# Improving the Quality of Ultrasound Reporting for Pediatric Breast Masses through Implementation of an Investigation and Management Algorithm

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# Introduction

- Breast Imaging-Reporting and Data System (BI-RADS) is not validated in the adolescent/pediatric population since breast malignancy is rare (<1%) in the pediatric population.
- BI-RADS has been shown to overestimate the likelihood of malignancy, increasing the risk of injury to the developing breast tissue if biopsies are recommended as frequently as in the adult population.
- Currently, there are no consensus guidelines for reporting and management of pediatric breast masses.

# Goal

To standardize and improve pediatric breast ultrasound (US) reporting through education and implementation of an algorithm for investigation and management of palpable breast masses evaluated by ultrasound.

# Methods

1st cycle: Retrospective review of breast ultrasound reports from April 1, 2011 – March 31, 2021

Education and implementation of algorithm for investigation of palpable pediatric breast masses

2nd cycle: Retrospective review of breast ultrasound reports from July 6, 2021 – September 30, 2022

- Retrospective review of breast ultrasound reports performed at BC Children's Hospital (BCCH) of female patients aged 8-20 years
- Report evaluation for the presence of:
  - Lesion descriptors: shape, orientation, margin, echo pattern, posterior features, calcifications, vascularity
  - Diagnosis or differential diagnosis
  - Management recommendations

- Lesions were subcategorized into solid or mixed solid & cystic (i.e. complex) masses, cystic masses, other findings (e.g. ductal ectasia, vascular masses).
- The audit focused on solid or complex masses since they have a greater risk of being malignant compared to other types of lesions.

# 1st Cycle Results

Total breast US reports: 195

Total reports with findings: 87

**Excluded:**

Normal or asymmetric breast buds: 106

Outside of age range (30 year-old): 1

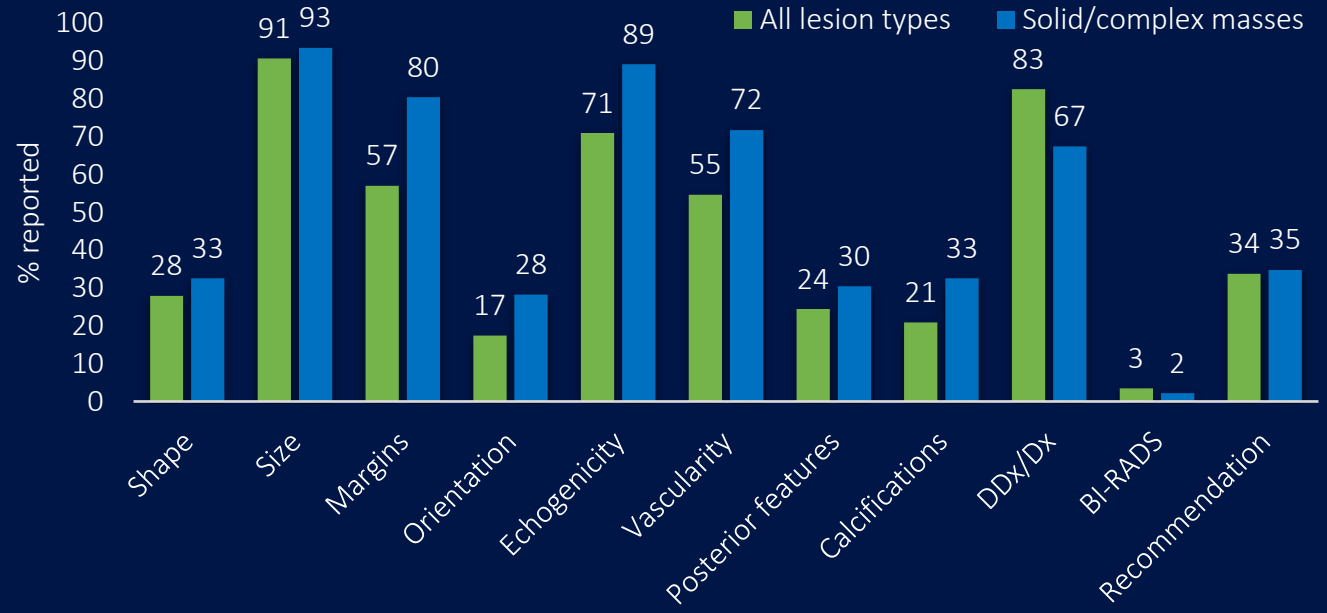
Reports of solid/complex masses: 47

Reports of cystic masses: 27

Reports of other findings: 13

| Lesion type | Diagnosis |
|---|---|
| Solid/complex mass | Fibroadenoma<br>Juvenile fibroadenoma<br>AML breast infiltrate<br>Post-surgical change<br>Intramammary lymph node |
| Cystic mass | Cyst, cluster of cysts, collapsed cyst |
| Other findings | Dilated ducts<br>Abscess<br>Congenital hemangioma<br>Low-flow lymphovenous malformation |

# 1st Cycle: Report content review




- There is variable use of lesion descriptors regardless of lesion type.
- Some reports included a BIRADS category, even though it is not applicable to the pediatric population.
- **Most reports do not include management recommendations.**

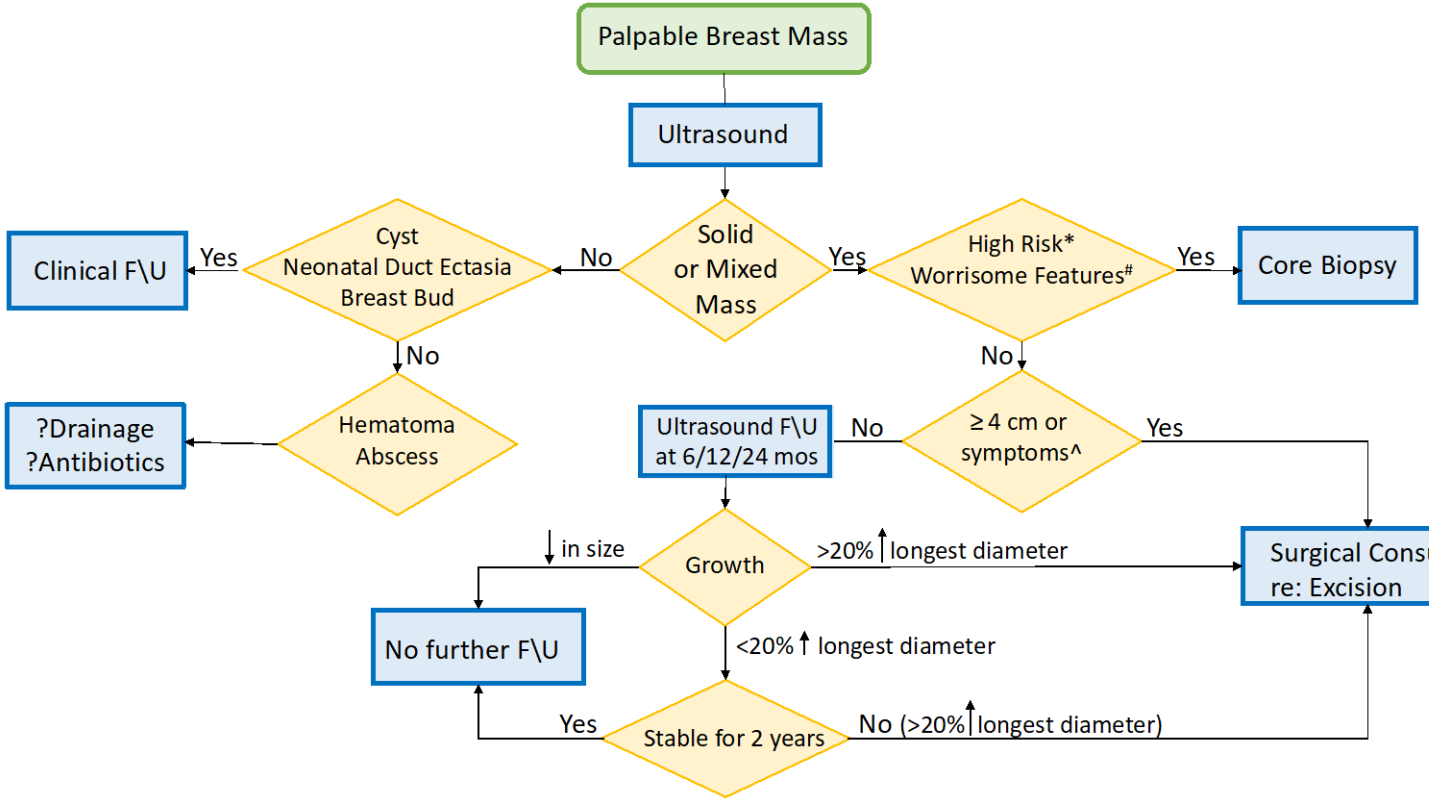
# Intervention

- Since there are no consensus guidelines on pediatric breast mass management, an institutional algorithm was created in conjunction with the Pediatric General Surgery and the Pediatric Oncology departments. The algorithm was presented at the Department of Pediatric Radiology Education/Quality Improvement Rounds to inform and provide guidance for Pediatric Radiologists.

- The framework of the algorithm was based on a literature review including proposed algorithms by different institutions, with the key points:
    - Solid masses up to 4-5 cm with no worrisome features are typically benign
    - Any suspicious sonographic features warrants surgical consultation or biopsy
    - Lesion growth of <20% of the longest diameter was associated with a benign lesion
    - Patients with genetic mutations predisposing to cancer, patients with prior mantle radiation and those with known other primary malignancy with a breast lesion warrant surgical consultation

- Internal review of breast pathology samples in our institution during the 10-year period showed that breast malignancy was only found in patients with prior cancer.

# Investigation Algorithm for Palpable Breast Masses in Pediatric Population




*** High Risk**

1. Known malignancy
2. Tumour Syndrome / mutation
   - BRCA mutation
   - Li Fraumeni
   - Cowden / PTEN
   - Rett's
3. Prior chest radiation

**# Worrisome Features**

1. Irregular shape
2. Non-circumscribed margins
   - -spiculated / angular
   - -microlobulated
3. Antiparallel to skin margin
   - i.e. taller than wide
4. Calcification
5. Posterior shadowing

**^ Symptoms**

1. Nipple discharge
2. Skin Changes
3. Pain
4. Anxiety

The algorithm was introduced to the institution's Pediatric Radiology department during the Quality Improvement Rounds in June 2022. A second cycle review of US reports between July 2021 – September 2022 was undertaken.

# 2nd Cycle Results

Total breast US reports: 60

Total reports with findings: 23

**Excluded:**

Normal or asymmetric breast buds: 37

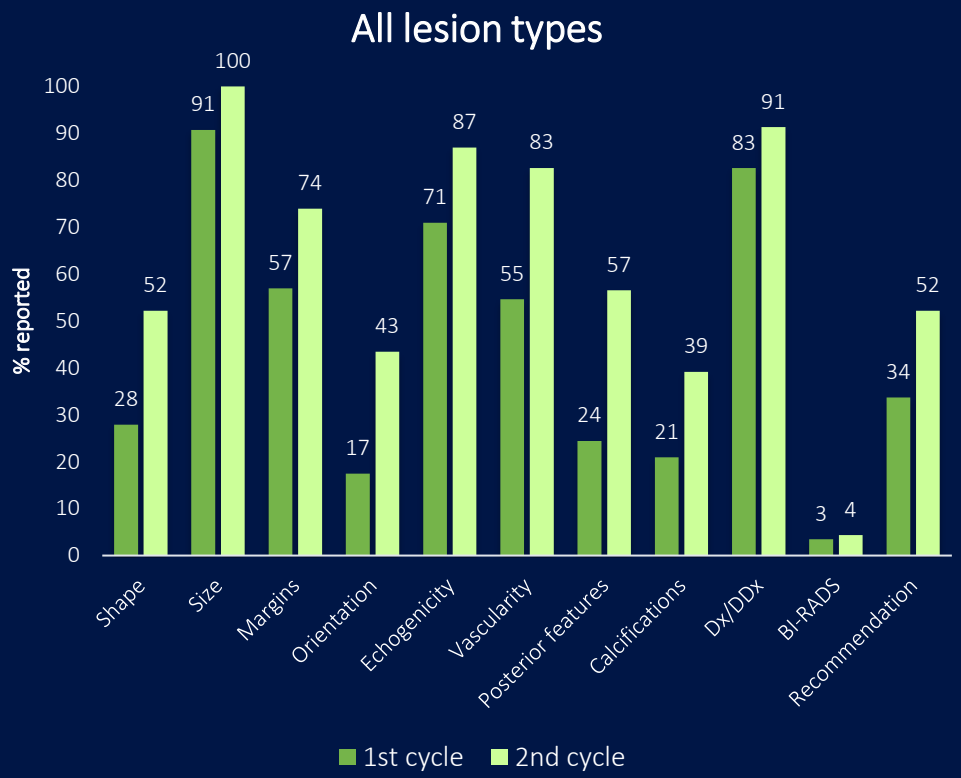
Reports of solid/complex masses: 12

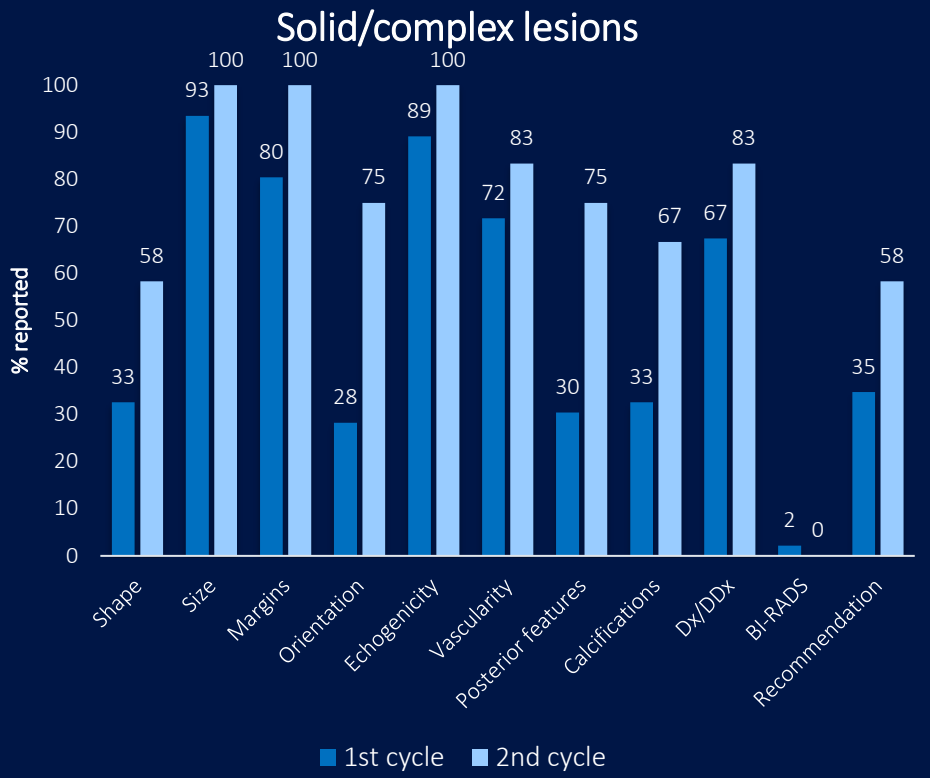
Reports of cystic masses: 5

Reports of other findings: 6

| Lesion type | Diagnosis |
|---|---|
| Solid/complex mass | Fibroadenoma<br>Juvenile fibroadenoma<br>“Mixed solid cystic retroareolar lesion” vs abscess |
| Cystic mass | Cysts, cluster of cysts, collapsed cyst |
| Other findings | Dilated ducts<br>Ductal ectasia<br>Abscess |

# 2nd cycle: Report content review




- Substantial improvement in the inclusion of lesion descriptors, diagnosis or differential diagnosis, but only slight improvement in the provision of a management recommendation.

# Conclusions

- Prior to intervention, pediatric breast ultrasound report content were inconsistent.
- The investigational algorithm provides guidance for management of pediatric breast masses.
- Since the introduction of the algorithm, there has been improvement in the inclusion of relevant lesion descriptors, provision of a diagnosis or differential diagnosis and management recommendations.