Button Battery Ingestion: A Race Against the Clock

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1. **DEFINE**

**Problem Statement:** According to the National Poison Data System, 3435 button battery ingestion cases were reported in 2012. Of those cases, 66% occurred in children younger than 6 years and 30 reported fatalities occurred in patients 4 years or younger. Pediatric patients who have swallowed a button battery present a unique challenge to the medical team, who must quickly and correctly distinguish the button battery from a myriad of benign foreign objects. The consequence of misdiagnosis or delayed diagnosis can be serious injury or death. At our own organization, we identified opportunities for improving timely recognition and treatment of suspected button battery ingestion patients.

**Aim Statement:**
- For all patients with suspected button battery ingestion, reduce time from patient arrival to diagnosis to within one hour.
- For all patients with confirmed button battery ingestion requiring urgent removal, reduce time from patient arrival to time of button battery removal to within 2 hours, which aligns with national guidelines for preventing permanent harm or patient death.

2. **MEASURE AND ANALYZE**

**Inclusion criteria:** ED patients with chief complaint of foreign body: button battery/coin/magnet

**Exclusion criteria:** None

**Process Metrics:**
- Patient arrival to acuity assigned
- Patient arrival to X-ray order
- Patient arrival to X-ray complete

**Outcome Metrics:**
- Proxy for time to diagnosis
- *Patient arrival to X-ray read
- *Patient arrival to cut time
- Proxy for time removal

3. **PILOTED IMPROVEMENTS**

- Care algorithm that delineates agreed upon workflows and specific role responsibilities
- Implementation of a clinical care guideline anchored by a series of BPAs within the EHR
- Order set that informs best practice and optimizes efficiency
- Series of BPAs that guide the right team members to the right information at the right time
- Focus on reliable, system changes as a mechanism for improvement (e.g., 24/7 radiology availability)

4. **RESULTS**

**Baseline vs. Post Intervention**

- Arrivals to X-ray Read (average in minutes)
  - Baseline: 85.6
  - Post Intervention: 75.95
- Arrivals to X-ray Completed (average in minutes)
  - Baseline: 115
  - Post Intervention: 113
- Arrivals to X-ray Ordered (average in minutes)
  - Baseline: 83
  - Post Intervention: 67.6
- Arrivals to Acuity assigned (average in minutes)
  - Baseline: 6.5
  - Post Intervention: 5.9

**In the 7 month post-intervention period, average time from patient arrival to x-ray read (or diagnosis) is 85.6 minutes, a 76% reduction from the average time of 351 minutes in the pre-intervention period.**

In the post-intervention period, we have not had a patient requiring an urgent surgical intervention. Therefore, we cannot yet report results in time from patient arrival to button battery removal.

5. **LESSONS LEARNED**

1. Making a sustainable impact requires working across departments rather than in silos.
2. Value and functionality of clinical decision support increases dramatically with EHR end-users as team leads during the design phase.
3. Engaging in improvement work does not mean you have to select a QI OR safety approach—chances for success increase with a blend of both.

**References:**