiratory complications are more common in young children undergoing surgery for obstructive sleep apnoea compared with older children and adults with recurrent tonsillitis⁷. Anaesthetists in many general hospitals may be reluctant to anaesthetise children so young, and ward staff may be reluctant to look after them post-operatively. As a result, such young children who are judged to require surgery may need to be referred to a regional children's hospital where the necessary skills and experience are readily available, and a paediatric intensive care unit is available if required. Concerns about the post-operative care of young, high risk children undergoing tonsillectomy for obstructive sleep apnoea led to the development of multi-disciplinary referral guidance in 2009¹⁵. This suggested that age less than 2 years, weight less than 15kg and significant co-morbidities were reasons to refer the child for tonsillectomy in a specialist children's hospital. While these seemed reasonable recommendations on the evidence at the time, they unfortunately led to very large

numbers of children being referred to regional centres, leading to increased waiting times and significant strain on children's hospital services. Substantial reductions in the number of children being operated on in general hospitals runs the risk of deskilling the anaesthetists, surgeons and nurses with regard to the care of young children, destabilising their paediatric services. The more young children are transferred out of local hospitals and into regional centres, the less confident surgeons in local hospitals will be in dealing with young children, resulting in a spiralling decline in confidence. Children are denied the advantages of having their surgery carried out close to home in their local hospital and instead are forced to wait for long periods of time to have surgery in over-stretched regional referral centres. There is no evidence that any harm has been avoided by this shift in referral patterns. More recent guidance has now been produced with the referral threshold reduced to 1 year of age and a weight of 10kg¹⁶. It is hoped that this will ease pressures on regional services and allow more surgery to be safely and efficiently performed in local hospitals.

Surgeons have embraced the need to limit tonsillectomy for recurrent tonsillitis to only those children deemed likely to gain significant clinical benefit, according to published guidance based on good quality, evidence-based indicators from a series of randomised controlled trials. It is to be hoped that future research trials will produce similar evidence to guide intervention in young children with obstructive sleep apnoea. At the moment, the diagnosis and optimal management of this condition are subject to debate and better-quality evidence is needed to ensure we are not overtreating and exposing very young children to the risks and discomforts of surgery unnecessarily.

Conclusions

The rate of tonsillectomy in children in Scotland has remained static between 2000 and 2018, despite a slight fall in the population. The number of children undergoing tonsillectomy under the age of 4 years and under the age of 2 years has risen significantly over this time period, such that a much greater proportion of tonsillectomies are now performed at a young age, with obstructive sleep apnoea as the main indication for surgery. This is associated with an increase in the number of tonsillectomies being performed in

regional children's hospitals. This has important implications for the workload of these specialist hospitals.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

1. Paradise JL, Bluestone CD, Bachman RZ, Colborn DK, Bernard BS, Taylor FH, et al. Efficacy of tonsillectomy for recurrent throat infection in severely affected children. *New England Journal of Medicine* 1984;310(11):674-83
2. Paradise JL, Bluestone CD, Colborn DK, Bernard BS, Rockette HE, Kurs-Lasky M. Tonsillectomy and adenotonsillectomy for recurrent throat infection in moderately affected children. *Pediatrics*. 2002;110(1 Pt 1):7-1
3. van Staaik BK, Akker EH, Rovers MM, Hordijk GJ, Hoes AW, Schilder AGM. Effectiveness of adenotonsillectomy in children with mild symptoms of throat infections or adenotonsillar hypertrophy: open, randomised trial. *BMJ* 2004;329(7467):651
4. Lock C, Wilson J, Steen N, Eccles M, Mason H, Carrie S, Clarke R, Kubba H, Raine C, Zarod A, Brittain K, Vanoli A, Bond J. North of England and Scotland Study of Tonsillectomy and Adeno-tonsillectomy in Children (NESSTAC): a pragmatic randomised controlled trial with a parallel non-randomised preference study. *Health Technology Assessment (Winchester, England)*. 2010; 14(13); 1-164, iii-iv
5. Scottish Intercollegiate Guidelines Network. SIGN 117: Management of sore throat and indications for tonsillectomy (accessed at: <https://www.sign.ac.uk/sign-117-management-of-sore-throat-and-indications-for-tonsillectomy>)

6. Brouillette RT, Fernbach SK, Hunt CE. Obstructive sleep apnea in infants and children. *Journal of Pediatrics* 1982; 100: 31-40.
7. Powell S, Kubba H, O'Brien C, Tremlett M. Paediatric obstructive sleep apnoea. *BMJ* 2010; 340; c1918
8. <https://www.isdscotland.org/products-and-Services/Data-Support-and-Monitoring/SMR-Completeness/>
9. <https://icd.who.int/browse10/2016/en>
10. <https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/population/population-estimates/mid-year-population-estimates/population-estimates-time-series-data>
11. Østvoll E, Sunnergren O, Stalfors J. Increasing readmission rates for hemorrhage after tonsil surgery: a longitudinal (26 Years) national study. *Otolaryngology - Head Neck Surgery*. 2018; 158: 167-176
12. Borgström A, Nerfeldt P, Friberg D, Sunnergren O, Stalfors J. Trends and changes in paediatric tonsil surgery in Sweden 1987-2013: a population-based cohort study. *BMJ Open*. 2017; 7: e013346
13. HessénSöderman AC, Ericsson E, Hemlin C, Hultcrantz E, Månsson I, Roos K, Stalfors J. Reduced risk of primary postoperative hemorrhage after tonsil surgery in Sweden: results from the National Tonsil Surgery Register in Sweden covering more than 10 years and 54,696 operations. *Laryngoscope*. 2011; 121: 2322-2326
14. Windfuhr JP, Chen YS. Do changing trends in tonsil surgery affect hemorrhage rates? A longitudinal study covering 1,452,637 procedures. *European Archives of Otorhinolaryngology*. 2019; 276: 2585-2593.

15. Robb PJ, Bew S, Kubba H, Murphy N, Primhak R, Rollin AM, Tremlett M.
Tonsillectomy and adenoidectomy in children with sleep-related breathing disorders:
consensus statement of a UK multidisciplinary working party *Clinical Otolaryngology*
2009; 34(1); 61-3
16. Combined Working Party of the British Association for Paediatric Otolaryngology
(BAPO), ENT UK, The Royal College of Anaesthetists (RCoA) and the Association of
Paediatric Anaesthetists of Great Britain and Ireland (APAGBI). *Safe Delivery of
Paediatric ENT Surgery in the UK: A National Strategy* 2019 (accessed at
<https://www.entuk.org/safe-delivery-paediatric-ent-surgery-uk-national-strategy>)

Table 1

Total number of tonsillectomies performed in children in Scotland for each year, 2000-2018

Year	Number of procedures in all children (0-16 years)	Number (%) of procedures in children aged 0-4 years	Number (%) of procedures in children aged 0-2 years
2000	3261	671 (20.6)	79 (2.4)
2001	1893	419 (22.1)	66 (3.5)
2002	2664	497 (18.7)	67 (2.5)
2003	2456	512 (20.8)	91 (3.7)
2004	2460	434 (17.6)	67 (2.7)
2005	2624	558 (21.3)	88 (3.4)
2006	2541	565 (22.2)	108 (4.3)
2007	2589	620 (23.9)	129 (5.0)
2008	2746	721 (26.3)	146 (5.3)
2009	2748	742 (27.0)	162 (5.9)
2010	2727	819 (30.0)	185 (6.8)
2011	2513	817 (32.5)	202 (8.0)
2012	2762	966 (35.0)	208 (7.5)

2013	2940	1083 (36.8)	275 (9.4)
2014	2723	995 (36.5)	249 (9.1)
2015	2854	1083 (37.9)	247 (8.7)
2016	2779	1022 (36.8)	225 (8.1)
2017	2360	877 (37.2)	182 (7.7)
2018	2554	916 (35.9)	208 (8.1)

Figure 1

Total number of tonsillectomies performed in Scotland 2000-2018, showing children aged 0-16 years, 0-2 years, 3-4 years and 5-16 years, each expressed per 1000 children of that age in the Scottish population that year. There is no significant trend in the overall figure or in the 5-16 year age group, but a significant increase in the 0-2 age group ($R=0.912$, $p<0.001$) and in the 3-4 age group ($R=0.864$, $p<0.001$).

Figure 2

Number of tonsillectomies performed in Greater Glasgow and Clyde Health Board 2000-2018 for children aged 0-16 years, 0-2 years, 3-4 years and 5-16 years, each expressed as interventions per 1000 children of that age living in the health board area that year.

Children's tonsillectomies are only undertaken at the Royal Hospital for Children, Glasgow. There is no significant trend in the overall figure or in the 5-16 age group but there is a significant increase over time in the 0-2 age group ($R=0.906$, $p<0.001$) and in the 3-4 age group ($R=0.735$, $p<0.001$).

Figure 3

Number of tonsillectomies performed in Lothian Health Board 2000-2018 for children aged 0-16 years, 0-2 years, 3-4 years and 5-16 years, each expressed as interventions per 1000 children of that age living in the health board area that year. Children's tonsillectomies are

only undertaken at the Royal Hospital for Sick Children, Edinburgh. There is a significant increase over time in the overall figure ($R=0.693$, $p=0.001$), in the 0-2 age group ($R=0.749$, $p<0.001$) and in the 3-4 age group ($R=0.838$, $p<0.001$). There is no trend over time in the children aged 5-16 years ($R=0.424$, $p=0.07$).

Figure 4

Number of tonsillectomies performed in Lanarkshire Health Board 2000-2018 for children aged 3-4 years and 5-16 years, each expressed as interventions per 1000 children of that age living in the health board area that year. Otolaryngological surgery in this health board is performed in a large district hospital with a busy paediatric practice. Children below the age of 3 years are not routinely operated upon here. The intervention rate for children aged 3-4 years has significantly increased over the study period ($R=0.615$, $p=0.005$). The rate of intervention for 5-16 year-olds has not changed significantly ($R=0.348$, $p=0.144$).

Figure 5

Mean length of stay in days for children undergoing tonsil surgery in Scotland 2000-2018, by age group

Figure 6

The proportion of tonsil procedures where diagnostic coding suggests they were performed for recurrent tonsillitis, obstructive sleep apnoea or other reasons, by age.

Figure 7

Changes in diagnostic codes over time, 2000-2018.

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Author/s:

Kubba, H;Downie, LS

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