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Using quality improvement methodology to improve ovarian salvage for benign ovarian masses

Jennifer H. Aldrink [a,*], Dani O. Gonzalez [b], Stephen P. Sales [c], Katherine J. Deans [a,b],
Gail E. Besner [a], Geri D. Hewitt [d]

[a] *Department of Surgery, Division of Pediatric Surgery, The Ohio State University College of Medicine, Nationwide Children's Hospital, Columbus, OH*
[b] *Center for Surgical Outcomes Research, Nationwide Children's Hospital, Columbus, OH*
[c] *Department of Quality Improvement, Nationwide Children's Hospital, Columbus, OH*
[d] *Department of Surgery, Division of Obstetrics and Gynecology, The Ohio State University College of Medicine, Nationwide Children's Hospital, Columbus, OH*

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ABSTRACT

Purpose: Most ovarian masses in children are benign and potentially amenable to ovarian salvage surgery (OSS). Despite the common use of OSS among pediatric and adolescent gynecologists (PAG) in recognition of reproductive and hormonal health advantages, this technique is not commonly performed by pediatric surgeons. The aim of this quality improvement (QI) initiative was to improve our institutional rate of OSS for benign ovarian masses.
Methods: Baseline data were obtained retrospectively from surgical procedures performed for benign ovarian masses between January 2012 and February 2016. Designed interventions to improve the rate of OSS included the development of an ovarian mass algorithm, standardization of radiologic templates, multidisciplinary analyses of ovarian procedures, and implementation of a training model for performing OSS. Procedures performed for benign ovarian masses from March 2016 to February 2017 comprised the process stage.
Results: Our institutional baseline OSS rate was 28.8%. After implementation of the institutional algorithm, a single oophorectomy was performed for a benign mass, increasing the OSS rate to 96%. There have been no missed ovarian malignancies.
Conclusions: Utilizing preoperative risk assessment, QI methodology and multidisciplinary collaboration resulted in improved OSS rates for benign ovarian masses with no evidence of missed ovarian malignancies.
Level of evidence: Level II. This is a prospective comparative study, with comparison to a retrospective cohort. This is a quality improvement initiative without randomization.

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Ovarian masses in pediatric patients are uncommon, with an annual estimated incidence of 2.6/100,000 [1,2]. Most ovarian lesions occurring in this age group are benign, with malignancy accounting for less than 10% of surgically excised ovarian masses, and for only 1% of all pediatric cancers [1–5]. Variability exists for the surgical management of pediatric and adolescent patients with ovarian masses, dependent on institutional bias, surgical specialty, and demographics [6–9].

We performed a recent analysis of the Pediatric Health Information System, revealing significant variability in the use of ovarian sparing surgery across North American tertiary children's hospitals [10]. Furthermore, we discovered that our institution was a low performer for ovarian salvage. This information served as the basis for this hospital-based quality initiative. The purpose of this initiative was to improve the rate of ovarian salvage for benign ovarian masses within our

institution. We hypothesized that implementation of a quality improvement (QI) initiative would improve our institutional ovarian salvage rate.

1. Methods

This QI project implemented evidence-based interventions and best practices that were designed to improve the rate of ovarian salvage surgery to a goal of 75% in patients with suspected benign ovarian masses, thus reducing the rate of oophorectomy. In accordance with our institutional guidelines, institutional review board approval was not required as this work was not considered human subjects research.

Baseline data were obtained retrospectively from surgical procedures performed for benign ovarian masses between January 2012 and February 2016. Procedures performed for benign ovarian masses from March 2016 to February 2017 comprised the process stage. International Classification of Diseases, 9th edition (ICD-9) and Current Procedural Terminology (CPT) code sets were utilized to capture baseline retrospective data, while corresponding International Classification of

* Corresponding author at: Nationwide Children's Hospital, 700 Children's Drive, FB 6B.1, Columbus, OH 43205. Tel.: +1 614 722 0440; fax: +1 614 722 3903.
E-mail address: Jennifer.Aldrink@NationwideChildrens.org (J.H. Aldrink).

Diseases, 10th edition (ICD-10) codes were utilized for prospective data capture given the timing of implementation of this updated coding system (Appendix B). Procedures performed for simple ovarian cysts and/ or adnexal torsions without masses were excluded. Designed key driver interventions are outlined in Fig. 1, and included the development of an evidence-based ovarian mass algorithm (Fig. 2), standardization of radiologic interpretation of pelvic ultrasounds (Table 1), documentation of multidisciplinary discussion of each patient using an electronic chart template, monthly multidisciplinary analysis of all ovarian procedures performed including review of pathology and surgical procedure performed, and implementation of a co-surgeon training model for technical guidance in performing successful ovarian salvage surgery. Multidisciplinary team members included faculty representatives in pediatric surgery, pediatric and adolescent gynecology, oncology, radiology, and pathology.

1.1. Ovarian mass algorithm

To guide preoperative risk stratification, an ovarian mass algorithm was created. The algorithm incorporated evidence-based guidelines regarding size and descriptive characteristics of ovarian lesions (cystic, solid, complex, mixed) based upon imaging characteristics, age of the patient, and tumor markers including lactate dehydrogenase (LDH), alpha fetoprotein (AFP), beta human chorionic gonadotropin (βHCG), inhibin A and B, cancer antigen (CA) 19-9, CA 125, and carcinoembryonic antigen (CEA), when applicable. Faculty within the departments of pediatric surgery, pediatric and adolescent gynecology, and oncology developed this algorithm. Introduction and education were provided to the relevant departments prior to hospital-wide implementation. A monthly multidisciplinary review of all operative cases involving ovarian masses was performed for compliance with the algorithm.

1.2. Ovarian salvage technique

The basic principle of ovarian salvage surgery is to resect abnormal tissue while preserving normal ovarian tissue. Ovarian salvage techniques include ovarian cystectomy, detorsion, and/or drainage, fenestration, or unroofing of ovarian cysts. In contrast to adult and adolescent gynecologic surgical training, the technical aspects of ovarian sparing resection of lesions are not widely taught in many pediatric surgical training programs. Divisional growth and collaboration between the pediatric surgical and the pediatric and adolescent gynecological programs at our institution facilitated widespread familiarity with ovarian sparing techniques. Members within both departments performed cases as co-surgeons with members unfamiliar with the techniques of ovarian salvage. This allowed all faculty members and surgical trainees in both programs to become adept at consistent ovarian salvage techniques.

1.3. Standardization of pelvic ultrasonography reports

A standard template for transabdominal and transvaginal pelvic ultrasound reports was developed in coordination with the department of radiology at the beginning of the process stage. In routine sequence, the template reports measurements and relevant findings regarding the bladder, uterus, ovaries including volume, presence or absence of pelvic fluid, and overall impression.

1.4. Data analysis

This study used a time series experimental design. Data were collected on a monthly basis, and were tracked and analyzed using a P-Chart. Statistical analysis was performed on the data monthly to identify special cause variation or a baseline shift using Minitab 17 statistical software (Minitab Inc., State College, PA, USA). A test of two proportions was conducted to verify the special cause variation between baseline and process stage after 8 months of prospective data collection.

2. Results

From the baseline data captured retrospectively between January 2012 and February 2016, 128 patients presented with an ovarian cystic or solid mass. Sixty-nine of these patients had simple cysts, corpus luteal cysts, or hemorrhagic cysts. Since all ovaries with these diagnoses were preserved, these patients were excluded from both our retrospective and prospective analysis. The remaining fifty-nine patients were included in the retrospective baseline analysis, 17 of whom underwent ovarian salvage surgery. Thus, our baseline ovarian preservation rate was 28.8%.

The process stage included patients who presented with complex ovarian cystic or solid masses between March 2016 and February 2017. Our prospective cohort included 23 patients with 25 suspected benign ovarian neoplasms, including one patient with bilateral mature teratomas and one patient who developed torsion secondary to a mature teratoma and subsequently developed a metachronous contralateral mature teratoma identified 4 months later during routine follow-up. Twenty-four of the twenty-five ovarian masses underwent
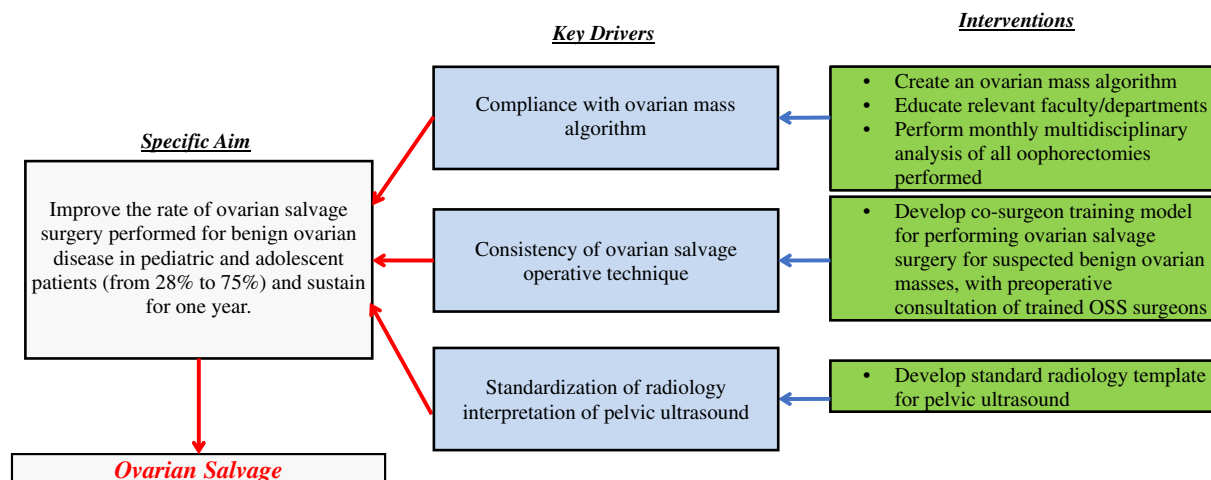

Fig. 1. Key Driver Diagram. The key driver diagram summarizes specific interventions targeting the specific aim of improving ovarian sparing surgery, with the ultimate goal of ovarian preservation. OSS: ovarian salvage surgery.