BMJ Paediatrics Open

BMJ Paediatrics Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Paediatrics Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (http://bmjpaedsopen.bmj.com).

If you have any questions on BMJ Paediatrics Open's open peer review process please email info.bmjpo@bmj.com

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

BMJ Paediatrics Open

Emergency department use and hospital admission in children following ambulatory surgery: Results of a population-based cohort study

Journal:	*BMJ Paediatrics Open*
Manuscript ID	bmjpo-2021-001188
Article Type:	Original research
Date Submitted by the Author:	08-Jul-2021

Complete List of Authors:	Sawhney, Monakshi; Queen's University, School of Nursng VanDenKerkhof, Elizabeth; Mount Royal University, School of Nursing and Midwifery Goldstein, David; University of Calgary Faculty of Medicine, Department of Anesthesiology Wei, Xuejiao; Institute for Clinical Evaluative Sciences, Queen's University Pare, Genevieve; Queen's University, School of Nursng Mayne, Ian; North York General Hospital, Department of Orthopaedic Surgery Tranmer, Joan; Queen's University, School of Nursng

Keywords:	Health services research

SCHOLARONE™
Manuscripts

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Confidential: For Review Only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Emergency department use and hospital admission in children following ambulatory surgery: Results of a population-based cohort study

Corresponding Author:

Monakshi Sawhney, School of Nursing, and Department of Anesthesiology and Perioperative Medicine, Queen's University,
Address: 92 Barrie Street, Kingston, Ontario, Canada, K7L 3N6,
Telephone: 1-416-816-0487 email: mona.sawhney@queensu.ca
ORCID ID https://orcid.org/0000-0001-5399-1715, Scopus Author ID: 35300368800

Co-authors:

Elizabeth G. VanDenKerkhof, School of Nursing and Midwifery, 4825 Mount Royal Gate SW, Calgary, Alberta, Canada, T3E 6K6, Mount Royal University
email: evandenkerkhof@mtroyal.ca
ORCID ID https://orcid.org/0000-0003-4287-346X , Scopus Author ID: 55665271700

David H. Goldstein, Department of Anesthesiology, University of Calgary, South Health Campus, 4448 Front Street SE, Calgary, Alberta, Canada, T3M 1M4
email: david.goldstein@albertahealthservices.ca
ORCID ID https://orcid.org/0000-0003-2055-3246

Xuejiao Wei, ICES, Queen's University, 21 Arch Street, Suite 208, Kingston, Ontario, Canada, K7L 3N6
email: shelly.wei@ices.on.ca

Genevieve Pare, School of Nursing, Queen's University, 92 Barrie Street, Kingston, Ontario, Canada, K7L 3N6,
email: genevieve.pare@queensu.ca
ORCID ID https://orcid.org/0000-0002-3714-9744

Ian Mayne, Department of Orthopaedic Surgery, North York General Hospital and University of Toronto, 4001 Leslie St., Toronto, ON M2K 1E1
email: ian.mayne@utoronto.ca
ORCID ID https://orcid.org/0000-0002-7935-5781

Joan Tranmer, School of Nursing, Queen's University, 92 Barrie Street, Kingston, Ontario, Canada, K7L
email: tranmerj@queensu.ca
ORCID ID https://orcid.org/0000-0001-5192-5992

Keywords: children, healthcare use, ambulatory surgery, Canada, pain, hemorrhage.

Word Count: (excluding title page, abstract, references, figures and tables): 2786

Reference Count: 24

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Emergency department use and hospital admission in children following ambulatory surgery: Results of a population-based cohort study

ABSTRACT

Introduction: Pediatric ambulatory surgery (same day surgery and planned same day discharge) is more frequently being performed more frequently in Canada and around the world; however, after surgery children return to hospital, either through the emergency department (ED) or through a hospital admission (HA). The aim of this study was to determine the patient characteristics associated with ED visits and HA in the 3 days following pediatric ambulatory surgery.

Methods: This population-based retrospective cohort study utilized de-identified health administrative database housed at ICES and included residents of Ontario, younger than 18 years of age, who underwent ambulatory surgery between 2014-2018. Patients were not involved in the design of this study. The proportion of ED visit and HA were calculated for the total cohort, and the type of surgery. The odds ratios and 95% confidence intervals were calculated for each outcome using logistic regression.

Results: 85,836 children underwent select ambulatory surgeries. 2,681 (3.1%) had an ED visit and 2,433 (2.8%) had a HA in the 3 days following surgery. The most common reasons for ED visits included pain (17.3%) and haemorrhage (10.6%). Reasons for HA included haemorrhage (8.6%), dehydration (5.9%), and pain (3.2%).

Conclusions: Our findings suggest that pain, bleeding and dehydration symptoms are associated with a return visit to the hospital. Providing caregivers with strategies to identify and manage these symptoms is a logical preventive strategy.

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

What is known about the subject?

- Pediatric ambulatory surgery (same day surgery and same day discharge) is being performed more frequently
- After discharge to home, children and parents do return to the emergency department or are admitted to hospital (HA)
- Children were more likely to have an ED visit or HA if they have comorbidities

What this study adds?

- Approximately 6% of children had an ED visit or HA following elective ambulatory surgery in Ontario, Canada
- Findings suggest that pain, bleeding and dehydration symptoms are associated with a return visit to the hospital
- Providing parents and caregivers with strategies regarding managing pain and hydration at home may prevent ED or HA.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Emergency department use and hospital admission in children following ambulatory surgery: Results of a population-based cohort study

Introduction:

Pediatric ambulatory surgery (same day surgery and planned same day discharge) is being performed more frequently in Canada and around the world. When surgeries are performed on an ambulatory basis it precludes the need for the patient to remain in hospital, the number of surgeries can be increased, and costs are decreased.[1,2] By minimizing the time spent in the hospital, ambulatory surgery decreases the impact on families, and risk of nosocomial infection. However, if children experience uncontrolled adverse effects following surgery it can lead to an emergency department (ED visit) or hospital admission (HA). In Ontario, Canada, 1,334,972 people between the age of 0 and 19 years had a ED visit in 2018-2019.[3] It is unclear how many of these ED visits were related to ambulatory pediatric surgery.

Following tonsillectomy, cholecystectomy, appendectomy, and orthopaedic surgery in children, the reported rates of return to hospital between 24 hours and 30 days after ambulatory surgery ranges from 1.1% to 14%.[4-10] Children were more likely to have an ED visit or HA if they had comorbidities including developmental delay, Downs Syndrome, attention deficit hyperactivity disorder (ADHD), asthma, diabetes, obesity or cardiac disease.[2,4,6,11] They were also more likely to return to hospital if they had surgery in the late afternoon, or who have parents who did not speak the primary language of the country (e.g. English).[6,9,11] The most common reasons for ED visit or readmission include pain, dehydration, nausea, vomiting, haemorrhage, and syncope.[4-6,8-10,12]

These studies provide information regarding the unplanned healthcare use following ambulatory surgery. However, it is unclear how many and for which clinical problems pediatric

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

patients have an ED visit or HA in the first 3 days following discharge after ambulatory surgery in Ontario. Services and systems could be put in place to prevent common adverse events to try to prevent return to hospital. The purpose of this study was to examine ED use and HA in the first 3 days after ambulatory surgery in children (17 years or younger) in Ontario. Three days following surgery was chosen to capture healthcare use most likely to be associated with surgery rather than other factors. The aims of this study were to determine the proportion of emergency department (ED) use and hospital admissions (HA) in children after common ambulatory surgery procedures; identify the surgical groups and patient characteristics associated with higher ED use or HA; and describe the top 5 reasons for ED use overall and top 5 reasons for ED use by surgical group in children.

Methods:

Study design and participants

This population-based retrospective cohort study followed the STROBE reporting guidelines and conducted using de-identified administrative databases held by ICES (formerly the Institute of Clinical Evaluative Sciences). The Ontario-specific databases utilized included the: Registered Persons Database (RPDB), Ontario Health Insurance Plan (OHIP), Ontario Marginalization Index (ON-MARG), Client Agency Program Enrolment database (CAPE), and Corporate Provider database (CPDB). The Canadian databases utilized included the: Canadian Census, Canadian Institute for Health Information Same Day Surgery (CIHI-SDS), Discharge Abstract Database (CIHI-DAD) and National Ambulatory Care Reporting System (CIHI-NACRS) databases. These databases were linked using unique encoded identifiers and were analyzed at ICES. This study was approved by the institutional review board at Sunnybrook Health Sciences Centre, Toronto, Canada and the Queen’s University Health Science and

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Affiliated Teaching Hospitals Research Ethics Board, Kingston, Canada (HSREB #6017706). Patients were not involved in the development of this study.

The cohort consisted of children between the age 0 and 17 years, residing in Ontario who underwent one of the commonly performed ambulatory surgical procedures as identified by CIHI between January 1, 2014 December 31, 2018. The selection of surgical procedures was adapted from the CIHI's report of the most common ambulatory surgery procedures.[13] Included surgical procedures were hernia-related muscle repair of the chest and abdomen, cholecystectomy, knee joint repair, release of nerves in the forearm, shoulder surgery, tonsillectomy, tympanic membrane procedures, and appendectomy. Description of the specific diagnostic and surgical procedures that fall under these surgical categories is included in Appendix A. Children who did not have province of Ontario health insurance coverage 1 year before index date were excluded from this study. To ensure that only elective surgical procedures were included, patients were excluded if they had an ED visit immediately prior to their surgery. Patients who died on the day of surgery were also excluded. If the child underwent more than one ambulatory surgery between 2014 to 2018 only their first ambulatory surgery was included, as prior ambulatory surgery experience could influence the post-operative care that was provided at home and subsequently the healthcare utilization.

The outcome of interest included any ED visit or HA within 3 days of the procedure. HA was exclusive of ED visit, and participants were not double counted. The main reason for an ED visit or a HA was captured from the CIHI-DAD or CIHI-NACRS. To ensure that HA following surgery was associated with a planned ambulatory surgery, the HA was cross-referenced between SDS database and the CIHI-DAD to confirm the surgery was booked as ambulatory, and the admission to hospital occurred after surgery was completed. The type of surgical procedure (main exposure variable) was captured from the CIHI-SDS Database. The Canadian Classification of

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60

Health Interventions (CCI) codes were used to classify surgical procedures.[14] The CCI codes and companion surgical procedures are provided in Appendix A.

Demographic characteristics included age, sex, and rurality of residence based on Rurality Index of Ontario 2008, and Local Health Integration Network (LHIN).[15] Individual measures of socioeconomic status were not available in the databases therefore material deprivation was captured from the ON-MARG database. The ON-MARG database provides aggregate level measures of socioeconomic status based on the neighbourhood, and considers variation in education, income, and family composition.[16] Primary care provider information, specifically the model of the usual provider of primary care was obtained from CAPE and CPDB databases (17,18). The Johns Hopkins Aggregated Diagnostic Groups Version 10 (ADGs) was used to measure comorbidity, and ADGs were captured from CIHI-DAD, CIHI-NACRS and OHIP.[19]

Data Analysis

Demographic data and clinical characteristics were summarized using measures of central tendency and spread or frequencies and percentages, as appropriate. Mean or proportion of patients were reported in the total cohort and those with at least one ED or HA, according to patient characterises and surgical category. Bivariate and multivariate logistic regression analyses were used to calculate the odds ratios (OR) and 95% confidence intervals (CI) for ED use and HA. In this study, odds ratios are used as a proxy of risk because incidence is rare (<10%).[20] Cholecystectomy was selected as the reference surgery for the purpose of interpreting the odds ratios. The rationale for selecting cholecystectomy was that sample size was sufficient for meaningful comparisons with other surgical procedures. The full adjusted models included all available variables; age, sex, primary care model, LHIN, material deprivation quintile, rural/urban residence, comorbidity (major ADGs) and surgical category. The main reasons for ED use were calculated for all surgical procedures combined and for those surgical procedures

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

with sufficient sample size and volume to avoid small cell frequencies. Hospital admissions were only calculated for all surgical procedures combined due to the small cell frequencies. All analyses were conducted using SAS© (SAS Enterprise Guide, Version 7.1).

Results:

Between January 1, 2014 and December 31, 2018 85,836 children in Ontario underwent the selected surgical procedures. The mean age was 6.2± 4.4 years, and 44.1% were female (Table 1). The most frequently performed surgical procedures were tonsillectomy (48.5%), implantation of internal devices into the tympanic membrane (39.1%), and muscle repair of the chest and abdomen (hernia, 7.3%). A total of 5,114 (5.9%) of children had a ED visit or HA in the first 3 days after surgery. There were 2,681 (3.1%) ED visits and 2,433 (2.8%) HAs (either through the ED or directly). One hundred and three (3.8%) children returned to the ED more than once, for a total of 2,784 ED visits. The majority of ED visits occurred on postoperative day 1 (930; 34.7%) or 2 (922; 34.4%) (Figure 1). Of the 2,681 patients who visited the ED at least once, 72% underwent tonsillectomy (Table 1). Most of the patients who had a HA were admitted immediately after their scheduled ambulatory surgery (n=1,310; 53%), and 40 children who had a HA were admitted more than once, resulting in 2,474 HA. Of the 2,433 patients who were admitted to hospital at least once, the majority underwent tonsillectomy (82.9%)

[Table 1]

[Figure 1]

Patients who underwent cholecystectomy had the highest proportion of ED visits (5.1%) and children who underwent appendectomy (27.4%) had the highest proportion of HA (Figure 2). Female children had a higher odds of ED use (adjusted OR=1.18 CI 1.10 - 1.28) (Table 2). Children were more likely to have an ED visit if they lived in a rural setting (adjusted OR= 1.21

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

CI 1.07 - 1.36) or had a poor socioeconomic status (adjusted OR=1.38, CI 1.22 – 1.56). The odds of ED use also increased as number of comorbidities increased (2+ ADGs; OR=1.34, CI 1.15-1.56). The adjusted odds of ED use was lower for all surgical categories compared to cholecystectomy. Acute pain (17.3%) and haemorrhage (10.6%) were the most frequent reasons for an ED visit (Table 3). Table 4 provides a detailed breakdown of the 5 most common reasons for an ED visit for children who underwent tonsillectomy, tympanic membrane procedures and hernia repair. The primary reason for admission to hospital was coded by providers as "convalescence following surgery" or an unidentified reason (53%), haemorrhage/hematoma (8.6%), dehydration (5.9%), and acute pain (3.2%). Due to small cell frequencies, the results for HA for specific surgical procedures are not presented.

[Table 2]

[Figure 2]

[Table 3]

Discussion:

This retrospective cohort study provides describes the rate of unplanned healthcare use after ambulatory surgery in children in Ontario, Canada. Between 2014 and 2018, 3.1% of children visited the ED and 2.8% were admitted to hospital during the first 3 days following select ambulatory surgery procedures. The highest proportion of healthcare use was in children who underwent tonsillectomy (ED) and appendectomy (HA). The main reason for ED use for all surgery types was unrelieved acute pain or haemorrhage. While the main reason for HAs was convalescence after surgery (unidentified reason), followed by haemorrhage. Our findings are similar to previously published studies that reported a readmission rate of 1% to 3.6% up to 30 days after surgery, with the majority of readmissions occurring between 3 and 7 days after surgery (4-10,21). The most common reasons for requiring hospital care were also consistent

with our findings and included pain, nausea and vomiting, dehydration, and haemorrhage.[4-10, 21]

Gilani & Bhattacharyya reported that 4.5% of children who underwent tonsillectomy on an ambulatory basis had a hospital revisit due to acute pain, haemorrhage, nausea, vomiting, and dehydration.[9] Our findings were similar with 4.8% of children who underwent tonsillectomy having a HA for similar reasons. Lavin et al. examined ED visits in children following ambulatory tonsillectomy, and reported that 7.4% had an ED visit, with 1.9% of these visits due to pain or dehydration.[11] Children who had non-English speaking parents, and had other health conditions including asthma, pre-term developmental delay, Downs Syndrome, and Attention deficit hyperactivity disorder were more likely to have an ED visit postoperatively. Language barriers and comorbid medical conditions made it more difficult for parents and children to adhere to the postoperative pain and hydration regimen they were provided.[11] In our study, children who underwent tonsillectomy had the highest odds of ED use with 4.6% of our sample having an ED visit due to unrelieved acute pain. Also, children in our sample had higher odds of ED use if they had 2 or more comorbid conditions.

Appendectomy is commonly performed as an emergency procedure, making it more challenging to perform on an elective ambulatory basis. Cairo et al. reported the 30-day readmission rate for children undergoing same day discharge following appendectomy as 1.8%, with 1.2% due to wound complications.[21] This rate of readmission is lower than the 4.2% of children who returned the ED or 27.4% of children with HA following ambulatory appendectomy in our study.

A US administrative database study reported the 30-day readmission rate following ambulatory pediatric cholecystectomy as 1.1%, with the most common reasons for readmission being persistent calculus in the biliary duct, abdominal pain, and dehydration.[8] Gould and colleagues reported that 21% of children were admitted to hospital following cholecystectomy

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

with 14% admitted for no identifiable reason.[7] Identifiable reasons for admission included pain and vomiting.[7] Similar to these studies, the reasons for admission or ED visits in our study were also pain and vomiting. However, in our study children who underwent ambulatory cholecystectomy had a higher rate of ED visit and HA.

Acute pain is a common reason for ED visits and HA. Guidelines for opioid prescribing to manage pain in children after surgery state that an optimal postoperative regimen should balance adequate pain control while also supporting recovery, including the return to school and sports.[22,23] Prescribers should use multimodal analgesia, including local anesthetics, acetaminophen and non-steroidal anti-inflammatory drugs (NSAIDs). Children and parents should be educated regarding the expectations regarding pain, and methods of pain management, both before surgery and again in the postoperative period. Education should be delivered verbally and written in plain, nonmedical terminology.[23]

Dehydration is a potentially preventable adverse effect, and intravenous (IV) hydration protocols that aim to replace fluids lost during the nothing by mouth (NPO) time, intraoperative time and postoperative time can be helpful in decreasing ED visits after surgery. A quality improvement study that focused on IV hydration examined ED visits due to dehydration in children who underwent ambulatory tonsillectomy prior to and after the implementation of the protocol.[12] Younger patients and patients with pre-existing complex chronic conditions were at higher risk of dehydration. After the implementation of a hydration protocol the ED visits due to dehydration decreased to 0.2% from 1%.[12] In our study, 2.6% of children had an ED visit, and 5.9% had a HA due to dehydration. The implementation of hydration protocols for all pediatric ambulatory surgeries may be helpful in reducing these ED visits and HA.

Strengths and Limitations

The use of administrative data is a strength because it does not rely on patient reports of

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

past experiences, minimizing the risk of recall bias. The databases that were used in this study undergo several quality checks by data collection and repository organizations, providing a high level of reliability. Information on outcomes after ambulatory orthopaedic procedures in children in included in this study, this population is not well documented in the published literature. The results of this study could be generalized with caution to the rest of Canada, where universal healthcare provides similar access to services.

The main disadvantage of this study is the lack of clinical detail in administrative data. This impacted the ability to identify the primary reason for HA that were coded with the term “convalescence after surgery”. Based on discussions with clinicians, this term may include the child requiring post-operative monitoring due to unstable vital signs, dehydration, or difficulty after receiving anesthesia. A further analysis of individual patient records is needed to explore the true meaning of “convalescence after surgery”. In addition, administrative data relies on accurate recording of information that is subject to human error.

Conclusion

This study utilized administrative data to identify ED visits and HAs following select ambulatory surgery in children. Many children undergo these surgical procedures without any complications or unanticipated hospital visits following discharge. However, we found that just under 6% of children had a ED visit or HA following elective ambulatory surgery in Ontario between 2014 and 2018, with the most common reasons for visit or admission being acute pain, haemorrhage, and dehydration. The results of this study can be utilized by both clinicians and administrators to identify those children who are at high risk of ED use or HA and implement strategies to help reduce ED visits and HA.

Prior to the COVID-19 pandemic, there was an increasing trend in the number of pediatric surgical procedures performed in Canada and around the world. The goal of pediatric ambulatory

https://mc.manuscriptcentral.com/bmjpo

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

surgery is to improve access to care. However, the restrictions associated with the COVID-19 pandemic and the need to limit HAs have created a backlog of elective and urgent surgical procedures for children and adults. Between February and April 30, 2019, there were 18,1544 ambulatory surgery procedures were completed in Ontario.[24] A similar number of ambulatory surgery procedures were scheduled and subsequently cancelled in 2020.[24] As healthcare teams look for creative ways to safely perform surgical procedures, ambulatory surgery may become an attractive option. These teams should proactively try to prevent the common reasons why children return to hospital. The effectiveness of interventions that prevent readmissions should continue to be examined.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Table 1: Demographic and clinical characteristics of children (under 18 years of age) who underwent ambulatory surgery in Ontario between 2014-2018

Characteristics	Total N=85,836 n (%)	ED Visits N=2,681 n (%)	Hospital Admission N=2,433 n (%)
Mean age in yrs (± SD)	6.24 (± 4.41)	7.02 (± 4.72)	6.52 (± 4.32)
Sex			
Female	37,820 (44.1%)	1324 (49.4%)	1,115 (45.8%)
Male	48,016 (56.0%)	1,357 (50.6%)	1,318 (54.2%)
Material Deprivation Quintile			
1- Lowest	20,246 (23.6%)	528 (19.7%)	480 (19.7%)
2	18,765 (21.9%)	538 (20.1%)	510 (21.0%)
3	16,148 (18.8%)	489 (18.2%)	414 (17.0%)
4	14,272 (16.6%)	520 (19.4%)	442 (18.2%)
5- Highest	15,849 (18.5%)	579 (21.6%)	551 (22.6%)
Missing	556 (0.6%)	27 (1.0%)	36 (1.5%)
Residence*			
Urban	75,575 (88.0%)	2,277 (84.9%)	2,102 (86.4%)
Rural	10,150 (11.8%)	400 (14.9%)	326 (13.4%)
missing	111 (0.1%)	<=5 (0.1%)	<=5 (0.2%)
Number of Major ADGs			
0	59,339 (69.1%)	1,744 (65.1%)	1603 (65.9%)
1	21,752 (25.3%)	745 (27.8%)	633 (26.0%)
2+	4,745 (5.5%)	192 (7.2%)	197 (8.1%)
Usual provider of care model			
Family Health Group†	14,914 (17.4%)	457 (17.0%)	468 (19.2%)
Family Health Team‡	22,749 (26.5%)	802 (29.9%)	611 (25.1%)
Family Health Organization[II]	19,198 (22.4%)	570 (21.3%)	494 (20.3%)
No-model	26,355 (30.7%)	778 (29.0%)	790 (32.5%)
Comprehensive Care Model**	1,799 (2.1%)	46 (1.7%)	57 (2.3%)
Other	847 (1.0%)	31 (1.2%)	14 (0.6%)
Type of Surgery			
Appendectomy	665 (0.8%)	28 (1.0%)	182 (7.5%)
Cholecystectomy	806 (0.9%)	41 (1.5%)	31 (1.3%)
Implantation of Internal Devices, tympanic membrane	33,567 (39.1%)	489 (18.2%)	122 (5.0%)
Knee joint repair	1,978 (2.3%)	45 (1.7%)	25 (1.0%)
Muscle repair of the chest and abdomen: Hernia	6,270 (7.3%)	124 (4.6%)	41 (1.7%)

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Nerves in the forearm and wrist	155 (0.2%)	6 (0.2%)	7 (0.3%)
Shoulder Surgery	764 (0.9%)	19 (0.7%)	9 (0.4%)
Tonsillectomy	41,631 (48.5%)	1,929 (72.0%)	2,016 (82.9%)

* Estimates based on Rurality Index of Ontario 2008. †Family Health Groups are groups of 3 or more family MDs. Care is provided through regular office hours and extended hours (weekday evenings and/or weekends) and they utilize fee-for-service plus some incentives and bonuses for services provided to enrolled patients.[19] ‡Family Health Teams are community-focused primary health care organizations that consist of interprofessional teams including MDs, nurse practitioners, registered nurses, social workers, dietitians, and other professionals who work together. Physicians are paid through a blended salary model. Other health professionals are paid through salary.[19]; IIFamily Health Organizations are groups of 3 or more family MDs who commit to enrol patients; care provided through regular office hours and extended hours based on the number of physicians; services are paid through a blended capitation model plus some incentives and bonuses for services to enrolled patients; **Comprehensive Care Models are solo primary care MD's, care is provided through regular office hours plus at least one session of extended hours weekly; utilize fee-for-service plus some incentives and bonuses for service.[19]

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Table 2: Univariate and multivariate odds ratios and 95% confidence intervals for ED visit and hospital admissions in the 3 days following ambulatory surgery: 2014-2018

		ED Visits		Hospital Admissions	
Character	Total	Unadjusted	Adjusted‡	Unadjusted	Adjusted‡
		OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Number of patients	85,836				
Sex (from RPDB)					
Male	48,016	1.00	1.00	1.00	1.00
Female	37,820	1.25 (1.16-1.35)	1.18 (1.10-1.28)	1.08 (0.99-1.17)	1.06 (0.98-1.16)
Material Deprivation Quintile					
1- Lowest (Reference)	20,246	1.00	1.00	1.00	1.00
2	18,765	1.10 (0.98-1.24)	1.10 (0.97-1.24)	1.15 (1.01-1.31)	1.17 (1.03-1.32)
3	16,148	1.17 (1.03-1.32)	1.16 (1.02-1.31)	1.08 (0.95-1.24)	1.11 (0.97-1.27)
4	14,272	1.41 (1.25-1.60)	1.40 (1.23-1.58)	1.32 (1.15-1.50)	1.35 (1.18-1.55)
5- Highest	15,849	1.42 (1.26-1.60)	1.38 (1.22-1.56)	1.48 (1.31-1.68)	1.53 (1.35-1.74)
Missing	556	1.91 (1.28-2.83)	1.80 (1.20-2.69)	2.85 (2.01-4.04)	3.03 (2.11-4.33)
Residence*					
Urban (Reference)	75,581	1.00	1.00	1.00	1.00
Rural	10,141	1.32 (1.19-1.47)	1.21 (1.07-1.36)	1.16 (1.03-1.31)	1.18 (1.04-1.34)
# of Major ADG†					
0 (Reference)	59,339	1.00	1.00	1.00	1.00
1	21,752	1.17 (1.07-1.28)	1.13 (1.04-1.23)	1.08 (0.98-1.19)	1.07 (0.97-1.17)
2	4,745	1.39 (1.20-1.62)	1.34 (1.15-1.56)	1.56 (1.34-1.81)	1.54 (1.32-1.79)
Usual Provider of Care Model					
No-model (Reference)	26,355	1.00	1.00	1.00	1.00
Family Health Group	14,914	1.04 (0.92-1.17)	0.99 (0.88-1.12)	1.05 (0.93-1.18)	0.99 (0.88-1.12)
Family Health Team	22,728	1.20 (1.08-1.32)	1.10 (0.99-1.22)	0.89 (0.80-1.00)	0.89 (0.80-1.00)
Family Health Organization	19,198	1.01 (0.90-1.12)	0.92 (0.82-1.03)	0.85 (0.76-0.96)	0.83 (0.74-0.94)
Comprehensive Care Model	1,799	0.86 (0.64-1.17)	0.80 (0.59-1.08)	1.06 (0.81-1.39)	1.02 (0.77-1.34)
Other	842	1.30 (0.91-1.86)	1.06 (0.72-1.57)	0.51 (0.29-0.88)	0.47 (0.26-0.84)
Type of Surgery					
Cholecystectomy (Reference)	806	1.00	1.00	1.00	1.00
Appendectomy	665	0.82 (0.50-1.34)	0.76 (0.46-1.24)	9.42 (6.33-14.0)	7.36 (4.91-11.0)

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Implantation of Internal Devices, tympanic membrane	33,567	0.28 (0.20-0.38)	0.28 (0.20-0.39)	0.09 (0.06-0.14)	0.03 (0.02-0.04)
Knee joint repair	1,978	0.43 (0.28-0.67)	0.45 (0.29-0.70)	0.32 (0.19-0.55)	0.32 (0.19-0.54)
Muscle repair of the chest and abdomen: Hernia	6,270	0.38 (0.26-0.54)	0.39 (0.26-0.56)	0.16 (0.10-0.26)	0.06 (0.03-0.09)
Nerves in the forearm and wrist	155	0.75 (0.31-1.80)	0.74 (0.31-1.78)	1.18 (0.51-2.74)	0.99 (0.42-2.30)
Shoulder Surgery	764	0.48 (0.27-0.83)	0.47 (0.27-0.83)	0.30 (0.14-0.63)	0.33 (0.15-0.69)
Tonsillectomy	41,631	0.91 (0.66-1.25)	0.92 (0.66-1.28)	1.27 (0.89-1.83)	0.52 (0.35-0.75)

* Estimates based on Rurality Index of Ontario 2008; †Johns Hopkins Aggregated Diagnostic Groups; ‡Adjusted for age and Local Health Integration Network (results not shown).

Table 3. Eight common reasons for Emergency Department visit and hospital admission for all procedures combined: 2014-2018

Reasons for ED visit	n	% of visits
Acute pain	483	17.3
Haemorrhage and haematoma	295	10.6
Fever	200	7.2
Other complications of procedures, not elsewhere classified	194	7.0
Vomiting	188	6.7
Infection following a procedure	128	4.6
Acute upper airway infection	84	3.0
Dehydration	73	2.6
Reasons for hospital admission	**n**	**% of admissions**
Convalescence following surgery	1310	53.0
Haemorrhage and haematoma	213	8.6
Dehydration	147	5.9
Acute Pain	79	3.2
Vomiting	55	2.2
Sleep apnea, obstructive airway	53	2.1
Abnormal blood chemistry	49	2.0
Nausea with vomiting	45	1.8

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Table 4. Top 5 reasons for ED visits for surgical procedures

Procedure (number of visits)	n	% of ED visits/procedure
Tonsillectomy (n=2006)		
Acute pain	415	20.7
Haemorrhage and haematoma	240	12.0
Other complications of procedures, not elsewhere classified	161	8.0
Vomiting	154	7.7
Fever	141	7.0
Implantation of Internal Devices, tympanic membrane (n=509)		
Fever	52	10.2
Otitis media	37	7.3
Acute upper respiratory infection	36	7.1
Haemorrhage and haematoma	27	5.3
Acute pain	26	5.1
Hernia (n=127)		
Haemorrhage and haematoma	15	11.8
Other complications of procedures, not elsewhere classified	11	8.7
Attention to surgical dressings and sutures	9	7.1
Acute pain	7	5.5
Vomiting alone	7	5.5

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

[Figure 1]

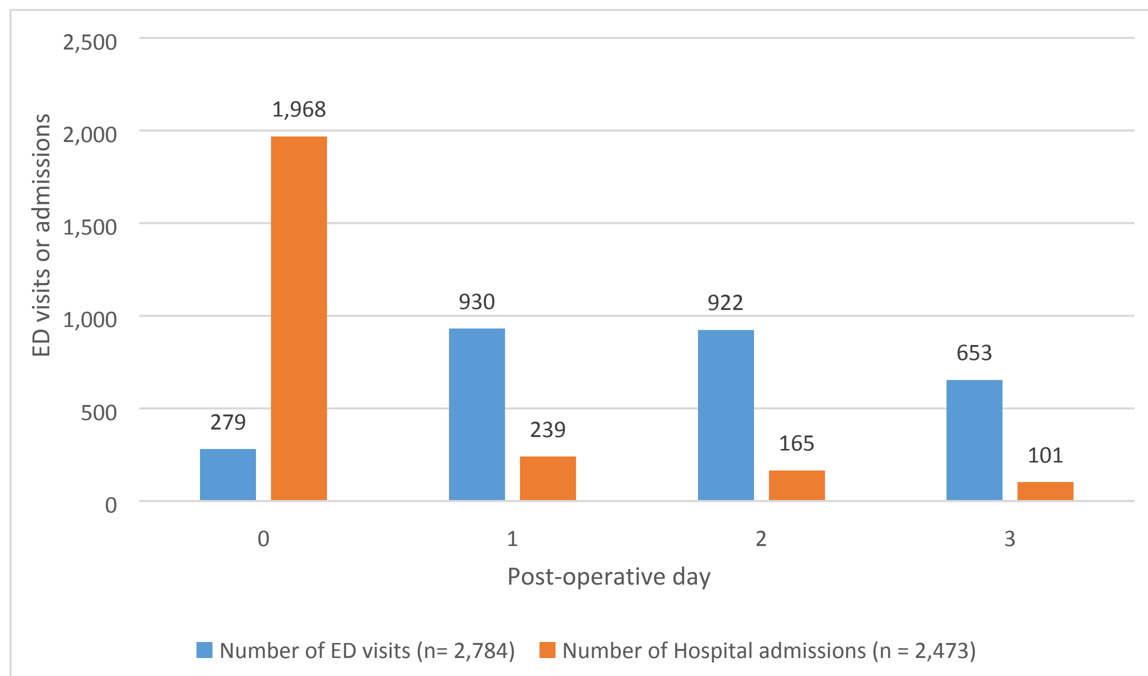

Figure 1. Distribution of Emergency Department visits and hospital admission by postoperative day: 2014 – 2018. All of the emergency department (ED) visits and hospital admissions are displayed as proportions based on the postoperative day.

For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

[Figure 2]

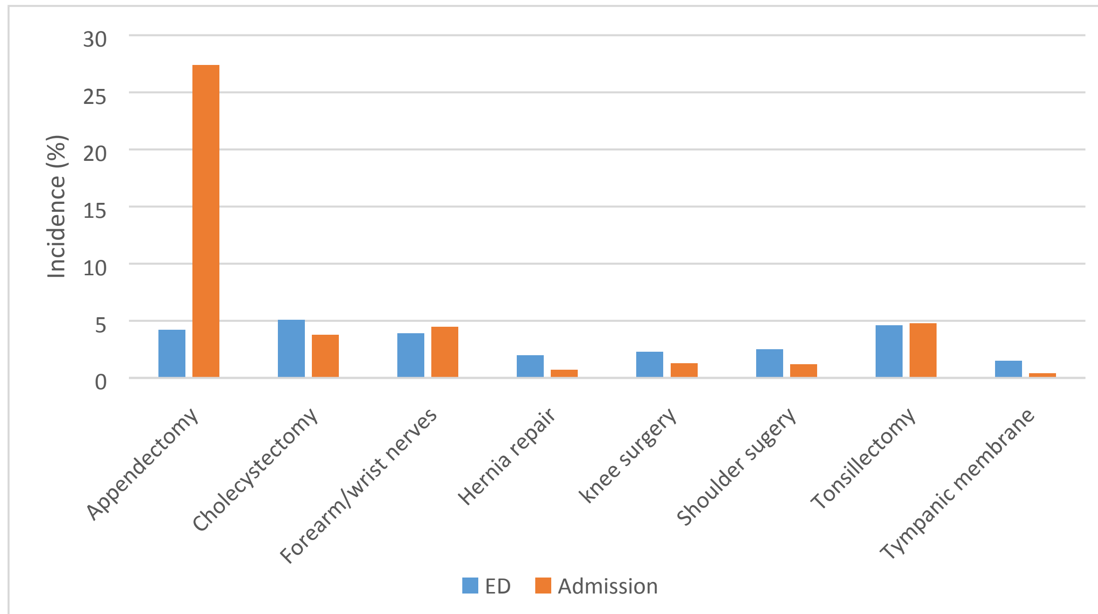

Figure 2. Incidence of Emergency Department visits and hospital admissions postoperatively by type of surgery: 2014-2018. Emergency department visits and hospital admissions by type of surgery are displayed in proportions. All ED visits and hospital admissions from day of surgery (postoperative day 0) to postoperative day 3 are included. Patients undergoing cholecystectomy (5.1%) had the highest incidence of ED use, followed by tonsillectomy (4.6%) and appendectomy (4.2%). The highest incidence of admission to hospital was for patients who underwent appendectomy (27.4%).

For peer review only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Declarations:

Declaration of Competing interests: The authors report no competing interests.

Ethics Approval and Consent to Participate: This study was approved by the institutional review board at Sunnybrook Health Sciences Centre, Toronto, Canada and the Queen's University Health Science and Affiliated Teaching Hospitals Research Ethics Board, Kingston, Canada. This study was conducted using de-identified administrative databases held by ICES, therefore individual participant consent was not obtained.

Data Availability: The data that support the findings of this study are available from ICES https://www.ices.on.ca/ but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of ICES.

Funding Statement: This study was funded by an Ontario Ministry of Health and Long-Term Care (MOHLTC) Applied Health Research Question grant (Project Trim 2016 0800 186 000) and a Queen's University School of Nursing Research Development Fund grant. This study was supported by the Institute for Clinical Evaluative Sciences (ICES), which is funded by an annual grant from the MOHLTC. The opinions, results and conclusions reported in this paper are those of the authors and are independent from the funding sources. No endorsement by ICES or the Ontario MOHLTC is intended or should be inferred.

Authors Contributions: All authors contributed substantially to conception and design, or acquisition of data, or analysis and interpretation of data. All authors were involved in drafting the article or revising it critically for important intellectual content. All authors gave final approval of the version to be published and agree to act as guarantor of the work (ensuring that questions related to any part of the work are appropriately investigated and resolved).

Acknowledgements: Not applicable.

For peer review only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

References

1 Nordin AB, Shah SR, Kenney BD. Ambulatory pediatric surgery. Semin. Pediatr. Surg 2018; 75-78. 10.1053/j.sempedsurg.2018.02.003

2 Miller DJ, Nelson SE, Shah AS, Ganley TJ. Outpatient pediatric orthopedic surgery. Orthop Clin N Am 2018;49:55-62. 10.1016/j.ocl.2017.08.007

3 Canadian Institute for Health Information. NACRS Emergency Department Visits and Length of Stay by Province/Territory, 2018–2019. Ottawa, ON: CIHI; 2019. https://www.cihi.ca/en/quick-stats

4 Murto K, Katz SL, McIassac D. Pediatric tonsillectomy is a resource-intensive procedure: a study of Canadian health administrative data. Can J Anesth/J Can Anesth 2017; 724-735. 10.1007/s12630-017-0888-y

5 Johnson RF, Chang A, Mitchell RB. Nationwide readmissions after tonsillectomy among pediatric patients – United States. Int. J. Pediatr. Otorhinolaryngol. 2018;10-3. https://doi.org/10.1016/j.ijporl.2018.01.026

6 McKeon M, Medina G, Kawai K. Readmissions following ambulatory pediatric endoscopic sinus surgery. The Laryngoscope 2019; 2681-86. https://doi.org/10.1002/lary.27898

7 Gould JL, Poola AS, St.Peter SD. Same day discharge protocol implementation trends in laparoscopic cholecystectomy in pediatric patients. J. Pediatr. Surg. 2016; 1936-38. https://doi.org/10.1016/j.jpedsurg.2016.09.008

8 Sacco Casamassima MG, Gause C, Yang J. Safety of outpatient laparoscopic cholecystectomy in children: analysis of 2050 elective ACS NSQIP-pediatric cases. Pediatr Surg Int 2016; 541-551. https://doi.org/10.1007/s00383-016-3888-z

9 Gillani S, Bhattacharyya N. Revisit rates for pediatric tonsillectomy: An analysis of admit and discharge times. Annals of Otology, Rhinology & Larngology 2020; 110-14. https://doi.org/10.1177/0003489419875758

10 Whippey A, Kostandoff G, Ma HK. Predictors of unanticipated admission following ambulatory surgery in the pediatric population: a retrospective case-control study. Paediatr Anaesth 2016; 831-37. 10.1111/pan.12937

11 Lavin J, Lehmann, D, Leon Silva A, Bai G, Hebal F, Manworren R, Stake C, Rychlik K, Billings KR. Variables associated with pediatric emergency department visits for uncontrolled pain in postoperative adenotonsillectomy patients. International Journal of Pediatric Otorhinolaryngology 2019;123:10-14. https://doi.org/10.1016/j.ijporl.2019.04.038

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

12 Hession-Laband E, Melvin P, Shermont H. Reducing Readmissions Post-tonsillectomy: A Quality Improvement Study on Intravenous Hydration. J Healthc Qual. 2018; 217-27. 10.1097/JHQ.0000000000000143.

13 Canadian Institute for Health Information. A snapshot of health care in Canada as demonstrated by Top 10 Lists, 2011. Ottawa, ON: CIHI publication; 2012. https://secure.cihi.ca/free_products/Top10ReportEN-Web.pdf

14 Canadian Institute for Health Information. CCI (Canadian Classification of Health Interventions). https://www cihi ca/en/submit-data-and-view-standards/codes-and-classifications/cci 2017 [accessed 30 Jan 2021]

15 Local Health Integration Network. Ontario's LHINs, http://www.lhins.on.ca/ [4 Jan 2021]

16 Durbin A, Moineddin R.,_Lin E, Steele LS, Glazier RH. Examining the relationship between neighbourhood deprivation and metnal health serv ice use of immigrants in Ontario, Canada: a cross-sectional study. BMJ Open 2015 Mar 13; 5(3): e006690. http://dx.doi.org/10.1136/bmjopen-2014-006690

17 Government of Ontario. Health Care Options, https://www ontario ca/locations/health/?gclid=CPX6jdOLs9MCFc64wAodeygNKA 2017 [accessed 30 Jan 2021]

18 Glazier RH, Hutchinson B, Kopp A. Comparison of Family Health Teams to other Ontario primary care models, 2004/05 to 2011/12. Toronto: ICES; 2015. ISBN: 978-1-926850-56-6

19 The Johns Hopkins University. The Johns Hopkins ACG System, https://www.hopkinsacg.org/ [accessed Feb 1, 2021]

20 Viera AJ. Odds rations and risk rations: what's the difference and why does it matter? South Med J 2008; 730-4.

21 Cairo SB, Raval MV, Browne M, Meyers H, Rothstein DH, Association of Same-Day Discharge With Hospital Readmission After Appendectomy in Pediatric Patients. JAMA Surg. 2017;152(12):1106-1112. doi: 10.1001/jamasurg.2017.2221.

22 Health Quality Ontario. Opioid Prescribing for Acute Pain. Toronto. 2018. Queen's Printer for Ontario. ISBN 978-1-4868-1407-7.

23 Kelley-Quon LI, Kirkpatrick MG, Ricca RL. Guidelines for Opioid Prescribing in Children and Adolescents After Surgery: An Expert Panel Opinion. JAMA Surg. 2021; 76-90. doi: 10.1001/jamasurg.2020.5045.

24 Canadian Institute for Health Information. Estimating Planned Surgical Cancellations Due to COVID-19 Using Historical Data — Data Tables. Ottawa, ON: CIHI; 2020. https://www.cihi.ca/en/quick-stats

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Appendix A Canadian Classification of Health Interventions codes for day surgery procedures

Code	Description
Muscle repair of the chest and abdomen	
1SY80DA	Repair, muscles of the chest and abdomen endoscopic [laparoscopic] approach without tissue [e.g. suturing or stapling]
1SY80DAXXA	Repair, muscles of the chest and abdomen endoscopic [laparoscopic] approach using autograft [e.g. fascia, skin]
1SY80DAXXF	Repair, muscles of the chest and abdomen endoscopic [laparoscopic] approach using free flap [e.g. free myocutaneous flap]
1SY80DAXXG	Repair, muscles of the chest and abdomen endoscopic [laparoscopic] approach using pedicled flap [e.g. abdominis rectus or deltopectoral]
1SY80DAXXL	Repair, muscles of the chest and abdomen, endoscopic [laparoscopic] approach using xenograft [e.g. Surgis, SIS (small intestine submucosa)]
1SY80DAXXN	Repair, muscles of the chest and abdomen endoscopic [laparoscopic] approach using synthetic tissue [e.g. mesh, sponge]
1SY80LA	Repair, muscles of the chest and abdomen open approach without tissue [e.g. suturing or stapling]
1SY80LAFF	Repair, muscles of the chest and abdomen open approach and using temporary abdominal closure device [e.g. Bogota bag]
1SY80LATZ	Repair, muscles of the chest and abdomen open approach using zipper [temporary] (for repeat access to abdomen)
1SY80LAXXA	Repair, muscles of the chest and abdomen open approach using autograft [e.g. fascia, skin]
1SY80LAXXF	Repair, muscles of the chest and abdomen open approach using free flap [e.g. free myocutaneous flap]
1SY80LAXXG	Repair, muscles of the chest and abdomen open approach using pedicled flap [e.g. abdominis rectus or deltopectoral]
1SY80LAXXL	Repair, muscles of the chest and abdomen, open approach using xenograft [e.g. Surgisis, SIS (small intestine submucosa)]
1SY80LAXXN	Repair, muscles of the chest and abdomen open approach using synthetic tissue [e.g. mesh, sponge]
1SY80LAXXQ	Repair, muscles of the chest and abdomen open approach and combined sources of tissue (e.g. mesh with autograft)
1SY80PN	Repair, muscles of the chest and abdomen robotic assisted telemanipulation of tools [telesurgery] without tissue [e.g. suturing or stapling]

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1SY80PNXXN	Repair, muscles of the chest and abdomen robotic assisted telemanipulation of tools [telesurgery] using synthetic tissue [e.g. mesh, sponge]
1SY80WJ	Repair, muscles of the chest and abdomen open approach using special excisional technique
Cholecystectomy	
1OD89DA	Excision total, gallbladder endoscopic [laparoscopic] approach without extraction (of calculi) cholecystectomy alone
1OD89DTAG	Excision total, gallbladder endoscopic [laparoscopic] approach with extraction (of calculi) from bile ducts using laser probe
1OD89DTAM	Excision total, gallbladder endoscopic [laparoscopic] approach with extraction (of calculi) from bile ducts using basket device
1OD89DTAS	Excision total, gallbladder endoscopic [laparoscopic] approach with extraction (of calculi) from bile ducts using electrohydraulic probe
1OD89DTBD	Excision total, gallbladder endoscopic [laparoscopic] approach with extraction (of calculi) from bile ducts using balloon device
1OD89DTGX	Excision total, gallbladder endoscopic [laparoscopic] approach with extraction (of calculi) from bile ducts using device NEC [e.g. forceps, metal probe]
1OD89EC	Excision total, gallbladder endoscopic [laparoscopic] approach cholecystectomy with bile duct exploration and no stones extracted
1OD89LA	Excision total, gallbladder open approach without extraction of calculi cholecystectomy alone
1OD89PN	Excision total, gallbladder robotic assisted telemanipulation of tools [telesurgery] without extraction of calculi cholecystectomy alone
1OD89SMAG	Excision total, gallbladder open approach with extraction (of calculi) from bile ducts using laser probe
1OD89SMAM	Excision total, gallbladder open approach uwith extraction (of calculi) from bile ducts sing basket device
1OD89SMAS	Excision total, gallbladder open approach with extraction (of calculi) from bile ducts using electrohydraulic probe
1OD89SMBD	Excision total, gallbladder open approach with extraction (of calculi) from bile ducts using balloon device
1OD89SMGX	Excision total, gallbladder open approach with extraction (of calculi) from bile ducts using device NEC [e.g. forceps, metal probe]
1OD89TP	Excision total, gallbladder open approach cholecystectomy with bile duct exploration and no stones extracted

Confidential: For Review Only
bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Repair, knee joints	
1VG80DA	Repair, knee joint endoscopic [arthroscopic] approach no tissue used (for repair) joint repair without meniscus involvement
1VG80DAAG	Repair, knee joint using endoscopic approach and laser NEC
1VG80DAXXA	Repair, knee joint endoscopic [arthroscopic] approach with autograft [e.g. bone, cartilage, or tendon] joint repair without meniscus involvement
1VG80DAXXK	Repair, knee joint endoscopic [arthroscopic] approach with homograft graft [e.g. bone or cartilage] joint repair without meniscus involvement
1VG80DAXXN	Repair, knee joint endoscopic [arthroscopic] approach with synthetic tissue [e.g. gortex, artificial polymer cartilage] joint repair without meniscus involvement
1VG80DAXXQ	Repair, knee joint endoscopic [arthroscopic] approach with combined sources of tissue [e.g. bone graft, synthetic tissue] joint repair without meniscus involvement
1VG80FY	Repair, knee joint endoscopic [arthroscopic] approach no tissue used (for repair) with meniscectomy [or meniscoplasty]
1VG80FYXXA	Repair, knee joint endoscopic [arthroscopic] approach with autograft [e.g. bone, cartilage, or tendon] with meniscectomy [or meniscoplasty]
1VG80FYXXK	Repair, knee joint endoscopic [arthroscopic] approach with homograft graft [e.g. bone or cartilage] with meniscectomy [or meniscoplasty]
1VG80FYXXN	Repair, knee joint endoscopic [arthroscopic] approach with synthetic tissue [e.g. gortex, artificial polymer cartilage] with meniscectomy [or meniscoplasty]
1VG80FYXXQ	Repair, knee joint endoscopic [arthroscopic] approach with combined sources of tissue [e.g. bone graft, synthetic tissue] with meniscectomy [or meniscoplasty]
1VG80GZ	Repair, knee joint, endoscopic (arthroscopic) approach using special incisional technique [e.g. multiple burr holes for tibial head revascularization]
1VG80GZXXK	Repair, knee joint using endoscopic (arthroscopic) approach with homograft [e.g. bone or cartilage] using special incisional technique [e.g. multiple burr holes for tibial head revascularization]
1VG80LA	Repair, knee joint open approach no tissue used (for repair) joint repair without meniscus involvement
1VG80LAXXA	Repair, knee joint open approach with autograft [e.g. bone, cartilage, or tendon] joint repair without meniscus involvement
1VG80LAXXK	Repair, knee joint open approach with homograft graft [e.g. bone or cartilage] joint repair without meniscus involvement

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1VG80LAXXN	Repair, knee joint open approach with synthetic tissue [e.g. gortex, artificial polymer cartilage] joint repair without meniscus involvement
1VG80LAXXQ	Repair, knee joint open approach with combined sources of tissue [e.g. bone graft, synthetic tissue] joint repair without meniscus involvement
1VG80UY	Repair, knee joint open approach no tissue used (for repair) with meniscectomy [or meniscoplasty]
1VG80UYXXA	Repair, knee joint open approach with autograft [e.g. bone, cartilage, or tendon] with meniscectomy [or meniscoplasty]
1VG80UYXXK	Repair, knee joint open approach with homograft graft [e.g. bone or cartilage] with meniscectomy [or meniscoplasty]
1VG80UYXXN	Repair, knee joint open approach with synthetic tissue [e.g. gortex, artificial polymer cartilage] with meniscectomy [or meniscoplasty]
1VG80UYXXQ	Repair, knee joint open approach with combined sources of tissue [e.g. bone graft, synthetic tissue] with meniscectomy [or meniscoplasty]
1VG80WK	Repair, knee joint, open approach using special incisional technique [e.g. multiple burr holes for tibial head revascularization]
1VG80WKXXK	Repair, knee joint using open approach with homograft [e.g. bone or cartilage] using special incisional technique [e.g. multiple burr holes for tibial head revascularization]
Implantation of Internal Devices, tympanic membrane	
1DF53JATS	Implantation of internal device, tympanic membrane of ventilation [grommet] tube using external approach
Nerves in the forearm and wrist	
1BN72DA	Release, nerve(s) of forearm and wrist using endoscopic approach
1BN72LA	Release, nerve(s) of forearm and wrist using open approach
1BN80LA	Repair, nerve(s) of forearm and wrist using end to end suture [rejoining] technique
1BN80LAW3	Repair, nerve(s) of forearm and wrist using fibrin glue [rejoining] technique
1BN80UH	Repair, nerve(s) of forearm and wrist using interfascicular [split] repair [rejoining] technique
1BN87LA	Excision partial, nerve(s) of forearm and wrist end to end [rejoining] technique (e.g. suture, glue) simple apposition of nerve ends

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1BN87LAXXA	Excision partial, nerve(s) of forearm and wrist end to end [rejoining] technique (e.g. suture, glue) nerve autograft (to replace lost length)
1BN87LAXXE	Excision partial, nerve(s) of forearm and wrist end to end [rejoining] technique (e.g. suture, glue) transposition of nerves [e.g. crossover]
1BN87LAXXN	Excision partial, nerve(s) of forearm and wrist, no rejoining [of nerve ends] nerve end(s) wrapped or bridged using synthetic tissue [e.g. neural tube]
1BN87LAXXQ	Excision partial, nerve(s) of forearm and wrist end to end [rejoining] technique (e.g. suture, glue) combined transposition of nerves with a nerve autograft
1BN87UH	Excision partial, nerve(s) of forearm and wrist interfascicular split repair [rejoining] technique simple apposition of nerve ends
1BN87UHXXA	Excision partial, nerve(s) of forearm and wrist interfascicular split repair [rejoining] technique nerve autograft (to replace lost length)
1BN87UHXXE	Excision partial, nerve(s) of forearm and wrist interfascicular split repair [rejoining] technique transposition of nerves [e.g. crossover]
1BN87UHXXQ	Excision partial, nerve(s) of forearm and wrist interfascicular split repair [rejoining] technique combined transposition of nerves with a nerve autograft
1BN87WF	Excision partial, nerve(s) of forearm and wrist no rejoining [of nerve ends] nerve end buried
Tonsillectomy	
1FR87LA	Excision partial, tonsils and adenoids using open (excisional) approach
1FR89LA	Excision total, tonsils and adenoids tonsillectomy alone using device NEC
1FR89LAAK	Excision total, tonsils and adenoids tonsillectomy alone using snare
1FR89WJ	Excision total, tonsils and adenoids tonsillectomy with Adenoidectomy using device NEC
1FR89WJAK	Excision total, tonsils and adenoids tonsillectomy with Adenoidectomy using snare
Shoulder Surgery	
Implantation, shoulder joint	
1TA53LAPM	Implantation of internal device, shoulder joint uncemented single-component prosthetic device [e.g. humeral head]

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1TA53LAPMA	Implantation of internal device, shoulder joint with bone autograft [uncemented] single-component prosthetic device [e.g. humeral head]
1TA53LAPMK	Implantation of internal device, shoulder joint with bone homograft [uncemented] single-component prosthetic device [e.g. humeral head]
1TA53LAPMN	Implantation of internal device, shoulder joint with synthetic material using single-component prosthetic device [e.g. humeral head]
1TA53LAPMQ	Implantation of internal device, shoulder joint with combined sources of tissue using single-component prosthetic device [e.g. humeral head]
1TA53LAPN	Implantation of internal device, shoulder joint uncemented dual-component prosthetic device [humeral head and glenoid cup]
1TA53LAPNA	Implantation of internal device, shoulder joint with bone autograft [uncemented] dual-component prosthetic device [humeral head and glenoid cup]
1TA53LAPNK	Implantation of internal device, shoulder joint with bone homograft [uncemented] dual-component prosthetic device [humeral head and glenoid cup]
1TA53LAPNN	Implantation of internal device, shoulder joint with synthetic material (e.g. bone paste, cement, Dynagraft, Osteoset) dual component prosthetic device [humeral head and glenoid cup]
1TA53LAPNQ	Implantation of internal device, shoulder joint with combined sources of tissue using dual-component prosthetic device [humeral head and glenoid cup]
1TA53LAPQ	Implantation of internal device, shoulder joint uncemented reverse dual component prosthetic device [humeral cup and glenoid head]
1TA53LAPQA	Implantation of internal device, shoulder joint with bone autograft [uncemented] reverse dual component prosthetic device [humeral cup and glenoid head]
1TA53LAPQK	Implantation of internal device, shoulder joint with bone homograft [uncemented] reverse dual component prosthetic device [humeral cup and glenoid head]
1TA53LAPQN	Implantation of internal device, shoulder joint with synthetic material (e.g. bone paste, cement, Dynagraft, Osteoset) reverse dual component prosthetic device [humeral cup and glenoid head]
1TA53LAPQQ	Implantation of internal device, shoulder joint with combined sources of tissue (e.g. bone graft, cement, paste) reverse dual component prosthetic device [humeral cup and glenoid head]
1TA53LASLN	Implantation of internal device, shoulder joint with synthetic material using cement spacer (temporary) [impregnated with antibiotics]
Repair, shoulder joint	

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1TA80DA	Repair, shoulder joint endoscopic [arthroscopic] approach using simple apposition technique only [e.g. suturing]
1TA80DAAG	Repair, shoulder joint endoscopic [arthroscopic] approach using laser (alone) [to shrink tissue]
1TA80DAFH	Repair, shoulder joint endoscopic [arthroscopic] approach using biodegradable binding device [e.g. Suretac anchor system]
1TA80DAXXA	Repair, shoulder joint endoscopic [arthroscopic] approach using autograft [e.g. bone, interpositional fascia, muscle graft]
1TA80DAXXE	Repair, shoulder joint endoscopic [arthroscopic] approach using local tendon transfer [rebalancing]
1TA80DAXXN	Repair, shoulder joint endoscopic [arthroscopic] approach using synthetic tissue [e.g. mesh, gortex, silastic sheath]
1TA80DAXXQ	Repair, shoulder joint endoscopic [arthroscopic] approach using combined sources of tissue [autograft with synthetic tissue]
1TA80GZ	Repair, shoulder joint endoscopic [arthroscopic] approach using special incisional technique [e.g. multiple burr holes for humeral head revascularization]
1TA80LA	Repair, shoulder joint open approach using simple apposition technique only [e.g. suturing]
1TA80LAFH	Repair, shoulder joint open approach using biodegradable binding device [e.g. Suretac anchor system]
1TA80LAXXA	Repair, shoulder joint open approach using autograft [e.g. bone, interpositional fascia, muscle graft]
1TA80LAXXE	Repair, shoulder joint open approach using local tendon transfer [rebalancing]
1TA80LAXXN	Repair, shoulder joint open approach using synthetic tissue [e.g. mesh, gortex, silastic sheath]
1TA80LAXXQ	Repair, shoulder joint open approach using combined sources of tissue [autograft with synthetic tissue]
1TA80WK	Repair, shoulder joint open approach using special incisional technique [e.g. multiple burr holes for humeral head revascularization]
Extraction, rotator cuff	
1TC57DA	Extraction, rotator cuff using endoscopic [arthroscopic] approach

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1TC57LA	Extraction, rotator cuff using open approach
Destruction, rotator cuff	
1TC59DA	Destruction, rotator cuff using endoscopic (arthroscopic) approach
1TC59LA	Destruction, rotator cuff using open approach
Release, rotator cuff	
1TC72DA	Release, rotator cuff using endoscopic [arthroscopic] approach
1TC72LA	Release, rotator cuff using open approach
Repair, rotator cuff	
1TC80DA	Repair, rotator cuff endoscopic [arthroscopic] approach using apposition technique [e.g. tendon sutured to tendon] simple repair (without graft or transfer involved)
1TC80DAFH	Repair, rotator cuff using endoscopic [arthroscopic]approach using apposition technique [e.g. tendon sutured to tendon] using biodegradable (binding) device [e.g. biostinger, fastener, anchor, arrow, staple or dart]
1TC80DAXXA	Repair, rotator cuff endoscopic [arthroscopic] approach using apposition technique [e.g. tendon sutured to tendon] with autograft [e.g. tendon, fascia]
1TC80DAXXE	Repair, rotator cuff endoscopic [arthroscopic] approach using apposition technique [e.g. tendon sutured to tendon] with tendon transfer for realignment [e.g. advancement, transposition]
1TC80DAXXK	Repair, rotator cuff endoscopic [arthroscopic] approach using apposition technique [e.g. tendon sutured to tendon] with homograft [e.g. GRAFTJACKET regenerative tissue matrix]
1TC80DAXXN	Repair, rotator cuff endoscopic [arthroscopic] approach using apposition technique [e.g. tendon sutured to tendon] with synthetic tissue [e.g. gortex, mesh]
1TC80DAXXQ	Repair, rotator cuff endoscopic [arthroscopic] approach using apposition technique [e.g. tendon sutured to tendon] with combined sources of tissue [e.g. autograft, tendon transfer, goretex]

Confidential: For Review Only
bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1TC80GC	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] simple repair (without graft or transfer involved)
1TC80GCFH	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] using biodegradable (binding) device [e.g. biostinger, fastener, anchor, arrow, staple or dart]
1TC80GCNW	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] simple repair (without graft or transfer involved)
1TC80GCNWA	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with autograft [e.g. tendon, fascia]
1TC80GCNWE	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with tendon transfer for realignment[e.g. advancement, transposition]
1TC80GCNWK	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with homograft [e.g. GRAFTJACKET regenerative tissue matrix]
1TC80GCNWN	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with synthetic tissue [e.g. gortex, mesh]
1TC80GCNWQ	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with combined sources of tissue [e.g. autograft, tendon transfer, goretex]
1TC80GCXXA	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with autograft [e.g. tendon, fascia]
1TC80GCXXE	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with tendon transfer for realignment[e.g. advancement, transposition]
1TC80GCXXK	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with homograft [e.g. GRAFTJACKET regenerative tissue matrix]
1TC80GCXXN	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with synthetic tissue [e.g. gortex, mesh]

Confidential: For Review Only
bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1TC80GCXXQ	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with combined sources of tissue [e.g. autograft, tendon transfer, goretex]
1TC80LA	Repair, rotator cuff open approach using apposition technique [e.g. tendon sutured to tendon] simple repair (without graft or transfer involved)
1TC80LAFH	Repair, rotator cuff open approach using apposition technique [e.g tendon sutured to tendon] using biodegradable (binding) device [e.g biostinger, fastener, anchor, arrow, staple or dart]
1TC80LAXXA	Repair, rotator cuff open approach using apposition technique [e.g. tendon sutured to tendon] with autograft [e.g. tendon, fascia]
1TC80LAXXE	Repair, rotator cuff open approach using apposition technique [e.g. tendon sutured to tendon] with tendon transfer for realignment[e.g. advancement, transposition]
1TC80LAXXK	Repair, rotator cuff using open approach using apposition technique [e.g. tendon sutured to tendon] with homograft [e.g. GRAFTJACKET regenerative tissue matrix]
1TC80LAXXN	Repair, rotator cuff open approach using apposition technique [e.g. tendon sutured to tendon] with synthetic tissue [e.g. gortex, mesh]
1TC80LAXXQ	Repair, rotator cuff open approach using apposition technique [e.g. tendon sutured to tendon] with combined sources of tissue [e.g. autograft, tendon transfer, goretex]
1TC80WU	Repair, rotator cuff open approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] simple repair (without graft or transfer involved)
1TC80WUFH	Repair, rotator cuff open approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] using biodegradable (binding) device [e.g. biostinger, fastener, anchor, arrow, staple or dart]
1TC80WUNW	Repair, rotator cuff open approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] simple repair (without graft or transfer involved)
1TC80WUNWA	Repair, rotator cuff open approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with autograft [e.g. tendon, fascia]
1TC80WUNWE	Repair, rotator cuff open approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with tendon transfer for realignment [e.g. advancement, transposition]
1TC80WUNWK	Repair, rotator cuff using open approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with homograft [e.g. GRAFTJACKET regenerative tissue matrix]
1TC80WUNWN	Repair, rotator cuff open approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with synthetic tissue [e.g. gortex, mesh]

Confidential: For Review Only
bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1TC80WUNWQ	Repair, rotator cuff open approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with combined sources of tissue [e.g. autograft, tendon transfer, goretex]
1TC80WUXXA	Repair, rotator cuff open approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with autograft [e.g. tendon, fascia]
1TC80WUXXE	Repair, rotator cuff open approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with tendon transfer for realignment[e.g. advancement, transposition]
1TC80WUXXK	Repair, rotator cuff open approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with homograft [e.g. GRAFTJACKET regenerative tissue matrix]
1TC80WUXXN	Repair, rotator cuff open approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with synthetic tissue [e.g. gortex, mesh]
1TC80WUXXQ	Repair, rotator cuff open approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with combined sources of tissue [e.g. autograft, tendon transfer, goretex]
Appendectomy	
1NV89DA	Excision total, appendix using endoscopic [laparoscopic] approach
1NV89LA	Excision total, appendix using open approach

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

BMJ Paediatrics Open

Emergency department use and hospital admission in children following ambulatory surgery: A retrospective population-based cohort study

Journal:	*BMJ Paediatrics Open*
Manuscript ID	bmjpo-2021-001188.R1
Article Type:	Original research
Date Submitted by the Author:	11-Oct-2021
Complete List of Authors:	Sawhney, Monakshi; Queen's University, School of Nursng VanDenKerkhof, Elizabeth; Mount Royal University, School of Nursing and Midwifery Goldstein, David; University of Calgary Faculty of Medicine, Department of Anesthesiology Wei, Xuejiao; Institute for Clinical Evaluative Sciences, Queen's University Pare, Genevieve; Queen's University, School of Nursng Mayne, Ian; North York General Hospital, Department of Orthopaedic Surgery Tranmer, Joan; Queen's University, School of Nursng
Keywords:	Health services research

SCHOLARONE™
Manuscripts

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

Emergency department use and hospital admission in children following ambulatory surgery: A retrospective population-based cohort study

Corresponding Author:

Monakshi Sawhney, School of Nursing, and Department of Anesthesiology and Perioperative Medicine, Queen's University
Address: 92 Barrie Street, Kingston, Ontario, Canada, K7L 3N6,
Telephone: 1-416-816-0487 email: mona.sawhney@queensu.ca
ORCID ID https://orcid.org/0000-0001-5399-1715, Scopus Author ID: 35300368800

Co-authors:

Elizabeth G. VanDenKerkhof, School of Nursing and Midwifery, 4825 Mount Royal Gate SW, Calgary, Alberta, Canada, T3E 6K6, Mount Royal University
email: evandenkerkhof@mtroyal.ca
ORCID ID https://orcid.org/0000-0003-4287-346X , Scopus Author ID: 55665271700

David H. Goldstein, Department of Anesthesiology, University of Calgary, South Health Campus, 4448 Front Street SE, Calgary, Alberta, Canada, T3M 1M4
email: david.goldstein@albertahealthservices.ca
ORCID ID https://orcid.org/0000-0003-2055-3246

Xuejiao Wei, ICES, Queen's University, 21 Arch Street, Suite 208, Kingston, Ontario, Canada, K7L 3N6
email: shelly.wei@ices.on.ca

Genevieve Pare, School of Nursing, Queen's University, 92 Barrie Street, Kingston, Ontario, Canada, K7L 3N6,
email: genevieve.pare@queensu.ca
ORCID ID https://orcid.org/0000-0002-3714-9744

Ian Mayne, Department of Orthopaedic Surgery, North York General Hospital and University of Toronto, 4001 Leslie St., Toronto, ON M2K 1E1
email: ian.mayne@utoronto.ca
ORCID ID https://orcid.org/0000-0002-7935-5781

Joan Tranmer, School of Nursing, Queen's University, 92 Barrie Street, Kingston, Ontario, Canada, K7L
email: tranmerj@queensu.ca
ORCID ID https://orcid.org/0000-0001-5192-5992

Keywords: children, healthcare use, ambulatory surgery, Canada, pain, hemorrhage.

Word Count: (excluding title page, abstract, what is known, what this study adds, references, figures and tables): 2729

Reference Count: 24

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

1
2
3
4
5
6
7
8
9

Emergency department use and hospital admission in children following ambulatory surgery: A retrospective population-based cohort study

10
11
12

ABSTRACT

13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54

Introduction: Pediatric ambulatory surgery (same day surgery and planned same day discharge) is more frequently being performed more in Canada and around the world; however, after surgery children may return to hospital, either through the emergency department (ED) or through a hospital admission (HA). The aim of this study was to determine the patient characteristics associated with ED visits and HA in the 3 days following pediatric ambulatory surgery.

Methods: This population-based retrospective cohort study utilized de-identified health administrative database housed at ICES and included residents of Ontario, younger than 18 years of age, who underwent ambulatory surgery between 2014-2018. Patients were not involved in the design of this study. The proportion of ED visit and HA were calculated for the total cohort, and the type of surgery. The odds ratios and 95% confidence intervals were calculated for each outcome using logistic regression.

Results: 83,468 children underwent select ambulatory surgeries. 2,588 (3.1%) had an ED visit and 608 (0.7%) had a HA in the 3 days following surgery. The most common reasons for ED visits included pain (17.2%) and haemorrhage (10.5%). Reasons for HA included haemorrhage (24.8%), dehydration (21.9%), and pain (9.1%).

Conclusions: Our findings suggest that pain, bleeding and dehydration symptoms are associated with a return visit to the hospital. Implementing approaches to prevent, identify and manage these symptoms may be helpful in reducing ED visits or hospital admissions.

55
56
57
58
59
60

Confidential: For Review Only

What is known about the subject?

- Pediatric ambulatory surgery (same day surgery and same day discharge) is being performed more frequently
- After discharge to home, children and parents do return to the emergency department or are admitted to hospital (HA)
- Children were more likely to have an ED visit or HA if they have comorbidities

What this study adds?

- Just under 4% of children had an ED visit or HA following elective ambulatory surgery in Ontario, Canada
- Findings suggest that pain, bleeding and dehydration symptoms are associated with a return visit to the hospital
- Providing parents and caregivers with strategies regarding managing pain and hydration at home may prevent ED or HA.

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Emergency department use and hospital admission in children following ambulatory surgery: Results of a population-based cohort study

Introduction:

Pediatric ambulatory surgery (same day surgery and planned same day discharge) is being performed more frequently in Canada and around the world. When surgeries are performed on an ambulatory basis it precludes the need for the patient to remain in hospital, the number of surgeries can be increased, and costs are decreased.[1,2] By minimizing the time spent in the hospital, ambulatory surgery decreases the impact on families, and risk of nosocomial infection. However, if children experience uncontrolled adverse effects following surgery it can lead to an emergency department (ED visit) or hospital admission (HA). In Ontario, Canada, 1,334,972 people between the ages of 0 and 19 years had a ED visit in 2018-2019.[3] It is unclear how many of these ED visits were related to ambulatory pediatric surgery.

Following tonsillectomy, cholecystectomy, and orthopaedic surgery in children, the reported rates of return to hospital between 24 hours and 30 days after ambulatory surgery ranges from 1.1% to 14%.[4-10] Children were more likely to have an ED visit or HA if they had comorbidities including developmental delay, Downs Syndrome, attention deficit hyperactivity disorder (ADHD), asthma, diabetes, obesity or cardiac disease.[2,4,6,11] They were also more likely to return to hospital if they had surgery in the late afternoon, or who have parents who did not speak the primary language of the country (e.g. English).[6,9,11] The most common reasons for ED visit or readmission include pain, dehydration, nausea, vomiting, haemorrhage, and syncope.[4-6,8-10,12]

These studies provide information regarding the unplanned healthcare use following ambulatory surgery. However, it is unclear how many and for which clinical problems pediatric

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

patients have an ED visit or HA in the first 3 days following discharge after ambulatory surgery in Ontario. Services and systems could be put in place to prevent common adverse events to try to prevent return to hospital. The purpose of this study was to examine ED use and HA in the first 3 days after ambulatory surgery in children (17 years or younger) in Ontario. Three days following surgery was chosen to capture healthcare use most likely to be associated with surgery rather than other factors. The aims of this study were to determine the proportion of emergency department (ED) use and hospital admissions (HA) in children after common ambulatory surgery procedures; identify the surgical groups and patient characteristics associated with higher ED use or HA; and describe the top 5 reasons for ED use overall and top 5 reasons for ED use by surgical group in children. A similar study was conducted examining ED use and HA in the first 3 days after ambulatory surgery in adults.[13]

Methods:

Study design and participants

This population-based retrospective cohort study followed the STROBE reporting guidelines and conducted using de-identified administrative databases held by ICES (formerly the Institute of Clinical Evaluative Sciences). The Ontario-specific databases utilized included the: Registered Persons Database (RPDB), Ontario Health Insurance Plan (OHIP), Ontario Marginalization Index (ON-MARG), Client Agency Program Enrolment database (CAPE), and Corporate Provider database (CPDB). The Canadian databases utilized included the: Canadian Census, Canadian Institute for Health Information Same Day Surgery (CIHI-SDS), Discharge Abstract Database (CIHI-DAD) and National Ambulatory Care Reporting System (CIHI-NACRS) databases. These databases were linked using unique encoded identifiers and were analyzed at ICES. This study was approved by the institutional review board at Sunnybrook Health Sciences Centre, Toronto, Canada and the Queen's University Health Science and

Affiliated Teaching Hospitals Research Ethics Board, Kingston, Canada (HSREB #6017706). Patients were not involved in the development of this study.

The cohort consisted of children between the age 0 and 17 years, residing in Ontario who underwent one of the commonly performed ambulatory surgical procedures as identified by CIHI between January 1, 2014 December 31, 2018. The selection of surgical procedures was adapted from the CIHI's report of the most common ambulatory surgery procedures.[14] Included surgical procedures were hernia-related muscle repair of the chest and abdomen, cholecystectomy, knee joint repair, release of nerves in the forearm, shoulder surgery, tonsillectomy, and tympanic membrane procedures. Description of the specific diagnostic and surgical procedures that fall under these surgical categories is included in Appendix A. Children who did not have province of Ontario health insurance coverage 1 year before index date were excluded from this study. To ensure that only elective surgical procedures were included, patients were excluded if they had an ED visit immediately prior to their surgery. Patients who died on the day of surgery were also excluded. If the child underwent more than one ambulatory surgery between 2014 to 2018 only their first ambulatory surgery was included, as prior ambulatory surgery experience could influence the post-operative care that was provided at home and subsequently the healthcare utilization.

The outcome of interest included any ED visit or HA within 3 days of the procedure. HA was exclusive of ED visit, and participants were not double counted. The main reason for an ED visit or a HA was captured from the CIHI-DAD or CIHI-NACRS. To ensure that HA following surgery was associated with a planned ambulatory surgery, the HA was cross-referenced between SDS database and the CIHI-DAD to confirm the surgery was booked as ambulatory, and the admission to hospital occurred after surgery was completed. The type of surgical procedure (main exposure variable) was captured from the CIHI-SDS Database. The Canadian Classification of

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

Health Interventions (CCI) codes were used to classify surgical procedures.[15] The CCI codes and companion surgical procedures are provided in Appendix A.

Demographic characteristics included age, sex, and rurality of residence based on Rurality Index of Ontario 2008, and Local Health Integration Network (LHIN).[16] Individual measures of socioeconomic status were not available in the databases therefore material deprivation was captured from the ON-MARG database. The ON-MARG database provides aggregate level measures of socioeconomic status based on the neighbourhood, and considers variation in education, income, and family composition.[17] Primary care provider information, specifically the model of the usual provider of primary care was obtained from CAPE and CPDB databases.[18,19] The Johns Hopkins Aggregated Diagnostic Groups Version 10 (ADGs) was used to measure comorbidity, and ADGs were captured from CIHI-DAD, CIHI-NACRS and OHIP.[20]

Data Analysis

Demographic data and clinical characteristics were summarized using measures of central tendency and spread or frequencies and percentages, as appropriate. Mean or proportion of patients were reported in the total cohort and those with at least one ED or HA, according to patient characterises and surgical category. Bivariate and multivariate logistic regression analyses were used to calculate the odds ratios (OR) and 95% confidence intervals (CI) for ED use and HA. In this study, odds ratios are used as a proxy of risk because incidence is rare (<10%).[21] Cholecystectomy was selected as the reference surgery for the purpose of interpreting the odds ratios. The rationale for selecting cholecystectomy was that sample size was sufficient for meaningful comparisons with other surgical procedures. The full adjusted models included all available variables; age, sex, primary care model, LHIN, material deprivation quintile, rural/urban residence, comorbidity (major ADGs) and surgical category. The main reasons for ED use were calculated for all surgical procedures combined and for those surgical procedures

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

with sufficient sample size and volume to avoid small cell frequencies. Hospital admissions were only calculated for all surgical procedures combined due to the small cell frequencies. All analyses were conducted using SAS© (SAS Enterprise Guide, Version 7.1).

Results:

Between January 1, 2014 and December 31, 2018 83,468 children in Ontario underwent the selected surgical procedures. The mean age was 6.2 (SD 4.4) years, and 44% were female (Table 1). The most frequently performed surgical procedures were tonsillectomy (48.1%), implantation of internal devices into the tympanic membrane (40.1%), and muscle repair of the chest and abdomen (hernia, 7.5%). A total of 3,196 (5.9%) of children had a ED visit or HA in the first 3 days after surgery. There were 2,588 (3.1%) ED visits and 608 (0.7%) HAs (either through the ED or directly). One hundred and three (3.9%) children returned to the ED more than once, for a total of 2,688 ED visits. The majority of ED visits occurred on postoperative day 1 (908; 35.1%) or 2 (881; 34%) (Figure 1). Of the 2,681 patients who visited the ED at least once, 72.4% underwent tonsillectomy (Table 1). Sixteen children who had a HA were admitted more than once, resulting in 616 HA. Of the 606 patients who were admitted to hospital at least once, the majority underwent tonsillectomy (92.3%).

[Table 1]

[Figure 1: Distribution of Emergency Department visits and hospital admission by postoperative day: 2014 – 2018. All of the emergency department (ED) visits and hospital admissions are displayed as proportions based on the postoperative day.]

Patients who underwent cholecystectomy had the highest proportion of ED visits (4.9%) (Figure 2). Children who underwent tonsillectomy (1.4%) had the highest proportion of HA Female children had a higher odds of ED use (adjusted OR=1.18, 95% CI 1.09, 1.28) (Table 2).

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

Children were more likely to have an ED visit if they lived in a rural setting (adjusted OR= 1.29, 95% CI 1.05, 1.34) or had a poor socioeconomic status (adjusted OR=1.39, 95% CI 1.22, 1.58). The odds of ED use also increased as number of comorbidities increased (2+ ADGs; OR=1.35, 95% CI 1.15, 1.58). The adjusted odds of ED use was lower for all surgical categories compared to cholecystectomy. Acute pain (17.2%) and haemorrhage (10.9%) were the most frequent reasons for an ED visit (Table 3). Table 4 provides a detailed breakdown of the 5 most common reasons for an ED visit for children who underwent tonsillectomy, tympanic membrane procedures and hernia repair. The primary reason for admission to hospital was haemorrhage/hematoma (24.8%), dehydration (21.9%), and acute pain (9.1%). Due to small cell frequencies, the results for HA for specific surgical procedures are not presented.

[Table 2]

[Figure 2: Incidence of Emergency Department visits postoperatively by type of surgery: 2014-2018. Emergency department visits are displayed in proportions. All ED visits from day of surgery (postoperative day 0) to postoperative day 3 are included. Patients undergoing cholecystectomy (4.9%) had the highest incidence of ED use, followed by tonsillectomy (4.7%).]

[Table 3]

Discussion:

This retrospective cohort study provides describes the rate of unplanned healthcare use after ambulatory surgery in children in Ontario, Canada. Between 2014 and 2018, 3.1% of children visited the ED and 0.7% were admitted to hospital during the first 3 days following select ambulatory surgery procedures. The highest proportion of healthcare use was in children who underwent tonsillectomy. The main reason for ED use for all surgery types was unrelieved acute pain or haemorrhage. While the main reason for HAs was haemorrhage and dehydration. Our findings are similar to previously published studies that reported a readmission rate of 1% to

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

3.6% up to 30 days after surgery, with the majority of readmissions occurring between 3 and 7 days after surgery (4-10,21).[4-10] The most common reasons for requiring hospital care were also consistent with our findings and included pain, nausea and vomiting, dehydration, and haemorrhage.[4-10]

Gilani & Bhattacharyya reported that 4.5% of children who underwent tonsillectomy on an ambulatory basis had a hospital revisit due to acute pain, haemorrhage, nausea, vomiting, and dehydration.[9] Our findings were similar with children who underwent tonsillectomy having a HA for similar reasons. Lavin et al. examined ED visits in children following ambulatory tonsillectomy, and reported that 7.4% had an ED visit, with 1.9% of these visits due to pain or dehydration.[11] Children who had non-English speaking parents, and had other health conditions including asthma, pre-term developmental delay, Downs Syndrome, and Attention deficit hyperactivity disorder were more likely to have an ED visit postoperatively. Language barriers and comorbid medical conditions made it more difficult for parents and children to adhere to the postoperative pain and hydration regimen they were provided.[11] In our study, the most common reason was for an ED visit due to unrelieved acute pain. Also, children in our sample had higher odds of ED use if they had 2 or more comorbid conditions.

A US administrative database study reported the 30-day readmission rate following ambulatory pediatric cholecystectomy as 1.1%, with the most common reasons for readmission being persistent calculus in the biliary duct, abdominal pain, and dehydration.[8] Gould and colleagues reported that 21% of children were admitted to hospital following cholecystectomy with 14% admitted for no identifiable reason.[7] Identifiable reasons for admission included pain and vomiting.[7] Similar to these studies, the reasons for admission or ED visits in our study were also pain and vomiting. However, in our study children who underwent ambulatory cholecystectomy had a higher rate of ED visit and HA.

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

Acute pain is a common reason for ED visits and HA. Guidelines for opioid prescribing to manage pain in children after surgery state that an optimal postoperative regimen should balance adequate pain control while also supporting recovery, including the return to school and sports.[22,23] Prescribers should use multimodal analgesia, including local anesthetics, acetaminophen and non-steroidal anti-inflammatory drugs (NSAIDs). Children and parents should be educated regarding the expectations regarding pain, and methods of pain management, both before surgery and again in the postoperative period. Education should be delivered verbally and written in plain, nonmedical terminology.[23]

Dehydration is a potentially preventable adverse effect, and intravenous (IV) hydration protocols that aim to replace fluids lost during the nothing by mouth (NPO) time, intraoperative time and postoperative time can be helpful in decreasing ED visits after surgery. A quality improvement study that focused on IV hydration examined ED visits due to dehydration in children who underwent ambulatory tonsillectomy prior to and after the implementation of the protocol.[12] Younger patients and patients with pre-existing complex chronic conditions were at higher risk of dehydration. After the implementation of a hydration protocol the ED visits due to dehydration decreased to 0.2% from 1%.[12] In our study, 2.6% of children had an ED visit, and 5.9% had a HA due to dehydration. The implementation of hydration protocols for all pediatric ambulatory surgeries may be helpful in reducing these ED visits and HA.

Strengths and Limitations

The use of administrative data is a strength as it does not rely on patient reports of past experiences, minimizing the risk of recall bias. The databases that were used in this study undergo several quality checks by data collection and repository organizations, providing a high level of reliability. Information on outcomes after ambulatory orthopaedic procedures in children in included in this study, this population is not well documented in the published literature. The

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

results of this study could be generalized with caution to the rest of Canada, where universal healthcare provides similar access to services.

The main disadvantage of this study is the small number of hospital admissions which limits the analysis that we were able to complete for this study. In addition, administrative data relies on accurate recording of information that is subject to human error.

Conclusion

This study utilized administrative data to identify ED visits and HAs following select ambulatory surgery in children. Many children undergo these surgical procedures without any complications or unanticipated hospital visits following discharge. However, we found that just under 6% of children had a ED visit or HA following elective ambulatory surgery in Ontario between 2014 and 2018, with the most common reasons for visit or admission being acute pain, haemorrhage, and dehydration. The results of this study can be utilized by both clinicians and administrators to identify those children who are at high risk of ED use or HA and implement strategies to help reduce ED visits and HA.

Prior to the COVID-19 pandemic, there was an increasing trend in the number of pediatric surgical procedures performed in Canada and around the world. The goal of pediatric ambulatory surgery is to improve access to care. However, the restrictions associated with the COVID-19 pandemic and the need to limit HAs have created a backlog of elective and urgent surgical procedures for children and adults. Between February and April 30, 2019, there were 18,1544 ambulatory surgery procedures were completed in Ontario, Canada.[24] A similar number of ambulatory surgery procedures were scheduled and subsequently cancelled in 2020.[24] As healthcare teams look for creative ways to safely perform surgical procedures, ambulatory surgery may become an attractive option. These teams should proactively try to prevent the common reasons why children return to hospital. The effectiveness of interventions that prevent

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

readmissions should continue to be examined.

Confidential: For Review Only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Table 1: Demographic and clinical characteristics of children who underwent ambulatory surgery in Ontario between 2014-2018

Characteristics	Total N=83,468 n (%)	ED Visits N=2,588 n (%)	Hospital Admission N=608 n (%)
Mean age in yrs (SD)	6.19 (SD 4.4)	6.94 (SD 4.7)	6.48 (SD 4.1)
Sex			
Female	36,744 (44.0%)	1,274 (49.2%)	298 (49.0%)
Male	46,724 (56.0%)	1,314 (50.8%)	310 (51.0%)
Material Deprivation Quintile			
1- Lowest	19,772 (23.7%)	513 (19.8%)	134 (22.0%)
2	18,280 (21.9%)	522 (20.2%)	133 (21.9%)
3	15,719 (18.8%)	478 (18.5%)	101 (16.6%)
4	13,822 (16.6%)	498 (19.2%)	95 (15.6%)
5- Highest	15,347 (18.4%)	550 (21.3%)	129 (21.2%)
Missing	528 (0.6%)	27 (1.0%)	16 (2.6%)
Residence*			
Urban	73,686 (88.3%)	2,210 (85.4%)	541 (89.0%)
Rural	9,648 (11.6%)	371 (14.3%)	61-67
missing	134 (0.2%)	7 (0.3%)	<=5
Number of Major ADGs			
0	57,966 (69.4%)	1,699 (65.6%)	414 (68.1%)
1	21,012 (25.2%)	708 (27.4%)	145 (23.8%)
2+	4,490 (5.4%)	181 (7.0%)	49 (8.1%)
Usual provider of care model			
Family Health Group†	14,482 (17.4%)	444 (17.2%)	114 (18.8%)
Family Health Team‡	22,046 (26.4%)	761 (29.4%)	135 (22.2%)
Family Health Organization II	18,699 (22.4%)	551 (21.3%)	140 (23.0%)
No-model	25,667 (30.8%)	759 (29.3%)	203 (33.4%)
Comprehensive Care Model**	1,745 (2.1%)	42 (1.6%)	10-16
Other	829 (1.0%)	31 (1.2%)	<=5
Type of Surgery			
Tonsillectomy	40,135 (48.1%)	1,875 (72.4%)	561 (92.3%)
Implantation of Internal Devices, tympanic membrane	33,458 (40.1%)	485 (18.7%)	28 (4.6%)
Muscle repair of the chest and abdomen: Hernia	6,235 (7.5%)	122 (4.7%)	9 (1.5%)
Knee joint repair	1,955 (2.3%)	44 (1.7%)	<=5
Cholecystectomy	782 (0.9%)	38 (1.5%)	<=10
Shoulder Surgery	755 (0.9%)	18-24	<=5
Nerves in the forearm and wrist	148 (0.2%)	<=5	0 (0.0%)

* Estimates based on Rurality Index of Ontario 2008. †Family Health Groups are groups of 3 or more family MDs. Care is provided through regular office hours and extended hours (weekday

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

evenings and/or weekends) and they utilize fee-for-service plus some incentives and bonuses for services provided to enrolled patients.[19] [‡]Family Health Teams are community-focused primary health care organizations that consist of interprofessional teams including MDs, nurse practitioners, registered nurses, social workers, dietitians, and other professionals who work together. Physicians are paid through a blended salary model. Other health professionals are paid through salary.[19]; [II]Family Health Organizations are groups of 3 or more family MDs who commit to enrol patients; care provided through regular office hours and extended hours based on the number of physicians; services are paid through a blended capitation model plus some incentives and bonuses for services to enrolled patients; [**]Comprehensive Care Models are solo primary care MD's, care is provided through regular office hours plus at least one session of extended hours weekly; utilize fee-for-service plus some incentives and bonuses for service.[19]

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Table 2: Univariate and multivariate odds ratios and 95% confidence intervals for ED visit and hospital admissions in the 3 days following ambulatory surgery: 2014-2018

		ED Visits		Hospital Admissions	
Character	Total	Unadjusted	Adjusted‡	Unadjusted	Adjusted‡
		OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Number of patients	83,468				
Sex (from RPDB)					
Male	46,724	1.00	1.00	1.00	1.00
Female	36,744	1.24 (1.15-1.34)	1.18 (1.09-1.28)	1.22 (1.04-1.44)	1.21 (1.03-1.42)
Material Deprivation Quintile					
1- Lowest (Reference)	19,772	1.00	1.00	1.00	1.00
2	18,280	1.10 (0.98-1.25)	1.10 (0.97-1.25)	1.07 (0.84-1.37)	1.11 (0.87-1.42)
3	15,719	1.18 (1.04-1.34)	1.17 (1.03-1.33)	0.95 (0.73-1.23)	1.00 (0.77-1.30)
4	13,822	1.40 (1.24-1.59)	1.39 (1.22-1.58)	1.01 (0.78-1.32)	1.06 (0.81-1.39)
5- Highest	15,347	1.40 (1.23-1.58)	1.37 (1.21-1.55)	1.24 (0.97-1.58)	1.26 (0.98-1.61)
Missing	528	2.02 (1.36-3.01)	1.92 (1.28-2.87)	4.58 (2.71-7.75)	4.80 (2.79-8.28)
Residence*					
Urban Reference)	73,686	1.00	1.00	1.00	1.00
Rural	9,648	1.29 (1.16-1.45)	1.19 (1.05-1.34)	0.93 (0.72-1.20)	0.99 (0.75-1.30)
# of Major ADG†					
0 (Reference)	57,966	1.00	1.00	1.00	1.00
1	21,012	1.15 (1.06-1.26)	1.12 (1.02-1.22)	0.97 (0.80-1.17)	0.96 (0.79-1.16)
2	4,490	1.39 (1.19-1.63)	1.35 (1.15-1.58)	1.53 (1.14-2.07)	1.53 (1.14-2.07)
Usual Provider of Care Model					
No-model (Reference)	25,667	1.00	1.00	1.00	1.00
Family Health Group	14,482	1.04 (0.92-1.17)	0.99 (0.88-1.12)	1.00 (0.79-1.25)	0.99 (0.79-1.26)
Family Health Team	22,046	1.17 (1.06-1.30)	1.08 (0.97-1.20)	0.77 (0.62-0.96)	0.76 (0.61-0.95)
Family Health Organization	18,699	1.00 (0.89-1.11)	0.91 (0.81-1.02)	0.95 (0.76-1.17)	0.90 (0.72-1.13)
Comprehensive Care Model	1,745	0.81 (0.59-1.11)	0.75 (0.55-1.03)	1.01 (0.59-1.75)	0.98 (0.57-1.70)
Other	829	1.28 (0.88-1.84)	1.03 (0.69-1.53)	0.30 (0.08-1.22)	0.26 (0.06-1.10)
Type of Surgery					
Cholecystectomy (Reference)	782	1.00	1.00	1.00	1.00
Tonsillectomy	40,135	0.96 (0.69-1.33)	0.94 (0.67-1.33)	1.83 (0.82-4.11)	1.12 (0.49-2.58)

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Implantation of Internal Devices, tympanic membrane	33,458	0.29 (0.21-0.40)	0.28 (0.19-0.40)	0.11 (0.04-0.26)	0.05 (0.02-0.13)
Muscle repair of the chest and abdomen: Hernia	6,235	0.39 (0.27-0.57)	0.39 (0.26-0.57)	0.19 (0.07-0.53)	0.11 (0.04-0.31)
Knee joint repair	1,955	0.45 (0.29-0.70)	0.47 (0.30-0.73)	0.20 (0.05-0.80)	0.21 (0.05-0.83)
Nerves in the forearm and wrist	148	0.68 (0.26-1.77)	0.67 (0.26-1.73)	0.00 (0.00-****)	0.00 (0.00-****)
Shoulder Surgery	755	0.51 (0.29-0.88)	0.50 (0.29-0.88)	0.17 (0.02-1.43)	0.18 (0.02-1.50)

* Estimates based on Rurality Index of Ontario 2008; [†]Johns Hopkins Aggregated Diagnostic Groups; [‡]Adjusted for age and Local Health Integration Network (results not shown).

Table 3. Eight common reasons for Emergency Department visit and hospital admission for all procedures combined: 2014-2018

Reasons for ED visit	n	% of visits
Acute pain	463	17.2
Haemorrhage and haematoma	293	10.9
Fever	195	7.3
Other complications of procedures, not elsewhere classified	186	6.9
Vomiting	181	6.7
Infection following a procedure	120	4.5
Acute upper airway infection	84	3.1
Dehydration	72	2.7
Reasons for hospital admission	**n**	**% of admissions**
Haemorrhage and haematoma	153	24.8
Dehydration	135	21.9
Acute Pain	56	9.1
Vomiting	15	2.4
Infection	13	2.1
Other complications of procedures	12	1.9
Fever	8	1.3
Nausea with vomiting	7	1.1

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Table 4. Top 5 reasons for ED visits for surgical procedures

Procedure (number of visits)	n	% of ED visits/procedure
Tonsillectomy (n=1950)		
Acute pain	403	20.7
Haemorrhage and haematoma	238	12.2
Other complications of procedures, not elsewhere classified	155	7.9
Vomiting	149	7.6
Fever	137	7.0
Implantation of Internal Devices, tympanic membrane (n=506)		
Fever	51	10.1
Otitis media	37	7.3
Acute upper respiratory infection	36	7.1
Haemorrhage and haematoma	27	5.4
Acute pain	26	5.2
Hernia (n=125)		
Haemorrhage and haematoma	15	12.0
Other complications of procedures	11	8.8
Attention to surgical dressings and sutures	9	7.2
Acute pain	7	5.6
Disruption of operation wound, not elsewhere classified	6	4.8

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Declarations:

Declaration of Competing interests: The authors report no competing interests.

Ethics Approval and Consent to Participate: This study was approved by the institutional review board at Sunnybrook Health Sciences Centre, Toronto, Canada and the Queen's University Health Science and Affiliated Teaching Hospitals Research Ethics Board, Kingston, Canada. This study was conducted using de-identified administrative databases held by ICES, therefore individual participant consent was not obtained.

Data Availability: The data that support the findings of this study are available from ICES https://www.ices.on.ca/ but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of ICES.

Funding Statement: This study was funded by an Ontario Ministry of Health and Long-Term Care (MOHLTC) Applied Health Research Question grant (Project Trim 2016 0800 186 000) and a Queen's University School of Nursing Research Development Fund grant. This study was supported by the Institute for Clinical Evaluative Sciences (ICES), which is funded by an annual grant from the MOHLTC. The opinions, results and conclusions reported in this paper are those of the authors and are independent from the funding sources. No endorsement by ICES or the Ontario MOHLTC is intended or should be inferred.

Authors Contributions: All authors contributed substantially to conception and design, or acquisition of data, or analysis and interpretation of data. All authors were involved in drafting the article or revising it critically for important intellectual content. All authors gave final approval of the version to be published and agree to act as guarantor of the work (ensuring that questions related to any part of the work are appropriately investigated and resolved).

Acknowledgements: Not applicable.

For Peer Review Only

Confidential: For Review Only

References

1 Nordin AB, Shah SR, Kenney BD. Ambulatory pediatric surgery. Semin. Pediatr. Surg 2018; 75-78. 10.1053/j.sempedsurg.2018.02.003

2 Miller DJ, Nelson SE, Shah AS, Ganley TJ. Outpatient pediatric orthopedic surgery. Orthop Clin N Am 2018;49:55-62. 10.1016/j.ocl.2017.08.007

3 Canadian Institute for Health Information. NACRS Emergency Department Visits and Length of Stay by Province/Territory, 2018–2019. Ottawa, ON: CIHI; 2019. https://www.cihi.ca/en/quick-stats

4 Murto K, Katz SL, McIassac D. Pediatric tonsillectomy is a resource-intensive procedure: a study of Canadian health administrative data. Can J Anesth/J Can Anesth 2017; 724-735. 10.1007/s12630-017-0888-y

5 Johnson RF, Chang A, Mitchell RB. Nationwide readmissions after tonsillectomy among pediatric patients – United States. Int. J. Pediatr. Otorhinolaryngol. 2018;10-3. https://doi.org/10.1016/j.ijporl.2018.01.026

6 McKeon M, Medina G, Kawai K. Readmissions following ambulatory pediatric endoscopic sinus surgery. The Laryngoscope 2019; 2681-86. https://doi.org/10.1002/lary.27898

7 Gould JL, Poola AS, St.Peter SD. Same day discharge protocol implementation trends in laparoscopic cholecystectomy in pediatric patients. J. Pediatr. Surg. 2016; 1936-38. https://doi.org/10.1016/j.jpedsurg.2016.09.008

8 Sacco Casamassima MG, Gause C, Yang J. Safety of outpatient laparoscopic cholecystectomy in children: analysis of 2050 elective ACS NSQIP-pediatric cases. Pediatr Surg Int 2016; 541-551. https://doi.org/10.1007/s00383-016-3888-z

9 Gillani S, Bhattacharyya N. Revisit rates for pediatric tonsillectomy: An analysis of admit and discharge times. Annals of Otology, Rhinology & Larngology 2020; 110-14. https://doi.org/10.1177/0003489419875758

10 Whippey A, Kostandoff G, Ma HK. Predictors of unanticipated admission following ambulatory surgery in the pediatric population: a retrospective case-control study. Paediatr Anaesth 2016; 831-37. 10.1111/pan.12937

11 Lavin J, Lehmann, D, Leon Silva A, Bai G, Hebal F, Manworren R, Stake C, Rychlik K, Billings KR. Variables associated with pediatric emergency department visits for uncontrolled pain in postoperative adenotonsillectomy patients. International Journal of Pediatric Otorhinolaryngology 2019;123:10-14. https://doi.org/10.1016/j.ijporl.2019.04.038

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

12 Hession-Laband E, Melvin P, Shermont H. Reducing Readmissions Post-tonsillectomy: A Quality Improvement Study on Intravenous Hydration. J Healthc Qual. 2018; 217-27. 10.1097/JHQ.0000000000000143.

13 Sawhney M, Goldstein DH, Wei X, Pare GC, Wang L, VanDenKerkhof EG. Pain and haemorrhage are the most common reasons for emergency department use and hospital admission in adults following ambulatory surgery: results of a population-based cohort study. Perioper Med (Lond). 2020 Aug 19;9:25. doi: 10.1186/s13741-020-00155-3. PMID: 32832075; PMCID: PMC7436986.

14 Canadian Institute for Health Information. A snapshot of health care in Canada as demonstrated by Top 10 Lists, 2011. Ottawa, ON: CIHI publication; 2012. https://secure.cihi.ca/free_products/Top10ReportEN-Web.pdf

15 Canadian Institute for Health Information. CCI (Canadian Classification of Health Interventions). https://www cihi ca/en/submit-data-and-view-standards/codes-and-classifications/cci 2017 [accessed 30 Jan 2021]

16 Local Health Integration Network. Ontario's LHINs, http://www.lhins.on.ca/ [4 Jan 2021]

17 Durbin A, Moineddin R., Lin E, Steele LS, Glazier RH. Examining the relationship between neighbourhood deprivation and metnal health serv ice use of immigrants in Ontario, Canada: a cross-sectional study. BMJ Open 2015 Mar 13; 5(3): e006690. http://dx.doi.org/10.1136/bmjopen-2014-006690

18 Government of Ontario. Health Care Options, https://www ontario ca/locations/health/?gclid=CPX6jdOLs9MCFc64wAodeygNKA 2017 [accessed 30 Jan 2021]

19 Glazier RH, Hutchinson B, Kopp A. Comparison of Family Health Teams to other Ontario primary care models, 2004/05 to 2011/12. Toronto: ICES; 2015. ISBN: 978-1-926850-56-6

20 The Johns Hopkins University. The Johns Hopkins ACG System, https://www.hopkinsacg.org/ [accessed Feb 1, 2021]

21 Viera AJ. Odds rations and risk rations: what's the difference and why does it matter? South Med J 2008; 730-4.

22 Health Quality Ontario. Opioid Prescribing for Acute Pain. Toronto. 2018. Queen's Printer for Ontario. ISBN 978-1-4868-1407-7.

23 Kelley-Quon LI, Kirkpatrick MG, Ricca RL. Guidelines for Opioid Prescribing in Children and Adolescents After Surgery: An Expert Panel Opinion. JAMA Surg. 2021; 76-90. doi: 10.1001/jamasurg.2020.5045.

24 Canadian Institute for Health Information. Estimating Planned Surgical Cancellations Due to COVID-19 Using Historical Data — Data Tables. Ottawa, ON: CIHI; 2020. https://www.cihi.ca/en/quick-stats

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

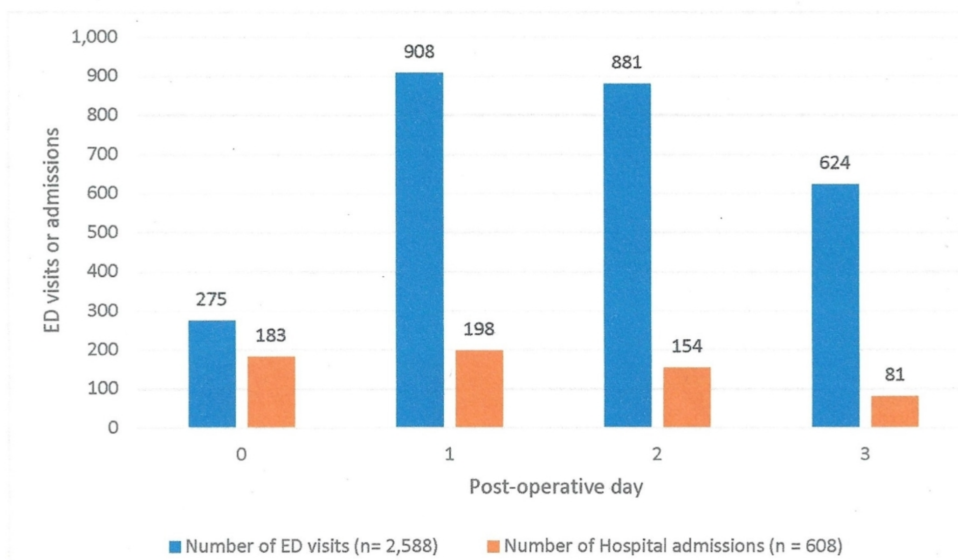

Figure 1: Distribution of Emergency Department visits and hospital admission by postoperative day: 2014 – 2018. All of the emergency department (ED) visits and hospital admissions are displayed as proportions based on the postoperative day.

157x92mm (300 x 300 DPI)

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

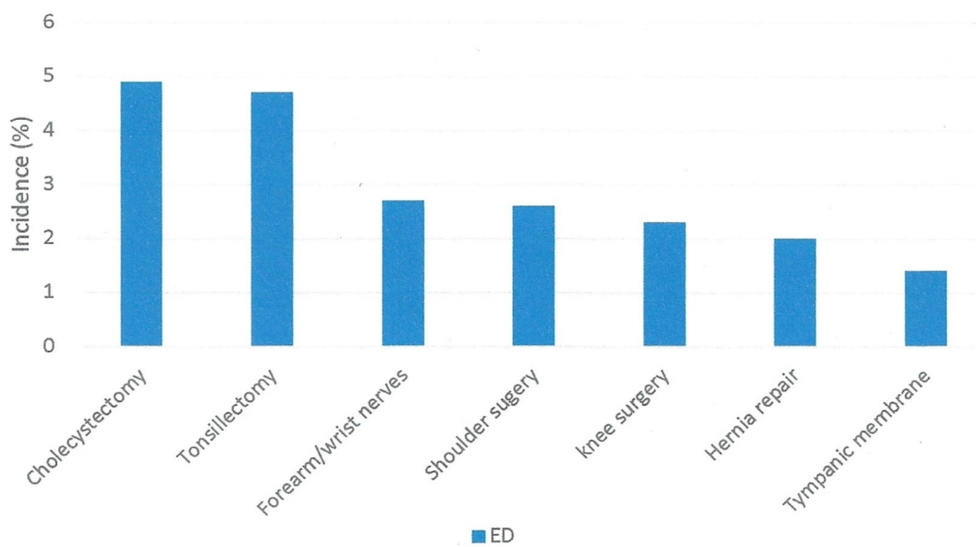

Figure 2: Incidence of Emergency Department visits postoperatively by type of surgery: 2014-2018. Emergency department visits are displayed in proportions. All ED visits from day of surgery (postoperative day 0) to postoperative day 3 are included. Patients undergoing cholecystectomy (4.9%) had the highest incidence of ED use, followed by tonsillectomy (4.7%).

141x81mm (300 x 300 DPI)

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Appendix A Canadian Classification of Health Interventions codes for day surgery procedures

Code	Description
Muscle repair of the chest and abdomen	
1SY80DA	Repair, muscles of the chest and abdomen endoscopic [laparoscopic] approach without tissue [e.g. suturing or stapling]
1SY80DAXXA	Repair, muscles of the chest and abdomen endoscopic [laparoscopic] approach using autograft [e.g. fascia, skin]
1SY80DAXXF	Repair, muscles of the chest and abdomen endoscopic [laparoscopic] approach using free flap [e.g. free myocutaneous flap]
1SY80DAXXG	Repair, muscles of the chest and abdomen endoscopic [laparoscopic] approach using pedicled flap [e.g. abdominis rectus or deltopectoral]
1SY80DAXXL	Repair, muscles of the chest and abdomen, endoscopic [laparoscopic] approach using xenograft [e.g. Surgis, SIS (small intestine submucosa)]
1SY80DAXXN	Repair, muscles of the chest and abdomen endoscopic [laparoscopic] approach using synthetic tissue [e.g. mesh, sponge]
1SY80LA	Repair, muscles of the chest and abdomen open approach without tissue [e.g. suturing or stapling]
1SY80LAFF	Repair, muscles of the chest and abdomen open approach and using temporary abdominal closure device [e.g. Bogota bag]
1SY80LATZ	Repair, muscles of the chest and abdomen open approach using zipper [temporary] (for repeat access to abdomen)
1SY80LAXXA	Repair, muscles of the chest and abdomen open approach using autograft [e.g. fascia, skin]
1SY80LAXXF	Repair, muscles of the chest and abdomen open approach using free flap [e.g. free myocutaneous flap]
1SY80LAXXG	Repair, muscles of the chest and abdomen open approach using pedicled flap [e.g. abdominis rectus or deltopectoral]
1SY80LAXXL	Repair, muscles of the chest and abdomen, open approach using xenograft [e.g. Surgisis, SIS (small intestine submucosa)]
1SY80LAXXN	Repair, muscles of the chest and abdomen open approach using synthetic tissue [e.g. mesh, sponge]
1SY80LAXXQ	Repair, muscles of the chest and abdomen open approach and combined sources of tissue (e.g. mesh with autograft)
1SY80PN	Repair, muscles of the chest and abdomen robotic assisted telemanipulation of tools [telesurgery] without tissue [e.g. suturing or stapling]

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1SY80PNXXN	Repair, muscles of the chest and abdomen robotic assisted telemanipulation of tools [telesurgery] using synthetic tissue [e.g. mesh, sponge]
1SY80WJ	Repair, muscles of the chest and abdomen open approach using special excisional technique
Cholecystectomy	
1OD89DA	Excision total, gallbladder endoscopic [laparoscopic] approach without extraction (of calculi) cholecystectomy alone
1OD89DTAG	Excision total, gallbladder endoscopic [laparoscopic] approach with extraction (of calculi) from bile ducts using laser probe
1OD89DTAM	Excision total, gallbladder endoscopic [laparoscopic] approach with extraction (of calculi) from bile ducts using basket device
1OD89DTAS	Excision total, gallbladder endoscopic [laparoscopic] approach with extraction (of calculi) from bile ducts using electrohydraulic probe
1OD89DTBD	Excision total, gallbladder endoscopic [laparoscopic] approach with extraction (of calculi) from bile ducts using balloon device
1OD89DTGX	Excision total, gallbladder endoscopic [laparoscopic] approach with extraction (of calculi) from bile ducts using device NEC [e.g. forceps, metal probe]
1OD89EC	Excision total, gallbladder endoscopic [laparoscopic] approach cholecystectomy with bile duct exploration and no stones extracted
1OD89LA	Excision total, gallbladder open approach without extraction of calculi cholecystectomy alone
1OD89PN	Excision total, gallbladder robotic assisted telemanipulation of tools [telesurgery] without extraction of calculi cholecystectomy alone
1OD89SMAG	Excision total, gallbladder open approach with extraction (of calculi) from bile ducts using laser probe
1OD89SMAM	Excision total, gallbladder open approach uwith extraction (of calculi) from bile ducts sing basket device
1OD89SMAS	Excision total, gallbladder open approach with extraction (of calculi) from bile ducts using electrohydraulic probe
1OD89SMBD	Excision total, gallbladder open approach with extraction (of calculi) from bile ducts using balloon device
1OD89SMGX	Excision total, gallbladder open approach with extraction (of calculi) from bile ducts using device NEC [e.g. forceps, metal probe]
1OD89TP	Excision total, gallbladder open approach cholecystectomy with bile duct exploration and no stones extracted

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Repair, knee joints	
1VG80DA	Repair, knee joint endoscopic [arthroscopic] approach no tissue used (for repair) joint repair without meniscus involvement
1VG80DAAG	Repair, knee joint using endoscopic approach and laser NEC
1VG80DAXXA	Repair, knee joint endoscopic [arthroscopic] approach with autograft [e.g. bone, cartilage, or tendon] joint repair without meniscus involvement
1VG80DAXXK	Repair, knee joint endoscopic [arthroscopic] approach with homograft graft [e.g. bone or cartilage] joint repair without meniscus involvement
1VG80DAXXN	Repair, knee joint endoscopic [arthroscopic] approach with synthetic tissue [e.g. gortex, artificial polymer cartilage] joint repair without meniscus involvement
1VG80DAXXQ	Repair, knee joint endoscopic [arthroscopic] approach with combined sources of tissue [e.g. bone graft, synthetic tissue] joint repair without meniscus involvement
1VG80FY	Repair, knee joint endoscopic [arthroscopic] approach no tissue used (for repair) with meniscectomy [or meniscoplasty]
1VG80FYXXA	Repair, knee joint endoscopic [arthroscopic] approach with autograft [e.g. bone, cartilage, or tendon] with meniscectomy [or meniscoplasty]
1VG80FYXXK	Repair, knee joint endoscopic [arthroscopic] approach with homograft graft [e.g. bone or cartilage] with meniscectomy [or meniscoplasty]
1VG80FYXXN	Repair, knee joint endoscopic [arthroscopic] approach with synthetic tissue [e.g. gortex, artificial polymer cartilage] with meniscectomy [or meniscoplasty]
1VG80FYXXQ	Repair, knee joint endoscopic [arthroscopic] approach with combined sources of tissue [e.g. bone graft, synthetic tissue] with meniscectomy [or meniscoplasty]
1VG80GZ	Repair, knee joint, endoscopic (arthroscopic) approach using special incisional technique [e.g. multiple burr holes for tibial head revascularization]
1VG80GZXXK	Repair, knee joint using endoscopic (arthroscopic) approach with homograft [e.g. bone or cartilage] using special incisional technique [e.g. multiple burr holes for tibial head revascularization]
1VG80LA	Repair, knee joint open approach no tissue used (for repair) joint repair without meniscus involvement
1VG80LAXXA	Repair, knee joint open approach with autograft [e.g. bone, cartilage, or tendon] joint repair without meniscus involvement
1VG80LAXXK	Repair, knee joint open approach with homograft graft [e.g. bone or cartilage] joint repair without meniscus involvement

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1VG80LAXXN	Repair, knee joint open approach with synthetic tissue [e.g. gortex, artificial polymer cartilage] joint repair without meniscus involvement
1VG80LAXXQ	Repair, knee joint open approach with combined sources of tissue [e.g. bone graft, synthetic tissue] joint repair without meniscus involvement
1VG80UY	Repair, knee joint open approach no tissue used (for repair) with meniscectomy [or meniscoplasty]
1VG80UYXXA	Repair, knee joint open approach with autograft [e.g. bone, cartilage, or tendon] with meniscectomy [or meniscoplasty]
1VG80UYXXK	Repair, knee joint open approach with homograft graft [e.g. bone or cartilage] with meniscectomy [or meniscoplasty]
1VG80UYXXN	Repair, knee joint open approach with synthetic tissue [e.g. gortex, artificial polymer cartilage] with meniscectomy [or meniscoplasty]
1VG80UYXXQ	Repair, knee joint open approach with combined sources of tissue [e.g. bone graft, synthetic tissue] with meniscectomy [or meniscoplasty]
1VG80WK	Repair, knee joint, open approach using special incisional technique [e.g. multiple burr holes for tibial head revascularization]
1VG80WKXXK	Repair, knee joint using open approach with homograft [e.g. bone or cartilage] using special incisional technique [e.g. multiple burr holes for tibial head revascularization]
Implantation of Internal Devices, tympanic membrane	
1DF53JATS	Implantation of internal device, tympanic membrane of ventilation [grommet] tube using external approach
Nerves in the forearm and wrist	
1BN72DA	Release, nerve(s) of forearm and wrist using endoscopic approach
1BN72LA	Release, nerve(s) of forearm and wrist using open approach
1BN80LA	Repair, nerve(s) of forearm and wrist using end to end suture [rejoining] technique
1BN80LAW3	Repair, nerve(s) of forearm and wrist using fibrin glue [rejoining] technique
1BN80UH	Repair, nerve(s) of forearm and wrist using interfascicular [split] repair [rejoining] technique
1BN87LA	Excision partial, nerve(s) of forearm and wrist end to end [rejoining] technique (e.g. suture, glue) simple apposition of nerve ends

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1BN87LAXXA	Excision partial, nerve(s) of forearm and wrist end to end [rejoining] technique (e.g. suture, glue) nerve autograft (to replace lost length)
1BN87LAXXE	Excision partial, nerve(s) of forearm and wrist end to end [rejoining] technique (e.g. suture, glue) transposition of nerves [e.g. crossover]
1BN87LAXXN	Excision partial, nerve(s) of forearm and wrist, no rejoining [of nerve ends] nerve end(s) wrapped or bridged using synthetic tissue [e.g. neural tube]
1BN87LAXXQ	Excision partial, nerve(s) of forearm and wrist end to end [rejoining] technique (e.g. suture, glue) combined transposition of nerves with a nerve autograft
1BN87UH	Excision partial, nerve(s) of forearm and wrist interfascicular split repair [rejoining] technique simple apposition of nerve ends
1BN87UHXXA	Excision partial, nerve(s) of forearm and wrist interfascicular split repair [rejoining] technique nerve autograft (to replace lost length)
1BN87UHXXE	Excision partial, nerve(s) of forearm and wrist interfascicular split repair [rejoining] technique transposition of nerves [e.g. crossover]
1BN87UHXXQ	Excision partial, nerve(s) of forearm and wrist interfascicular split repair [rejoining] technique combined transposition of nerves with a nerve autograft
1BN87WF	Excision partial, nerve(s) of forearm and wrist no rejoining [of nerve ends] nerve end buried
Tonsillectomy	
1FR87LA	Excision partial, tonsils and adenoids using open (excisional) approach
1FR89LA	Excision total, tonsils and adenoids tonsillectomy alone using device NEC
1FR89LAAK	Excision total, tonsils and adenoids tonsillectomy alone using snare
1FR89WJ	Excision total, tonsils and adenoids tonsillectomy with Adenoidectomy using device NEC
1FR89WJAK	Excision total, tonsils and adenoids tonsillectomy with Adenoidectomy using snare
Shoulder Surgery	
Implantation, shoulder joint	
1TA53LAPM	Implantation of internal device, shoulder joint uncemented single-component prosthetic device [e.g. humeral head]

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60

1TA53LAPMA	Implantation of internal device, shoulder joint with bone autograft [uncemented] single-component prosthetic device [e.g. humeral head]
1TA53LAPMK	Implantation of internal device, shoulder joint with bone homograft [uncemented] single-component prosthetic device [e.g. humeral head]
1TA53LAPMN	Implantation of internal device, shoulder joint with synthetic material using single-component prosthetic device [e.g. humeral head]
1TA53LAPMQ	Implantation of internal device, shoulder joint with combined sources of tissue using single-component prosthetic device [e.g. humeral head]
1TA53LAPN	Implantation of internal device, shoulder joint uncemented dual-component prosthetic device [humeral head and glenoid cup]
1TA53LAPNA	Implantation of internal device, shoulder joint with bone autograft [uncemented] dual-component prosthetic device [humeral head and glenoid cup]
1TA53LAPNK	Implantation of internal device, shoulder joint with bone homograft [uncemented] dual-component prosthetic device [humeral head and glenoid cup]
1TA53LAPNN	Implantation of internal device, shoulder joint with synthetic material (e.g. bone paste, cement, Dynagraft, Osteoset) dual component prosthetic device [humeral head and glenoid cup]
1TA53LAPNQ	Implantation of internal device, shoulder joint with combined sources of tissue using dual-component prosthetic device [humeral head and glenoid cup]
1TA53LAPQ	Implantation of internal device, shoulder joint uncemented reverse dual component prosthetic device [humeral cup and glenoid head]
1TA53LAPQA	Implantation of internal device, shoulder joint with bone autograft [uncemented] reverse dual component prosthetic device [humeral cup and glenoid head]
1TA53LAPQK	Implantation of internal device, shoulder joint with bone homograft [uncemented] reverse dual component prosthetic device [humeral cup and glenoid head]
1TA53LAPQN	Implantation of internal device, shoulder joint with synthetic material (e.g. bone paste, cement, Dynagraft, Osteoset) reverse dual component prosthetic device [humeral cup and glenoid head]
1TA53LAPQQ	Implantation of internal device, shoulder joint with combined sources of tissue (e.g. bone graft, cement, paste) reverse dual component prosthetic device [humeral cup and glenoid head]
1TA53LASLN	Implantation of internal device, shoulder joint with synthetic material using cement spacer (temporary) [impregnated with antibiotics]
Repair, shoulder joint	

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1TA80DA	Repair, shoulder joint endoscopic [arthroscopic] approach using simple apposition technique only [e.g. suturing]
1TA80DAAG	Repair, shoulder joint endoscopic [arthroscopic] approach using laser (alone) [to shrink tissue]
1TA80DAFH	Repair, shoulder joint endoscopic [arthroscopic] approach using biodegradable binding device [e.g. Suretac anchor system]
1TA80DAXXA	Repair, shoulder joint endoscopic [arthroscopic] approach using autograft [e.g. bone, interpositional fascia, muscle graft]
1TA80DAXXE	Repair, shoulder joint endoscopic [arthroscopic] approach using local tendon transfer [rebalancing]
1TA80DAXXN	Repair, shoulder joint endoscopic [arthroscopic] approach using synthetic tissue [e.g. mesh, gortex, silastic sheath]
1TA80DAXXQ	Repair, shoulder joint endoscopic [arthroscopic] approach using combined sources of tissue [autograft with synthetic tissue]
1TA80GZ	Repair, shoulder joint endoscopic [arthroscopic] approach using special incisional technique [e.g. multiple burr holes for humeral head revascularization]
1TA80LA	Repair, shoulder joint open approach using simple apposition technique only [e.g. suturing]
1TA80LAFH	Repair, shoulder joint open approach using biodegradable binding device [e.g. Suretac anchor system]
1TA80LAXXA	Repair, shoulder joint open approach using autograft [e.g. bone, interpositional fascia, muscle graft]
1TA80LAXXE	Repair, shoulder joint open approach using local tendon transfer [rebalancing]
1TA80LAXXN	Repair, shoulder joint open approach using synthetic tissue [e.g. mesh, gortex, silastic sheath]
1TA80LAXXQ	Repair, shoulder joint open approach using combined sources of tissue [autograft with synthetic tissue]
1TA80WK	Repair, shoulder joint open approach using special incisional technique [e.g. multiple burr holes for humeral head revascularization]
Extraction, rotator cuff	
1TC57DA	Extraction, rotator cuff using endoscopic [arthroscopic] approach

Confidential: For Review Only
bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1TC57LA	Extraction, rotator cuff using open approach
Destruction, rotator cuff	
1TC59DA	Destruction, rotator cuff using endoscopic (arthroscopic) approach
1TC59LA	Destruction, rotator cuff using open approach
Release, rotator cuff	
1TC72DA	Release, rotator cuff using endoscopic [arthroscopic] approach
1TC72LA	Release, rotator cuff using open approach
Repair, rotator cuff	
1TC80DA	Repair, rotator cuff endoscopic [arthroscopic] approach using apposition technique [e.g. tendon sutured to tendon] simple repair (without graft or transfer involved)
1TC80DAFH	Repair, rotator cuff using endoscopic [arthroscopic]approach using apposition technique [e.g. tendon sutured to tendon] using biodegradable (binding) device [e.g. biostinger, fastener, anchor, arrow, staple or dart]
1TC80DAXXA	Repair, rotator cuff endoscopic [arthroscopic] approach using apposition technique [e.g. tendon sutured to tendon] with autograft [e.g. tendon, fascia]
1TC80DAXXE	Repair, rotator cuff endoscopic [arthroscopic] approach using apposition technique [e.g. tendon sutured to tendon] with tendon transfer for realignment [e.g. advancement, transposition]
1TC80DAXXK	Repair, rotator cuff endoscopic [arthroscopic] approach using apposition technique [e.g. tendon sutured to tendon] with homograft [e.g. GRAFTJACKET regenerative tissue matrix]
1TC80DAXXN	Repair, rotator cuff endoscopic [arthroscopic] approach using apposition technique [e.g. tendon sutured to tendon] with synthetic tissue [e.g. gortex, mesh]
1TC80DAXXQ	Repair, rotator cuff endoscopic [arthroscopic] approach using apposition technique [e.g. tendon sutured to tendon] with combined sources of tissue [e.g. autograft, tendon transfer, goretex]

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

Confidential: For Review Only

1TC80GC	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] simple repair (without graft or transfer involved)
1TC80GCFH	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] using biodegradable (binding) device [e.g. biostinger, fastener, anchor, arrow, staple or dart]
1TC80GCNW	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] simple repair (without graft or transfer involved)
1TC80GCNWA	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with autograft [e.g. tendon, fascia]
1TC80GCNWE	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with tendon transfer for realignment[e.g. advancement, transposition]
1TC80GCNWK	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with homograft [e.g. GRAFTJACKET regenerative tissue matrix]
1TC80GCNWN	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with synthetic tissue [e.g. gortex, mesh]
1TC80GCNWQ	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with combined sources of tissue [e.g. autograft, tendon transfer, goretex]
1TC80GCXXA	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with autograft [e.g. tendon, fascia]
1TC80GCXXE	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with tendon transfer for realignment[e.g. advancement, transposition]
1TC80GCXXK	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with homograft [e.g. GRAFTJACKET regenerative tissue matrix]
1TC80GCXXN	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with synthetic tissue [e.g. gortex, mesh]

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1TC80GCXXQ	Repair, rotator cuff endoscopic [arthroscopic] approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with combined sources of tissue [e.g. autograft, tendon transfer, goretex]
1TC80LA	Repair, rotator cuff open approach using apposition technique [e.g. tendon sutured to tendon] simple repair (without graft or transfer involved)
1TC80LAFH	Repair, rotator cuff open approach using apposition technique [e.g tendon sutured to tendon] using biodegradable (binding) device [e.g biostinger, fastener, anchor, arrow, staple or dart]
1TC80LAXXA	Repair, rotator cuff open approach using apposition technique [e.g. tendon sutured to tendon] with autograft [e.g. tendon, fascia]
1TC80LAXXE	Repair, rotator cuff open approach using apposition technique [e.g. tendon sutured to tendon] with tendon transfer for realignment[e.g. advancement, transposition]
1TC80LAXXK	Repair, rotator cuff using open approach using apposition technique [e.g. tendon sutured to tendon] with homograft [e.g. GRAFTJACKET regenerative tissue matrix]
1TC80LAXXN	Repair, rotator cuff open approach using apposition technique [e.g. tendon sutured to tendon] with synthetic tissue [e.g. gortex, mesh]
1TC80LAXXQ	Repair, rotator cuff open approach using apposition technique [e.g. tendon sutured to tendon] with combined sources of tissue [e.g. autograft, tendon transfer, goretex]
1TC80WU	Repair, rotator cuff open approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] simple repair (without graft or transfer involved)
1TC80WUFH	Repair, rotator cuff open approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] using biodegradable (binding) device [e.g. biostinger, fastener, anchor, arrow, staple or dart]
1TC80WUNW	Repair, rotator cuff open approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] simple repair (without graft or transfer involved)
1TC80WUNW A	Repair, rotator cuff open approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with autograft [e.g. tendon, fascia]
1TC80WUNWE	Repair, rotator cuff open approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with tendon transfer for realignment [e.g. advancement, transposition]
1TC80WUNW K	Repair, rotator cuff using open approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with homograft [e.g. GRAFTJACKET regenerative tissue matrix]
1TC80WUNW N	Repair, rotator cuff open approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with synthetic tissue [e.g. gortex, mesh]

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1TC80WUNWQ	Repair, rotator cuff open approach using tenodesis with screw fixation [e.g. tendon with a bone plug fixed to bone with screw] with combined sources of tissue [e.g. autograft, tendon transfer, goretex]
1TC80WUXXA	Repair, rotator cuff open approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with autograft [e.g. tendon, fascia]
1TC80WUXXE	Repair, rotator cuff open approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with tendon transfer for realignment[e.g. advancement, transposition]
1TC80WUXXK	Repair, rotator cuff open approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with homograft [e.g. GRAFTJACKET regenerative tissue matrix]
1TC80WUXXN	Repair, rotator cuff open approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with synthetic tissue [e.g. gortex, mesh]
1TC80WUXXQ	Repair, rotator cuff open approach using tenodesis technique [e.g. tendon looped or sutured to or through bone] with combined sources of tissue [e.g. autograft, tendon transfer, goretex]
Appendectomy	
1NV89DA	Excision total, appendix using endoscopic [laparoscopic] approach
1NV89LA	Excision total, appendix using open approach

Confidential: For Review Only

bmjpo: first published as 10.1136/bmjpo-2021-001188 on 23 November 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 20, 2024 by guest. Protected by copyright.