

## Constipation in infants and children: evaluation and management

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Constipation is a common condition in pediatrics. The aim of this review is to give the general practitioner an overview of constipation in infants and children, discussing the definition, pathophysiology, dynamics of defecation, etiology and differential diagnosis, signs and symptoms, and evaluation of patients. Proper history and clinical examination

would guide the clinician to the appropriate investigations and management, which can often be a challenge in children.

*Key words:* children, constipation, patient management

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### Introduction

Childhood constipation is an extremely common problem, accounting for roughly 3% of general pediatrics outpatient visits and 25% of pediatrics gastroenterology outpatient consultations.<sup>1</sup> Estimates of the worldwide prevalence of constipation vary widely, from 0.3% to 28%, with younger children being affected most often.<sup>2</sup>

The underlying mechanisms responsible for chronic constipation remain unknown. In adults the normal frequency of defecation is in the range of three per day to three per week.<sup>3</sup> Stool frequency varies with age in pediatric patients. Breast-fed infants may initially have more frequent stools than formula-fed infants, but by four months of age most infants, regardless of feeding source, pass, on average, two stools a day (Table 1).<sup>4,5</sup> Since a normal pattern of stool evacuation is thought to be a sign of good health, constipation is a source of anxiety to the parents, who think a serious disease may be causing the problem.

The most important cause of constipation beyond the neonatal period is functional, and it has been called idiopathic constipation, functional fecal retention, and fecal withholding.<sup>4</sup>

**Table 1. Normal frequency of bowel movements\***

Age	Bowel movements per week	Bowel movements per day
0-3 months		
breast-fed	5-40	2.9
formula-fed	5-28	2.0
6-12 months	5-28	1.8
1-3 years	4-21	1.4
Above 3 years	3-14	1.0

\* Adapted from Fontana M, Bianchi C, Cataldo F, et al. Bowel frequency in healthy children. *Acta Paediatr Scand* 1987;68:682-4.

### Definition

Constipation has been defined in the literature in different ways. The definition of constipation varies among individuals, too: to some, it is hard stools, to others it is large stools, and to many it is infrequent stools.<sup>6</sup> The North American Society of Pediatric Gastroenterology and Nutrition define constipation as a delay or difficulty in defecation present for two or more weeks, and sufficient to cause significant distress to the patient.<sup>4</sup>

Constipation is termed idiopathic when it cannot be explained by any anatomic, physiologic, radiologic or histopathologic abnormality.<sup>7</sup>

Encopresis is a repeated passage of stool into inappropriate places (clothing), either voluntary or involuntary, in a child who should be toilet trained on the basis of age and developmental level, and who has no primary organic

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pathology. Retentive encopresis is a seepage of liquid stool around the fecal mass in a chronically distended rectum, and is usually the event that causes parents to seek medical attention.<sup>1</sup>

### Pathophysiology and Pathogenesis

Stool is normally propelled down the colon to the anorectum where it is stored until it can be eliminated in a socially acceptable manner. The normal process of defecation starts with fecal filling of the rectum where distention of the wall initiates relaxation of the tonically contracted internal anal sphincter, allowing stool to come in contact with sensitive receptors in the anal canal. The external sphincter simultaneously contracts giving the individual time to decide if circumstances are appropriate to allow stool to escape. If the individual decides to allow stool to escape, increased intrarectal pressure from straining moves the fecal material towards the anal canal, and the puborectalis muscle relaxes allowing the pelvic floor to descend. With the descent of the pelvic floor the anorectal angle is straightened, the external anal sphincter is inhibited, and the fecal material is evacuated. If defecation is to be deferred, voluntary contraction of the puborectalis muscle and the external anal sphincter muscle decreases the anorectal angle to less than the usual 85 to 105 degrees; defecation is prevented, and the rectum accommodates to its contents. In newborn babies and very young infants, the role played by the cerebral cortex in these normal events is not yet developed; therefore, defecation occurs when the internal sphincter relaxes.<sup>7</sup>

Although the exact mechanism of idiopathic constipation is not known, it is generally believed that a multiplicity of factors may be involved. Mechanisms of constipation are likely to be related to a decrease in propulsive forces, impaired rectal sensation, or a functional outlet obstruction. A decrease in propulsive forces may result from genetic predisposition. It is believed that childhood chronic constipation results mostly from intentional or subconscious withholding of stool.<sup>7</sup>

Passage of large, hard stools that painfully stretch the anus may frighten the child, resulting in a fearful determination to avoid all defecation. Such children respond to the urge

to defecate by contracting their anal sphincter and gluteal muscles, attempting to withhold stool. Eventually the rectum habituates to the stimulus of the enlarging fecal mass, and the urge to defecate subsides.<sup>4</sup>

### Etiology and Differential Diagnosis

The causes of constipation in pediatric patients can be divided into organic or functional. Organic causes account for only 5% of constipation in children, and include anatomo-

**Table 2. Some organic causes of constipation**

- 
- Abnormalities of colon and rectum
    - Chronic intestinal pseudo-obstruction
    - Anal stenosis
    - Anal or colonic stricture – post NEC or IBD
    - Post-surgical repair of imperforate anus
    - Ectopic anus
  - Spinal cord lesions
    - Spina bifida
    - Meningocele
    - Sacral agenesis
    - Diastematomyelia
    - Spinal cord tumors (lipomas, cysts, teratomas)
  - Neuropathic lesions of the gastrointestinal tract
    - Hirschsprung's disease
    - Intestinal neuronal dysplasia
  - Systemic disorders
    - Diabetes mellitus
    - Multiple endocrine neoplasia
    - Diabetes insipidus
    - Pheochromocytoma
    - Hypothyroidism
    - Amyotonia congenita
    - Panhypopituitarism
    - Neurofibromatosis
    - Hypocalcemia
    - Infectious polyneuritis
    - Hypercalcemia
    - Prune belly syndrome
    - Dermatomyositis
    - Scleroderma
    - Myotonic dystrophy
    - Cerebral palsy
    - Multiple sclerosis
  - Drugs
    - Analgesics
    - Antacids
    - Anticholinergics
    - Bismuth
    - Iron
    - Cholestyramine
    - Psychotropics
  - Others
    - Celiac disease
    - Cystic fibrosis
    - Lead toxicity
    - NEC (Necrotizing enterocolitis)
    - IBD (Inflammatory bowel disease)

mic, neuromuscular, metabolic, endocrine or others as shown in Table 2.<sup>6,7</sup>

Non-organic causes account for the majority (95%) of cases. Common causes are linked to food, lack of exercise, and behavioral or psychological problems. Predisposing causes include starting toilet training, change in routine or diet, change from breastfeeding to cow's milk, or change from liquid to solid foods, the birth of a sibling, starting daycare,

**Table 3. History in pediatric patients with constipation**

- Age
- Sex
- Chief symptom
- Constipation history
  - Frequency and consistency of the stools
  - Pain or bleeding with passing stools
  - Abdominal pain
  - Variations of symptoms
  - Age of onset
  - Toilet training
  - Fecal soiling
  - Withholding behavior
  - Change in appetite
  - Nausea or vomiting
  - Weight loss
  - Perianal fissures, dermatitis, abscess, or fistula
  - Current treatment
    - Current diet (24-hour recall history)
    - Current medication (for all medical problems)
      - Oral, enema, suppository, herbal
  - Previous treatment
    - Diet
    - Medications
      - Oral, enema, suppository, herbal
    - Prior successful treatments
    - Behavioral treatment
    - Results of prior tests
    - Estimate of parent / patient adherence
- Family history
  - Significant illnesses
  - Gastrointestinal (constipation, Hirschsprung's disease)
  - Other
    - Thyroid, parathyroid, cystic fibrosis, celiac disease
- Medical history
  - Gestational age
  - Time of passage of meconium
  - Condition at birth
  - Acute injury or disease
  - Hospital admissions, surgeries
  - Allergies and immunization
  - Delayed growth and development
  - Sensitive to cold, dry skin, coarse hair
  - Recurrent urinary tract infections
- Developmental history
  - Normal or delayed
  - School performance
- Psychosocial history
  - Psychosocial disruption of child or family
  - Interaction with peers, temperament, toilet habits at school

traveling, the unavailability of toilets or the presence of intractable illness.<sup>2,5,7</sup>

It has been reported by Borowitz et al. that painful defecation is the primary precipitant of constipation during early childhood.<sup>2</sup>

Hirschsprung's disease must be differentiated from idiopathic constipation. Hirschsprung's disease is a colonic motility disorder resulting from segmental colonic aganglionosis, with a prevalence of 1 in 5000 live births and a male to female ratio of 4:1.<sup>8</sup> It is believed to account for 20 to 25 per cent of all cases of neonatal intestinal obstruction and 3 per cent of constipated children referred to the gastroenterologist. It can lead to severe enterocolitis with fever, diarrhea, and severe prostration, which may be fatal if the diagnosis is not recognized early. Most affected

**Table 4. Physical examination of children with constipation**

- General appearance
- Vital signs
  - Temperature
  - Pulse
  - Respiratory rate
  - Blood pressure
- Growth parameters
- Head, ears, eyes, nose, throat
- Neck
- Cardiovascular
- Lung and chest
- Abdomen
  - Distension
  - Palpable liver and spleen
  - Fecal mass
- Anal inspection
  - Position
  - Stool present around anus or on clothes
  - Perianal erythema
  - Skin tags
  - Anal fissures
- Rectal examination
  - Anal wink
  - Anal tone
  - Fecal mass
  - Present of stool
  - Consistency of stool
  - Other masses
  - Explosive stool on withdrawal of finger
  - Occult blood in stool
- Back and spine examination
  - Dimple
  - Tuft of hair
- Neurologic examination
  - Tone
  - Strength
  - Cremasteric reflex
  - Deep tendon reflexes

infants develop difficulties with defecation during the first few weeks of life. Other signs and symptoms associated with the condition include abdominal distention, refusal to feed, and bilious vomiting.<sup>5,7</sup> In the older infant or child, in whom the diagnosis is not made early in life, there may be persistent abdominal distention, recurrent fecal impaction, and failure to thrive. In some patients with short segment or ultrashort segment Hirschsprung's disease, the diagnosis may not be made until later in life. These patients have long histories of chronic constipation and may have normal ganglion cells on rectal biopsy despite anorectal manometric findings consistent with Hirschsprung's disease.<sup>5,7</sup>

## Signs and Symptoms

Signs and symptoms may vary according to the age of the child. Infants may present with grunting baby syndrome, the clinical features of which are straining, turning red in face, grimacing, and crying.<sup>6</sup> Toddlers may present with passing painful and hard stool that may be associated with bleeding per rectum secondary to a small tear in the anal canal, which leads to further withholding. Parents may note that the child resists the urge to defecate by rocking back and forth on his or her toes, squeezing the buttocks together, clenching the fists and fidgeting.

Patients may also present with retentive fecal soiling secondary to withholding (encopresis) that can be mistaken as diarrhea and which makes the parent seek medical care.<sup>5</sup> Other manifestations include abdominal pain, distention, and feeling of fullness causing nausea and decreased appetite. Some patients also present with enuresis and urinary tract infections because stool masses press on the urinary tract and block normal urinary flow.<sup>6,9</sup>

## Evaluation

### HISTORY AND CLINICAL EXAMINATION

A thorough history and clinical examination are generally important in the evaluation of patients with constipation (Tables 3 and 4).<sup>4</sup> A proper history and physical examination are sufficient to allow the practitioner to establish whether the child has a functional or organic cause of constipation, or if the child needs any further evaluation.

The presence of fever, abdominal distention, anorexia, nausea, vomiting, weight loss, or poor weight gain may indicate organic etiology. The findings can be summarized as in Table 5.<sup>4</sup>

**Table 5. Physical findings distinguishing organic constipation from functional constipation**

- Failure to thrive
- Abdominal distention
- Lack of lumbosacral curve
- Pilonidal dimple covered by tuft of hair
- Midline pigmentary abnormalities of the lower spine
- Sacral agenesis
- Flat buttocks
- Anteriorly displaced anus
- Patulous anus
- Tight, empty rectum in the presence of palpable abdominal fecal mass
- Gush of liquid stool and air from the rectum on withdrawal of finger
- Occult blood in the stool
- Absence of anal wink
- Absence of cremasteric reflex
- Decreased lower extremity tone and/or strength
- Absence or delay in relaxation phase of the lower extremity deep tendon reflexes

## INVESTIGATIONS

Most infants and children with chronic constipation require no laboratory investigation. Plain radiographs of the abdomen may be necessary to establish a fecal impaction in a child who refuses a rectal examination, and in the obese child when abdominal and rectal examinations are suboptimal to assist fecal load.<sup>7</sup>

Barium enema on unprepared colon, rectal biopsy, and anorectal manometry study are performed in case of suspicion of Hirschsprung's disease.

Anorectal manometry is also helpful to identify functional abnormalities in some children with chronic idiopathic constipation, including an increased rectal sensory threshold, decreased rectal contractility on attempted defecation, and paradoxical contraction of the external anal sphincter and puborectalis muscles during attempts at defecation.<sup>7,10</sup>

If the patient does not respond to initial treatment other laboratory blood tests that need to be performed include thyroid function test, serum electrolyte (Ca, K), lead level, and celiac disease antibodies.

Rectal biopsy or anorectal manometry may also be indicated.

An MRI of the lumbosacral spine and colonic manometry may be necessary to identify occult spine abnormalities and occult myopathy or neuropathy of the gastrointestinal tract.<sup>5,7</sup>

### Treatment

The treatment of constipation is a challenge to the practitioner. Most cases of constipation can be evaluated and managed by the primary care physician.

There is no single treatment for constipation. Many children do not respond, and continue to have chronic problems. The lack of response could be multifactorial, most likely being related to the fact that the exact pathop-

hysiology of constipation is not known. Treatment may take a long time. The intestine may take months to regain its strength and feeling after being stretched for a long time.<sup>11</sup>

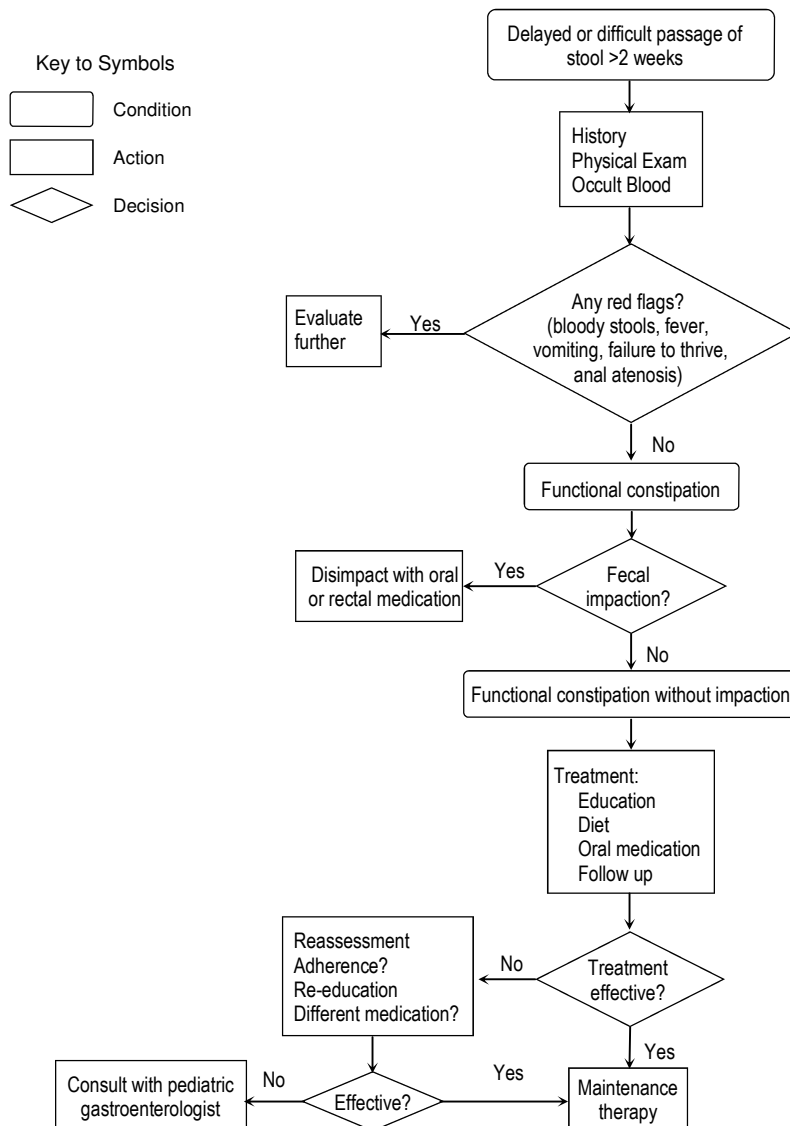
The treatment plan consists of a number of components (Fig. 1):

- Cleaning any existing impaction
- Maintenance therapy and prevention of re-impaction, and establishing regular bowel habits
- Diet modification
- Behavioral modification and education

### CLEANING OF EXISTING IMPACTION

Any existing impaction can be cleaned by medication administered orally or by rectal enema, or both. Three hypertonic phosphate

Figure 1. Treatment algorithm for pediatric constipation\*



\*Adapted from Baker SS, et al. www.naspghan.org, 1999

**Table 6. Medications for use in treatment of constipation**

Laxatives	Dosage	Side Effects	Notes
<b>Osmotic</b>			
Lactulose*	1-3 ml/kg per day in divided doses; available as 70% solution.	Flatulence, abdominal cramps; hypernatremia	Synthetic disaccharide. Well tolerated long term
Sorbitol*	1-3 ml/kg per day in divided doses; available as 70% solution	Same as lactulose	Less expensive than lactulose
Barley malt extract*	2-10 ml/240 ml of milk or juice		Unpleasant odor. Suitable for infants to drink from a bottle
Magnesium hydroxide*	1-3 ml/kg per day of 400 mg/5 ml; available as liquid, 400 mg/5 ml and 800 mg/5 ml, and tablets.	Infants susceptible to magnesium poisoning. Overdose can lead to hypermagnesemia, hypophosphatemia and secondary hypocalcemia	Acts as an osmotic laxative. Releases cholecystokinin, which stimulates gastrointestinal secretion and motility. Use with caution in renal impairment
Magnesium citrate*	<6 years, 1-3 ml/kg per day; 6-12 years, 100-150 ml/day; >12 years, 150-300 ml/day; in single or divided doses. Available as liquid, 16.17% magnesium.	Same as Magnesium hydroxide	
<b>Osmotic enema</b>			
Phosphate enemas	< 2 years old; to be avoided; ≥ 2years old; 6 ml/kg up to 135 ml.	Risk of mechanical trauma to rectal wall, abdominal distention or vomiting. May cause severe hyperphosphatemia hypocalcemia, with tetany.	Some of the anion is absorbed but if kidney is normal, no accumulation occurs in children with renal failure or Hirschsprung disease
<b>Lavage</b>			
Polyethylene glycol-electrolyte solution	For disimpaction: 25 ml/kg per hr (to 1000 ml/hr) by nasogastric tube until clear or 20 ml/kg for 4 hr/day. For maintenance: (older children) 5-10, and ml/kg per day.	Difficult to take. Nausea, bloating, abdominal cramps, vomiting and anal irritation. Aspiration, pneumonia, pulmonary edema, Mallory-Weiss tear.	Information mostly obtained from use for total colonic irrigation. May require hospital admission and nasogastric tube.
<b>Lubricant</b>			
Mineral oil*	<1 year old; not recommended. Disimpaction: 15-30 ml/yr of age, up to 240 ml daily. Maintenance: 1-3 ml/kg per day.	Lipoid pneumonia if aspirated. Foreign-body reaction in intestinal mucosa.	Softens stool and decreases water absorption. More palatable if chilled. Anal leakage indicates dose too high or need for clean-out.
<b>Prokinetic</b>			
Cisaprid	0.2 mg/kg per dose, 3 or 4 times daily. Available as suspension, 1 mg/ml and 5-10, and 20-mg tablets	Headaches, abdominal pain, diarrhea, frequent urination, cardiac arrhythmias	Can cause cardiac arrhythmia when given with medication that interacts with cytochrome P450 3A4 (77).
<b>Stimulants</b>			
Senna	2-6 years old: 2.5 - 7.5 ml/day; 6-12 years old: 5-15 ml/day. Available as syrup, 8.8 mg of sennosides/5ml. Also available as granules and tablets.	Abdominal pain, cathartic colon (possibility of permanent gut, nerve or muscle damage)	Idiosyncratic hepatitis, Melanosis coli, Hypertrophic osteoarthropathy, analgesic nephropathy
Bisacodyl	≥2 years old: 0.5-1 suppository 1-3 tablets per dose. Available in 5-mg tablets and 10-mg suppositories	Abdominal pain, diarrhea and hypokalemia, abnormal rectal mucosa and (rarely) proctitis. Case reports of urolithiasis	Melanosis coli improves 4-12 months after medications discontinued
Glycerin suppositories		No side effects	

\* Adjust dose to induce a daily bowel movement for 1 to 2 months.

enemas, approximately 3 cc/kg body weight (maximum 135 cc) each, over a 36-hour period can be used.<sup>7</sup> Excessive administration of phosphate enemas may result in systemic absorption and lead to symptoms associated with hyperphosphatemia and hypocalcemia, and even death, particularly in very young

infants and in patients with Hirschsprung's disease.<sup>12,13</sup> Enema can be performed also by using mineral oil or saline. Rectal disimpaction has also been effectively performed using glycerin suppository in infants.<sup>4</sup> A high dose of mineral oil and polyethylene glycol solution has been found to be effective as oral medica-

tion for disimpaction. Patients who do not respond to enema or oral polyethylene glycol solution may need manual disimpaction under general anesthesia.<sup>5,6</sup>

#### **MAINTENANCE THERAPY**

Maintenance therapy should be started immediately after disimpaction to prevent re-impaction. A wide variety of laxatives is used, generally in incrementally decreasing dosage according to patient response (Table 6).<sup>4</sup> Available medication includes lubricants such as mineral oil, osmotic laxatives such as lactulose, sorbitol, and polyethylene glycol solution (PEG). The prolonged use of stimulant laxatives such as senna is not recommended, but they may be used intermittently as a rescue therapy to prevent re-impaction. The patient should be weaned away from stimulant laxatives as early as possible to prevent dependence.<sup>4,7</sup>

A combination of different laxatives such as osmotic and lubricant can be used together. Mineral oil has a risk of aspiration and should be avoided in infants and in children who resist taking it or have dysphagia or vomiting. Mineral oil, lactulose or sorbitol are equally efficacious, the choice among these being based on safety, cost, the child's preference, ease of administration, and the practitioner's experience.<sup>4,6</sup>

It has been reported that PEG is a safe and effective laxative in a dose of 0.8 g/kg/day with fewer side effects than lactulose. PEG did not cause persistent gas, abdominal pain, or perianal irritation in children.<sup>14,15</sup>

Relapses are common, and maintenance therapy may be necessary for many months, to be tapered slowly.

In infancy, most constipation is functional. Great variability in stool frequency occurs among breast-fed infants compared to formula-fed infants. Increased fluid intake, particularly of juice containing sorbitol, such as prune, pear and apple can correct the problem. Glycerin suppositories are useful and can correct fecal impaction. Enemas are to be avoided, and anal fissure, if present, should be treated.<sup>7</sup>

If treatment fails or the infant has delayed passage of meconium or the presence of red flags such as fever, vomiting, bloody diarrhea, failure to thrive, distention, or tight empty rectum further evaluation is needed to exclude Hirschsprung's disease. If the patient has

delayed passage of meconium and Hirschsprung's disease is excluded, Sweat Test to rule out cystic fibrosis is recommended.<sup>4</sup>

#### **DIET**

A commonly recommended method to soften stools is increasing the intake of fluid and non-absorbable carbohydrates. Thompson states that fiber does not play a beneficial role in the management of constipation.<sup>16</sup> Baker et al. found no randomized controlled studies that demonstrated that increasing the intake of fluid, non-absorbable carbohydrates or dietary fiber in children had a proven effect on stools. Nonetheless, many authors continue to recommend diet that contains high fibers.<sup>6,17,18</sup>

#### **BEHAVIORAL MODIFICATION AND PARENT EDUCATION**

A well organized family plays an important part in managing the patient with chronic constipation. The parents should be educated about the normal stooling patterns and appropriate toilet training practices.

The child should sit on the toilet, with proper foot support to allow for hip flexion and to help leverage, for five to 10 minutes after breakfast and after the evening meal, so as to take advantage of the gastrocolic reflex to evacuate the rectum. The child should be comfortable and relaxed. Rewards such as a calendar with stickers may be used to provide positive reinforcement. A diary can indicate to the health care provider how the child responds. The parents should avoid punishment, and toilet training should be continued until stools become soft and regular.<sup>6,7</sup>

For successful management 3-4 weeks of follow up is needed. A telephone call would provide excellent support to the family.<sup>4</sup>

#### **WHEN TO CONSULT A SPECIALIST**

- Referral to pediatric gastroenterologist is needed when the therapy fails, when organic disease is suspected, or when management is complex. Basic work up including thyroid function, calcium level, antibody screening for celiac disease and lead level, if indicated, should be performed before referral.<sup>4</sup>
- Patients with obvious emotional disturbances and those with fecal soiling with no documented impaction on repeated examination are best treated by a psychiatrist or behavioralist.<sup>7,19</sup>

## Prognosis

Functional constipation is usually amenable to routine management although treatment failures are reported in 20% of children. The prognosis for full recovery, defined as no soiling and no constipation while off medication, has been reported as 48% at 5 year follow up.<sup>5</sup> Early onset of symptoms during the first year, family history of constipation, poor self esteem, and prior sexual abuse are associated with poor prognosis.<sup>7</sup>

## Conclusion

Constipation is a very common problem during childhood. Thorough history and clinical examination are important to guide the practitioner to the diagnosis and further workup or referral to a specialist. Continual close follow up is an important component in the management of patients with chronic constipation. Patients who do not respond to treatment should have further evaluation to exclude an organic etiology. Treatment of constipation requires a team effort involving the physician, the parents and the child.

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### **CME/CPD Questions**

After you have completed reading the article *Constipation in infants and children: evaluation and management*, take the test given below. Circle T (True) or F (False) in the answer sheet (page 42) to show the correct answer to each question. Questions 1 to 10 are related to the content in this article.

1. At the age of six months the average number of stools per day is two.
2. Encopresis is a voluntary leakage of liquid or semi-formed stools around the fecal mass in patients with spinal cord lesions.
3. Intentional or subconscious withholding of defecation is considered to be one of the main causes of constipation in children.
4. Organic causes account for at least 40% of cases of constipation in children.
5. Enterocolitis is one of the complications that may occur in patients with functional constipation.
6. Constipation is one of the clinical manifestations in the infant who has cystic fibrosis.
7. The onset of constipation early in infancy with failure to thrive is suggestive of an organic etiology.
8. Anorectal manometry and rectal biopsy are indicated for older children with constipation who do not respond to treatment.
9. Plain abdominal X-ray is one of the basic investigations that needs to be done for all patients with constipation.
10. The presence of a tuft of hair or skin dimple in the sacral region is an indication for doing plain lumbar and sacral x-ray investigations and spinal MRI.