'Cut and push' as an alternative to endoscopic retrieval of PEG type gastrostomy tubes.

Harry Claxton[1,3], Karen Dick[1,4], Rhoda Taylor[1,4], Maddie Allam[1,4], Francesca Stedman[1,5], Charlie Keys[1,6], Nigel J Hall[1,2,7]

Correspondence:

1) Department of Paediatric Surgery and Urology, Southampton Children's Hospital, Southampton, UK

2) University Surgery Unit, Faculty of Medicine, University of Southampton, Southampton, UK

3) **Corresponding author:** Harry Claxton

Harry.claxton1@nhs.net

Address:

18 Woodham Park Road, Woodham, Addlestone, Surrey, KT153ST

4) pscns@uhs.nhs.uk

5) francesca.stedman@uhs.nhs.uk

6) charles.keys@uhs.nhs.uk

7) **Primary supervising author:** n.j.hall@soton.ac.uk

Authorship Contribution and Conflict of interest statement

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All authors declare that they do not have any financial and/or personal relationships with other people or organizations that could inappropriately influence (bias) their work to disclose.

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Abstract

Purpose:

Percutaneous Endoscopically placed Gastrostomy (PEG) tubes are frequently used in children. The traditional endoscopic method to remove/change the PEG device requires general anaesthesia in children. A minimally invasive alternative is the 'Cut and Push' method (C&P): avoiding the risks/wait times of general anaesthesia and reducing resource burden. Data regarding safety/effectiveness of C&P in children are lacking with concerns raised about the possibility of gastrointestinal obstruction.

Methods:

We retrospectively reviewed all cases of PEG removal / change to button in children (<18yrs) between December 2020 and January 2022. Cases were identified from a prospectively maintained database and all cases of C&P included. Parents/carers were asked if the child had suffered any complications following C&P and if flange was visualised in stools.

Results:

During the time period, 27 PEGs were either removed or changed to button via C&P. The average waiting time for C&P was 14.29 days, significantly shorter than the minimum 6 month waiting time for elective endoscopy. Our evaluation revealed no complications of C&P at median 70 days (range 25-301). In three cases the flange was visualised in the stool, at 2 days, 3 days and 5 weeks following C&P respectively.

Discussion:

These data support the available literature suggesting C&P is an effective means to facilitate minimally invasive and prompt PEG removal / change to button in children. We recommend minimum weight and age parameters for this procedure and further evaluation of the safety and resource implications of this technique.

Keywords:

Paediatric surgery, Upper gastrointestinal, Cut and Push, Percutaneous Endoscopically placed Gastrostomy, PEG, Button gastrostomy.

Abbreviations used:

PEG = Percutaneous Endoscopically placed Gastrostomy

C&P = Cut and Push' method

GA = General anaesthesia

Main body of manuscript.

Introduction:

Percutaneous Endoscopically placed Gastrostomy (PEG) tubes are frequently used in children for a variety of reasons including nutritional supplementation, exclusive route of nutrition and medication administration. Within the stomach the PEG is held in place with a 'flange', a flexible disk held against the internal stomach wall [1]. Most PEG tubes require either removal or replacement as a matter of course [2] either due to tube deterioration or patient choice and traditionally this is achieved by accessing the flange via endoscopy. Since endoscopy in most children is poorly tolerated without either general anaesthesia (GA) or sedation [3] a GA is usually required. While GA is never without risk, there may be additional considerations and hence desire to avoid GA in children with significant co-morbidities and the population of children requiring PEG access has a high incidence of co-morbidities [4]. For these reasons a safe alternative to GA for PEG removals would be attractive.

One alternative to endoscopic removal is the 'Cut and Push' method (C&P). The cut and push method refers to the process of cutting the PEG tube externally, flush with the skin and advancing it into the stomach thereby releasing the internal flange. Following this the intention is that the flange passes through the gastrointestinal (GI) tract of the patient [5]. This method has been used in adult patients for over 20 years [5]. There is limited available literature regarding safety and effectiveness of C&P in children.

Historically our practice has been to remove all PEG tubes via endoscopy under GA and avoid C&P due to anecdotal reports of complications related to a retained flange. However, we reconsidered this approach during the SARS-CoV-2 pandemic in light of limited capacity for endoscopic PEG removal under GA resulting in extremely long wait times. We were also aware that this approach was being utilised at other specialist Children's centres. Our motivation to introduce this service was therefore primarily to relieve pressure on our GA endoscopy service as well as to reduce waiting times for patients (and their families), but we were also mindful of the potential benefit of avoiding GA. Given the limited data available regarding outcomes of children who have undergone C&P PEG removal we report our experience.

Methods:

Development of a Cut and Push service:

A C&P service was started in December 2020. Prior to offering our service we developed some inclusion / exclusion criteria following discussion with colleagues at other institutions but not based on any firm evidence. Inclusion criteria were a minimum age of 36 months and minimum weight of 14kg. These limits were intended to reduce the chance of complications, most notably gastrointestinal obstruction due to the physical size of the flange in relation to the child. We excluded patients with any previous abdominal surgery or gastrointestinal comorbidities which may increase the risk of intestinal stricture or adhesions. The C&P is performed by (or under the guidance of) our Specialist Paediatric Surgical nursing team. The final decision for suitability for C&P versus endoscopic retrieval is made by the responsible consultant in conjunction with parental/patient preference. The majority of PEG tubes inserted in our institution are made by Freka (Fresenius Kabi) and size 15Fr. Thus all cases regardless of patient age had the same size of internal flange. Cases that did not meet the criteria for C&P or in whom parents did not wish to proceed were placed on a waiting list for removal under GA. Our institution does not currently offer an endoscopy service under sedation.

Following C&P procedure, parents/carers are provided with an information sheet (figure 1) advising as to signs of obstruction and other concerning symptoms. Carers of children undergoing C+P were given strict safety-netting instructions to contact the specialist nursing team, or visit the emergency department, with any significant gastro-intestinal complaint in the months following the procedure. They were educated as to the theoretical complications of gastro-intestinal obstruction, vomiting and pain. Carers were given no prospective instruction to be vigilant for the flange, they were advised that not visualising the flange was not of concern as it was flexible and likely to pass undetected hidden in the stool.

Initially all cases were performed in hospital by a member of the Specialist Paediatric Surgical nursing team. However more recently some cases have been performed in other hospitals within the region with guidance from our Specialist Paediatric Surgical nurses.

Data collection

We keep a departmental clinical database of all children who have undergone gastrostomy tube insertion to aid effective administration of our service. Since the inception of the C&P service, the specialist nursing team prospectively collected additional data within this database including indication for C&P and any complications. All

cases undergoing C&P from December 2020 until January 2022 were extracted from this database and all cases are included in this report.

For each case, patient case-notes were also reviewed to identify any hospital attendances or admissions following the C&P procedure aiming to identify any complication or adverse event that may be related to C&P.

A single member of the team (HC) undertook a follow-up phone-call with the primary carer for each case, at a minimum of one-month post C+P procedure, and asked a standardised set of follow-up questions:

1. Did the carer have any concern about the C&P procedure?
2. Did the child demonstrate any new complaints or symptoms in the months following the C&P procedure?
3. Specifically did the child demonstrate any vomiting, constipation or change in bowel habit in the months following the C&P procedure?
4. Did the carer visualise the flange in the stool? If so, how long after the C&P procedure?

Service evaluation permission

The project was approved as a service evaluation by our institution.

Results:

During the study time period, 27 PEG's were removed via C&P. Patient demographics are shown in Table 1. During our review, 4 cases were identified that did not meet the pre-planned inclusion/exclusion criteria for our clinical service. Details of these cases, which are included in this report and shown in Table 2.

Twenty two of the 27 cases were performed as elective or planned procedures for the following indications: damaged PEG tube requiring change to button device (n=5), elective change to button gastrostomy device for parent/patient choice (n=14), and gastrostomy no longer required (n=3). All 22 elective cases were performed by the specialist nursing team during a hospital attendance but without hospital admission. The average waiting time for

these elective procedures was 14 days following initial request for change, markedly shorter than waiting time for elective endoscopy under GA which ranged from 6-8 months during the study period.

The remaining 5 procedures were performed on an urgent or unplanned basis, all because the PEG tube was damaged and could no longer be used. Of these cases, 4 were performed by other clinical teams (3 by emergency department doctors and 1 by a regional physician) all guided remotely by our specialist nurse team and the remaining case by the specialist nursing team.

Review of case notes and data regarding follow-up extracted from our departmental database revealed no instance of emergency department or hospital attendance related to complication of C&P procedure.

Follow-up phone calls with parents were performed at median 70 days (range 35 – 517) after C&P procedure. No complications were reported by parents, no case of regurgitation was reported. The flange was visualised in the stool in 3 cases by carers, at 2 days, 3 days and 5 weeks following C&P. Parent feedback about the service has been very positive, with many commenting that they appreciated avoiding the waiting time for endoscopy and also avoiding the stress of GA.

Discussion:

Here we report our recent experience with C&P removal of PEG tubes. Our intention in making this report is to increase the body of evidence available to clinicians who may wish to use the C&P technique for removal of PEG tubes in children. Whilst based on a relatively small number of cases, we have found C&P to be an effective technique and found no evidence of harm in the series we report.

Endoscopic retrieval of a non-collapsible PEG flange usually requires GA in children. Logistics and waiting times for GA can be impractical and GA is not without risk [4]. Delays in removals of PEG tubes could result in tube degradation and associated complications [6]. Additional complications related to endoscopic removal of PEG tubes have been reported, not least airway compromise and oesophageal trauma [6]. Given the complete avoidance of these complications and avoidance of waiting for GA, C&P - a minimally invasive alternative to endoscopic retrieval, appears a favourable alternative. This alternative is only acceptable however if it is not associated with patient harm. We have not identified any evidence of harm in our series but acknowledge that it is a relatively small cohort. It will be important to further actively monitor for any evidence of harm and report larger patient numbers in due course. This is of particular importance since on discussion with colleagues at other centres, we are aware of a small number of cases involving impaction of the retained flange in the oesophagus in children

following C&P, presumably following reflux / regurgitation from the stomach. Full details of these are not available but we are aware that they have been the cause of significant patient morbidity. Such a complication has been reported in the literature by Haanstra and colleagues but details are limited since the article is in Dutch [7]. Given the rare risk of significant complications we recommend that cases are actively reviewed following C&P to identify any evidence of harms and that these be reported for the benefit of all clinicians.

A greater literature is available regarding safety and effectiveness of C&P in adults. This suggests complications following C&P are uncommon. In a systematic review including 5 cohort studies and 22 case studies with a total of 373 cases of C&P, a complication rate of less than 1% was identified [1]. The most frequent complication was gastrointestinal obstruction. While often resolving spontaneously, these complications sometimes require intervention such as laparotomy or endoscopy [1]. A small number of case studies report significant complications following C&P in adults including peritonitis, bleeding and even mortality [8–11]. Extrapolating the incidence of these complications is not possible however due to lack of reported denominators. When gastrointestinal obstruction does occur, it has been reported in various sites, from the oesophagus and stomach through the intestine and at ileostomy sites. Time until obstruction ranged up to almost 2 years following C&P in adults, most frequently occurring at around 9 weeks post procedure [1]. Overall, in the adult literature, the majority of complications are seen in patients who have either undergone previous abdominal surgery or who have comorbidities increasing risk of decreased intestinal motility or intestinal stricture [1].

Literature that is specific to paediatric populations is limited. In an update to the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition position paper from 2015, Homan et al recommends that C&P should be avoided in paediatric populations [12]. Homan et al draw this conclusion from Thomas et al 2018, who compared C&P to the 'traction' technique in a paediatric cohort, where 94 cases underwent C&P and 33 cases underwent 'Traction' technique [13]. The traction technique refers to pulling collapsible type PEG flanges through the abdominal wall with an outward pulling force [13]. Their findings suggest the C&P technique significantly reduces the need for procedural sedation compared to the traction technique but they did identify a higher rate of complications with C&P. Most notably, given the anecdotal experience reported above, flange impaction in the oesophagus requiring endoscopic retrieval occurred in 3.2%. They also report more minor complications associated with C&P occurring in 6.4% of their cohort; these included vomiting PEG remnants and aspiration pneumonia. Complications following C&P correlated strongly with lower patient body weight (mean weight in those with a complication was 9kg and all complications occurred in children under 12kg), and patient age (mean age in

those with a complication was 26 months and all complications occurred in children under 5 years). Thomas et al specifically comment that younger children appear to be more likely to vomit the residual bumper [13]. A small number of paediatric case reports highlight complications, some significant, following C&P although most again, do not allow an understanding of the incidence of this problem. Kliener and colleagues report a case of asymptomatic flange remaining in the oesophagus of a two year old [14]. Mollitt and colleagues report an incidence of retained internal crossbar (SILASTIC" (Dow Coming, Midland, MI) bolster) in 2.1% (5 of 234 cases) following C&P. This consisted of oesophageal impaction in 3 cases, and failure of passage beyond the stomach in 2 cases (including 1 which was asymptomatic). Of note one case was as young as 6 months. Their report from 1998, reporting C&P in the context of the 'crossbar' predecessor to the current flange in modern PEG devices [15]. Pitersen-Oberndorff [16] report 3 complications following C&P including one fatal case of oesophageal impaction, one case of asymptomatic gastric retention and one case of distal ileal obstruction amongst small bowel adhesions in a child who had a ventriculo-peritoneal shunt. To our knowledge this is the only case of obstruction distal to the pylorus reported in the paediatric literature, a fact which supports the use of some inclusion criteria based on age or weight. We theorise that weight should correlate with the size of pyloric outlet; a larger pyloric outlet should reduce risk of pre-pyloric complications.

Parallels can be drawn between a PEG flange pushed into the stomach and ingested gastric foreign bodies. Data regarding ingested foreign bodies is more available in the paediatric literature, with up to 90% of cases presenting to hospital passing spontaneously [18–20]. We would therefore anticipate that a PEG flange should pass spontaneously. We took these factors into account when introducing our service and took measures to minimise incidence of harms. These include a minimum weight limit and absence of previous gastrointestinal surgery. We reasoned that with the majority of complications in children occurring proximal to the gastric outlet, a small pyloric lumen in small patients would likely be the key mechanism underlying increased risk of complications in children [13]. Whether there are additional co-morbidities such as known gastro-oesophageal reflux, hiatus hernia, neurological disability, and kypho-scoliosis that further increase the risk of complications is not clear. Haanstra and colleague's report opens the possibility of specific co-morbidities increasing the risk of pre-pyloric complications of C&P in older children [7].

Over the 18 months for which our service has been running, we have encountered a few patients who did not fulfil our original inclusion criteria yet who have been included in this report (Table 2). Most of these (3 of 4) have been unplanned cases due to accidental severing of the PEG tube. This was replaced with a button gastrostomy

device and the flange allowed to pass as has been previously reported. Similarly, some of these cases have been managed remotely under the guidance of our specialist nursing team, thereby avoiding transfer or admission to our regional specialist centre. These are additional indications for which C&P may carry advantages. During this time period, patient feedback has been positive. Although we have not formally measured patient satisfaction, particular benefits reported by parents are reducing time to PEG removal and avoiding a GA.

The principal limitation to our report is the relatively limited sample size, yet it is one of the largest reported series in the paediatric literature. A strength is that we have included ALL children who had a C&P procedure, with no exceptions, even some cases which did not meet our ongoing criteria. A further strength is that we have contacted the patients' parents following C&P to determine any evidence of adverse events related to C&P procedure. The duration following C&P is limited and it will be important to monitor this cohort for a longer period of time to ensure any later complications are captured. We acknowledge we have not formally assessed patient/parent satisfaction, nor the impact of introducing this technique on resource utilisation and costs. These are important considerations and worthy of further investigation.

Conclusion:

In conclusion these data suggest C&P is an effective means to facilitate minimally invasive and prompt PEG removal / change in children. Various benefits of the C&P procedure compensate for theoretical adverse complications. Whilst the absence of any adverse events in our series is reassuring, it is important to continue to monitor for these in a larger population and for a longer period of time to confirm the safety of this approach. The literature suggests that the flange not passing through the pyloric sphincter is the primary mechanism leading to complications in children. We therefore recommend minimum age and weight criteria for C&P and routine follow-up following C&P. Further investigation should include measures of patient / parent satisfaction and impact of resource utilisation and cost savings. Refinement of inclusion/exclusion criteria may be warranted as we gather greater experience.

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Tables:

Demographic	**Cases (Total 27)**
Gender	19 male, 8 female
Age	Median: 6 Years 138 Days (range 1y86d - 18y82d)
Weight	Median: 17kg (range 9-48kg)

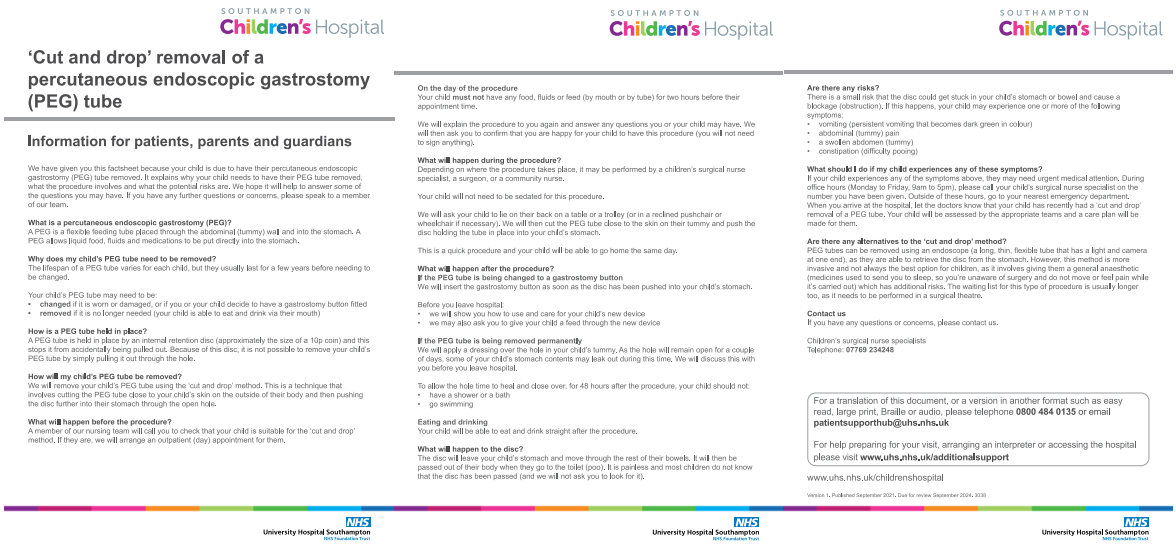
Table 1 - Demographics of the cases included in this report. Cases outside the inclusion criteria are justified in table 2.

Case number	**Weight and Age**	**Details**
11	4 years 156 days **13kg***	Unplanned case, PEG tube snapped in the community and was replaced by a 'button gastrostomy' out of hours in the emergency department.
13	3 years 281 days **9kg***	Unplanned case, PEG tube snapped in the community and was replaced by a 'button gastrostomy' out of hours in the emergency department.
19	4 years 192 days **13kg***	Elective removal of PEG tube as child no longer needed a feeding gastrostomy. Anxiety from parents at unused PEG appearing damaged resulted in pressure for urgent removal, this was at the time of the most significant delays due to the COVID pandemic. Consultant consented to the carers to the theoretical increased risk of obstruction increased by low weight of child, they chose to proceed.

21	**1 year 83 days*** 16kg	Unplanned case, PEG snapped in the community and was replaced by a 'button gastrostomy' out of hours in the emergency department.

Table 2 - Description of four cases outside of the original inclusion criteria for the C&P service. The weight or age outside the intended range is marked with a '*'.

Figures:



SOUTHAMPTON Children's Hospital

'Cut and drop' removal of a percutaneous endoscopic gastrostomy (PEG) tube

Information for patients, parents and guardians

We have given you this factsheet because your child is due to have their percutaneous endoscopic gastrostomy (PEG) tube removed. It explains why your child needs to have their PEG tube removed, what the procedure involves and what the potential risks are. We hope it will help to answer some of the questions you may have. If you have any further questions or concerns, please speak to a member of our team.

What is a percutaneous endoscopic gastrostomy (PEG)?
A PEG is a flexible feeding tube placed through the abdominal (tummy) wall and into the stomach. A PEG allows liquid food, fluids and medications to be put directly into the stomach.

Why does my child's PEG tube need to be removed?
The lifespan of a PEG tube varies for each child, but they usually last for a few years before needing to be changed.

Your child's PEG tube may need to be:
- **changed** if it is worn or damaged, or if you or your child decide to have a gastrostomy button fitted
- **removed** if it is no longer needed (your child is able to eat and drink via their mouth)

How is a PEG tube held in place?
A PEG tube is held in place by an internal retention disc (approximately the size of a 10p coin) and this stops it from accidentally being pulled out. Because of this disc, it is not possible to remove your child's PEG tube by simply pulling it out through the hole.

How will my child's PEG tube be removed?
We will remove your child's PEG tube using the 'cut and drop' method. This is a technique that involves cutting the PEG tube close to your child's skin on the outside of their body and then pushing the disc further into their stomach through the open hole.

What will happen before the procedure?
A member of our nursing team will call you to check that your child is suitable for the 'cut and drop' method. If they are, we will arrange an outpatient (day) appointment for them.

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On the day of the procedure
Your child **must not** have any food, fluids or feed (by mouth or by tube) for two hours before their appointment time.

We will explain the procedure to you again and answer any questions you or your child may have. We will then ask you to confirm that you are happy for your child to have this procedure (you will not need to sign anything).

What will happen during the procedure?
Depending on where the procedure takes place, it may be performed by a children's surgical nurse specialist, a surgeon, or a community nurse.

Your child will not need to be sedated for this procedure.

We will ask your child to lie on their back on a table or a trolley (or in a reclined pushchair or wheelchair if necessary). We will then cut the PEG tube close to the skin on their tummy and push the disc holding the tube in place into your child's stomach.

This is a quick procedure and your child will be able to go home the same day.

What will happen after the procedure?
If the PEG tube is being changed to a gastrostomy button
We will insert the gastrostomy button as soon as the disc has been pushed into your child's stomach.

Before you leave hospital:
- we will show you how to use and care for your child's new device
- we may also ask you to give your child a feed through the new device

If the PEG tube is being removed permanently
We will apply a dressing over the hole in your child's tummy. As the hole will remain open for a couple of days, some of your child's stomach contents may leak out during this time. We will discuss this with you before you leave hospital.

To allow the hole time to heal and close over, for 48 hours after the procedure, your child should not:
- have a shower or a bath
- go swimming

Eating and drinking
Your child will be able to eat and drink straight after the procedure.

What will happen to the disc?
The disc will leave your child's stomach and move through the rest of their bowels. It will then be passed out of their body when they go to the toilet (poo). It is painless and most children do not know that the disc has been passed (and we will not ask you to look for it).

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Are there any risks?
There is a small risk that the disc could get stuck in your child's stomach or bowel and cause a blockage (obstruction). If this happens, your child may experience one or more of the following symptoms:
- vomiting (persistent vomiting that becomes dark green in colour)
- abdominal (tummy) pain
- a swollen abdomen (tummy)
- constipation (difficulty pooing)

What should I do if my child experiences any of these symptoms?
If your child experiences any of the symptoms above, they may need urgent medical attention. During office hours (Monday to Friday, 9am to 5pm), please call your child's surgical nurse specialist on the number you have been given. Outside of these hours, go to your nearest emergency department. When you arrive at the hospital, let the doctors know that your child has recently had a 'cut and drop' removal of a PEG tube. Your child will be assessed by the appropriate teams and a care plan will be made for them.

Are there any alternatives to the 'cut and drop' method?
PEG tubes can be removed using an endoscope (a long, thin, flexible tube that has a light and camera at one end), as they are able to retrieve the disc from the stomach. However, this method is more invasive and not always the best option for children, as it involves giving them a general anaesthetic (medicines used to send you to sleep, so you're unaware of surgery and do not move or feel pain while it's carried out) which has additional risks. The waiting list for this type of procedure is usually longer too, as it needs to be performed in a surgical theatre.

Contact us
If you have any questions or concerns, please contact us.

Children's surgical nurse specialists
Telephone: **07769 234248**

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Figure 1 - Demonstrates the information sheet that parents / carers are provided with either when considering or following the C&P procedure. The document both explains the risks and benefits of the procedure.

STROBE checklist

	Item No.	Recommendation	Page No.	Relevant text from manuscript
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	3	See abstract methods
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	3	See abstract results
Introduction				
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4	There is limited available literature regarding safety and effectiveness of C&P in children…
Objectives	3	State specific objectives, including any prespecified hypotheses	4	Given the limited data available regarding outcomes of children who have under-gone C&P PEG removal we report our experience…
Methods				
Study design	4	Present key elements of study design early in the paper	5	Data collection We keep a departmental clinical database of all children who have undergone gas-trostomy tube insertion…

Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5	Data collection We keep a departmental clinical database of all children who have undergone gas-trostomy tube insertion…
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	5	All cases undergoing C&P from December 2020 until January 2022 were extracted from this database and all cases are included in this report…
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	6	During the study time period, 27 PEG's were removed via C&P. Patient demographics are shown in Table 1…
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	-	*Not applicable*

Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	-	*Not applicable*
Bias	9	Describe any efforts to address potential sources of bias	5	All cases undergoing C&P from December 2020 until January 2022 were extracted from this database and all cases are included in this report…
Study size	10	Explain how the study size was arrived at	5	All cases undergoing C&P from December 2020 until January 2022 were extracted from this database and all cases are included in this report… 27 PEG's were removed via C&P. Patient demographics are shown in Table 1…
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	-	*Not applicable*
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	-	*Not applicable*

		(*b*) Describe any methods used to examine subgroups and interactions	-	*Not applicable*
		(*c*) Explain how missing data were addressed	-	*Not applicable*
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	-	*Not applicable*
		(*e*) Describe any sensitivity analyses	-	*Not applicable*
Results				
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6	27 PEG's were removed via C&P. Patient demographics are shown in Table 1…
		(b) Give reasons for non-participation at each stage	-	*Not applicable*
		(c) Consider use of a flow diagram	-	*Not applicable*
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	6	27 PEG's were removed via C&P. Patient demographics are shown in Table 1…

		(b) Indicate number of participants with missing data for each variable of interest	-	*Not applicable*
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	6	Follow-up phone calls with parents were performed at median 70 days (range 35 – 517) after C&P procedure
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time		
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	-	*Not applicable*
		Cross-sectional study—Report numbers of outcome events or summary measures	-	*Not applicable*
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	5	Results…
		(*b*) Report category boundaries when continuous variables were categorized	-	*Not applicable*
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-	*Not applicable*
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	-	*Not applicable*

Discussion				
Key results	18	Summarise key results with reference to study objectives	9	In conclusion these data suggest C&P is an effective means to facilitate minimally invasive and prompt PEG removal / change in children…
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	8	The principal limitation to our report is…
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9	In conclusion these data suggest C&P is an effective means to facilitate minimally invasive and prompt PEG removal / change in children…
Generalisability	21	Discuss the generalisability (external validity) of the study results	8	The principal limitation to our report is…
Other information				
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	2	*No funding received*

STROBE Statement - checklist of items that should be included in reports of observational studies [21]