EVALUATING THE IMPLEMENTATION OF A QUALITY IMPROVEMENT INITIATIVE: WEEKEND GASTROJEJUNOSTOMY TUBE MAINTENANCE SERVICE IN A TERTIARY PEDIATRIC CENTER

Diana Jaskolka BMSc[1], Nicole Brown CRA [2], Eyal Cohen MD, MSc, FRCP(C) [3], Bill Mounstephen MD [4],, Bairbre Connolly MB, FRCP(C) [2]

The Hospital for Sick Children, Toronto, University of Toronto

1. Medical Sciences, University of Western Ontario; 2. Division of Image Guided Therapy, Diagnostic Imaging, SickKids, University of Toronto
3. Division of Pediatric Medicine, SickKids, University of Toronto. 4.Division of Emergency Medicine, SickKids, University of Toronto.

INTRODUCTION

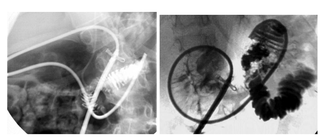
BACKGROUND:

- Children unable to feed safely and adequately by mouth may be fed via a gastrostomy tube (G)
- Children with associated severe gastroesophageal reflux may be fed via a gastrojejunostomy (GJ) tube.
- Many children fed via GJ tubes have multiple complex co-morbidities – medically fragile group of children
- GJ tubes require intermittent maintenance procedures (tube checks, changes, reinsertions)
- Most GJ maintenance procedures require fluoroscopy & a return visit to hospital (mean 1.2-1.7 times/year)
- GJ Tube maintenance procedures are usually not considered an emergency

CLINICAL SETTING:

A tertiary academic pediatric center, SickKids, Toronto, Canada

- 300 bed pediatric hospital
- 160 new G tubes placed annually by IR
- 30 new GJ tubes placed annually by IR
- 380 GJ Maintenance procedures annually



PRIOR PROCESS FOR GJ MAINTENANCE

Monday – Friday 8am – 6pm

➢ Patients/families call Enterostomy Service or IR directly for problems relating to their GJ tube. Maintenance procedure added to the existing IR list that day.

After Hours

➢ Most patients present to the Emergency Department (E.D.) are added to the following day's IR list.

At Weekends (W/E)

➢ Most patients present to the E.D. and wait until the next working day (Monday), to have their GJ problem addressed (i.e. could wait up to 72 hours in the E.D.; some admitted for hydration). Not optimal clinical care!

➢ Occasionally GJ maintenance procedures were performed at W/E on an ad-hoc or case-by-case basis, and following staff-to-staff discussion (E.D. to IR)

GAP

We Identified a gap in service provided for children requiring GJ maintenance procedures at W/E

QUALITY IMPROVEMENT INITIATIVE

PRIMARY GOAL: To improve clinical care of patients & their families by providing a W/E GJ service

AIM:

- To reduce the length of stay in the E.D.,
- To reduce number of GJ related hospital admissions,
- To reduce overall hospital costs, which would outweigh the additional costs born by IR.

.

ADDRESSING THE GAP

1. Multidisciplinary discussions involving E.D., IR & General Pediatric Staff , on how best to bridge the identified gap in care
2. Created **New Weekend Quality Improvement Initiative:**
   1. IR team would offer GJ maintenance procedures once a day at W/E.
   2. On the W/E mornings, the IR team would call the E.D. to enquire if there were any patients with GJ- related problems
   3. The case would be arranged to be done when the team was called in for another case. If no other case pending, the IR team would be called in specifically for the GJ maintenance procedure
   4. Any cases which arrived to E.D. after that time would be held until the next day
3. Under new initiative:
   - Maximum wait time therefore should be <23 hours in E.D
   - Admissions solely while waiting for a GJ maintenance procedure should be avoided.
   - Assessment of impact of the initiative after implementation in terms of patients, IR and costs
4. Concerns or foreseen potential problems:
   - ➢ Additional service would add more stress on already overstretched IR team
   - ➢ Cost impact greatest on IR
   - ➢ Abuse of the system

PROVISION OF A W/E GJ MAINTENANCE SERVICE COMMENCED IN MAY 2007.

PURPOSE OF THE STUDY

The purpose of this study was to evaluate the impact of the W/E GJ Tube Maintenance Procedures Initiative by comparing the year prior to the initiative (Period 1. May 2006- 2007) to the year following the initiative (Period 2. May 2007 -2008).

MATERIALS AND METHODS

Hospital Research Ethics Board approval

Retrospective review undertaken

To study experience of providing GJ tube maintenance procedures at W/E

Inclusion criteria: patients presenting to the E.D. at the W/E (Friday 5pm to Monday 8.00AM) with GJ related problems

Exclusion criteria: inpatients with GJ related problems; patients in the E.D. outside of the W/E hours

Outcome measures: wait time in E.D. (from triage to procedure time) in hours; number of admissions to hospital; number of complications

CLINICAL DATA SOURCES

1. Electronic Patient Chart
2. PACS
3. *ESH*-IGT a dedicated IR database (www.*esh*igt.ca)
4. Sources for cost assessments
   - Ontario Health Insurance Plan (OHIP) Schedule of Benefits (per case)
   - Standard per diem hospital costing for admissions
   - Case costing from *ESH*-IGT database
     - Labor – Nursing & Technologists call back fees, Physicians salary
     - Room occupancy & overheads
     - Consumables / Materials

STATISTICAL ANALYSIS

1. Minitab Release 14.20 (State College, PA)
2. Compared Period 1 to Period 2, (demographics, clinical presentation, outcomes, costing
3. Fishers's exact

RESULTS

Table 1: Patient demographics

38 Patients eligible
14 patients in Period 1 and 24 patients in Period 2.
No statistical difference in patient demographics between Period 1 and Period 2

Table 2: Outcome measures relating to Q.I. initiative

- ❖ No difference in the mean overall duration in the E.D. between Period 1 and 2 (p=0.58)
- ❖ Triage to procedure time decreased from 16.4 hours in Period 1, to 11.2 hours in Period 2
- ❖ Significant reduction in the maximum wait time between Period 1 (54.6 hours) and Period 2 (24.2 hours)
- ❖ Mean procedure length significantly reduced between Period 1 (22mins) & Period 2 (16mins) (p=0.02)
- ❖ No admissions in Period 2 solely to wait for the GJ tube maintenance procedure:
  - 4 patients admitted in Period 1 for hydration/supportive care waiting GJ; mean length of stay 1.25 days.
  - 1 patient admitted in Period 2 for 2 days for medical issues from complex co-morbidities unrelated to his GJ tube (p=0.05).
- ❖ No complications occurred in either Period

72% of procedures were performed during a call back for another procedure in Period 1 versus 62.5% in Period 2 (p=0.73).
No nasogastric / nasojejunal tubes were placed in either period.
Number of IV starts not measurable to inconsistency in documentation

Table 3 Total Costs

Admissions costs were higher in Period 1 than Period 2 (Table 3).
All other total costs to the hospital increased in Period 2, as more patients were treated in Period 2 than 1 (24 versus 14). But cost per patient decreased (p=0.04)

Table 4: Costs per Patient

- Almost twice as many patients presented to the E.D. in Period 2 as compared to Period 1
- The mean costs per patient reduced in all aspects except labor and diagnostic imaging costs in Period 2

Informal interviews of the IR and E.D. staff revealed a strong preference for the planned, organized arrangement in Period 2, as compared to the irregular, unplanned ad hoc process in Period 1

Table 1	Period 1 n = 14	Period 2 n = 24	P-Value
Age Mean (years ± SD) Median, Range	5.2 ± 4.73.5, 0.3 - 14.0	3.4 ± 4.51.6, 0.3 - 15.0	0.26
Weight Mean (kg ± SD) Median, Range	16.4 ± 10.914.0, 6.1 - 48.0	14.1 ± 10.39.7, 5.1 - 40.0	0.53
Gender: Males, n (%) Females , n(%)	8 (57)6 (43)	15 (63)9 (37)	0.75
Diagnosis:			
Cardiac: n(%)	3 (21.4)	4 (16.7)	1
Neurological: n (%)	4 (28.6)	7 (29.2)	1
Cong Anomalies: n (%)	5 (35.7)	8 (33.3)	0.89
Gastrointestinal: n (%)	2 (14.3)	3 (12.5)	1
Other: n (%)	0 (0)	2 (8.3)	n/a

Table 2	Period 1 N = 14	Period 2 N = 24	P-value
Mean duration in ED (hours±SD) Median (Range)	12.9 ± 8.9 11.3 (2.1 - 30.3)	11.3 ± 7.6 10.2 (1.7 - 24.8)	0.58
Mean Interval from Triage to Procedure (hours ± SD) Median (Range)	16.4 ± 14 13.6 (2-54.6)	11.2 ± 7.7 12.3 (1.2 - 24.2)	0.22
Mean Procedure Time (mins ± SD) Median (Range)	22.1 ± 6.1 25.0 (15.0-30.0)	16.7 ± 7.2 15.0 (10.0-30.0)	0.02
Number of Patients Admitted, n (%)	4 (28.6)*	1 (4.2)**	0.05

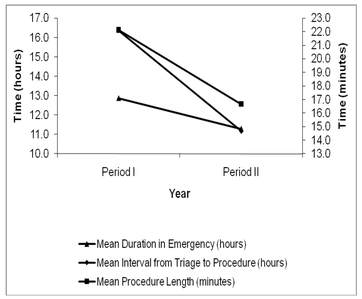


Table 3 n = 38	May 15 '06 – May 14 '07 n = 14	May 15 '07 – May 14 '08 n = 24
Cost for Emergency Stays ($)	6,037.36	9,257.05
Cost for Diagnostic Imaging ($)	260.90	563.70
Cost for Image Guided Therapy ($)	13,639.13	22,110.93
-Material Costs ($)	2,722.67	3,666.44
-Labor Costs ($)*	9,286.57*	16,393.94*
-Equipment Costs ($)	1,629.83	2,050.55
Cost for Admissions for GJ ($)	3,675.00	1,470.00
TOTAL Cost for Given Period ($)**	23,612.39**	33,401.68**

Table 4 n = 38	Period I n = 14	Period II -n = 24	P-value
ED			
Mean Cost for Emergency Stays ($ ± SD) Median, Range	431.2 ± 255.6 384.1, 120 – 934	385.7 ± 218.5 353.3, 107.9 - 774.3	0.59
IGT			
-Mean Material Costs ($ ± SD) Median, Range	194.5 ± 76.1 170.8, 129.8 - 392.1	152.8 ± 52 152.1, 14.1 - 290.8	0.08
-Mean Labor Costs ($ ± SD)* Median, Range	663.3 ± 225* 659.2, 348.- 959.2	683.1 ± 231.2* 659.2, 135.8 - 959.2	0.74
-Mean Equipment Costs ($ ± SD) Median, Range	116.4 ± 32.1 131.4, 78.9 - 157.7	85.4 ± 36.6 78.9, 52.6 - 157.7	0.01
Mean Total Cost for IGT ($ ± SD) Median, Range	974.2 ± 207.7 934.9, 597.6 - 1,269	921.3 ± 272.5 875.8, 220.5 - 1,381.4	0.5
DI			
-Mean Cost for Diagnostic Imaging ($ ± SD) Median, Range	18.6 ± 30.2 0, 0 – 98	23.5 ± 53.8 0, 0 - 173.3	0.72
HOSPITAL STAY (n=4 Period I; n=14 in Period II)			
- Mean Cost for patient admitted ($)	262.60	61.25	n/a
TOTAL COSTS			
-Mean Cost Per Patient ($ ± SD)** Median, Range	1,686.60 ± 447.3** 1,319.6, 717.5 - 2,300.7	1,391.74 ± 293.6** 1,392.82, 855.70 - 1,813.42	0.04

DISCUSSION

Interventional radiology led quality initiative
Resulted in improvement in the provision of care (shorter wait times, avoidance of admissions, shorter procedure times), and some associated cost savings
In line with increasing focus in health care on evaluation of initiatives for Quality, Cost, Safety, and Different measurement models / metrics.
In line with Institute of Medicine's recognized 6 cornerstones of quality in health care: **Safety, Effectiveness, Patient centeredness, Timeliness, Efficiency , Equity.**
Triage-to-procedure time in E.D. is pertinent to this study and showed a reduction.; many other factors influence overall wait times in E.D. , outside of this study
Did not result in any loss in quality (no increase in complications).
Unexpected increase in numbers of patients presenting to E.D. with GJ related problems in period 2. Cause is uncertain: parental networking? greater expectation

LIMITATIONS: Retrospective
Numbers in both period are small and unequal
Some factors not measurable (# of I.V. starts and attempts)
Requisitions from E.D. are not electronic, so not easily traceable or accurately timed

CONCLUSION

This represents an I.R. led quality improvement initiative that improved the timely delivery of patient care.
Eliminated hospital admissions for GJ maintenance procedures, cost less per patient and eased staff stress.

RFERENCES

1. Wales, P.W., Diamond, I.R., Dutta, I.R., Muraca, S., Chait, P., Connolly, B., Langer, J.C., Fundoplication and Gastrostomy Versus Image-Guided Gastrojejunal Tube for Enteral Feeding in Neurologically Impaired Children with Gastroesophageal Reflux. J Pediatr Surg. 2003; 37(3): 407-12.
2. Srivastava, R., Downey, E.C., O'Gorman, M., et al. Impact of Fundoplication Versus Gastrojejunal Feeding Tubes on Mortality and in Preventing Aspiration Pneumonia in Young Children with Neurologic Impairment who have Gastroesophageal Reflux Disease. Pediatrics. 2009; 123(1): 338-45.
3. Friedman, J.N., Ahmed, S., Connolly, B., Chait, P., Mahant, S., Complications Associated with Image-Guided Gastrostomy and Gastrojejunostomy Tubes in Children. Pediatrics. 2004; 114(2): 458-61.
4. Goldberg, E., Kaye, R., Yaworski, J., Liacouras, C., Gastrostomy Tubes: Facts, Fallacies, Fistulas, and False Tracts.Gastroenterol Nurs. 2005; 28(6): 485-93
5. Saavedra, H., Losk, J., Shanley, L., Titu, M., Gastrostomy Tube -Related Complaints in the Pediatric Emergency Department. Ped Emerg Care. 2009; 25(11): 728-732
6. Ministry of Health and Long Term Care, Ontario. 2009 Schedule of Benefits for Physician Services. Available at: www.health.gov.on.ca/english/providers/program/ohip/sob/physserv/d_radiol.pdf. Accessed September 10, 2009.
7. Physician-Parent Caregivers Inc. What is Quality Health Care? Available at: www.ppc-inc.org/qualitymain.php. Accessed July 15, 2009.
8. Shaller, D, Implementing and Using Quality Measures for Children's Health Care: Perspectives on the State of the Practice. Pediatrics. 2004; 113(1): 217-27.
9. Horton, R., Murray, C., Frenk, J., A New Initiative and Invitation for Health Monitoring, Tracking, and Evaluation. Lancet. 2008; 371(9619): 1139-40.
10. Johnson, C.D., Krecke, K.N., Miranda, R., Roberts, C.C., Denham, C. Quality Initiatives: Developing a Radiology Quality and Safety Program: A Primer. Radiographics. 2009; 29(4): 951-9.
11. Blackmore, C.C., Defining Quality in Radiology. J Am Coll Radiol. 2007; 4(4): 217-23.
12. Maher, B., Pratt, S., What is Quality Radiology? Radiology Business Journal. 2008; Fall: 22-27
13. Anderson, E.A., Zwelling, L.A., Strategic Service Quality Management for Health Care. Am J Med Qual. 1996; 11(1): 3-10.
14. Steele, J.R., Schomer, D.F, Continuous Quality Improvement Programs Provide New Opportunities to Drive Value Innovation Initiatives in Hospital-Based Radiology Practices. J Am Coll Radiol. 2009; 6(7): 491-9
15. Mills, A.M., Baumann, B.M., Chen, E.H., et al.The Impact of Crowding on Time Until Abdominal CT Interpretation in Emergency Department Patients with Acute Abdominal Pain. Postgrad Med. 2010; 122(1): 75-81.
16. Donnelly, L.F., Dickerson, J.M., Lehkamp, T.W., Gessner, K.E., Moskovitz, J., Hutchinson, S., IRQN Award Paper: Operational Rounds: A Practical Administrative Process to Improve Safety and Clinical Services in Radiology. J Am Coll Radiol. 2008; 5(11): 1142-9.
17. Rachlis, M, Kushner, C. Second Opinion: What's Wrong with Canada's Health Care System and How to Fix it. Toronto, Canada: William Collins Sons & Company, Canada Ltd.; 1989.