# Implementing an Early Feeding Pathway Post-Gastrostomy Insertion Reduces Inpatient Stay

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## Abstract

**Background:** There is no consensus regarding optimal post-operative feeding strategy following gastrostomy insertion in children. The aim of this study was to determine whether implementing an early post-operative feeding pathway reduces length of stay (LOS) without increasing complications.

**Methods:** Retrospective casenote review of all children having a new gastrostomy inserted during a one-year period prior to (July 2016 - July 2017) and following (July 2017-July 2018) pathway introduction. Children unable to follow the pathway for co-existing medical or nutritional reasons were excluded. The pathway comprised feeding 50% of normal feed 2 hours post-procedure, followed by 100% of normal feed at 5 and 8 hours. Previously, patients were fed post-operatively according to surgeon’s preference.

**Results:** 116 cases met inclusion criterial; 55 prior to and 61 after pathway implementation. Children following the early feeding pathway had a shorter post-operative LOS than the historical group (median 28 *vs* 33 hours, p<0.003) whilst immediate (<72 hours) and early (<30 day) complication rates were similar (8.2 *vs* 7.3%, p=1.00 and 12 *vs* 16%, p=0.59 respectively).

**Conclusions:** We conclude that early post-operative feeding after gastrostomy insertion is safe and reduces LOS.

**Type of Study:** Quality improvement

**Level of Evidence: III**

**Keywords:** Gastrostomy; Early feeding; Paediatric; PEG

## Introduction

Gastrostomy insertion is a common elective paediatric surgery operation. The most frequent indication for gastrostomy insertion is nutritional deficiency or swallowing impairment secondary to neurological disorders or congenital malformations [1–3].

Traditionally, feeding has been held after gastrostomy insertion for a period of time (often up to 12 hours or more) to reduce the risk of aspiration and leakage either into the peritoneal cavity or around a newly formed gastrostomy tract[3]. In the adult population, there is evidence that early feeding after gastrostomy insertion is safe and well-tolerated[4,5]. However, there is currently no consensus about optimal time for withholding gastric feeds after gastrostomy insertion in children[6]. This results in a wide variation in length of stay (LOS) in hospital following elective gastrostomy insertion which may subsequently contribute to high healthcare costs[7].

At our centre, we implemented an early standardised feeding pathway following elective gastrostomy insertion as part of a quality improvement initiative. The aim of introducing the pathway was to attempt to standardise care and reduce LOS, whilst maintaining an acceptably low complication and readmission rate. We herein report our findings.

## Methods

### 1.1 Study design

Following institutional approval, cases were identified from a prospectively maintained departmental clinical database. Data collection from casenotes was retrospective. Children (age <18 years) having an elective new gastrostomy inserted during a one-year period prior to (July 2016 - July 2017) and one-year following (July 2017-July 2018) pathway introduction were eligible for inclusion. Prior to pathway introduction, the timing of commencement of feeds and rate of advancement following gastrostomy insertion was at surgeon discretion. Following the introduction of the new pathway in July 2017, the default option was for all children having a gastrostomy to follow the pathway. However the pathway was found not to be suitable for all children since some had co-existing medical reasons (e.g. cancer and chronic renal failure patients) or nutritional reasons (e.g at high risk of refeeding syndrome) that precluded them from following the pathway. The cases were excluded from comparative analysis within this report.

Patient demographics (including gender, age, weight at surgery and co-morbidities), indication for procedure, tube type, insertion method, LOS in hospital from admission and from time of surgery, immediate (<72 hours) and early (<30 days) post-operative complications and re-admissions were recorded.

### 1.2 Clinical Pathway

The early feeding pathway comprised giving 50% of the patient’s normal feed at 2 hours post-procedure, followed by 100% of normal feed at 5 and 8 hours. (Figure 1) Timing for the first feed was calculated from the end of the procedure. If the patient did not tolerate the feed, they had a medical review and repeated the step later on. Intolerance was defined as leak of feed from gastrostomy site, increased pain from feeding, emesis of >50% of feed or respiratory or haemodynamic instability. All patients had gastrostomy care teaching pre and/or post-operatively as part of the pathway by a paediatric surgical nurse specialist. Once patients achieved 2 full feeds and had their gastrostomy teaching, they were fit for discharge. All patients on the pathway had a 30-day telephone follow-up by a paediatric surgical nurse specialist and would be able to contact a paediatric surgical nurse specialist with any problems after insertion.

### 1.3 Statistical Analysis

Data from the two groups (prior to pathway introduction and following pathway introduction) were compared using appropriate statistical techniques. The primary outcome for this study was hospital length of stay following procedure. Secondary outcomes were hospital length of stay from time of admission, proportion discharged within 36 hours of procedure (i.e. no more than 2 nights stay in hospital), immediate (<72 hours) and early (<30 days) post-operative complications and re-admissions related to the gastrostomy insertion procedure. All statistical analyses were performed using SPSS V.25 (IBM, Armonk, New York, United States of America). Data are presented as either percentages or median with range. The Mann-Whitney U test was used for non-parametric continuous data and Fisher’s exact test for categorical data analyses. A P value of <0.05 was considered statistically significant.

## Results

### 2.1 Patient characteristics

Of the 185 gastrostomy insertions, 116 cases met inclusion criteria; 55 prior to and 61 after pathway implementation (Figure 2). 49 patients were in hospital for another medical reason, 7 had a concurrent procedure, 3 had a primary percutaneous endoscopic gastrostomy-jejenostomy, 5 had a risk of refeeding, 1 had a complication in theatre and 1 was over 18 years of age. Two further patients were excluded from the pathway as their gastrostomy was only used for medication.

Demographic and clinical features were similar between both groups (Table 1). The indication for all gastrostomy insertions in both groups in our dataset was for nutritional support.

Overall most patients (109/116) had a percutaneous endoscopic gastrostomy (PEG) which was inserted with laparoscopic assistance in 98. Other methods included single stage Percutaneous Rapid Insertion of Gastrostomy (SPRING)[8] laparoscopic assisted SPRING, and laparoscopic assisted mini Stamm. (Table 2)

### 2.2 Length of Stay in Hospital

Children following the feeding pathway had a shorter post-operative LOS from procedure with a median of 28 hours (20-126) following pathway introduction compared to 33 hours (22 – 174) (p<0.003). Overall, 80% of post-pathway patients were discharged within 36 hours from the time of the procedure compared to 55% of the pre-pathway patients. (p<0.009) (Figure 3).

Similarly, the post-operative LOS from admission was shorter in the feeding pathway group with a median of 32 hours (25-128) compared to 36 hours (25-181) (p<0.01). 72% of patients in the post-pathway group were discharged within 36 hours of their admission as opposed to 48% in the pre-pathway group. (p<0.04)

### 2.3 Complications and Re-admission

Complication rates in both groups were similar for both immediate and early complications (Table 3). Complications included leakage, infection, displacement, erythema, vomiting and febrile illness. Re-admission into hospital, or for the pre-pathway group - prolonging the stay in hospital for a gastrostomy related complication, was also similar between both groups.

## Discussion

Our data indicate that implementing a standardised early feeding pathway after gastrostomy insertion reduces LOS in hospital and is safe, tolerable to the patient and family, and results in shorter hospital stay. Literature currently suggests that most gastrostomy insertions stay approximately 2-3 days in hospital, which may be due to the variability in starting the enteral feed[9]. Our study demonstrates that by standardizing early post-gastrostomy feeding and starting feeds as early as 2 hours following the procedure, more patients can be discharged by 36 hours. These findings are particularly important at time when reducing healthcare costs is increasingly important.

Whilst previously surgeons routinely delayed feeds after elective gastrostomy insertion for relatively long periods of time, there are some studies that demonstrate this is not necessary in all children. Several observational studies and a small number of randomised trials have shown that early feeding pathways are associated with reduced length of stay and no increase in complication rates[10–15]. Anecdotally these practices have not been universally adopted into routine clinical practice. Encouraged by the evidence to date we therefore implemented a standardised pathway and have been able to show benefit in real life, outside the constraints of a RCT.

The definition of what different surgeons and researchers have defined as ‘early’ feeds varies. Previous definitions of ‘early’ feeding after gastrostomy insertion range from 3 hours [10,11] to 6 hours[13,14]. We decided, perhaps somewhat arbitrarily, to feed after 2 hours and have demonstrated this to be safe. Similarly, the detail of the feed pathways used varies between reports. We used a pragmatic approach including appropriate post-operative clinical monitoring, that allows advancement to full feeds by 5 hours following gastrostomy insertion and discharge after 2 full volume feeds have been tolerated at 8 hours following surgery. We acknowledge that in the future it is possible that an even shorter post-operative length of stay may be appropriate and achievable in some children.

There are a number of other aspects to the peri-operative care that we believe are important to realise the success of this pathway. These include adequate engagement with the family and community nursing teams prior to gastrostomy insertion, allowing for provision of specialist equipment that may be necessary as well as education of the family in gastrostomy care, ideally before the day of the procedure. Thus unnecessary delays in discharge due to these factors can be avoided. The prior involvement of a paediatric dietician is also recommended.

Most previous studies report primarily PEG insertions[10,12,13] with some only on laparoscopic gastrostomy[15]. Our study is similar in that the majority of gastrostomies inserted were PEGs but we have included all methods of gastrostomy insertion at our centre. Thus despite tube insertion method, an early feeding pathway is appropriate.

There are some limitations to our study. Firstly, this is a single centre study where we have implemented the pathway. Generalisability of our study should be taken with caution until further studies at other centres can be completed. Secondly, data were collected retrospectively which relies on the accuracy of documentation in notes. However, we were able to record all data required for this study. The specific nature of our patient population may have negatively affected their discharge time; as our centre is a tertiary paediatric centre, some of our patients are from further afar and discharge may be delayed by travel arrangements such as flight times, or for other social reasons. Future studies should measure the time at which the patient was ready for discharge rather than actually discharged.

The implications of these data are that there are likely to be significant benefits to the healthcare system and patients from adoption of a standardised early feeding pathway. We have shown a significant reduction in length of stay which is likely to be associated with reduced cost and potentially improved patient and family satisfaction. We acknowledge that we have not measured either of these outcomes but plan to in the future. The reduction in length of stay that can be achieved in some patients also raises the concept of day case elective gastrostomy insertions if the procedure were to be performed first case in the morning.

### Conclusion

Our study demonstrates an early feeding pathway is associated with a shorter hospital admission without an increase in complication rates. Early initiation of feeds with a standardised feeding pathway should be considered in paediatric elective gastrostomy insertions. Future work should examine the further anticipated benefits including cost savings and improved patient and family satisfaction.

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## Appendix

#### Figure 1

Early Feeding Pathway



#### Figure 2

Patient Inclusion and Exclusion (A) Pre-pathway (B) Post-pathway



#### Figure 3

Length of Stay in Hospital from Time of Procedure (A) Pre-pathway and (B) Post-pathway



#### Table 1

Patient Demographics

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Pre-pathway (n=55)** | **Post-pathway (n=61)** | **P\*** |
| **Age, years (range)** | 4.3 (0.6-17.4) | 2.4 (0.6-15.6) | 0.21 |
| **Weight, kg (range)** | 14.7 (4.0-52.0) | 11.2 (5.0-27.0) | 0.05 |
| **Male, n (%)** | 28 (51) | 41 (67) | 0.09 |
| **Neurodisability, n(%)** | 45 (82) | 48 (79) | 0.82 |

Data presented as median (range) or number of cases (%)

\* Mann-Whitney U test or Fisher’s exact test as appropriate

#### Table 2

Procedure Type

|  |  |  |
| --- | --- | --- |
|  | **Pre-pathway (n=55)** | **Post-pathway (n=61)** |
| **Laparoscopic assisted PEG** | 89.1% (49) | 80.3% (49) |
| **PEG** | 0% (0) | 18% (11) |
| **Laparoscopic assisted Mini Stamm** | 5.5% (3) | 0% (0) |
| **SPRING** | 3.6% (2) | 1.6% (1) |
| **Laparoscopic assisted SPRING** | 1.8% (1) | 0% (0) |

PEG – percutaneous endoscopic gastrostomy;

SPRING – single stage percutaneous rapid insertion of gastrostomy button

#### Table 3

Complication and Re-admission rates

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **72 Hr**  **Pre-Pathway**  **(n=55)** | **72 Hr**  **Post-Pathway**  **(n=61)** | **30 days**  **Pre-Pathway**  **(n=55)** | **30 days**  **Post-Pathway**  **(n=61)** |
| **Leakage** | 4 (7.3%) | 3 (4.9%) | 7 (12.7%) | 8 (13.1%) |
| **Infection** | 0 | 0 | 3 (5.5%) | 0 |
| **Displacement** | 0 | 0 | 0 | 1 (1.6%) |
| **Other** | 0 | 2 (3.3%)  (febrile) | 3 (5.5%)  (vomiting, rash) | 3 (1.6%)  (febrile, erythema) |
| **Re-admission**  **(/stayed in**  **hospital)** | 3 (5.5%)  (leak) | 2 (3.3%)  (febrile and  vomiting,  leak) | 5 (9.1%)  (leak, infection,  inability to  tolerate feeds) | 3 (4.9%)  (febrile and  vomiting,  leak) |

PEG- percutaneous endoscopic gastrostomy