

Neurogenic Bowel Management in Adults with Spinal Cord Injury

Consortium for Spinal Cord Medicine

Administrative and financial support provided by Paralyzed Veterans of America

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This guide has been prepared based on scientific and professional information known about neurogenic bowel management, its causes, and its treatment, in 1998. Users of this guide should periodically review this material to ensure that the advice herein is consistent with current reasonable clinical practice.

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Foreword

The guidelines are designed for use by health-care providers, individuals with spinal cord injury (SCI), family members and significant others, health-care attendants, administrators, and third-party payors. Health-care providers include not only the interdisciplinary acute care and rehabilitation teams, but also the practitioners who treat these individuals in a variety of settings, such as emergency rooms and outpatient clinics. A neurogenic bowel after SCI has the potential to disrupt almost every aspect of life. These guidelines were developed to improve management of neurogenic bowel, thereby promoting physical/functional and psychosocial quality of life in individuals with neurogenic bowel. The specific aims are to:

- Encourage clinicians, in conjunction with the individual with SCI, to assess physical and psychosocial health outcomes over the continuum of care and to modify management programs.
- Describe options to maximize independence in bowel management.
- Identify risk factors for negative outcomes.
- Critically review and synthesize the scientific literature on neurogenic bowel assessment and management, short- and long-term outcomes, and effects on gastrointestinal function.
- Identify gaps in the scientific knowledge on neurogenic bowel management and outcomes.

These goals are interpreted and applied within the SCI continuum of care, including acute, acute rehabilitation, transition to community care, and long-term care. An adjunct guide for consumers, attendants, family members, and significant others is under development by the panel.

These guidelines use the World Health Organization's model of disablement (World Health Organization, 1980) as a base. In this model, impairment represents a condition that affects the normal structure and function of the body; disability refers to inability to perform a task in the usual manner; and handicap refers to inability to fulfill usual roles. This model promotes a holistic examination of neurogenic bowel management and outcomes and emphasizes prevention of complications.

The guideline recommendations are based on scientific evidence and expert consensus on the epidemiology, physiology, and pathophysiology associated with SCI; assessment of impairment and disability; management goals and interventions; patient, family member, and staff education; and handicaps such as psychosocial responses.

Rosemarie B. King, PhD, RN
Chair, Guideline Development Panel

Preface

This new offering of the Spinal Cord Medicine Consortium represents our commitment to meeting the needs of individuals with spinal cord injury and those who support them. Bowel management is often a major source of difficulty in the reintegration of these individuals into their home and community. Who among us would feel confident about being present at work or school if we could not trust our continence? Instead of five to ten minutes per day to attend to bowel needs, how would we tolerate planning every evening around a process that takes several hours? Our sense of privacy vis-a-vis a parent or intimacy with a spouse would be threatened if we were required to depend on them to assist us with managing our bowel evacuation and cleanup. As one of my patients recently said, “When it comes to life after spinal cord injury, the bowel rules!”

Neurogenic Bowel Management in Adults with Spinal Cord Injury is the third in series of evidence-based clinical practice guidelines (CPG) that attempts to provide guidance and assistance in the decisions that are necessary to restore health, independence, and a sense of self-control to individuals with spinal cord injury. The information in this document will benefit people with spinal cord dysfunction, their family members, their caregivers, their physicians, and even their insurers. We believe that this document will help persons to customize a cost-effective bowel management program that is both adequate and predictable. When problems arise, this document should provide the conceptual framework to develop alternative solutions. Furthermore, as spinal cord injury survivors advance in age, physiological alterations will bring new challenges and force new decisions. This CPG should help all of us to meet those challenges.

Fundamental to all these tasks is an understanding of normal physiologic control of bowel function and the alterations brought by various forms of neurological impairment. Health-care professionals, whether in training or vastly experienced, will benefit from this review. The bewildering array of medications available for bowel management will become more understandable and recent advances in research will be of benefit. Goal setting and patient teaching will be enhanced. Whether measuring impairment, disability, or handicap, outcome measurement also will be supported.

My congratulations to the panel members for their excellent work and to its chair, Rosemarie B. King, PhD, RN, for her exemplary leadership as the panel prepared this document. My thanks to all the reviewers who contributed their time and expertise. Also I appreciate the ongoing support—the committed people and the resources—of the Paralyzed Veterans of America (PVA). Without PVA, we would not have been able to undertake this project.

We look forward to the review and critique of this guideline as the field puts it to use. As with our other offerings, we plan to publish future editions that will incorporate new research findings and correct errors and omissions. So please, let us know your thoughts.

If we have accomplished our task, then individuals with spinal cord injury will no longer feel ruled by their bowels.

Kenneth C. Parsons, MD
Chair, Spinal Cord Medicine Consortium

Acknowledgments

The chair and members of the neurogenic bowel management guideline development panel wish to express special appreciation to the individuals and professional organizations who were involved in the Spinal Cord Medicine Consortium; to the expert clinicians and health-care providers who reviewed the draft document; and to the consumers, advocacy organizations, and the staffs of the numerous medical facilities and spinal cord injury rehabilitation centers who contributed their time and expertise to the development of these guidelines.

Andrea K. Biddle, PhD, and her colleagues at the Department of Health Policy and Administration, University of North Carolina at Chapel Hill, served as consultant methodologists. They masterfully conducted the initial and secondary-level literature searches, evaluated the quality and strength of the scientific evidence, constructed evidence tables, and graded the quality of research for all identified literature citations.

Members of the Consortium Steering Committee, representing 17 professional, payer, and consumer organizations, were joined in the guidelines development process by 41 expert reviewers. Through their clinical analysis and thoughtful comments, the recommendations were refined and additional supporting evidence from the scientific literature was identified. The quality of the technical assistance from these dedicated reviewers contributed significantly to the professional consensus building that is hopefully achieved through the guidelines development process. Attorney William H. Archambault of the Piedmont Liability Trust conducted a comprehensive analysis of the legal and health policy issues associated with this complex, multifaceted topic.

The neurogenic bowel management guideline development panel is grateful for the many technical support services provided by various departments of PVA. In particular, the panel recognizes J. Paul Thomas and Dawn M. Sexton in the Consortium Coordinating Office for their help in organizing and managing the process; John L. Carswell for his astute analysis of the draft recommendations; Fred Cowell in the Health Policy Department for his cogent comments reflecting the perspective of consumers; James A. Angelo, Patricia E. Scully, Sarah E. Ornstein, and Miranda Stewart in the Communication and Information Services Department for their guidance in writing, formatting, and creating art; medical writers Joellen Talbot and Barbara Shapiro for their excellent technical review and editing of both the clinical practice guideline and consumer guide; and PVA staff and consultants for their development of the glossary and index and standardization of the nomenclature.

Appreciation is expressed for the steadfast commitment and enthusiastic advocacy of the entire PVA board of directors and of PVA's senior officers, including Immediate Past President Richard Grant, National President Kenneth C. Huber, Executive Director Gordon H. Mansfield, and Deputy Executive Director John C. Bollinger. Their generous financial support has made the CPG consortium and guideline development process a successful venture.

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Summary of Recommendations

The recommendations for assessment, management, monitoring, and education concerning the neurogenic bowel are summarized below. The subsequent text contains the scientific evidence and supporting rationale for each recommendation.

Assessment of the Neurogenic Bowel

ASSESSMENT OF IMPAIRMENT AND DISABILITY

1. A systematic, comprehensive evaluation of bowel function, impairment, and possible problems should be completed at the onset of SCI and at least annually throughout the continuum of care.
2. The patient history should include the following elements:
 - Premorbid gastrointestinal function and medical conditions.
 - Current bowel program, including patient satisfaction.
 - Current symptoms, including abdominal distention, respiratory compromise, early satiety, nausea, evacuation difficulty, unplanned evacuations, rectal bleeding, diarrhea, constipation, and pain.
 - Defecation or bowel care (assisted defecation procedure) frequency, and duration and characteristics of stool.
 - Medication use and potential effect on bowel program.
3. A physical examination should be done at the onset of SCI and annually thereafter. The examination should include:
 - Complete abdominal assessment including palpation along the course of the colon.
 - Rectal examination.
 - Assessment of anal sphincter tone.
 - Elicitation of anocutaneous and bulbocavernosus reflexes to determine if the patient has upper motor neuron (UMN) or lower motor neuron (LMN) bowel.
 - Stool testing for occult blood beginning at age 50.

ASSESSMENT OF FUNCTION (DISABILITY)

4. An assessment of knowledge, cognition, function, and performance should be conducted to determine the ability of the individual to complete bowel care or to

direct a caregiver to complete the procedure safely and effectively. The assessment should include the following elements:

- Ability to learn.
- Ability to direct others.
- Sitting tolerance and angle.
- Sitting balance.
- Upper extremity strength and proprioception.
- Hand and arm function.
- Spasticity.
- Transfer skills.
- Actual and potential risks to skin.
- Anthropometric characteristics.
- Home accessibility and equipment needs.

Management of the Neurogenic Bowel

DESIGNING A BOWEL PROGRAM

5. The bowel program should provide predictable and effective elimination and reduce evacuation problems and gastrointestinal complaints. Bowel programs should be revised as needed throughout the continuum of care.
6. Within established parameters of safety and effectiveness, the design of the bowel program should take into account attendant care, personal goals, life schedules, role obligations of the individual, and self-rated quality of life.
7. Bowel programs should be initiated during acute care and continued throughout life, unless full recovery of bowel function returns. Differences in bowel programs for reflexic and areflexic bowels include type of rectal stimulant, consistency of stool, and frequency of bowel care. To establish a bowel program:
 - Encourage appropriate fluids, diet, and activity.
 - Choose an appropriate rectal stimulant.
 - Provide rectal stimulation initially to trigger defecation daily.
 - Select optimal scheduling and positioning.
 - Select appropriate assistive techniques.
 - Evaluate medications that promote or inhibit bowel function.

8. A consistent schedule for defecation should be established based on factors that influence elimination, preinjury patterns of elimination, and anticipated life demands.
9. Prescribe mechanical and/or chemical rectal stimulation to predictably and effectively evacuate stool.
10. The use of assistive techniques should be individualized and their effectiveness in aiding evacuation should be evaluated. Push-ups, abdominal massage, Valsalva maneuver, deep breathing, ingestion of warm fluids, and a seated or forward-leaning position are some of the techniques used to aid in bowel emptying.

NUTRITION

11. Individuals with SCI should not be placed uniformly on high fiber diets. A diet history should be taken to determine the individual's usual fiber intake. The effects of current fiber intake on consistency of stool and frequency of evacuation should be evaluated. A diet containing no less than 15 grams of fiber daily is needed initially. Increases in fiber intake should be done gradually, from a wide variety of sources. Symptoms of intolerance should be monitored, and reductions in fiber are recommended, if they occur.
12. The amount of fluid needed to promote optimal stool consistency must be balanced with the amount needed for bladder management. In general, fluid intake should be approximately 500 ml/day greater than the standard guidelines used to estimate the needs of the general public (National Research Council, 1989). Standard guidelines indicate that adult fluid needs can be estimated by either of the following formulas:

$$1 \text{ ml fluid/Kcal of energy needs} + 500 \text{ ml/day}$$

or

$$40 \text{ ml/kg body weight} + 500 \text{ ml/day}$$

MANAGING THE NEUROGENIC BOWEL AT HOME OR IN THE COMMUNITY

13. Appropriate adaptive equipment for bowel care should be prescribed based on the individual's functional status and discharge environment.
14. Careful measures should be taken to avoid pressure ulcers and falls related to the use of bowel care equipment.
15. Adequate social and emotional support should be available to help individuals manage actual or potential disabilities and handicaps associated with neurogenic bowel.
16. All aspects of the bowel management program should be designed to be easily replicated in the individual's home and community setting.

MONITORING PROGRAM EFFECTIVENESS

17. The following variables should be monitored during and documented after every bowel care procedure during hospitalization or when developing or revising a bowel program in any community setting:
 - Date and time of day.
 - Time from rectal stimulation until defecation is completed.
 - Total time for completion of bowel care.
 - Mechanical stimulation techniques.
 - Pharmacological stimulation.
 - Position/assistive techniques.
 - Color, consistency, and amount of stool.
 - Adverse reactions.
 - Unplanned evacuations.
18. When a bowel program is not effective (i.e., if constipation, GI symptoms or complications, or unplanned or delayed evacuations occur) and a consistent schedule has been adhered to, changes in the following components should be considered:
 - Diet.
 - Fluid intake.
 - Level of activity.
 - Frequency of bowel care.
 - Position/assistive techniques.
 - Type of rectal stimulant.
 - Oral medications.
19. In the absence of adverse reactions and indicators for potential medical complications, the bowel care regimen should be maintained for 3 to 5 bowel care cycles prior to considering possible modifications. Only one element should be changed at a time.
20. When evaluating individuals complaining of bowel management difficulties, adherence to treatment recommendations should be assessed.
21. Colorectal cancer must be ruled out in individuals with SCI over the age of 50 with a positive fecal occult blood test or with a change in bowel function that does not respond to corrective interventions.

Managing Complications of the Neurogenic Bowel

22. Knowledge of the unique clinical presentation and prompt diagnosis of common complications are necessary for the effective treatment of conditions associated with the neurogenic bowel in individuals with spinal cord injury.
23. Constipation after SCI is manifested by unusually long bowel care periods, small amounts of results, and dry, hard stools. Its causes should be investigated.
24. Management of chronic constipation in individuals with SCI should start with the establishment of a balanced diet, adequate fluid and fiber intake, increased daily activity, and to the extent possible, reduction or elimination of medication contributing to constipation. If evacuation of stool has not occurred within 24 hours of scheduled evacuation or if stool is hard-formed and difficult to pass, a trial is warranted of a bulk-forming agent or of one or more of the following categories of laxative agents: lubricants, osmotics, and stimulant cathartics. These agents should be ingested at least 8 hours before planned bowel care.
25. Effective treatment of common complications of neurogenic bowel in individuals with spinal cord injury, including fecal impaction and hemorrhoids, is necessary to minimize potential long-term morbidities.
26. Prokinetic medication should be reserved for use in individuals with severe constipation or difficulty with evacuation that is resistant to modification of the bowel program.

Surgical and Nonsurgical Therapies

27. Biofeedback is not likely to be an effective treatment modality for most individuals with spinal cord injury.
28. The decision about a colostomy or ileostomy should be based upon the results of specialized screening procedures and the individual's expectations. If surgery is decided upon, a permanent stoma is the best option.
29. Proposed surgical changes in the anatomy of individuals with SCI should be reviewed with the individual and the interdisciplinary team. These considerations should include discussions of anesthesia, surgical and postoperative risks, body image, independence in self-management after the procedure, and the permanence of the procedure.

Education Strategies for the Neurogenic Bowel

30. Educational programs for bowel management should be structured and comprehensive; should consider the home setting and available resources; and should be directed at all levels of health-care providers, patients, and caregivers. The content and timing of such programs will depend on medical stability, readiness to learn, safety, and related factors. An educational program for bowel management after SCI should include:
 - Anatomy.
 - Process of defecation.
 - Effect of SCI on bowel function.
 - Description, goals, and rationale of successful bowel program management.
 - Factors that promote successful bowel management.
 - Role of regularity, timing, and positioning in successful bowel management.
 - Safe, effective use of assistive devices and equipment.
 - Techniques for manual evacuation, digital stimulation, and suppository insertion.
 - Prescription bowel medications.
 - Prevention and treatment of common bowel problems, including constipation, impactions, diarrhea, hemorrhoids, incontinence, and autonomic dysreflexia.
 - When and how to make changes in medications and schedules.
 - Management of emergencies.
 - Long-term implications of neurogenic bowel dysfunction.
31. Patient and caregiver knowledge of, performance of, and confidence in the recommended bowel management program should be assessed at each follow-up evaluation.

The Spinal Cord Medicine Consortium

Seventeen organizations, including the Paralyzed Veterans of America joined in a consortium in June 1995 to develop clinical practice guidelines in spinal cord medicine. A steering committee was established to lead the guideline development process, identify topics, select panels of experts for each topic, and carry out a comprehensive plan of dissemination and utilization. The steering committee is composed of one representative with CPG experience from each consortium member organization. PVA provides financial resources, administrative support, and programmatic coordination of consortium activities.

After studying the processes used to develop other guidelines, the consortium steering committee unanimously agreed on a new, modified, scientific evidence-based model derived from the Agency for Health Care Policy and Research. The model is:

- Interdisciplinary, to reflect the multiple information needs of the spinal cord medicine practice community.
- Responsive, with a timeline of 12 months for completion of each guideline.
- Reality-based, to make the best use of the time and expertise of the clinicians who serve as panel members, field expert reviewers, and select topic consultants.

The consortium's approach to the development of evidence-based guidelines is both innovative and cost-efficient. The process recognizes the specialized needs of the national spinal cord medicine community, encourages the participation of both payer representatives and consumers with spinal cord injury, and emphasizes utilization of graded evidence drawn from the international scientific literature.

The Spinal Cord Medicine Consortium is unique to the clinical practice guidelines field in that it employs highly effective management strategies based on the availability of resources in the health-care community; it is coordinated by a recognized national consumer organization with a reputation for providing effective service and advocacy for individuals with spinal cord injury and disease; and, it includes third-party and reinsurance payer organizations at every level of the development and dissemination process. The consortium expects to work on four or more CPG topics per year. Evaluation and revision of previously completed guidelines will be undertaken as newly acquired research knowledge demands.

Guideline Development Process

The guideline development process adopted by the Spinal Cord Medicine Consortium consists of 12 steps, leading to panel consensus and organizational endorsement. After the steering committee chooses a topic, the group selects a panel of experts who have conducted independent scientific investigations, published in the field, and demonstrated their leadership in the topic area. Following a detailed explication of the topic by select steering committee and panel members, consultant methodologists review the international literature, grade and rank the quality of the research studies, prepare evidence tables, and conduct statistical meta-analyses and other specialized studies, as warranted. The panel chair then assigns specific sections of the topic to individual panel members, based on their area of expertise, and writing begins on each component. The panel members draw heavily from the references and other materials furnished by the methodological support group.

When the panel members have completed their sections, a draft guideline document is generated. The CPG panel incorporates new literature citations and other evidence-based information not previously available. After panel members have reviewed all the sections and chapters, some parts are rewritten to ensure that the document is complete and accurate. Then, each guideline recommendation is discussed and voted on to determine the level of consensus among panel members. At this point, charts, graphs, algorithms, and other visual aids, as well as a complete bibliography, are added, and the full document is sent to legal counsel for review.

After legal analysis to consider antitrust, restraint-of-trade, and health policy matters, the draft CPG document is reviewed by clinical experts from each of the consortium organizations and by other select experts and consumers. The review comments are assembled, analyzed, and entered into a database by the PVA Consortium Coordinating Office staff and incorporated into the document. Following a second legal review, the CPG document is distributed to all consortium organization governing boards. Final technical details are negotiated among the panel chair, members of the organizations' boards, and expert panelists. If substantive changes are required, the draft receives a final legal review. The document is then ready for editing, formatting, and preparation for publication.

The benefits of clinical practice guidelines for the spinal cord medical practice community are numerous. Among the more significant applications and results are the following:

- Clinical practice options and care standards.
- Building blocks for pathways and algorithms.
- Medical and health professional education and training.
- Knowledge base for improved professional consensus building.
- Evaluation studies of CPG use and outcomes.
- Cost and policy studies for improved quantification.
- Research gap identification.
- Primary source for consumer information and public education.

Neurogenic Bowel Management Guideline Methodology

The strategy for finding evidence relevant to the management of neurogenic bowel in individuals with SCI is modeled after the methods recommended by the Agency for Health Care Policy and Research and the National Academy of Sciences Institute of Medicine. First, an initial search of the MEDLINE database from 1966 to 1997 was conducted, the main issues associated with neurogenic bowel were identified, and the volume of literature available on the subject was estimated. A limited number of selected overviews and review articles was retrieved and used to identify relevant topics. The main areas of interest were pathophysiology, management, prophylaxis, treatment of complications, epidemiology, and economic issues.

Data extraction forms were developed to standardize the collection of data used for evaluation. This form included sections on study design; study population; demographics; inclusion and exclusion criteria; intervention, management, and prophylactic techniques; methods used to measure bowel function (if applicable); techniques for statistical analysis (if any); results; and conclusions. The forms were pilot-tested by 5 abstractors who evaluated a sample of 10 articles from the initial searches. The results of this pilot-test were used to revise the extraction form.

The primary search strategy was identified during a conference call to explicate the guideline topic, identify the intended audience, and establish inclusion and exclusion criteria for the literature searches. The initial focus of the articles—traumatic or nonprogressive etiologies of spinal cord dysfunction—was broadened to include articles on nontraumatic SCI because many authors grouped both traumatic and nontraumatic SCI together in the samples. Articles on progressive and congenital spinal cord disorders and animal studies were excluded. Initially, the literature search included children and adults, but was subsequently narrowed to concentrate on adults of all ages with SCI. Consequently, articles discussing neuro-

genic bowel in pediatric populations were excluded from further consideration. Initially, all articles written in English, French, and German were included; unanticipated difficulties later limited articles to English only. Case series, case studies, crossover studies, and “n-of-one” studies were included because the literature is relatively lacking in nonobservational studies. Review articles and articles examining functional outcomes for individuals with SCI were included if bowel management or neurogenic bowel was the focus of discussion.

Appropriate key words and Index Medicus subheadings (MeSH) were identified during the topic explication process and were used to search the MEDLINE database (1966–97) and the CINAHL nursing and allied health database (1982–97). For related nonclinical topics, such as quality of life and individual satisfaction, literature searches were conducted using the PsychLit database (1974–present). Whenever possible, “exploded” MeSH subheadings were used, allowing the capture of more relevant literature than would be discovered using text word searches. Second-level searches were conducted using the major and minor MeSH subheadings retrieved from relevant articles.

Abstracts culled from the searches were reviewed, using the inclusion and exclusion criteria, to determine relevance to management of the neurogenic bowel. Those abstracts that met the criteria were retrieved. If an article did not have an abstract or if its relevance was unclear, the article was retrieved for further evaluation. Additionally, the reference lists of all relevant articles were reviewed to identify additional or “fugitive” articles.

The data extraction forms were used to compile information from the approximately 200 articles found in the primary and secondary searches. Extracted information was compiled into evidence tables according to subject area, including adjunctive therapies, biofeedback and behavioral therapy, comparisons of bowel management programs, complications, dietary intake and nutrition, educational interventions, prokinetic agents, quality of life, oral laxatives and rectal stimulants, and surgical interventions. Additional tables were created for epidemiology, economic issues, physiology (normal and pathophysiology), as well as for review articles of neurogenic bowel management and related topics, (such as pulsed irrigation enhanced evacuation, functional electrical stimulation, and the bowel management protocols of various rehabilitation institutions).

The methodologists disseminated relevant articles and evidence tables to panel members for study and consideration for inclusion. During the subsequent periods, the methodologists responded to queries from the panel chair and panel members. Additional articles identified by panel members were extracted and supplemental evidence tables were created and disseminated, as required.

STRENGTH OF SCIENTIFIC EVIDENCE FOR THE RECOMMENDATIONS

The methodologists began by employing the hierarchy first discussed by Sackett (1989) and later enhanced by Cook et al. (1992) and the U.S. Preventive Health Services Task Force (1996), presented in Table 1. Additionally, each study was evaluated for internal and external validity. Factors affecting internal validity (i.e., the extent to which the study provided valid information about the individuals and conditions studied) included sample size and statistical power; selection bias and inclusion criteria; selection of control groups, if any; randomization methods and comparability of groups; definition of interventions and/or exposures; definition of outcome measures; attrition rates; confounding variables; data collection methods and observation bias; and methods of statistical analysis. External validity—the extent to which the study findings were generalizable to conditions other than the setting of the study—was evaluated through an examination of the characteristics of the study population, the clinical setting and environment, and the investigators and providers of care. The resulting rankings were provided to the panel members during the writing and deliberation process.

If the literature supporting a guideline recommendation came from two or more levels, the number and level of the studies were reported (e.g., in the case of a guideline recommendation that was supported by two studies, one a level III, the other a level V, the “scientific evidence” was indicated as “one level III study and one level V study”).

TABLE 1
Hierarchy of the Levels of Scientific Evidence

Level	Description
I	Large randomized trials with clear-cut results (and low risk of error)
II	Small randomized trials with uncertain results (and moderate to high risk of error)
III	Nonrandomized trials with concurrent or contemporaneous controls
IV	Nonrandomized trials with historical controls
V	Case series with no controls

Sources: Sackett D. L., Rules of evidence and clinical recommendations on the use of antithrombotic agents; *Chest* 95 (2 Suppl) (1989): 2S–4S; and U.S. Preventive Health Services Task Force, *Guide to Clinical Preventive Services: An Assessment of the Effectiveness of 169 Interventions* (Baltimore: Williams and Wilkins, 1989).

Next, each of the guideline recommendations was classified, according to the level of scientific evidence used in the development of the recommendation. The schema used by the panel is shown in Table 2. It should be emphasized that these ratings,

like those just described, represent the strength of the supporting evidence, not the strength of the recommendation itself. The strength of the recommendation is indicated by the language describing the rationale.

Category A requires that the guideline recommendation be supported by scientific evidence from at least one properly designed and implemented randomized, controlled trial, providing statistical results that consistently support the guideline statement. Category B requires that the guideline recommendation be supported by scientific evidence from at least one small randomized trial with uncertain results; this category also may include small randomized trials with certain results where statistical power is low. Category C recommendations are supported either by nonrandomized, controlled trials or by trials for which no controls were used (observational studies).

If a guideline recommendation was supported by literature that crossed two categories, both categories were reported (e.g., a guideline recommendation that included both level II and III studies would be classified as categories B/C and be indicated as “grade of recommendation–B/C”).

In situations where no published literature existed, consensus of the panel members and outside expert reviewers was used to develop the guideline recommendation and the “grade of recommendation” is indicated as “expert consensus.”

TABLE 2
Categories of the Strength of Evidence Associated with the Recommendation

Category	Description
A	The guideline recommendation is supported by one or more level I studies
B	The guideline recommendation is supported by one or more level II studies
C	The guideline recommendation is supported only by level III, IV, or V studies

Sources: Sackett, D.L., Rules of evidence and clinical recommendations on the use of antithrombotic agents; *Chest* 95 (2 Suppl) (1989): 2S–4S; and U.S. Preventive Health Services Task Force; *Guide to Clinical Preventive Services: An Assessment of the Effectiveness of 169 Interventions* (Baltimore: Williams and Wilkins, 1989).

STRENGTH OF PANEL OPINION

After deliberation and discussion of each guideline recommendation and the supporting evidence, the level of expert panel agreement with the recommendation was assessed as either low, moderate, or strong. In this assessment, each panel member was asked to indicate his or her level of agreement on a 5-point scale, with 1 corresponding to neutrality and 5 representing maximum agreement. Panel members could abstain from this voting process for a variety of reasons, such as lack of expertise associated with a particular guideline recommendation. Subsequently, the scores were aggregated across the panel members, and an arithmetic mean was calculated. This mean score was then translated into low, moderate, or strong, as shown in Table 3.

TABLE 3
Levels of Panel Agreement with the Guideline Recommendation

Level	Mean Agreement Score
Low	1.0 to less than 2.33
Moderate	2.33 to less than 3.67
Strong	3.67 to 5.0

Introduction

A neurogenic bowel is a life-altering impairment of gastrointestinal and anorectal function resulting from a lesion of the nervous system that can lead to life-threatening complications. It is common following spinal cord injury (SCI) and has the potential to influence the social, emotional, and physical well-being of individuals living with SCI. Establishment of an effective bowel management program can minimize the development of disability and handicaps related to neurogenic bowel. Nevertheless, research reports on neurogenic bowel outcomes document a high prevalence of gastrointestinal (GI) complaints and a negative impact on quality of life after SCI (Glickman and Kamm, 1996; Kirk et al., 1997; Levi et al., 1995; Stone et al., 1990a). The litany of complications and evacuation problems is extensive and includes, but is not limited to, ileus, gastric ulcers, gastroesophageal reflux, autonomic dysreflexia, pain, distention, diverticulosis, complications such as hemorrhoids, nausea, appetite loss, impaction, constipation, diarrhea, delayed evacuation, and unplanned evacuation (Glickman and Kamm, 1996; Gore et al., 1981; Kirk et al., 1997; Stone et al., 1990a). Up to 23 percent of individuals with long-term SCI have required hospitalization for one or more of these complaints (Kirk et al., 1997; Stone et al., 1990a).

Bowel dysfunction has been reported to affect life activities or lifestyle in 41 percent to 61 percent of subjects (Glickman and Kamm, 1996; Kirk et al., 1997), to be a moderate to severe life problem (Levi et al., 1995), and to be related to depression (Glickman and Kamm, 1996). Dunn (1977) reported that the occurrence of uncontrolled bowel evacuation was the source of the greatest social discomfort in subjects with SCI. Such findings suggest the need to consider and incorporate quality of life into the development of interventions and as an outcome in program evaluation and research.

Despite the frequency of complications, evacuation difficulties, and negative psychosocial outcomes, few controlled studies have been reported on methods to improve neurogenic bowel management. For instance, a limited number of studies have been reported on innovations to enhance the effectiveness of rectal stimulants (Dunn and Galka, 1994; Frost et

al., 1993; House and Stiens, 1997; MacDonagh et al., 1990; Stiens, 1995). Furthermore, few clinical practices related to bowel health (such as the components of a bowel management program or patient education) have been examined in controlled studies. Because there have been so few randomized controlled trials published on this topic, many of the recommendations in this set of guidelines are based on expert opinion rather than research. The basis for each recommendation is clearly delineated. A research agenda was developed to identify priority areas needed to support evidence-based practice in neurogenic bowel management in adults with SCI.

Epidemiology of Spinal Cord Injury and Neurogenic Bowel

This section reviews the literature on the epidemiology of spinal cord injury in general and on neurogenic bowel in particular. Estimates of incidence and prevalence in the United States are presented first, followed by a description of the demographic distribution of cases and the etiology of injury. Finally, studies examining the rates of bowel-related mortality, impairment and disability, and serious complications are examined.

Most estimates place the number of new cases of spinal cord injury in the United States at approximately 10,000 per year (approximately 30-35 cases per million population).¹ The number of individuals living with spinal cord injury in the United States has been estimated to range between 183,000 and 251,000. (Collins, 1987; Devivo et al., 1980, 1992; Ergas, 1985; Harvey et al., 1987).² Nevertheless, little in the epidemiological research literature speaks to the issue of the frequency or distribution of neurogenic bowel as a consequence of spinal cord injury. Two studies examine the need for bowel management or the incidence of fecal or bowel incontinence; however, these studies do not provide estimates using the same measure and thus are difficult to compare. Glickman and Kamm (1996) reported that 95 percent of 115 consecutive outpatients with spinal cord injury required at least one therapeutic procedure to initiate defecation. Subbarao et al. (1987) retrospectively examined the rehabilitation outcomes of 87 patients discharged

¹Wide variation in both incidence and prevalence rates exists as a result of the sources of data and the techniques used to estimate these rates (e.g., extrapolation from existing surveys, use of mathematical models). Researchers have relied on data such as state-level SCI or trauma registries (Burney et al., 1993; Ergas, 1985), national health surveys (Brachen et al. 1981; Collins, 1987), data from the Model Spinal Cord Injury Care System (presently residing at the National Spinal Cord Injury Statistical Center) (DeVivo et al., 1980, 1992), and epidemiological surveys designed to obtain data about individuals with SCI (Harvey et al., 1990; Kraus et al., 1975). Readers interested in more detail about the estimation of SCI incidence and prevalence and the limitations and biases associated with the existing estimates are referred to Berkowitz et al. (1992).

²This range is slightly higher than that reported in the National Spinal Cord Injury Statistical Center's Spinal Cord Injury Facts and Figures at a Glance because we used the 1995 U.S. Census population estimate of 261.6 million (U.S. Bureau of the Census, 1995) rather than the 1990 Census figures.

from a spinal cord injury rehabilitation unit. Twenty-five percent of patients age 50 and older and 3 percent of patients under 50 were incontinent of stool. Because incontinence was not defined, it is not known if incontinence referred to absence of volitional control or unplanned evacuation.

Several studies indicate that unidentified gastrointestinal complications may account for 5 percent to 10 percent of deaths associated with SCI (Charney et al., 1975; Juler and Eltorai, 1985; Miller et al., 1975; Whiteneck et al., 1992). In examining the records of 567 hospitalized SCI patients, Gore et al. (1981) found that 11 percent (87 total complications) had serious gastrointestinal complications. These complications were more frequent among individuals with cervical and upper thoracic injuries (14 percent and 11 percent, respectively) than among individuals with lower thoracic (6 percent) and lumbar-sacral (5 percent) injuries.

Complications observed during the first month postinjury included reflex ileus in 26 people with SCI (4.6 percent), peptic ulcers in 8 (1.4 percent), and pancreatitis in 2 (2.2 percent). Fecal impaction, which occurred in 39 (6.9 percent) individuals with SCI, was the most common complication after the first month postinjury, followed by peptic ulcers in 0.7 percent of the population studied. No studies on the economics of bowel management were found.

Anatomy and Physiology

COLON ANATOMY

The colon can be visualized as a closed, compliant tube that takes a clockwise circumferential course through the abdomen. It is bounded by the ileocecal sphincter at its origin and by the anal sphincter at the perineum. At the end of the colon, the continuous inner smooth muscle layer of the rectum thickens to produce the internal anal sphincter (IAS). The external anal sphincter (EAS) is a circular band of striated muscle that contracts with the pelvic floor. The puborectalis muscle loops around the proximal rectum and maintains the nearly 90° anorectal angle by tethering the rectum toward the pubis (Stiens et al., 1997).

Together, the IAS, EAS, and the puborectalis act in concert to maintain fecal continence. Continence in the resting state is maintained by the tonic activity of the IAS (Schweiger, 1979). Reflex contraction of the EAS and puborectalis prevents incontinence with cough or Valsalva maneuver.

The colon and pelvic floor receive parasympathetic, sympathetic, and somatic innervation. The colon wall contains an enteric nervous system that includes Auerbach's plexus (intramuscular myenteric), which is situated between the longitudinal and circular muscle layers, and Meissner's plexus, which is located in the submucosa. The enteric nervous system coordinates much of the colonic wall movement, which mixes and locally advances stool through the colon.

The extrinsic innervation of the colon consists of parasympathetic, sympathetic, and somatic nerves.

Afferent and efferent fibers that complete reflex arcs and modulate peristalsis are carried by the vagus, pelvic, and hypogastric nerves and respond to a wide variety of mechanical and chemical stimuli. The vagus nerve provides parasympathetic innervation to the gut from the esophagus to the splenic flexure of the colon. The pelvic nerve (also called *nervi erigentes* or inferior splanchnic nerves) carries pelvic parasympathetic fibers from sacral spinal cord levels S2-S4 to the descending colon and rectum. Some pelvic nerve branches travel proximally within the colon wall and overlap with the vagal innervated transverse and ascending colon segments (Sarna, 1991). Sympathetic innervation of the colon comes via the superior and inferior mesenteric (T9-T12) and the hypogastric (lumbar colonic T12-L3) nerves. The EAS is supplied by the somatic pudendal nerve (S2-S4), which innervates the pelvic floor.

COLON PHYSIOLOGY

Storage

The colon forms and contains stool, supports growth of symbiotic bacteria (Gibson and Roberfroid, 1995), secretes mucus for feces lubrication, and propels stool toward the anus. It reabsorbs water, electrolytes, short-chain fatty acids, and bacterial metabolites, giving form to the feces.

Propulsion

Small and large intestinal movement is coordinated primarily within the gut wall, with some spinal cord but minimal brain influence. Peristaltic waves may travel toward or away from the ileocecal valve, mixing feces in the right colon, but consistently drive contents to the anus in the left colon (Christensen, 1991). The coordination of colonic motility is accomplished with three primary transmission mechanisms: chemical, neurogenic, and myogenic (Bassotti et al., 1995). Chemical control modulates colonic activity with neurotransmitters and hormones (Bassotti et al., 1995; Sarna, 1991). Local neurogenic control is via the enteric nervous system, which coordinates all segmental motility and some propagated movement (Sarna, 1991). Enteric reflexes do not require extrinsic colonic innervation (Bayliss and Starling, 1899). When the intestinal wall is stretched or dilated, the nerves in the myenteric plexus cause the muscles above the dilation to constrict and those below the dilation to relax, propelling the contents caudally. The combined contraction of smooth muscle cells is triggered by electric coupling through gap junctions, which allow myogenic transmission from cell to cell (Christensen, 1991). Sympathetic prevertebral reflex circuits have been hypothesized to be primarily inhibitory and to aid in the storage function of the colon (Szurszewski and King, 1989; Weems and Szurszewski, 1977).

Extrinsic reflex pathways from the central nervous system to the intestine and colon both facilitate

and inhibit motility. Vagal reflexes increase propulsive peristalsis of the small intestine down through the transverse colon. Sacral parasympathetic reflexes are excitatory and are relayed from the colon to sacral spinal cord segments within the conus medullaris and back along the pelvic nerve. Spinal cord-mediated reflexes via the pelvic nerve are initiated from enteric circuits in response to colonic dilation and serve to reinforce colonic-initiated propulsive activity in defecation (Sarna, 1991). The rectocolic reflex is a pelvic nerve-mediated pathway that produces propulsive colonic peristalsis in response to chemical or mechanical stimulation of the rectum and anal canal. Stimulation of the parasympathetic pelvic splanchnic nerve can increase motility of the entire colon.

Colonic movements can be individual segmental contractions, organized groups (colonic migrating or nonmigrating), and special propulsive (giant migrating contractions, or GMC) (Sarna, 1991) waves of peristalsis that propel stool over long distances. In the neurally intact state, colonic transport takes 12 to 30 hours from the ileocecal valve to the rectum (Menardo et al., 1987).

Continence

In the resting state, fecal continence is maintained by a closed IAS and by the acute angle of the anorectal canal produced by the puborectalis sling. Sympathetic (L1-L2) discharges via the lumbar colonic nerve increases IAS tone. IAS tone is inhibited with rectal dilatation by stool (rectal anal inhibitory reflex) or digital stimulation.

Defecation

Voluntary control of abdominal musculature and relaxation of the EAS permit willful defecation at times of increased colonic motility. In the neurally intact state, defecation begins with spontaneous involuntary advancement of stool into the rectum (Sarna, 1991). The urge to defecate comes from the rectal and puborectalis stretch (Rasmussen, 1994). Stool can be temporarily retained by the voluntary contraction of the EAS. Defecation occurs with relaxation of the puborectalis muscle and the EAS. This produces a straighter anorectal tunnel for stool passage, driven by peristalsis and increased intraabdominal pressure produced by the Valsalva maneuver (Stiens et al., 1997).

Pathophysiology of the Neurogenic Bowel

SPINAL SHOCK

Spinal shock is a term for the phenomenon of temporary loss or depression of all or most reflex activity below the level of the spinal cord injury in the period following injury (Atkinson, 1996). Spinal shock may last from hours to weeks. Autonomic reflex arcs are variably affected during spinal shock because they often traverse ganglia outside of the spinal cord. During the first few weeks after SCI,

reflex-mediated defecation is less robust. The termination of spinal shock is signaled by the return of reflex activity, which typically follows a pattern from proximal to distal.

GASTROCOLIC RESPONSE

The gastrocolic response or gastrocolic reflex, which is triggered by feeding, produces propulsive peristalsis of the small intestine and colon. This response may be facilitated by a fatty or proteinaceous meal or blunted by anticholinergic drugs. The mechanism has not been conclusively defined (Stiens et al., 1997) and may include neural (Snape et al., 1979) and hormonal (Connell et al., 1963) influences. Connell et al. (1963) studied alterations in motility of the rectosigmoid in subjects with clinically complete transverse spinal cord lesions. In this study, ingested food caused an increase in colonic motility that would start in less than 15 minutes and could last longer than an hour. In contrast, a study by Glick et al. (1984) failed to demonstrate any evidence of a gastrocolic response in nine subjects with spinal cord injuries. It seems likely that the gastrocolic response remains active in at least some individuals with spinal cord injuries.

EFFECTS ON COLONIC AND RECTAL COMPLIANCE AND MOTILITY

Intracolonic pressures have been studied in subjects with upper motor neuron SCI. Colonometry studies of SCI individuals with complete thoracic-level injuries following the gradual instillation of water have demonstrated low compliance, by producing abnormal pressures of 40mm Hg at volumes as low as 300 ml. (Glick et al., 1984; Meshkinpour et al., 1983; White et al., 1940). Neurally intact subjects' colons could be instilled with greater than 2000 ml before such pressures were observed. However, localized balloon manometric studies of rectal compliance (Frenckner, 1975; MacDonagh et al., 1992; Nino-Murcia et al., 1990) revealed no significant differences between persons with thoracic SCI and normal controls. Further research is needed to reconcile these findings.

Intraluminal electromyographic recordings of the colon wall have revealed higher basal colonic myoelectric activity in SCI. Fasting myoelectric activity of the colons of persons with cervical and thoracic SCI has revealed more spike wave activity ($N=6$ $p < 0.025$) than controls (Aaronson et al., 1985). Rectal recordings reveal dysrhythmic discharges in subjects with upper motor neuron lesions and no recordable electrical activity in lower motor neuron SCI (Shafik, 1995).

Colonic transit times have been studied in people with upper motor neuron SCI. By utilizing swallowed radiopaque markers, mean total transit times have been measured at 80.7 ± 11 hours for individuals with SCI as compared with 39 ± 5 hours for neurally

intact adults (Nino-Murcia et al., 1990). The main delay has been demonstrated to be at the descending colon and anorectum (Beuret-Blanquart et al., 1990; Menardo et al., 1987). Other radioisotopic methods (Keshavarzian et al., 1995) with scintigraphy and radiographic marker studies (Nino-Murcia et al., 1990) suggest slowing along the entire length of the colon.

ALTERATIONS IN THE ANAL SPHINCTER

Several studies (Denny-Brown and Robertson, 1935; Frenckner, 1975; Schuster, 1975) have demonstrated that resting anal pressures and reflex IAS relaxation in individuals with SCI are similar to those observed in neurally intact individuals. The function of the EAS also has been studied in individuals with SCI (Frenckner, 1975). In eight with transverse injuries of the spinal cord, rectal distention with a balloon stimulated contraction of the striated EAS. Contractions of the EAS of individuals with SCI occurred less frequently and at greater volumes of inflation than neurally intact controls. In all of the subjects with SCI, the balloon was reflexively defecated after inflation. This occurred in none of the neurally intact controls.

Hyperactive reflex defecation appears to be spinal reflex mediated as it is diminished after selective sacral posterior root rhizotomy (Sun et al., 1995). Longo et al. (1995) indicate that EAS tone at rest is similar to resting IAS tone, but markedly below squeeze pressures of the EAS that can be willfully generated by neurally intact individuals. Nino-

Murcia et al. (1990) found two abnormal patterns of anorectal response to balloon dilatation after SCI: high rectal compliance and anorectal dyssynergia (anal sphincter contraction in response to rectal contraction).

FUNCTIONAL RESULTS

The effect of SCI on colonic and anorectal function has been reviewed by Stiens et al. (1997). Depending on the location of injury, SCI produces two different patterns of bowel dysfunction. An injury above the sacral segments of the spinal cord produces a reflexic or upper motor neuron (UMN) bowel in which defecation cannot be initiated by voluntary relaxation of the EAS. Inability to voluntarily modulate descending inhibition and spasticity of the pelvic floor prevents EAS relaxation, thus promoting stool retention. However, nerve connections between the spinal cord and colon and in the colonic wall remain intact, allowing for reflex coordination of stool propulsion.

A complete injury at the sacral segments (or the cauda equina) results in an areflexic or lower motor neuron (LMN) bowel in which no spinal cord-mediated reflex peristalsis occurs. The myenteric plexus within the colonic wall coordinates slow stool propulsion, and the denervated EAS has low tone. This results in a sluggish stool movement, a dryer, rounder shape, and a greater risk for fecal incontinence through the hypotonic anal sphincter.

Recommendations

Assessment of the Neurogenic Bowel

ASSESSMENT OF IMPAIRMENT AND DISABILITY

1. **A systematic, comprehensive evaluation of bowel function, impairment, and possible problems should be completed at the onset of SCI and at least annually throughout the continuum of care.** (Scientific evidence—none; grade of recommendation—expert consensus; strength of panel opinion—strong)
2. **The patient history should include the following elements:**
 - Premorbid gastrointestinal function and medical conditions.
 - Current bowel program, including patient satisfaction.
 - Current symptoms, including abdominal distention, respiratory compromise, early satiety, nausea, evacuation difficulty, unplanned evacuations, rectal bleeding, diarrhea, constipation, and pain.
 - Defecation or bowel care (assisted defecation procedure) frequency, and duration and characteristics of stool.
 - Medication use and potential effect on bowel program.

(Scientific evidence—three level V studies for assessment of symptoms, otherwise none; grade of recommendation—C/expert consensus; strength of panel opinion—strong)

The medical history should cover bowel function prior to SCI because premorbid bowel function provides the foundation for a postinjury bowel care regimen. Medical conditions that affect bowel function should be evaluated because preexisting laxative dependency, diabetes, irritable bowel syndrome, lactose intolerance, or inflammatory bowel disease can affect transit time, can decrease the responsiveness of the gut to medications, and can even predispose the individual to life-threatening complications, such as toxic megacolon.

Systematic assessment of the bowel program facilitates problem identification and possible solution. The components include:

- Daily fluid intake.
- Diet (number of calories, grams of fiber, frequency of meals, and amounts consumed).
- Activity level.

- Time of day.
- Frequency and type of rectal stimulation (chemical, mechanical).
- Facilitative techniques.
- Components of bowel care (frequency, assistance required, and duration).
- Characteristics of stool (amount, consistency, color, mucus, and presence of blood).
- Medications to aid bowel function.

Difficulties with evacuation include:

- Delayed or painful evacuations.
- Constipation.
- Hard, round stools that may be difficult to evacuate.
- Diarrhea.
- Unplanned evacuations occurring between bowel care.

When assessing GI function in individuals with longstanding SCI, a review of systems should be carried out during the history to elicit symptoms related to GI complications. Three studies have examined GI complaints of individuals with chronic SCI. Stone et al. (1990a) reported that 27 percent of the subjects experienced chronic GI problems that altered their lifestyles or required chronic treatment. These complaints included hemorrhoids (74 percent), abdominal distention (43 percent), autonomic dysreflexia related to the GI tract (43 percent), difficulty with bowel evacuation (20 percent), and poorly localized abdominal pain (14 percent). The prevalence of GI complaints increased with time after injury. Gore et al. (1981) found fecal impaction to be the most common complication in SCI. Right colonic impactions predominated with UMN bowel, and left colonic impactions were more common with LMN bowel. These authors also reported a higher than expected incidence of gastroesophageal reflux, hiatal hernia, and diverticulosis among individuals under 35 years of age who were injured longer than 4 years. Kirk et al. (1997) found that 76 percent of 171 subjects with SCI reported one or more GI symptoms in the previous month. Common symptoms were bloating (53 percent), rectal bleeding (39 percent), and impaction (13 percent). Early recognition of symptoms is essential to prevent serious GI complications such as abscess or perforation.

A number of medications commonly used by individuals with SCI have the potential to alter bowel function due to their mechanism of action. It is, therefore, important to be aware of the individual's current medications when evaluating bowel function and methods of bowel management. Unfortunately, studies on the effects of such medications on bowel function specific to individuals with SCI could not be found. In general, the use of antibiotics can change the balance of the colon microflora and result in soft stool or diarrhea. Any medication that has anticholinergic properties has the potential to slow bowel motility, resulting in constipation or even adynamic ileus. Drugs commonly used to manage a neurogenic bladder, such as oxybutynin and propantheline, may decrease bowel motility. A number of antidepressant drugs, such as amitriptyline, also have anticholinergic effects. Narcotic pain medications can result in constipation, due to the slowing of bowel motility. Certain medications used for the treatment of spasticity in individuals with SCI also may have an effect on bowel function. For instance, gastrointestinal side effects can occur with dantrolene sodium. Use of this drug may produce nausea, emesis, and diarrhea, although the side effects are usually transient and can be avoided if the initial doses are low and then increased gradually.

3. A physical examination should be done at the onset of SCI and annually thereafter. The examination should include:

- Complete abdominal assessment, including palpation along the course of the colon.
- Rectal examination.
- Assessment of anal sphincter tone.
- Elicitation of anocutaneous and bulbocavernosus reflexes to determine if the patient has UMN or LMN bowel.
- Stool testing for occult blood beginning at age 50.

(Scientific evidence—none, clinical practice guidelines for colorectal cancer screening; grade of recommendation—C/expert consensus; strength of panel opinion—strong [onset], moderate [annual])

Symptoms relative to the gastrointestinal tract are often vague and increase in incidence after SCI. Sensory deficits and motor limitations can prevent individuals with SCI from recognizing problems that might be detected by individuals who are neurally intact. Periodic examinations can detect functional changes, pelvic floor spasticity, colonic overdistention, carcinoma, and perianal lesions. Should such findings emerge, appropriate interventions may limit the severity and functional impact of gastrointestinal complications.

The purpose of the physical examination is to confirm and quantify suspected colonic and pelvic floor dysfunction, to screen for complications of neurogenic bowel, and to devise a plan for adaptive compensation for functional impairment (Stiens et al., 1997). First, the abdomen should be inspected for distention; then, presence of bowel sounds should be noted. Percussion frequently reveals widespread tympany, suggesting flatus retention. Abdominal muscle relaxation can frequently be accomplished by supporting the flexed knees with a pillow and gently massaging the abdomen. Superficial palpation allows assessment of the tone and voluntary control of abdominal musculature. Deep palpation may reveal the presence of masses, organomegaly, or high colonic impaction (Wrenn, 1989). The examination process also provides an opportunity to teach the individual about colonic function and adaptive techniques.

The neurologic examination will yield information about the completeness of SCI and the extent of damage to the upper motor neurons or lower motor neurons. The examination should include assessment of sacral reflexes, including anal tone, anocutaneous reflex, and the bulbocavernosus reflex (Stiens et al., 1997). The anocutaneous reflex is contraction of the EAS in response to touch or pin stimulus to the perianal skin. The bulbocavernosus reflex is elicited by pinching the dorsal glans penis or by pressing the clitoris and palpating for bulbocavernosus and EAS contraction (S2, S3) within the anal canal. Positive anocutaneous and bulbocavernosus reflexes suggest the presence of conus-mediated reflex activity, or UMN bowel.

The rectal examination provides information about sensation, sphincter innervation, stool in the rectal vault, and the presence of hemorrhoids or masses. If there is risk of autonomic dysreflexia, an anesthetic lubricant should be considered. The examining finger should be held firmly against the anal verge to allow gradual passive relaxation of EAS tone. As the EAS opens, the examining finger should be pointed at the umbilicus and advanced toward the rectal angle maintained by the puborectalis muscle. The individual's perception of the examining finger should be elicited to determine presence of anorectal sensation. The voluntary strength of the EAS and puborectalis can be assessed by requesting the individual to tighten the pelvic floor as if to prevent stool from escaping. The puborectalis is palpated a few inches inside the anal canal. Gentle pressure toward the sacrum is applied to assess the puborectalis for tone, strength, and spasticity. Strength should be assessed (Wyndaele and Van Eetvelde, 1996).

The physical examination may be complemented by basic laboratory studies. Annual stool testing for occult blood is offered to patients age 50 and older (Winawer et al., 1997). Stool examination for fecal leukocytes, *clostridium difficile* toxin, ova and parasites, or other enteropathogens may be useful in

diagnosing diarrhea with no obvious cause. A flat-plate radiograph of the abdomen can be helpful in confirming and quantifying fecal retention and megacolon (Nino-Murcia et al., 1990).

ASSESSMENT OF FUNCTION (DISABILITY)

4. An assessment of knowledge, cognition, function, and performance should be conducted to determine the ability of the individual to complete bowel care or to direct a caregiver to complete the procedure safely and effectively. The assessment should include the following elements:

- Ability to learn.
- Ability to direct others.
- Sitting tolerance and angle.
- Sitting balance.
- Upper extremity strength and proprioception.
- Hand and arm function.
- Spasticity.
- Transfer skills.
- Actual and potential risks to skin.
- Anthropometric characteristics.
- Home accessibility and equipment needs.

(Scientific evidence—V; grade of recommendation—C; strength of panel opinion—strong)

Most individuals with SCI are able to learn either to perform or to direct bowel care, but individuals with cognitive deficits may be unable to manage their complete bowel program safely and effectively. To manage a comprehensive bowel program, knowledge of diet, normal bowel function, and bowel function after SCI must be assimilated. Cognitive skills include adequate memory, judgment, and problem-solving skills to capably implement and follow through on a comprehensive bowel program, as well as manage potential problems. If the individual is cognitively intact, he or she should be able to direct a caregiver to complete the bowel care procedures safely and effectively, even if unable to perform these tasks independently.

There is little scientific evidence on functional assessment specifically related to bowel care. Using a population-based survey, Berkowitz et al. (1992) found that 36 percent of all individuals with spinal cord injury reported a need for assistance with bowel care. Individuals with tetraplegia were more than three times as likely to report the need for assistance than were those with paraplegia (59 percent com-

pared to 16 percent). In addition to level and completeness of injury, anthropometric characteristics, such as weight, height, and arm length, also affect an individual's functional abilities. Furthermore, spasticity may impede independent function and increase risk for falls when completing bowel care in a seated position. Typically, individuals with spinal cord injuries from level C5 and above will be dependent for all physical aspects of bowel care. Although individuals with C6 and C7 level injuries may perform bowel care without assistance for related areas such as clothing management and transfer skills, many opt for assistance to save time and energy and prevent frustration.

Should a caregiver be required to perform the functions of bowel care, the physical characteristics, cognitive ability, and endurance of the caregiver should be considered. Optimally, caregivers should be sensitive to the individual's need for privacy and dignity.

Functional requirements will vary depending on whether bowel care is completed in a seated or recumbent position. Sitting tolerance commensurate with the amount of time required for bowel care should be established. Two hours of sitting tolerance is usually sufficient. Individuals at high risk for skin breakdown need to weigh the value of completing bowel care in a seated position with the increased risk for pressure ulcers over the sacrum, coccyx, or ischial tuberosities (Nelson et al., 1994). A side-lying position in bed may be necessary for individuals who are unable to sit because of pressure ulcers or another medical condition or for those who lack the physical, environmental, or equipment resources needed to complete bowel care safely in a seated position. For people with limited sitting tolerance and prolonged evacuation times, one option is to insert a suppository while in a side-lying position, then transfer to the toilet after 15 minutes or longer. Transfer skills and transfer equipment are needed for positioning on the commode or toilet. Sitting balance, truncal mobility, hand function, and use of the arms are needed to manage clothing, as well as to set up and perform bowel care procedures, such as digital stimulation, insertion of suppository, and completion of perianal hygiene.

Functional assessment for bowel care should include home accessibility. Limitations in bathroom accessibility may necessitate performance of bowel care in another room. Modifications to the home may improve accessibility, but can be expensive to make. Bowel care equipment needs are based on the individual's functional requirements and home accessibility.

Management of the Neurogenic Bowel

DESIGNING A BOWEL PROGRAM

5. The bowel program should provide predictable and effective elimination and reduce evacuation problems and gastrointestinal complaints. Bowel

programs should be revised as needed throughout the continuum of care. (Scientific evidence—two level V studies, one review article, and one clinical textbook; grade of recommendation—C/expert consensus; strength of panel opinion—strong)

The goals of a well-designed, effective bowel program are to minimize or eliminate the occurrence of unplanned bowel movements (Davis et al., 1986); to evacuate stool at a regular, predictable time within 60 minutes of bowel care (Kirk et al., 1997; Zejdlik, 1992), and to minimize GI symptoms. Following SCI, individuals may have partial or complete loss of the ability to consciously feel stool in the rectum or to initiate or delay defecation. A bowel program helps compensate for these changes by providing for predictable elimination and avoiding colonic overdistention and fecal impaction.

Bowel programs consist of a number of components, including timing and frequency of administration of bowel care, diet and fluid management, activity level, rectal stimulation, and oral medications. Each individual's bowel program may include some or all of these components. Bowel care (the process for assisted defecation) consists of chemical or mechanical stimulation of defecation, positioning, assistive techniques, digital stimulation, and equipment. During the first days and weeks following injury, utilization of and adjustments in fluids, diet, positioning, and activity may be restricted. For these reasons, even patients with intact reflexes usually require stronger rectal stimulants and/or manual evacuation during acute care. A bowel program can take months to establish and will require careful management to maintain.

Age-related colonic disease, such as diverticular disease, may contribute to increased risk for gastrointestinal complications in individuals who are older at SCI onset or who age with an SCI. White-neck et al. (1992) reported that the frequency of gastrointestinal problems was greatest in the group age 60 and older at onset and those who were injured 30 years and longer. The frequency of GI complications in chronic SCI (Gore et al., 1981; Kirk et al., 1997; Stone et al., 1990a) and the potential for changes in general health and social support indicate a need to monitor bowel programs over the continuum of care (see "Monitoring Program Effectiveness").

6. **Within established parameters of safety and effectiveness, the design of the bowel program should take into account attendant care, personal goals, life schedules, role obligations of the individual, and self-rated quality of life.** (Scientific evidence—V; grade of recommendation—C; strength of panel opinion—strong)

When a bowel management routine is being designed, the individual with SCI is the most important member of the rehabilitation team. Studies have

shown that 27 percent to 61 percent of individuals with SCI rank bowel dysfunction as a major life-limiting problem (Glickman and Kamm; 1996, Kirk et al., 1997; Levi et al., 1995; Stone et al., 1990a).

In particular, unplanned evacuations and prolonged bowel care have been identified as contributing to psychological distress (Glickman and Kamm, 1996). Unplanned evacuations were reported to be a major concern affecting women's sexual activity (White et al., 1993). To minimize these negative outcomes, bowel programs should be designed and revised with the participation of the individual with SCI. In addition to physical and physiological factors, personal goals, life schedules, and role obligations of the individual and family caregiver, as well as the need for and availability of attendant care, should be considered in the design. Evaluation of the impact of neurogenic bowel on physical, social, and psychological quality of life over time will assist the health professional in providing guidance.

7. **Bowel programs should be initiated during acute care and continued throughout life, unless full recovery of bowel function returns. Differences in bowel programs for reflexic and areflexic bowels include type of rectal stimulant, consistency of stool, and frequency of bowel care. To establish a bowel program:**

- Encourage appropriate fluids, diet, and activity.
- Choose an appropriate rectal stimulant.
- Provide rectal stimulation initially to trigger defecation daily.
- Select optimal scheduling and positioning.
- Select appropriate assistive techniques.
- Evaluate medications that promote or inhibit bowel function.

(Scientific evidence—none, clinical textbooks and nursing procedure manuals; grade of recommendation—expert consensus; strength of panel opinion—strong)

Bowel programs should be initiated during acute care to avoid complications such as colorectal distention, impaction, and obstruction from the onset of injury (Gore et al., 1981). With the exception of a small number of studies on rectal stimulants and prokinetic medications and a study of dietary fiber, systematic testing of these components in individuals with neurogenic bowel is lacking.

In each type of bowel program: (1) bowel care should be scheduled at the same time of day to develop a habitual, predictable response, (2) ingestion of food or liquids approximately 30 minutes prior to bowel care may be needed to stimulate the

gastrocolic response, and (3) bowel care should typically be scheduled at least once every two days in the long-term to avoid chronic colorectal overdistention (Emick-Herring, 1993; Linsenmeyer and Stone, 1993; Stiens, 1997). Frequency of bowel care depends on the amount and type of dietary and fluid intake; activity; type of bowel impairment; variations in individual physiologic needs; and preinjury patterns of elimination.

The initial bowel care routine for **reflexic bowel** consists of placing a chemical stimulant onto the rectal mucosae, waiting an appropriate time for the stimulant to activate, assuming an upright or side-lying position, performing digital stimulation or other assistive techniques, and repeating the stimulation until evacuation occurs (Emick-Herring, 1993; Kubalanza-Sipp and French, 1990). A water-soluble lubricant is used with suppository insertion and digital stimulation. Slow, gentle rotation of the finger is used for digital stimulation to avoid increased spasticity of the sphincter (Stiens et al., 1997).

Once a stable and effective bowel program is established for individuals with reflexic bowel, the program can be simplified by reducing the frequency of bowel care, by changing the potency of the chemical stimulus, or by trying digital stimulation alone. Bowel care should be scheduled initially on a daily basis. The amount of stool resulting from each bowel care session is evaluated and the frequency of bowel care may be modified to every other day if daily bowel care does not consistently produce stool results. (See "Monitoring Programs Effectiveness.") Simplification of a program can be considered if elimination occurs consistently with no unplanned evacuations between bowel care for 3 to 5 cycles or a minimum of one week.

Usual bowel care routines for **areflexic bowel** consist of assuming an upright or a side-lying position, performing gentle Valsalva maneuvers, and/or manual evacuation until the rectum is free of stool. Prior to using the Valsalva maneuver, the bladder should be emptied to avoid vesico-ureteral reflux. During spinal shock when peristalsis is reduced and anorectal reflexes are absent, manual evacuation is the procedure of choice (Halm, 1990). Maintenance of firm stool facilitates ease of removal using manual evacuation. An areflexic or LMN bowel usually requires daily and sometimes twice daily bowel care.

Diet, fluids, and regular activity are used to modulate stool consistency. Foods that cause flatulence or loose or hard-formed stools should be identified by each individual and avoided, if possible. The goal for stool consistency in **reflexic bowel** is soft-formed stool that can be readily evacuated with rectal stimulation. In **areflexic bowel**, the goal is firm-formed stool that can be retained between bowel care sessions and easily manually evacuated. If diet, fluid, and activity alone prove ineffective, a trial of oral medications is warranted.

(See "Designing a Neurogenic Bowel Management Program for a Spinal Cord Injured Individual," page 17-18.)

8. **A consistent schedule for defecation should be established based on factors that influence elimination, preinjury patterns of elimination, and anticipated life demands.** (Scientific evidence—none; grade of recommendation—expert consensus; strength of panel opinion—strong)

The time of day for bowel care is based on physiologic and lifestyle needs. Anticipated postinjury life routines or demands of the individual with SCI and caregiver are a consideration in scheduling bowel care (Emick-Herring, 1993).

9. **Mechanical and/or chemical rectal stimulation should be prescribed to predictably and effectively evacuate stool.** (Mechanical: Scientific evidence—none; grade of recommendation—expert consensus; strength of panel opinion—strong. Chemical: Scientific evidence—two level III studies and one level V study; grade of recommendation—C; strength of panel opinion—strong)

When determining the most appropriate method of stimulation, the following factors should be considered:

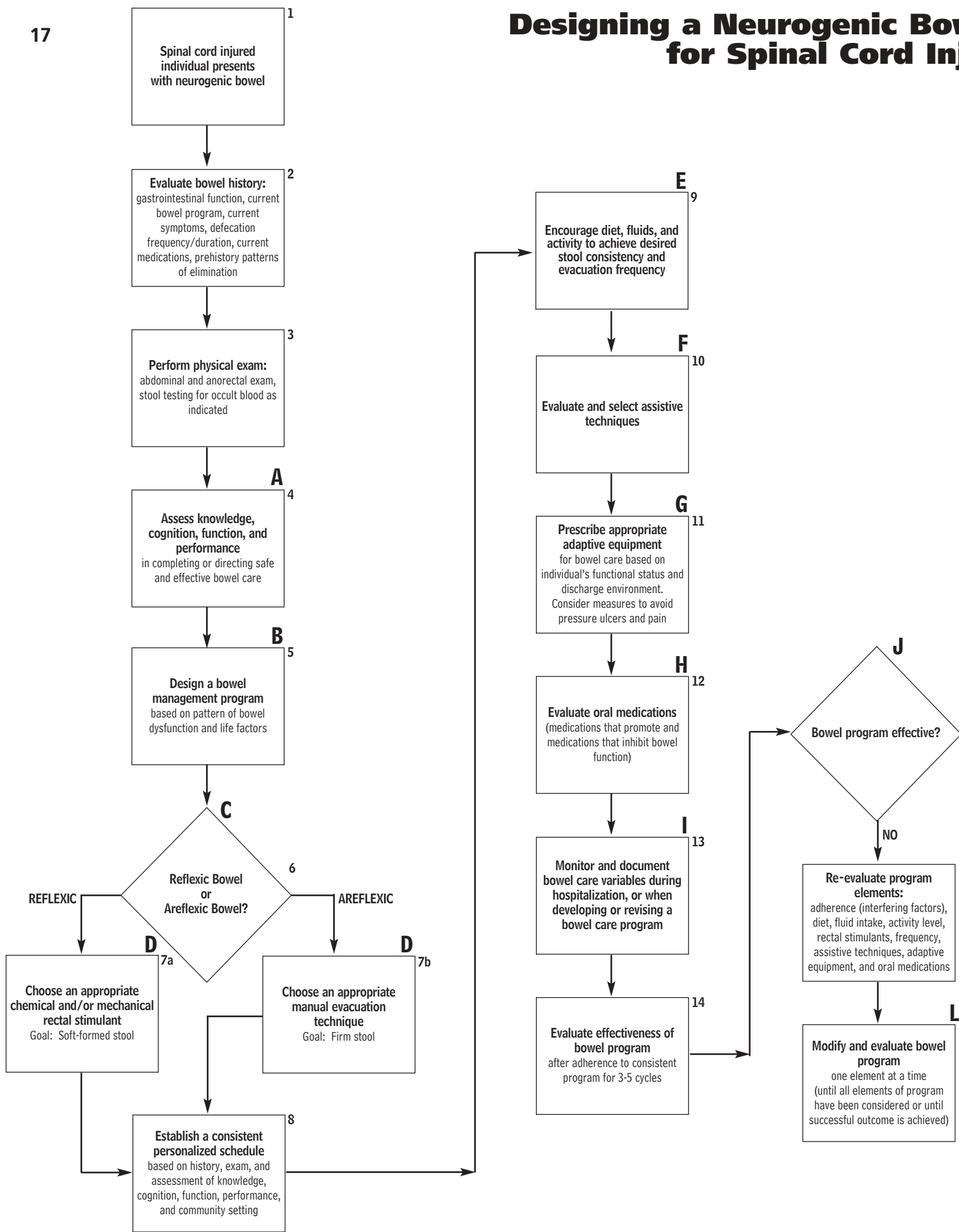
- Effectiveness, including time for evacuation and absence of evacuation problems.
- Type of bowel impairment.
- Tolerance to stimulation and presence of adverse reactions.
- Availability of the product in the community.

Bowel care may require the use of two methods of rectal stimulation—mechanical and chemical—which can be used individually or in combination. Regardless of the method, rectal stimulation may cause autonomic dysreflexia in individuals with cervical or high thoracic spinal cord lesions (Consortium for Spinal Cord Medicine, 1997). A small number of studies have provided scientific evidence to assist individuals with SCI and clinicians in determining which stimulants may contribute to the most efficient bowel care routine.

Mechanical Methods

Mechanical methods can be used alone, or they can be used to augment chemical stimulation in bowel care. Two mechanical methods used in bowel care are digital stimulation and manual evacuation. Digital stimulation is a technique that increases peristalsis and relaxes the external anal sphincter. It is performed by gently inserting a gloved, lubricated finger into the rectum and slowly rotating the finger in a

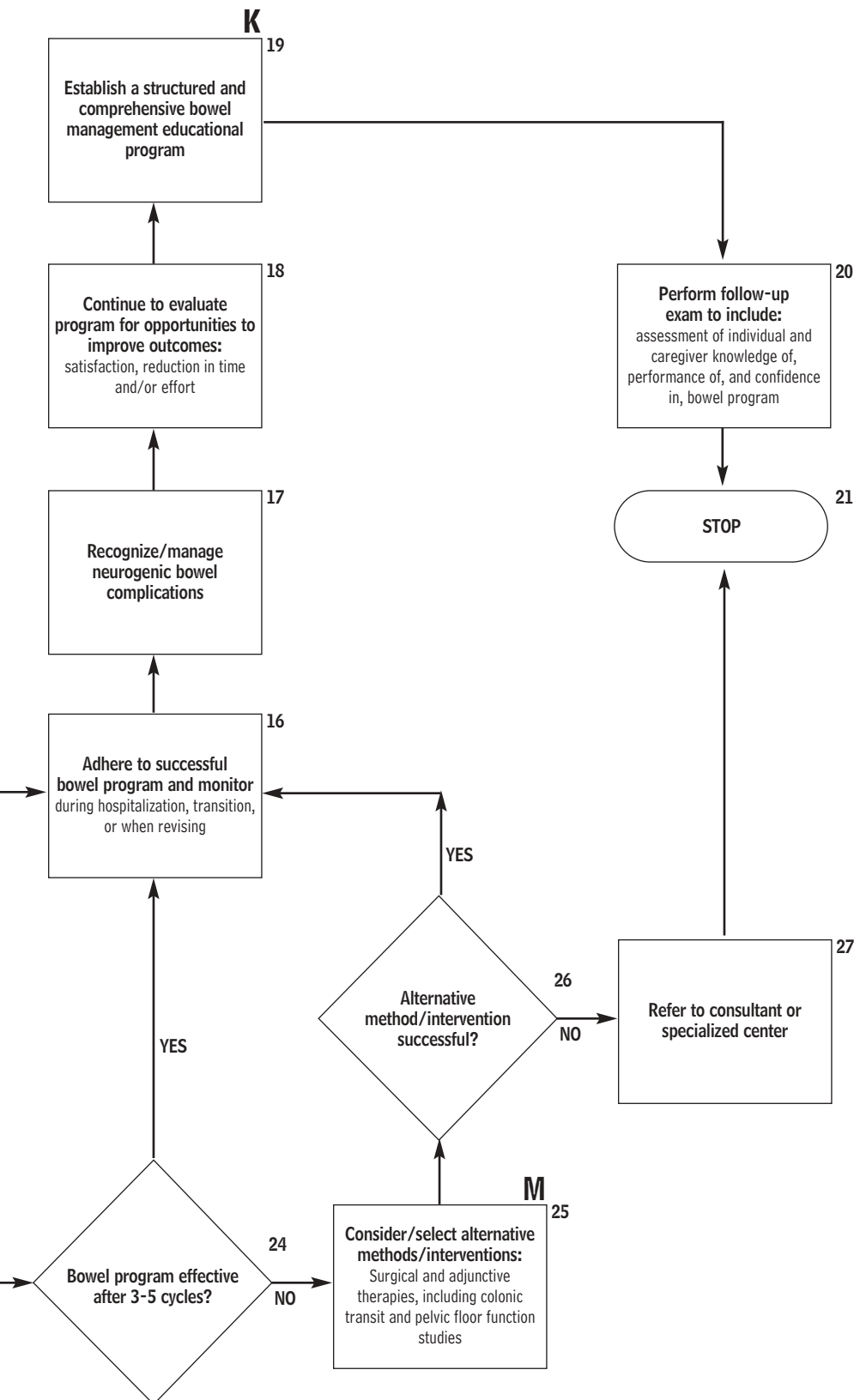
Designing a Neurogenic Bowel Program for Spinal Cord Injury



Bowel Management Program for Injured Individuals

Guiding Principles

- A systematic and comprehensive evaluation of bowel function and impairments is completed at onset of injury and continues on an annual basis.
- Bowel management starts during acute care and is revised as needed.
- Bowel management program provides predictable and effective elimination and reduces gastrointestinal and evacuation complaints.
- Knowledge, cognition, motor performance, and function are important assessments in determining the ability of the individual to complete a bowel care program or instruct a caregiver.
- Attendant care needs, personal goals, life schedules, role obligations, developmental needs, and self-rated quality of life are to be considered in the development of bowel care programs.
- The design of effective interventions includes an awareness of the individual's social and emotional support, as well as impairments, disabilities, and handicaps.
- Establishing a consistent schedule for defecation, based on factors that influence elimination, preinjury patterns of elimination, and anticipated life demands, is essential when designing a bowel care program.
- Prescriptions for appropriate adaptive equipment for bowel care should be based on the individual's functional status and discharge environment.
- All aspects of the bowel management program are designed to be easily replicated in the individual's home and community environments.
- Adherence to treatment recommendations is assessed when evaluating bowel complaints and problems.
- Knowledge of the unique clinical presentation and a prompt diagnosis of common complaints is necessary for the effective treatment of neurogenic bowel conditions.
- Effective treatment of common neurogenic bowel complications, including fecal impaction, constipation, and hemorrhoids, is necessary to minimize potential long-term morbidities.



- A. Assessment should include: ability to learn and to direct others, sitting tolerance and position, sitting balance, upper extremity strength and proprioception, hand and arm function, spasticity, transfer skills, actual and potential risks to skin, anthropometric characteristics, and home accessibility and equipment needs. Assessment of ability to adhere to a consistent bowel care program and identification of major factors such as community setting also is recommended.
- B. In each type of bowel care program:
1. bowel care should be scheduled at the same time of day,
 2. food should be ingested approximately 30 minutes prior to bowel care so gastrocolic response may occur, and
 3. bowel care should be routinely scheduled at least once every 2 days over the long term to avoid chronic colorectal overdistention.
- C. A spinal cord injury above the sacral segments of the spinal cord produces a REFLEXIC or upper motor neuron (UMN) bowel in which defecation cannot be triggered by conscious effort. Spinal cord and colon connections remain intact, allowing for reflex coordination of stool propulsion.
- A complete spinal cord injury below the sacral segments (damaged nerves connecting the spinal cord to the colon) produces an AREFLEXIC or lower motor neuron (LMN) bowel in which no spinal cord-mediated reflex defecation can occur.
- D. The least noxious stimulant meeting effectiveness, type of bowel dysfunction, tolerance, and availability of product criteria should be chosen. There are two methods of rectal stimulation, chemical and mechanical, which can be used individually or in combination. Chemical agents include suppositories and enemas. Mechanical methods include digital stimulation and manual evacuation.
- Regardless of method, rectal stimulation has the potential to cause autonomic dysreflexia, which is a potentially life-threatening condition, in individuals with T-6 thoracic spinal cord lesions or above.
- E. Diet, fluids, and activity are used to modulate stool consistency. Increased fluid intake helps prevent hard stool that can result from decreased colonic transit time. Individuals with SCI should not be placed uniformly on high fiber diets. A diet history should be taken to determine usual fiber intake to evaluate how it affects stool consistency and evacuation frequency. A diet containing no less than 15 grams of fiber daily is needed initially. Increases in fiber intake should be done gradually, from a wide variety of sources. Symptoms of intolerance should be monitored, and reduction in fiber is recommended if they occur.
- F. Although there is no research supporting assistive techniques to aid in evacuation, evaluation of these techniques should occur when designing a bowel care program as some maneuvers may be helpful. Caution should be used as positioning devices may be necessary to reduce risks to safety in some of the following techniques: push-ups, abdominal massage, Valsalva maneuver, deep breaths, ingestion of warm fluids, seated position, and leaning forward.
- G. See Table 4 (page 22), "Bathroom Equipment, Assistive Devices, and Outcomes by Level of Injury," in *Neurogenic Bowel Management in Adults with Spinal Cord Injury* clinical practice guideline.
- Careful measures should be taken to avoid pressure ulcers and falls related to equipment.
- H. Prior to embarking on oral medications, individuals with chronic constipation should be initially maintained on a well-balanced diet, with adequate hydration and appropriate daily physical activity.
- A number of oral agents currently are employed to promote bowel function in individuals with chronic constipation. If evacuation of stool has not occurred within 24 hours of scheduled evacuation or if stool is hard-formed and difficult to pass, a trial is warranted of a bulk-forming agent or of one or more of the following categories of laxative agents: lubricants, osmotics, and stimulant cathartics.
- I. When developing or revising a bowel management program, it is important to monitor and document the following factors after every bowel care procedure: date and time of day; time from rectal stimulation until defecation is completed; total time for completion of bowel care; mechanical stimulation techniques; pharmacological stimulation; position; color, consistency, and amount of stool; adverse reactions; and unplanned evacuations.
- J. In determining program effectiveness, the absence of constipation, GI symptoms or complaints, and delayed or unplanned evacuations are key elements.
- K. An educational program should include components on: anatomy; process of defecation; effect of SCI on bowel function; description, goals, and rationale of a successful bowel program; factors promoting successful bowel management; role of regularity, timing, and positioning; safe, effective use of assistive devices and equipment; techniques for manual evacuation, digital stimulation, and suppository insertion; prescription medications; prevention and treatment of common bowel problems; when and how to make changes in medications and schedules; managing emergencies; and long-term implications of neurogenic bowel dysfunction.

- L. Constipation is a frequent reason for ineffective bowel programs and the cause should be investigated. Obstruction or disease unrelated to SCI should be excluded. If other disease has been ruled out, and constipation is chronic and severe despite the use of laxatives and other program modifications, a trial of prokinetic medication may be considered. These medications must be used with caution because of potential side effects and weak evidence of efficacy in people with SCI.
- M. The role of surgery to effect optimal bowel function is limited. The decision about a colostomy or ileostomy should be based upon the results of specialized screening procedures and individual's expectations.

When considering surgical changes in the anatomy of individuals with SCI, discussions of anesthesia, surgical and postoperative risks, body image, indepen-

dence in self-management after the procedure, and permanency of the procedure should take place between the individual and the entire interdisciplinary team, including enterostomal therapists. If surgery is decided upon, a permanent stoma is the best option.

No research reports were found on the clinical benefit of biofeedback as a treatment for neurogenic bowel in individuals with spinal cord injuries.

Electrical stimulation has potential as a treatment modality, but further study is needed to support its use in clinical practice.

circular movement. Rotation is continued until relaxation of the bowel wall is felt, flatus passes, stool passes, or the internal sphincter contracts. In practice, digital stimulation takes 15 to 20 seconds, and stimulation longer than 1 minute is seldom necessary (Stiens et al., 1997). Digital stimulation is repeated every 5 to 10 minutes as necessary until stool evacuation is complete. Manual evacuation is the insertion of one or two lubricated fingers into the rectum to break up or hook stool and pull it out. It is generally the method of choice to empty the rectum in individuals with areflexic bowel. Manual evacuation also may be needed to remove stool prior to the insertion of a suppository against the rectal mucosa for reflexic bowel care.

Chemical Rectal Agents

Glycerin and bisacodyl are commonly used active ingredients in suppositories for bowel care. The glycerin suppository acts as a mild local stimulus and lubricating agent. The glycerin suppository is used in individuals who experience adverse reactions to the bisacodyl suppository, have a fast response to bisacodyl, or are making a transition from bisacodyl to mechanical stimulation (Mathews, 1987; Stiens et al., 1997). Bisacodyl is a contact irritant that acts directly on the colonic mucosa producing peristalsis throughout the colon. Bisacodyl may be compounded with a vegetable oil or a polyethylene glycol base. Carbon dioxide (CO₂) generating suppositories produce reflex defecation in response to colonic dilatation. The effectiveness of hydrogenated vegetable oil-based (HVB) bisacodyl suppositories compared to polyethylene glycol-based (PGB) bisacodyl suppositories was examined in a randomized single subject design study ("n of one"). The total bowel care time using the polyethylene glycol-based suppository was significantly less (85 minutes vs. 46 minutes, $p < .0001$) (Stiens, 1995).

House and Stiens (1997) compared the effectiveness of HVB, PGB, and docusate sodium glycerin (a mini-enema) in subjects with UMN spinal cord lesions in a randomized, prospective, double-blind study. Individuals served as their own controls. Results showed a significant decrease in bowel care time using the PGB suppository and the mini-enema as compared with the HVB suppositories. The mini-enema and PGB also were compared. They demonstrated similar total bowel care times (i.e., time from medication insertion through the end of stool flow), stool production, and frequency of unplanned evacuations (House and Stiens, 1997).

Although large-volume enemas are no longer used in routine bowel care, two early studies compared outcomes using large-volume enemas and other methods (Cornell et al., 1973; Holliday, 1967). The first study compared adverse symptoms with urgent treatments of individuals with SCI using manual evacuation and those using enemas. The sample

was composed of 54 individuals with SCI duration ranging from 1 month to greater than 19 years. The group with manual evacuation experienced a greater incidence of adverse symptoms, due to an urgent need for treatment, but no other differences were found between treatments (Holliday, 1967). Cornell et al. (1973) compared irritant-contact medication administered orally and rectally, stimulant medications administered orally and rectally, and tap water enemas (500cc) without oral laxative. Sixty individuals with SCI duration of 6 months or less were assigned randomly to one of the three interventions. The group using enemas required significantly less time for evacuation to occur, had fewer episodes of no results, and experienced fewer episodes of unplanned evacuations as compared to the other two groups (Cornell et al., 1973).

The infrequent use of large-volume enemas in contemporary management of the neurogenic bowel may be due to limitations in the technique for independent self-administration, the availability of other effective stimulation agents, or the potential to cause autonomic dysreflexia. They should be avoided until conservative techniques of mechanical, digital, or chemical rectal stimulation have been attempted. Anorectal injuries also have been reported with enema use. Hypertonic phospho soda enemas should be used with caution, particularly in individuals with hemorrhoids (Pietsch et al., 1977). Saltzstein et al. (1988) reported serious anal/rectal injuries in three non-SCI individuals using enemas.

Small-volume medicinal enemas are also used to trigger defecation. A 4cc liquid suppository mini-enema is a combination of liquid docusate and glycerin in a soft liquid soap base (polyethylene glycol). The mini-enema most likely triggers reflex-mediated colonic peristalsis by acting as a mucosal stimulus and providing lubrication. It is available with benzocaine for those who experience autonomic dysreflexia with rectal stimulation (Stiens et al., 1997). Small-volume bisacodyl in saline enemas have been used in routine bowel management by many; however, no clinical studies demonstrate their effectiveness in SCI.

In addition to the House and Stiens (1997) report cited above, Dunn and Galka (1994) used a crossover design to compare the effectiveness of a mini-enema and of vegetable oil-based bisacodyl suppositories in individuals with SCI. They studied subjects with SCI who had a mean duration of 19 years. The mini-enema significantly shortened the time between insertion of the stimulant and evacuation.

10. **The use of assistive techniques should be individualized and their effectiveness in aiding evacuation should be evaluated. Push-ups, abdominal massage, Valsalva maneuver, deep breathing, ingestion of warm fluids, and a seated or forward-leaning position are some of the**

techniques used to aid in bowel emptying.

(Scientific evidence—none; grade of recommendation—expert consensus; strength of panel opinion—moderate)

Although no research has been done on the use of assistive techniques in evacuation, some maneuvers may be helpful. Push-ups, abdominal massage, and a forward-leaning position may aid evacuation by increasing abdominal pressure. During bowel care, it may help to massage the abdomen in a clockwise motion up the ascending colon, across the transverse colon, and down the descending colon to aid in evacuation of the bowel (Longo et al., 1989). Leaning forward can be tried if balance is sufficient, if movement is not restricted by braces, and if spasticity is minimal. Safety straps or positioning devices can be used to reduce safety risks (Nelson et al., 1993).

Individuals who have strong abdominal muscles (innervated from T6-T12) can bear down (Valsalva maneuver) to initiate defecation (Banwell et al., 1993). This technique is contraindicated for individuals with cardiac problems, hypertension, hemorrhoids, and other conditions exacerbated by this maneuver. To minimize the risk of vesico-ureteral reflux, Valsalva maneuver should not be performed by anyone who has a full bladder. MacDonagh et al. (1992) reported that attempts to increase intra-abdominal pressure and to strain resulted in less increase in anal pressure among individuals with SCI than in controls and did not result in anal relaxation. Breathing deeply or drinking warm fluids can also stimulate bowel motility and evacuation by maximizing gastrocolic or duodenal reflexes (Edwards-Beckett and King, 1996; Zejdlik, 1992).

No studies have examined the effect of the seated position on defecation after SCI, although physiology and experience with non-SCI populations support the effect of the upright position on evacuation. In a survey of 277 individuals with SCI, the seated position was rated as faster (74 percent), more effective (79 percent), and more convenient (79 percent) than bowel care completed in bed (Nelson et al., 1993).

NUTRITION

- 11. Individuals with SCI should not be placed uniformly on high fiber diets. A diet history should be taken to determine the individual's usual fiber intake. The effects of current fiber intake on consistency of stool and frequency of evacuation should be evaluated. A diet containing no less than 15 grams of fiber daily is needed initially. Increases in fiber intake should be done gradually, from a wide variety of sources. Symptoms of intolerance should be monitored, and reductions in fiber are recommended, if they occur.** (Scientific evidence—V; grade of recommendation—C; strength of panel opinion—strong)

Constipation is a common complication following SCI. It is a consequence of a number of factors, including alteration of large bowel motor activity, loss of rectal sensation, loss of voluntary control of defecation, inactivity, and change in daily routine. High fiber diets (20 to 30 grams daily) are frequently recommended for all individuals with SCI on the premise that they will respond to high fiber intakes in ways similar to individuals without SCI (i.e., with a decrease in intestinal transit time and an increase in stool weight and volume). However, a neurogenic bowel may respond differently to fiber. In a British study, Menardo et al. (1987) reported that subjects with chronic SCI who were receiving the usual hospital diet of 16.4 grams of dietary fiber per day showed markedly delayed left colonic transit. Cameron et al. (1996) examined the effect of increased dietary fiber intake on mean colonic transit time (CTT) using radiopaque markers in 11 Australian inpatients with recent SCI. Mean fiber intake prior to intervention was 25 grams per day; mean bowel evacuation time was 13 minutes. Both parameters were greatly improved over findings in American studies (Kirk et al., 1997; Levine et al., 1992). Baseline mean CTT in this study was lower than that reported for healthy subjects. Cameron et al. (1996) observed that the addition of 6 grams of wheat bran cereal daily for 3 weeks resulted in increases in mean CTT from 28 hours to 42 hours and rectosigmoid colon transit time from 8 to 23 hours. They concluded that dietary fiber did not have the same effect on bowel function in individuals with SCI as observed in individuals whose bowels functioned normally.

Only two studies of fiber intake in Americans with SCI have been reported. Both reports indicated low fiber intake. Levine et al. (1992) reported that subjects consumed an average of only 12 to 14 grams daily. Kirk et al. (1997) reported average daily fiber intake of 7 grams based on intake for two days. These subjects had mean evacuation time of 47 minutes. The relationship of fiber intake to bowel function or evacuation problems was not reported. Findings from both studies, which relied on diaries for fiber estimation, indicate that daily fiber intake was well below the frequently cited goal of 20 to 30 grams per day to reduce risk of cardiac disease and cancer.

The efficacy of increased fiber therapy on stool consistency, evacuation frequency, and symptoms should be evaluated. Muller-Lissner (1988) reported a meta-analysis of the effect of wheat bran on stool weight and CTT in adults with constipation. Findings supported the results of Cameron et al. (1996) that increased wheat bran does not uniformly decrease CTT in persons with constipation. Studies are needed to compare the effects of dietary fiber in adults with SCI who complain of constipation with those who do not have constipation and healthy controls.

In general, foods that cause flatulence or loose or constipated stool should be avoided. Greater

intake of dietary fiber is likely to result in an increased amount of stool that may require more frequent bowel care.

- 12. The amount of fluid needed to promote optimal stool consistency must be balanced with the amount needed for bladder management. In general, fluid intake should be approximately 500 ml/day greater than the standard guidelines used to estimate the needs of the general public (National Research Council, 1989). Standard guidelines indicate that adult fluid needs can be estimated by either of the following formulas:**

**1 ml fluid/Kcal of energy needs + 500 ml/day
or
40 ml/kg body weight + 500 ml/day**

(Scientific evidence—none; grade of recommendation—expert consensus; strength of panel opinion—moderate)

No research articles were available to support this recommendation. If renal function is normal, increased fluid in the diet is recommended for prevention of constipation or impaction. The prolonged colonic transit time typically seen in individuals with neurogenic bowel can result in excessive fluid reabsorption and the formation of hardened stools. Increased fluid intake helps prevent hard, impacted stool (Guthrie and Picciano, 1995; Zeman, 1991). However, the frequency of intermittent catheterization may need to be increased to avoid bladder overdistention.

MANAGING THE NEUROGENIC BOWEL AT HOME OR IN THE COMMUNITY

- 13. Appropriate adaptive equipment for bowel care should be prescribed based on the individual's functional status and discharge environment.**

(Scientific evidence—one level V study for bowel care/shower chair; otherwise none; grade of recommendation—C/expert consensus; strength of panel opinion—strong)

Scientific literature for bathroom equipment exists for bowel care/shower chairs only. Various bowel care/shower chairs have been designed for both hospital and home settings. A pilot study to evaluate bowel care/shower chairs revealed potential limitations or hazards for use by individuals with a spinal cord injury (Malassiné et al., 1993).

A study of 147 individuals with a spinal cord injury who used bowel care/shower chairs was conducted to rate the importance of features of the chairs. Safety features, such as padding and brakes, were rated most important. Critical functions, such as transportability, access to the perianal area, and ease in operating brakes, footrests, and armrests,

were next in priority. Less important were functions such as back support, bedpan attachments, and safety straps used only by some individuals (Nelson et al., 1993).

Other bathroom equipment that can be used for completing bowel care includes benches, raised commode seats, and standard toilet seats with padding (see Table 4). Sufficient access to the perianal area must be assessed. A conventional U-shaped toilet seat usually allows adequate access. Bathroom benches and raised commode seats can be altered to accommodate a U-shaped opening in either the front, the sides, or the rear.

Individuals with SCI who lack sufficient hand function for gloving and digital stimulation may be candidates for a digital bowel stimulator or a suppository inserter. The effectiveness of commercially available equipment will depend on reach and positioning. If commercial equipment proves ineffective, custom adaptation or fabrication is possible.

Mechanical lifts and transfer boards may be necessary to complete bowel care in a seated position, depending on the functional ability for transfers. Mechanical lifts are typically necessary for individuals with higher level lesions of SCI. Individuals with high level lesions should weigh the value of completing bowel care in a seated position with the time, effort, and risk involved in transfers. Transfer boards are typically used by individuals with lower level tetraplegia or paraplegia. If the individual is unclothed when using a transfer board, a towel should be placed over the board to prevent friction or rash.

- 14. Careful measures should be taken to avoid pressure ulcers and falls related to the use of bowel care equipment.** (Scientific evidence—one level V study; grade of recommendation—C/expert consensus; strength of panel opinion—strong)

The safety and comfort of the individual during bowel care are critical, since the procedure can be prolonged. To protect the insensate skin, the toilet seat/commode chair should be padded and devoid of seams that are in contact with the skin. Care must be taken to maintain correct posture and to distribute weight evenly over the sitting surfaces on the toilet/commode to facilitate evacuation and to minimize the risk of pressure ulcers (Nelson et al., 1994). It is important not to part the buttocks, which will cause tension on the cleft of the gluteal crease, or to compress the buttocks, which will inhibit evacuation.

Risk factors for pressure ulcer development, such as decreased circulation and increased pressure areas, need to be weighed against duration of bowel care when prescribing bowel care equipment. The recumbent position is an option, but bedpans or diapers should be discouraged to prevent pressure ulcer development (Staas and DeNault, 1973).

Falls also can be a risk if balance is poor or if spasms cause a loss of position. In a survey of 277 individuals with SCI, nearly 35 percent of respondents who used bowel care chairs had experienced one or more falls (Nelson et al., 1993). Falls generally occur when transferring, when bending to access the perianal area or to reach supplies, or when performing pressure relief (Zejdlik, 1992). Safety straps should be considered when spasms are present or when lack of balance puts an individual at risk for falls.

15. Adequate social and emotional support should be available to help individuals manage actual or potential disabilities and handicaps associat-

ed with neurogenic bowel. (Scientific evidence—none; grade of recommendation—expert consensus; strength of panel opinion—strong)

Assessment should include how neurogenic bowel problems interact with other limitations and capabilities of the individual to increase risk for disability and handicap. Supportive interventions should be available to maximize resource utilization, enhance self-concept, and minimize embarrassment related to neurogenic bowel. Although studies have not examined the effectiveness of supportive counseling in managing bowel-related distress, reports by Dunn (1977) on the extent of social discomfort,

TABLE 4

Bathroom Equipment, Assistive Devices, and Outcomes by Level of Injury

Level of Injury	Potential Functional Performance Outcome for Bowel Care *	Bathroom Equipment Options	Assistive Device Options**
C1- C5	Independent in providing verbal instruction; dependent with clothing management; dependent with performance of bowel care; dependent with transfers	<ul style="list-style-type: none"> • Roll-in shower/commode chair with safety strap • Perform in bed 	<ul style="list-style-type: none"> • Mechanical lift
C6	Independent in providing verbal instruction; assistance with clothing management; independent performance of bowel care; assistance with transfers	<ul style="list-style-type: none"> • Roll-in shower/commode chair with safety strap • Shower/commode bench • Perform in bed 	<ul style="list-style-type: none"> • Digital stimulator • Suppository inserter • Adaptive equipment for clothing management • Transfer board • Mechanical lift
C7	Independent with all components	<ul style="list-style-type: none"> • Roll-in shower/commode chair with safety strap • Shower/commode bench with safety strap • Perform in bed 	<ul style="list-style-type: none"> • Digital stimulator • Suppository inserter • Adaptive equipment for clothing management • Transfer board
C8-T1	Independent with all components	<ul style="list-style-type: none"> • Roll-in shower/ commode chair • Shower/commode bench • Raised toilet seat • Perform in bed 	<ul style="list-style-type: none"> • Digital stimulator • Suppository inserter • Transfer board
T2-T6	Independent with all components	<ul style="list-style-type: none"> • Shower/commode bench • Raised toilet seat • Padded commode seat • Perform in bed 	<ul style="list-style-type: none"> • Transfer board
T7-L2	Independent with all components	<ul style="list-style-type: none"> • Raised toilet seat • Padded commode seat • Perform in bed 	<ul style="list-style-type: none"> • Transfer board

*Potential functional performance outcomes are considered to be optimal functional outcomes by level of injury. However, other factors, such as those listed in the recommendation on the assessment of activities of daily living as well as the amount of time, energy, and resources available to complete bowel care, may limit achievement of performance outcomes.

**Additional supplies for bowel care (individuals may not need every item listed): gloves, suppository, water soluble lubricant, plastic-lined pads, and wash cloths or wipes for cleanup.

White et al. (1993) on sexuality concerns, and Glickman and Kamm (1996) on depression related to bowel function suggest that psychosocial difficulties are common. The fullest awareness of the individual's capabilities and resources along with their impairments, disabilities, and handicaps permits the design of the most effective interventions.

The following domains should be assessed initially and periodically thereafter to evaluate the impact of bowel management on the life of the individual with SCI:

- Impairment.
- Disability.
- Role handicaps.
- Quality of life.
- Satisfaction of the individual served.

Such assessments and related interventions can reduce the risk for bowel-related handicaps in physical functioning, vocational achievements, sexual activity, and psychological and social functioning. For instance, disability may be reduced through the use of appropriate adaptive equipment or through changes in the bowel program that result in more effective evacuation. Thus, functional independence can be improved, side effects such as pressure ulcers and falls avoided, and the time commitment to bowel care reduced for the individual with SCI and the caregiver. Reduction in gastrointestinal symptoms and unplanned evacuations may improve vocational and social functioning and overall quality of life.

- 16. All aspects of the bowel management program should be designed to be easily replicated in the individual's home and community setting.** (Scientific evidence—none; grade of recommendation—expert consensus; strength of panel opinion—strong)

An evaluation of resources should encompass the cost and accessibility of supplies, including medications and stimulants; the functional abilities of the individual; availability of caregiver and equipment; and the physical layout of the home. Third-party payers, including state-based medical assistance programs, differ in reimbursement policies. New products may not be widely available. Suppositories and enemas vary widely in cost, but in general, suppositories are less expensive than enemas. However, when evaluating the cost of stimulants, benefits to the individual and savings in the cost of labor should be considered because some of the more expensive stimulants have been shown to decrease the amount of time required for bowel care (Dunn and Galka, 1994; House and Stiens, 1997).

MONITORING PROGRAM EFFECTIVENESS

- 17. The following variables should be monitored during and documented after every bowel care procedure during hospitalization or when developing or revising a bowel program in any community setting:**

- Date and time of day.
- Time from rectal stimulation until defecation is completed.
- Total time for completion of bowel care.
- Mechanical stimulation techniques.
- Pharmacological stimulation.
- Position.
- Color, consistency, and amount of stool.
- Adverse reactions.
- Unplanned evacuations.

(Scientific evidence—none; grade of recommendation—expert consensus; strength of panel opinion—strong)

The amount of time required for completed defecation is the time from rectal stimulation until cessation of stool flow (Stiens et al., 1997) or from setup to cleanup (Nelson et al., 1993). The time it takes to complete bowel care and to end stool flow varies among individuals. There are no research-based indicators for determining completed defecation. The goal of many individuals with SCI is to complete bowel care in less than 1 hour (Davis et al., 1986; Zejdlik, 1992). Two surveys gathered data on the amount of time spent in bowel care in individuals with chronic SCI. In one survey, 277 respondents reported that typical bowel care was performed three times a week and took approximately 2 hours (Nelson et al., 1993). Another survey of 140 respondents reported a mean time from stimulation to evacuation of 47 minutes, with 85 percent reporting 60 minutes or less. A majority performed bowel care three to seven times a week (Kirk et al., 1997).

A normal stool is softly formed and has a characteristic odor caused by bacteria in the large bowel that aid digestion; it is composed of 75 percent water and 25 percent solid materials, such as undigested roughage and other digestive wastes. Hard, dry stools that are difficult to pass or loose, watery stools should be noted. During the first 4 weeks after injury, when gastric ulceration is most frequent, health-care providers should be alert for dark, tarry stools (Davis et al., 1986). This may be a life-threatening event and should be treated as an emergency. Suspicion of blood in the stool can be confirmed with

stool testing for occult blood. The occurrence and severity of complications in the bowel care regime, including falls and the development of pressure ulcers, should be noted.

Digital stimulation commonly generates some bleeding through hemorrhoidal irritation. Use of adequate lubrication and adjustment of stimulation technique frequently can prevent bleeding. Unplanned evacuations should be noted, and contributing factors such as changes in activity level, medication, or diet should be carefully assessed. Early corrective treatment should be initiated to prevent skin breakdown and recurrent unplanned evacuations. Recent bowel program history should be reviewed, including diet, time since last bowel care, medication, and type of rectal stimulant. The perineal skin should be cleaned soon after defecation to prevent skin breakdown.

Changes in the bowel program should be based on deriving consistent benefits of new interventions in repeated bowel care episodes. Adverse reactions, such as dysreflexia, abdominal cramping, pain, muscle spasms, pressure ulcers, hemorrhoids, and bleeding, should be noted.

18. When a bowel program is not effective (i.e., if constipation, GI symptoms or complications, or unplanned or delayed evacuations occur) and a consistent schedule has been adhered to, changes in the following components should be considered:

- Diet.
- Fluid intake.
- Level of activity.
- Frequency of bowel care.
- Position/assistive techniques.
- Type of rectal stimulant.
- Oral medications.

(Scientific evidence—none; grade of recommendation—expert consensus; strength of panel opinion—strong)

No scientific evidence is available on the indicators for bowel program change. Indications for changing the bowel management program include the unavailability of resources and the need to improve overall patient outcomes, resolve evacuation problems, minimize adverse reactions, and enhance consumer and caregiver satisfaction. Ongoing monitoring is required to evaluate and modify the regime as needed to ensure safety, effectiveness, and predictability, as well as to meet the goals of the individual with SCI and significant others.

There are no studies to guide individuals in modifying a bowel program. Careful documentation of bowel care components and evacuation data is needed to discern patterns (see Table 5). Reassessment should occur at points of transition in the provision of services, such as the transition from rehabilitation to home, or changes in health, function, or developmental status.

19. In the absence of adverse reactions and indicators for potential medical complications, the bowel care regimen should be maintained for 3 to 5 bowel care cycles prior to considering possible modifications. Only one element should be changed at a time. (Scientific evidence—none; grade of recommendation—expert consensus; strength of panel opinion—strong)

One bowel care cycle consists of the planned evacuation process at the time and frequency specified by the individual's bowel program, usually every day or every other day. There is no scientific evidence on the number of completed cycles needed for evaluation, but it should be sufficient to assess a pattern. When changing a bowel program, only one program element (e.g., frequency or time of bowel care or diet) should be changed at one time to allow the intervention to be assessed. If serious symptoms are present, more immediate and aggressive changes in treatment may be indicated.

20. When evaluating individuals complaining of bowel management difficulties, adherence to treatment recommendations should be assessed. (Scientific evidence—V; grade of recommendation—C; strength of panel opinion—strong)

Kirk et al. (1997) reported that 44 percent of 171 subjects changed their bowel programs after discharge from rehabilitation. Of these, 24 (32 percent) felt they no longer needed a program; 11 (15 percent) changed for reasons of convenience; 4 (6 percent) wanted to decrease the frequency of evacuation; and 4 (6 percent) had financial difficulties. Twenty-three subjects (29 percent) changed programs because of evacuation problems, and nine (12 percent) changed for a variety of reasons. Some of the subjects no longer on a program reported evacuation difficulties, such as constipation. These findings indicate that a variety of factors may contribute to nonadherence to a prescribed program.

21. Colorectal cancer must be ruled out in individuals with SCI over the age of 50 with a positive fecal occult blood test or with a change in bowel function that does not respond to corrective interventions. (Scientific evidence—clinical practice guideline; grade of recommendation—none given; strength of panel opinion—strong)

TABLE 5
Monitoring Bowel Program: Documentation Record

Date	Start Time	Stimulation Method	Other Methods	Time of Results	Stool Amount, Type, Position, and Consistency	Comments

In a population-based study of individuals with SCI, Stratton et al. (1996) found a distribution of colonic tumors and presenting symptoms similar to the general population. However, diagnosis was often delayed. Frisbie et al. (1984) reported a higher than expected incidence of colorectal cancer in individuals with SCI, although these findings have not been confirmed. Nevertheless, these findings, the prevalence of constipation, the sensory deficits, and the low dietary fiber intake of Americans with SCI (Kirk et al., 1997; Levine et al., 1992) emphasize the need for routine screening for colorectal cancer as outlined for the general population (Winawer et al., 1997). Transit studies will document colonic inertia and may aid surgical planning.

Managing Complications of the Neurogenic Bowel

22. Knowledge of the unique clinical presentation and prompt diagnosis of common complications are necessary for the effective treatment of conditions associated with the neurogenic bowel in individuals with spinal cord injury. (Scientific evidence—V; grade of recommendation—C; strength of panel opinion—strong)

Effective management of neurogenic bowel complications begins with prompt recognition of commonly associated complications and appreciation of their often unique and subtle clinical presentation. Stone et al. (1990a) reported a greater frequency of bowel dysfunction symptoms in study participants who had been injured more than 5 years. Clinical recognition of intra-abdominal complications is often hampered by diminished visceral sensation and other physical signs usually relied on for diagnosis. The usual symptoms associated with abdominal pathology may be altered or absent in the individual with a complete or an incomplete SCI. For this reason, diagnosis of abdominal emergencies in individuals with SCI deserves particular discussion.

The presentation of signs and symptoms depends on the level of injury and the degree of completeness because this indicates the nerve path-

ways that may be spared. Abdominal tenderness is not common in individuals with complete lesions above T5. Individuals with injuries above T6 may present with autonomic dysreflexia, vague nonlocalized discomfort, increased spasticity, and a rigid abdomen. An injury level between T6 and T10 may allow for some localization of pain via sympathetic visceral afferent and/or somatic afferent from the abdominal wall. A level below T12 spares sympathetic and parietal peritoneum, innervated from the abdominal wall, and yields complaints and findings similar to those of neurologically intact individuals. Early diagnosis is achieved by having a high suspicion for pathology, obtaining appropriate laboratory studies, immediate imaging, and reassessing the situation repeatedly.

The most common complaint in individuals with SCI with abdominal pathology is anorexia. Pain may or may not be a presenting complaint. When present, it may be dull, poorly localized, or oppressive. Reflex sweating may occur with GI complications, and autonomic dysreflexia often may develop as a result of abdominal pathology (Charney et al., 1975; Ingersoll, 1985). There is a higher incidence of urinary tract infection in women with spinal cord injury, which may be related to the proximity of the short urethra to the anus (Bennett et al., 1995). Effective, timely management of neurogenic bowel complications ultimately depends upon the health-care provider having a high index of suspicion when any of these symptoms appear, even though there does not appear to be any clear etiology.

23. Constipation after SCI is manifested by unusually long bowel care periods, small amounts of results, and dry, hard stools. Its causes should be investigated. (Scientific evidence—none; grade of recommendations—expert consensus; strength of panel opinion—strong)

Identifiable causes of constipation are either mechanical, pharmacological, endocrinologic, neurologic (central nervous system, spinal, or peripheral), or systemic. Constipation after SCI can be due to transit/functional constipation, pelvic floor outlet

obstruction, colonic inertia, idiopathic megacolon, or an obstruction lesion.

In the constipated individual, if there is no evidence of obstruction, stool accumulated in the colon can be cleared with saline or electrolyte laxatives and enemas as needed.

Specialized screening procedures for chronic constipation and fecal incontinence have become much more sophisticated over the past 15 years (Kuijpers, 1990). A plain film of the abdomen is strongly suggested to screen for evidence of obstruction. Diseases not related to the spinal cord injury, particularly colorectal cancer, should be excluded. Evaluation through visualization of the entire colonic mucosal surface through a colonoscope or with a barium enema is as outlined for the general population (Winawer et al., 1997).

A barium contrast enema will either delineate an obstructing lesion, if present, or may reveal a huge colon with redundant bowel. Although this finding will not delineate the specific etiology, it will indicate the magnitude of the anatomic abnormality. The decision to proceed with colonoscopy depends on the individual's clinical history and findings, as well as whether the physician is satisfied with the results of the contrast enema. Oral laxatives and frequent bowel care should be utilized for a few days after studies that require barium, to clear the contrast and prevent constipation.

If studies to this point are not revealing of a condition in addition to the SCI, specialized investigations assessing colonic transit and pelvic floor function may be considered. Colonic transit is assessed by administering a capsule with radiopaque markers to be taken orally and then by taking a series of abdominal X-rays on days 1, 3, and 5 (Wald, 1994). Bowel care procedures should be carried out at least daily during the testing period. A diagnosis of colonic inertia (slow transit constipation) requires retention of at least 20 percent of the markers in the colon on the fifth day after ingestion (Ducrotte et al., 1986). Three possible marker patterns are normal—diffuse, slow transit, or rectosigmoid delay. A number of individuals with SCI will demonstrate either diffuse, slow transit, or rectosigmoid delay (Beuret-Blanquart et al., 1990; Nino-Murcia et al., 1990).

- 24. Management of chronic constipation in individuals with SCI should start with the establishment of a balanced diet, adequate fluid and fiber intake, increased daily activity, and to the extent possible, reduction or elimination of medication contributing to constipation. If evacuation of stool has not occurred within 24 hours of scheduled evacuation or if stool is hard-formed and difficult to pass, a trial is warranted of a bulk-forming agent or of one or more of the following categories of laxative agents: lubricants, osmotics, and stimulant**

cathartics. These agents should be ingested at least 8 hours before planned bowel care. (Scientific evidence—none; grade of recommendation—expert consensus; strength of panel opinion—strong)

No research studies were found on the efficacy of laxatives for the treatment of constipation in persons with SCI. Laxatives may be classified as lubricants, osmotics, or stimulants. Saline cathartics are not used in maintenance bowel programs because of their unpredictable and harsh stimulation of evacuation and sometimes serious side effects (Stiens et al., 1997). Two studies of docusate, which is commonly used to treat neurogenic bowel, indicated no significant difference in stool weight, water, or frequency between docusate and placebo (Castle et al., 1991; Chapman et al., 1985). The limitations of these studies include small samples and no subjects with SCI. A well-balanced diet, exercise, adequate hydration, and reduction or elimination of medications contributing to constipation are essential prior to embarking on bulk-forming or laxative agents to treat constipation. Psyllium is a bulk-forming agent that maintains stool moisture and consistency. Adequate hydration is required with psyllium to decrease the risk of esophageal or intestinal obstruction. Although a high fiber diet is generally recommended for bowel programs, its effect on large bowel function in individuals with SCI is debated (Cameron et al., 1996). The effects of the addition of fiber or laxatives on the total bowel program should be carefully evaluated in each case.

Readers are referred to a systematic review of 36 studies of laxatives and fiber agents in the treatment of constipation in adults without SCI (Tramonte et al., 1997). The authors reported that no class of laxatives or fiber therapy was more effective than another and that adverse effects were uncommon. Seven studies assessing bowel evacuation frequency after discontinuation of therapy reported that the frequency of bowel evacuation decreased. No long-term effects were reported. Findings may be different in individuals with neurogenic bowel.

- 25. Effective treatment of common complications of neurogenic bowel in individuals with spinal cord injury, including fecal impaction and hemorrhoids, is necessary to minimize potential long-term morbidities.** (Scientific evidence—none; grade of recommendation—expert consensus; strength of panel opinion—strong)

In a review of the medical records of 567 individuals with SCI, Gore et al. (1981) found that nearly 7 percent of individuals experienced fecal impaction, making it the most common complication after the first month postinjury. Fecal impaction is confirmed with colonic palpation, rectal examination, and/or abdominal radiograph (Wrenn, 1989). When sus-

pected, prompt intervention is necessary to prevent further bowel problems, such as bowel obstruction.

If the feces is palpable, the initial step should be an attempt at manual evacuation. Anesthetic ointment or jelly may be used to decrease the noxious stimuli to avoid producing autonomic dysreflexia in those susceptible individuals. If autonomic dysreflexia, a life-threatening condition, does occur, it requires immediate treatment (Consortium for Spinal Cord Medicine, 1997). If the impaction is located more proximally in the bowel, oral stimulants, such as magnesium citrate solution or bisacodyl tablets, may be required. Caution in the use of oral medication is needed if a bowel obstruction is suspected. (See recommendation 23.) Intestinal perforation could result. Additionally, oil retention enemas may be helpful in combination with oral agents to loosen the stool (Kubalanza-Sipp and French, 1990).

Hemorrhoids become more symptomatic as they increase in size (Haas et al., 1983) and may be exacerbated by physical interventions, such as suppositories, enemas, or digital stimulation, to regulate the bowels in individuals with spinal cord injury. Maintaining soft-formed stool with oral agents, if necessary, and minimizing the physical trauma during anal stimulation are methods of minimizing the development of hemorrhoids. When hemorrhoids become clinically significant, causing pain (if sensation is present), bleeding, mucus incontinence secondary to prolapsed mucosa, or symptoms of autonomic dysreflexia, a number of interventions may be used. Discouraging straining and minimizing digital stimulation during bowel care are initial steps. Increasing the use of stool softeners to decrease hard stools also is recommended. Also, topical anti-inflammatory creams or suppositories may be used (Kubalanza-Sipp and French, 1990). Persistent bleeding and autonomic dysreflexia that are not responsive to changes in bowel care routine are indications for consideration of hemorrhoidectomy.

- 26. Prokinetic medication should be reserved for use in individuals with severe constipation or difficulty with evacuation that is resistant to modification of the bowel program.** (Non-SCI patients: scientific evidence—one study in each of levels I, II, and V; grade of recommendation—A; strength of panel opinion—strong. SCI patients: scientific evidence—two studies in each of levels II and V, and one level III study; grade of recommendation—B; strength of panel opinion—strong)

If the measures outlined in the prior recommendation fail, a trial of prokinetic agents, which promote transit throughout the gastrointestinal tract, may be considered. Prokinetic agents currently are being employed for a variety of disorders, including those that affect the proximal and distal gastrointestinal tract, such as gastroesophageal reflux, diabetic

gastroparesis, bile reflux gastritis, and irritable bowel syndrome (Longo and Vernava, 1993). The mechanisms of action of these agents are not completely understood. However, it is speculated that they enhance intestinal function by either promoting the effect of motility agonists or antagonizing the effect of inhibitory neurotransmitters (Reynolds, 1989).

Cisapride appears to function as an indirect cholinergic stimulant that increases the release of acetylcholine in the intramural plexuses throughout the alimentary canal. In neurally intact individuals, studies have shown that cisapride increases lower esophageal sphincter pressure in normal volunteers and in individuals with gastrointestinal reflux (Smout et al., 1985). In the stomach, it accelerates gastric emptying of both liquids and solids (Muller-Lissner et al., 1986). In individuals with postoperative ileus, cisapride is associated with an earlier return of bowel function as compared with placebo (Boghaert et al., 1987; Tolleson et al., 1991). In neurally intact adults with chronic constipation, cisapride increases stool frequency and decreases laxative overuse (Muller-Lissner et al., 1987). In individuals with chronic SCI, cisapride appears to produce subjective improvement of both colonic and anorectal function with alleviation of symptoms (de Groot and de Pagter, 1988; Longo et al., 1995). Three studies using crossover designs compared cisapride and placebo or usual practice in small samples (N=9, 10, 14) of individuals with SCI. Significant reductions in colonic transit time were reported by Binnie et al. (1988) and Geders et al. (1995). Rajendran et al. (1992) reported improved mouth to cecum transit time (MCTT) in subjects with tetraplegia. Baseline MCTT was similar for controls and subjects with paraplegia, but was significantly slower in persons with tetraplegia.

The studies cited above reported no serious side effects. However, cisapride must be used with caution because of isolated reports of serious arrhythmias (Wysowski and Bacsanyi, 1996) and because the evidence to support its efficacy in persons with SCI is weak due to very small sample sizes. The spectrum of clinical disorders of the colon and rectum that prokinetic agents may be useful in treating has been incompletely examined. The evidence to support its efficacy in individuals with SCI is limited to a few studies with small sample sizes. Large bowel motility disorders that may respond to prokinetic agents include postoperative ileus, nonmechanical pseudo-obstruction of the colon, and chronic lower gastrointestinal motility disorders associated with systemic disease and constipation (i.e., diabetes mellitus, systemic sclerosis, and SCI).

Although cholinergic agonists such as bethanechol are known to improve postoperative ileus, their use on a chronic basis is limited because of side effects. They have no role in the treatment of chronic constipation (McCallum et al., 1983).

Dopamine antagonists appear to have maximal prokinetic effect in the proximal gastrointestinal tract and are effective for such conditions as gastroparesis and gastroesophageal reflux, but they appear to have little physiologic effect in the colon or in colonic motility disorders (Lanfranchi et al., 1985). Side effects include headaches, skin rashes, diarrhea, and increased prolactin levels. Metoclopramide, a combined cholinergic agonist and dopamine antagonist, is currently used exclusively for proximal motility dysfunction (Longo and Vernava, 1993). Metoclopramide is used successfully to promote gastric emptying in tetraplegics (Segal et al., 1987). Side effects include drowsiness, lassitude, and at times anxiety. Extrapyramidal effects and autonomic dysreflexia may occur. It should not be given to individuals taking monoamine oxidase inhibitors or antidepressants. The most frequent side effects are gastrointestinal, including vomiting and diarrhea.

Surgical and Nonsurgical Therapies

- 27. Biofeedback is not likely to be an effective treatment modality for most individuals with spinal cord injury.** (Scientific evidence—none; grade of recommendation—expert consensus; strength of panel opinion—strong)

Biofeedback appears to have some benefit for the treatment of fecal incontinence, but primarily in individuals with altered bowel function who have some degree of intact rectal sensation and who are able to contract the anal sphincter voluntarily (Cerulli et al., 1979; MacLeod, 1979). Unfortunately, this excludes most individuals with neurogenic bowel due to spinal cord injury. The literature review found no reports on the clinical benefit of biofeedback in the management of neurogenic bowel in individuals with SCI.

- 28. The decision about a colostomy or ileostomy should be based upon the results of specialized screening procedures and the individual's expectations. If surgery is decided upon, a permanent stoma is the best option.** (Scientific evidence—V; grade of recommendation—C; strength of panel opinion—strong)

All members of the interdisciplinary rehabilitation team can contribute to the evaluation process for colostomy and therefore to the likelihood of success of the procedure. The team should be satisfied that all suitable medical alternatives have been tried and have failed to alleviate the individual's limitations. Once colostomy is considered, a psychologist can evaluate the individual's expectations of the procedure. A rehabilitation nurse and an occupational therapist can assist in predicting the functional effects of the procedure.

All team members, including enterostomal therapists, should help the individual to choose a site on the abdomen for the ostomy that will maximize both functional independence and body image. The decision-making process should include planning for the appropriate adjunctive equipment, such as disks and bags. Finally, there should be interdisciplinary intervention throughout the process with arrangement of peer interaction as needed to achieve the best adaptive outcome.

- 29. Proposed surgical changes in the anatomy of individuals with SCI should be reviewed with the individual and the interdisciplinary team. These considerations should include discussions of anesthesia, surgical and postoperative risks, body image, independence in self management after the procedure, and realization of the permanence of the procedure.** (Scientific evidence—none; grade of recommendation—expert consensus; strength of panel opinion—strong)

The decision to intervene surgically for bowel dysfunction in individuals with SCI may be a difficult one for the individual, the family, and the physician. The decision most frequently involves a permanent stoma. At times, this decision is accelerated by concomitant pressure ulcers or persistent pelvic sepsis where fecal diversion would be efficacious. However, often a combination of bowel chair skin trauma, hemorrhoidal bleeding, sweating, nausea, anorexia, fatigue, abdominal pain, a leakage of fecal material resulting in a restriction of social activities, or dissatisfaction with the amount of time spent in bowel care may persuade the individual to consider surgical options (Frisbie et al., 1986; Saltzstein and Romano, 1990; Stone et al., 1990b). Most individuals with SCI are satisfied with their quality of life with a stoma (Frisbie et al., 1986; Saltzstein and Romano, 1990; Stone et al., 1990b). The average time spent in bowel care has been reported to decrease from 11 hours to 4 hours per week (Saltzstein and Romano, 1990).

The ability of surgery to effect optimal bowel function in individuals with SCI is limited. Diversion of fecal stream to either a colostomy or ileostomy is the most commonly utilized option. When individuals with difficult bowel evacuation or fecal incontinence are considered, fecal diversion will reliably simplify bowel care, relieve abdominal distention, and prevent fecal incontinence. Unlike the neurally intact individual, where removal of the abdominal colon and performance of ileorectal anastomosis is favorable for chronic constipation, the SCI individual would not benefit from such a procedure. This is due to the fact that pelvic floor abnormalities and colonic dysmotility may still contribute to disabling constipation.

Major abdominal surgery can be performed safely in individuals with SCI for a variety of disease

processes (Stratton et al., 1996). Proper anesthesia, good surgical technique, and postoperative monitoring in an intensive care unit are very important to this population. However, a number of surgical complications can occur with intestinal stomas. These include diversion colitis (Lai et al., 1997), bowel obstruction, stomal ischemia, retraction, prolapse, peristomal hernia, fistula, and variceal bleeding (Arun et al., 1990). Many of these complications can be corrected with additional surgery.

If surgery has been decided upon, the choice of colostomy or ileostomy will depend upon the results of colonic transit studies. Segmental colectomy with primary anastomosis should be avoided. If the cause of constipation is total colonic inertia, an ileostomy is more appropriate. If the cause is hindgut inertia (rectosigmoid delay), then an end-descending colostomy should be performed. Fecal incontinence can be managed by a sigmoid colostomy. The patient's needs and functional ability should be considered carefully. Finally, it must be emphasized that the preoperative visit to the enterostomal therapist for proper stoma marking and the postoperative visit for patient education are as important as the surgery itself.

Education Strategies for the Neurogenic Bowel

30. Educational programs for bowel management should be structured and comprehensive; should consider the home setting and available resources; and should be directed at all levels of health-care providers, patients, and caregivers. The content and timing of such programs will depend on medical stability, readiness to learn, safety, and related factors. An educational program for bowel management after SCI should include:

- Anatomy.
- Process of defecation.
- Effect of SCI on bowel function.
- Description, goals, and rationale of successful bowel program management.
- Factors that promote successful bowel management.
- Role of regularity, timing, and positioning in successful bowel management.
- Safe, effective use of assistive devices and equipment.
- Techniques for manual evacuation, digital stimulation, and suppository insertion.
- Prescription bowel medications.
- Prevention and treatment of common bowel problems, including constipation, impactions, diarrhea, hemorrhoids, incontinence, and autonomic dysreflexia.
- When and how to make changes in medications and schedules.
- Management of emergencies.
- Long-term implications of neurogenic bowel dysfunction.
- Economic analyses including cost-effectiveness and cost-utility analyses, of bowel management interventions and programs. Studies should meet currently accepted standards (Gold et al., 1996).

(Scientific evidence—none; grade of recommendation—expert consensus; strength of panel opinion—strong)

Both patients and caregivers are integral to effective neurogenic bowel management. Topics for individual education include responsibilities, potential problems, modification of the prescribed bowel regime, and skill development. Other topics include: what to do and why it is important, when to expect results, what are the possible danger signs, and what to do if problems arise. Providing a good learning environment that respects the need for privacy is critical. These education sessions can significantly enhance competence in self-care, an area of little competence among individuals with SCI (Boss et al., 1995).

A general overview of the process of defecation provides necessary background information for a description of how bowel function was affected by the spinal cord injury (Minton, 1983; Sullivan and Rago, 1976). The description and rationale for the individually prescribed program should cover procedures; specific psychomotor skills required for techniques such as digital stimulation; timing; and schedule for the bowel care regime. Techniques to help the individual learn the idiosyncratic signs of a full bowel are critical (Davis et al., 1986; Tudor, 1970).

The roles of regularity, timing, and position in bowel management should be stressed. Bowel programs can be discouraging in the beginning, and health-care providers should impress the need for scheduled bowel evacuations because this is not always obvious to the individual at onset.

Safe, effective use of assistive devices and equipment, manual evacuation, or digital stimulation and suppository insertion techniques will need to be demonstrated, with successful return demonstrations by the individual who will be responsible for the bowel care assistance. Prescribed bowel medications should be discussed, including the type, purpose, dose, frequency, side effects, and potential drug interactions. An understanding of the role of laxatives

and enemas in regulation is important (Davis et al., 1986). Basic considerations, such as the cost and availability of supplies and equipment, accessibility of bathrooms both in the home and in public settings, and level of assistance needed to implement the bowel program at home should be discussed.

Anticipatory guidance is needed for common bowel problems that may arise. The discussion should cover the signs, symptoms, and treatment of complications, including ileitis or gastric ulcers in the acute phase and constipation, impactions, diarrhea, hemorrhoids, and autonomic dysreflexia in the post-acute phase (Davis et al., 1986; Minton, 1983). Information on when and how to make changes in medications and schedules is essential. If there is time, the long-term implications of neurogenic bowel dysfunction can be presented, including the effects of aging on bowel programs.

Health education related to ostomy care, if applicable, includes an overview of the indication of ostomy; location of the stoma, which determines the nature of fecal output; type of ostomy; control of ostomy elimination (natural and dietary); artificial stimulation (irrigation and suppositories); problems and complications (odor, excessive flatus, bleeding, constipation, impaction, diarrhea, skin irritation, fistulae, and perforation); maintenance of ostomy appliances; and maintenance of skin integrity in the perineal and ostomy areas (Davis et al., 1986).

Only one study could be found that tested the effectiveness of bowel management educational programs (Minton, 1983). The purpose of this study was to compare videotaped instruction and discussion with lectures, visual aids, and discussions for teaching bowel and bladder management in SCI. There was no significant difference between methods; both groups demonstrated a significant improvement between pre- and posttests. However, it is not clear if the findings were due to intervention, a small sample size ($n=14$), lack of a control group, or lack of sensitivity in the tool.

No studies have examined bowel management difficulties during the transition from hospital to

home. Effective bowel care management depends on the coordinated efforts of health-care professionals in hospital settings and continued implementation of preventive interventions, considering the home setting and resources available.

- 31. Patient and caregiver knowledge of, performance of, and confidence in the recommended bowel management program should be assessed at each followup evaluation.** (Scientific evidence—none; grade of recommendation—expert consensus; strength of panel opinion—strong)

An assessment of patient education clarifies the needs and concerns of both the individual with SCI and the caregiver. Motivation, anxiety, anger, fear, and beliefs about the medical condition affect readiness to learn. Barriers to learning, such as illness, pain, cognition, literacy, language, and cultural issues, should be addressed. Once a baseline of information has been obtained, mutual goal-setting and planning are essential next steps. Assessment with a measurement tool, such as the Self-Care Assessment Tool, (Boss et al., 1995), may provide useful indications of self-perceived competency and comfort in personal bowel care management and facilitate generalizability of inpatient rehabilitation learning to community settings. Boss et al. (1995) reported that, although knowledge of bowel care was adequate, functional bowel care skills were frequently low.

Factors such as aging, new or exacerbated illness, increased disability, or change in lifestyle can affect bowel routines and outcomes and may require additional and/or different methods to increase efficacy of bowel management. Information on new products and technologies that may improve neurogenic bowel outcomes can be made available during routine assessments.

Recommendations for Future Research

A comprehensive review of the research literature on neurogenic bowel management after SCI was completed in 1997. To the extent possible, the recommendations in this clinical guideline were based on the findings reported in that review. Unfortunately, few studies have been reported on the type and frequency of assessments required or on the efficacy of education and therapies in the treatment of neurogenic bowel.

Clinical trials on bowel functioning should measure the well-being of the individual as an outcome. Studies of bowel management outcomes need to analyze results by type of neurogenic bowel (reflexic or areflexic) and by level of injury. Randomized, controlled studies should be considered for future research in neurogenic bowel treatment. Sample sizes that provide adequate statistical power are needed. Such methods will increase the likelihood that findings are due to the treatment and not to chance or bias. Cost analysis studies of bowel management are needed. Improvement in the effectiveness of management of the neurogenic bowel after SCI requires further research in the following areas:

- The timing and frequency of effective bowel care programs.
- The effect of dietary fiber intake on bowel functioning.
- The effects of oral medication on bowel function.
- The long-term effects of laxatives.
- The effects of small-volume enemas on bowel function.
- The effectiveness of facilitative techniques, such as abdominal massage and Valsalva maneuver, for bowel care.
- Longitudinal, controlled studies on the effectiveness of various positions for bowel care (e.g., upright, right vs. left lateral recumbent positions).
- Large-scale clinical trials to test the efficacy and safety of new treatments, such as pulsed irrigation evacuation.
- Large-scale, prospective studies on the use of sacral anterior root electrical stimulation.
- The indicators of completed evacuation.
- The effects of activity and exercise on bowel function.

- The frequency and content of routine assessments needed to prevent complications.
- The content and methods for teaching bowel management.
- Design and large-scale testing of shower/commode chairs.

Although the efficacy of electrical stimulation and pulsed irrigation evacuation has been examined, the research is insufficient to support recommendations. Electrical stimulation appears to have potential benefits in the management of neurogenic bowel in individuals with SCI, possibly even as a sole method of treatment, when administered in a specific manner. However, its efficacy has not been established sufficiently to permit a recommendation for treatment of neurogenic bowel. Utilizing a simple, noninvasive form of electrical stimulation, Frost et al. (1993) found that surface electrode stimulation of the sacral dermatomes, especially S2, resulted in a significant increase in the number of rectal pressure spikes; however, no clinical effect on bowel emptying was demonstrated. Several investigators have suggested that sacral anterior root stimulation may be effective in promoting bowel emptying. MacDonagh et al. (1990) were able to produce regular complete bowel emptying with sacral root stimulation alone in 6 of 12 individuals and to significantly decrease the total time required for complete defecation in 11 of 12 individuals. Binnie et al. (1991) reported that sacral anterior root stimulation resulted in more rapid colonic transit time and more frequent passage of formed stool in 7 individuals with SCI. Similarly, Brindley and Rushton (1990) reported that the benefits of sacral anterior root electrical stimulation may include decreased time spent on bowel emptying and decreased need for manual evacuation. It is important to note that, in all of the studies reporting benefits of sacral anterior root stimulation on bowel management, the primary objective for the use of electrical stimulation was on improving bladder management. Most of the studies that have reported potential beneficial effects have been based on observation and small case series rather than prospective, large-scale studies.

Pulsed irrigation evacuation consists of pulses of warm tap water administered rectally. The device delivers intermittent irrigation that rehydrates feces, promotes peristalsis, and breaks up an impaction. This method has been used successfully in resolving fecal impactions in a smaller number of children (Gilger et al., 1994) and in adults (Kokoszka et al., 1994) with minimal discomfort compared to tradi-

tional interventions. Pulsed irrigation has been reported to be as effective and as well tolerated as oral lavage in preparation for gastrointestinal examinations (Chang et al., 1991). Puet et al. (1991) found pulsed irrigation to be effective in resolving fecal impaction in 28 patients who had a variety of neurologic diagnoses, including 8 patients with SCI. None of the individuals with SCI experienced autonomic dysreflexia during the procedure. However, the level of SCI of subjects was not described. No reports have been published on the efficacy of this

procedure for routine bowel care, and therefore it is not recommended for that purpose.

Randomized controlled trials involving people with varying levels of SCI should be conducted to determine the efficacy and safety of this treatment. Such studies will provide data on risk of autonomic dysreflexia and indications of when and when not to use this technique.

Bibliography

- Aaronson, M.J., M.M. Freed, and R. Burkakoff. Colonic myoelectric activity in persons with spinal cord injury. *Dig Dis Sci* 30 (1985): 25–300.
- Arun, H., A. Ledgerwood, and C.E. Lucas. Ostomy prolapse in paraplegic patients: Etiology, prevention, and treatment. *J Am Paraplegia Soc* 13 (1990): 7–9.
- Atkinson, P.P., and J.L.D. Atkinson. Spinal shock. [Review]. *Mayo Clinic Proc* 71 (1996): 384–89.
- Banwell, J.G., G.H. Creasey, A.M. Aggarwal, et al. Management of the neurogenic bowel in patients with spinal cord injury. [Review] *Urol Clin North Am* 20 (1993): 517–26.
- Bassotti, G., U. Germani, and A. Morelli. Human colonic motility: Physiological aspects. [Review] *Int J Colorectal Dis* 10 (1995): 173–80.
- Bayliss, W.M., and E.H. Starling. The movements and innervation of the small intestine. *J Physiol London* 24 (1899): 99–143.
- Bennett, C.J., M.N. Young, and H. Darrington. Differences in urinary tract infections in male and female spinal cord injury patients on intermittent catheterization. *Paraplegia* 33 (1995): 69–72.
- Berkowitz, M., C. Harvey, C.G. Greene, et al. *The Economic Consequences of Traumatic Spinal Cord Injury*. New York, NY: Demos Publications, 1992.
- Beuret-Blanquart, F., J. Weber, J.P. Gouverneur, et al. Colonic transit time and anorectal manometric anomalies in 19 patients with complete transection of the spinal cord. *J Auton Nerv Syst* 30 (1990): 199–207.
- Binnie, N.R., G.H. Creasey, P. Edmond, et al. The action of cisapride on the chronic constipation of paraplegia. *Paraplegia* 26 (1988): 151–58.
- Binnie, N.R., A.N. Smith, G.H. Creasey, et al. Constipation associated with chronic spinal cord injury: The effect of pelvic parasympathetic stimulation by the Brindley stimulator. *Paraplegia* 29 (1991): 463–69.
- Boghaert, A., G. Haesaert, P. Maurisse, et al. Placebo-controlled trial of cisapride in postoperative ileus. *Acta Anaesthesiol Belg* 38 (1987): 195–99.
- Boss, B.J., L. Pecanty, S.M. McFarland, et al. Self-care competence among persons with spinal cord injury. *SCI Nurs* 12 (1995): 48–53.
- Bracken, M.B., D.H. Freeman, Jr., and K. Hellenbrand. Incidence of acute traumatic hospitalized spinal cord injury in the United States, 1970–1977. *Am J Epidemiol* 113 (1981): 615–22.
- Brindley, G.S., and D.N. Rushton. Long-term followup of patients with sacral anterior root stimulator implants. *Paraplegia* 28 (1990): 469–75.
- Burney, R.E., R.F. Maio, F. Maynard, et al. Incidence, characteristics, and outcome of spinal cord injury at trauma centers in North America. *Arch Surg* 128 (1993): 596–99.
- Cameron, K.J., I.B. Nyulasi, G.R. Collier, et al. Assessment of the effect of increased dietary fibre intake on bowel function in patients with spinal cord injury. *Spinal Cord* 34 (1996): 277–83.
- Castle, S.C., M. Cantrell, D.S. Israel, et al. Constipation prevention: Empiric use of stool softeners questioned. *Geriatrics* 46 (1991): 84–86.
- Cerulli, M.A., P. Nikoomanesh, and M.M. Schuster. Progress in biofeedback conditioning for fecal incontinence. *Gastroenterology* 76 (1979): 742–46.
- Chang, K.J., R.A. Erickson, S. Schandler, et al. Per-rectal irrigation versus per-oral colonic lavage for colonoscopy preparation: A randomized, controlled trial. *Gastrointest Endoscopy* 37 (1991): 444–48.
- Chapman, R.W., J. Sillery, D.D. Fontana, et al. Effect of oral dioctyl sodium sulfosuccinate on intake-output studies of human small and large intestine. *Gastroenterology* 89 (1985): 489–93.
- Charney, K.J., G.L. Juler, and A.E. Comarr. General surgery problems in patients with spinal cord injuries. *Arch Surg* 110 (1975): 1083–88.
- Christensen, J. The motor function of the colon. In *Textbook of Gastroenterology*, edited by T. Yamada, 180–96. Philadelphia, PA: Lippincott, 1991.
- Collins, J.G. Types of injuries and impairments due to injuries. In *Vital and Health Statistics*, Series 10, No. 159. U.S. Department of Health and Human Services Publication (PHS) 87–1587. Hyattsville, MD: National Center for Health Statistics, 1987.
- Connell, A.M., H. Frankel, and L. Guttman. The motility of the pelvic colon following complete lesions of the spinal cord. *Paraplegia* 1 (1963): 98–115.
- Consortium for Spinal Cord Medicine. *Acute Management of Autonomic Dysreflexia: Adults with Spinal Cord Injury Presenting to Health-Care Facilities*. Washington, DC: Paralyzed Veterans of America, 1997.
- Cook, D.J., G.H. Guyatt, A. Laupacis, et al. Rules of evidence and clinical recommendations on the use of antithrombotic agents. Antithrombotic Therapy Consensus Conference. [Review] *Chest* 102 (1992): 305S–311S.
- Cornell, S.A., L. Champion, S. Bacero, et al. Comparison of three bowel management programs during rehabilitation of spinal cord injured patients. *Nurs Res* 22 (1973): 321–28.
- Davis, A., M.J. Nagelhout, M. Hoban, et al. Bowel management: A quality assurance approach to upgrading programs. *J Gerontol Nurs* 12 (1986): 13–17.
- de Groot, G.H., and G.F. de Pagter. Effects of cisapride on constipation due to a neurological lesion. *Paraplegia* 26 (1988): 159–61.
- Denny-Brown, D., and E.G. Robertson. An investigation of the nervous control of defecation. *Brain* 58 (1935): 256–310.
- DeVivo, M.J., P.R. Fine, H.M. Maetz, et al. Prevalence of spinal cord injury: A reestimation employing life table techniques. *Arch Neurol* 37 (1980): 707–8.

- DeVivo, M.J., R.D. Rutt, K.J. Black, et al. Trends in spinal cord injury demographics and treatment outcomes between 1973 and 1986. *Arch Phys Med Rehabil* 73 (1992): 424-30.
- Ducrotte, P., B. Rodomanska, J. Weber, et al. Colonic transit time of radiopaque markers and rectoanal manometry in patients complaining of constipation. *Dis Colon Rectum* 29 (1986): 630-34.
- Dunn, K.L., and M.L. Galka. A comparison of the effectiveness of Therevac SB and bisacodyl suppositories in SCI patients' bowel programs. *Rehabil Nurs* 19 (1994): 334-38.
- Dunn, M. Social discomfort in the patient with spinal cord injury. *Arch Phys Med Rehabil* 58 (1977): 257-60.
- Edwards-Beckett, J., and H. King. The impact of spinal pathology on bowel control in children. *Rehabil Nurs* 21 (1996): 292-97.
- Emick-Herring, B. Elimination pattern. In *The Specialty Practice of Rehabilitation Nursing: A Core Curriculum* (3rd Edition), edited by A. E. McCourt, 73-93. Skokie, IL: Rehabilitation Nursing Foundation, 1993.
- Ergas, Z. Spinal cord injury in the United States: A statistical update. *Cent Nerv Syst Trauma* 2 (1985): 19-30.
- Frenckner, B. Function of the anal sphincters in spinal man. *Gut* 16 (1975): 638-44.
- Frisbie, J.H., S. Chopra, D. Foo, et al. Colorectal carcinoma and myelopathy. *J Am Paraplegia Soc* 7 (1984): 33-36.
- Frisbie, J.H., C.G. Tun, and C.H. Nguyen. Effect of enterostomy on quality of life in spinal cord injury patients. *J Am Paraplegia Soc* 9 (1986): 3-5.
- Frost, F., D. Hartwig, R. Jaeger, et al. Electrical stimulation of the sacral dermatomes in spinal cord injury: Effect on rectal manometry and bowel emptying. *Arch Phys Med Rehabil* 74 (1993): 696-701.
- Geders, J.M., A. Gaing, W.A. Bauman, et al. The effect of cisapride on segmental colonic transit time in patients with spinal cord injury. *Am J Gastroenterol* 90 (1995): 285-89.
- Gibson, G.R., and M.B. Roberfroid. Dietary modulation of the human colonic microbiota: Introducing the concepts of prebiotics. [Review] *J Nutr* 125 (1995): 1401-12.
- Gilger, M.A., M.L. Wagner, J.O. Barrish, et al. New treatment for rectal impaction in children: An efficacy, comfort and safety trial of the pulsed-irrigation enhanced-evacuation procedure. *J Pediatr Gastroenterol Nutr* 18 (1994): 92-95.
- Glick, M.E., H. Meshkinpour, S. Haldemang, et al. Colonic dysfunction in patients with thoracic spinal cord injury. *Gastroenterology* 86 (1984): 287-94.
- Glickman, S., and M.A. Kamm. Bowel dysfunction in spinal cord injury patients. *Lancet* 347 (1996): 1651-53.
- Gold, M.R., J.E. Siegel, L.B. Russell, et al. *Cost-Effectiveness in Health and Medicine*. Oxford: Oxford University Press, 1996.
- Gore, R.M., R.A. Mintzer, and L. Calenoff. Gastrointestinal complications of spinal cord injury. *Spine* 6 (1981): 538-44.
- Guthrie, H., and M.F. Picciano. Water and electrolysis. In *Human Nutrition*, 261-73. St. Louis: Mosby-Yearbook, Inc., 1995.
- Haas, P.A., T.A. Fox, Jr., and G.P. Haas. The pathogenesis of hemorrhoids. *Dis Colon Rectum* 26 (1983): 435-39.
- Halm, M.A. Elimination concerns with acute spinal cord trauma. Assessment and nursing intervention. *Crit Care Nurs Clin North Am* 2 (1990): 385-98.
- Harvey, C., B.B. Rothschild, A.J. Asmann, et al. New estimates of traumatic SCI prevalence: Survey-based approach. *Paraplegia* 28 (1990): 537-44.
- Holliday, J. Bowel programs of patients with spinal cord injury: A clinical study. *Nurs Res* 16 (1967): 4-15.
- House, J.G., and S.A. Stiens. Pharmacologically initiated defecation of persons with spinal cord injury: Effectiveness of three agents. *Arch Phys Med Rehabil* 78 (1997): 1062-65.
- Ingersoll, G.L. Abdominal pathology in spinal cord injured persons. *J Neurosurg Nurs* 17 (1985): 343-48.
- Jones, R. Bladder and bowel management. In *Spinal Cord Injury: A Guide to Functional Outcome in Occupational Therapy*, edited by J. Hill, 145-68. Gaithersburg, MD: Aspen Publications, 1986.
- Juler, G.L., and I.M. Eltorai. The acute abdomen in spinal cord patients. *Paraplegia* 23 (1985): 118-23.
- Keshavarzian, A., W.E. Barnes, K. Bruninga, et al. Delayed colonic transit in spinal cord-injured patients measured by Indium-111 Amberlite scintigraphy. *Amer J Gastroenterol* 90 (1995): 1295-1300.
- Kirk, P.M., R.B. King, R. Temple, et al. Long-term followup of bowel management after spinal cord injury. *SCI Nurs* 14 (1997): 56-63.
- Kokoszka, J., R. Nelson, M. Falconio, et al. Treatment of fecal impaction with pulsed irrigation enhanced evacuation. *Dis Colon Rectum* 37 (1994): 161-64.
- Kraus, J.F., C.E. Franti, R.S. Riggins, et al. Incidence of traumatic spinal cord lesions. *J Chron Dis* 28 (1975): 471-92.
- Kubalanza-Sipp, D., and E. French. Establishing and maintaining elimination. In *Rehabilitation Nursing Procedures Manual*, 128. Rockville, MD: Aspen, 1990.
- Kuijpers, H.C. Application of the colorectal laboratory in diagnosis and treatment of functional constipation. *Dis Colon Rectum* 33 (1990): 35-39.
- Lai, J.M., T.Y. Chuang, G.E. Francisco, et al. Diversion colitis: A cause of abdominal discomfort in spinal cord injury patients with colostomy. *Arch Phys Med Rehabil* 78 (1997): 670-71.
- Lanfranchi, G.A., G. Bazzocchi, F. Fois, et al. Effect of domperidone and dopamine on colonic motor activity in patients with the irritable bowel syndrome. *Eur J Clin Pharmacol* 29 (1985): 307-10.
- Levi, R., C. Hultling, M.S. Nash, et al. The Stockholm spinal cord injury study: 1. Medical problems in a regional SCI population. *Paraplegia* 33 (1995): 308-15.

- Levine, A.M., M.S. Nash, B.A. Green, et al. An examination of dietary intakes and nutritional status of chronic healthy spinal cord injured individuals. *Paraplegia* 30 (1992): 880-89.
- Linsenmeyer, T.A., and J.M. Stone. Neurogenic bladder and bowel dysfunction. In *Rehabilitation Medicine: Principles and Practice*, edited by J.A. DeLisa, 733-62. Philadelphia, PA: Lippincott Co., 1993.
- Longo, W.E., G.H. Ballantyne, and I.M. Modlin. The colon, anorectum, and spinal cord patient: A review of the functional alterations of the denervated hindgut. *Dis Colon Rectum* 32 (1989): 261-67.
- Longo, W.E., and A.M. Vernava III. Prokinetic agents for lower gastrointestinal motility disorders. *Dis Colon Rectum* 36 (1993): 696-708.
- Longo, W.E., R.M. Woolsey, A.M. Vernava, et al. Cisapride for constipation in spinal cord injured patients: A preliminary report. *J Spinal Cord Med* 18 (1995): 240-44.
- McCallum, R.W., S.M. Fink, E. Lerner, et al. Effects of metoclopramide and bethanechol on delayed gastric emptying present in gastroesophageal reflux patients. *Gastroenterology* 84 (1983): 1573-77.
- MacDonagh, R.P., W.M. Sun, R. Smallwood, et al. Control of defecation in patients with spinal cord injuries by stimulation of sacral anterior nerve roots. *Br Med J* 300 (1990): 1494-97.
- MacDonagh, R., W.M. Sun, D.G. Thomas, et al. Anorectal function in patients with complete supraconal spinal cord lesions. *Gut* 33 (1992): 1532-38.
- MacLeod, J.H. Biofeedback in the management of partial anal incontinence: A preliminary report. *Dis Colon Rectum* 22 (1979): 169-71.
- Malassigné, P., A. Nelson, T. Amerson, et al. Toward the design of a new bowel care chair for the spinal cord injured: A pilot study. *SCI Nurs* 10 (1993): 84-90.
- Matthews, P. Elimination. In *Spinal Cord Injury: A Guide to Rehabilitation Nursing*, edited by P. Matthews and C. Carlson, 97-119. Rockville, MD: Aspen, 1987.
- Menardo, G., G. Bausano, E. Corazziari, et al. Large-bowel transit in paraplegic patients. *Dis Colon Rectum* 30 (1987): 924-28.
- Meshkinpour, H., F. Nowroozi, and M.E. Glick. Colonic compliance in patients with spinal cord injury. *Arch Phys Med Rehabil* 64 (1983): 111-12.
- Miller, L.S., W.E. Staas, and G.J. Herbison. Abdominal problems in patients with spinal cord lesions. *Arch Phys Med Rehabil* 56 (1975): 405-8.
- Minton, P.N. Videotape instruction: An effective way to learn. *Rehabil Nurs* 8 (1983): 15-17.
- Mollinger, L.A., G.B. Spurr, A.Z. El Ghatit, et al. Daily energy expenditure and basal metabolic rates of patients with spinal cord injury. *Arch Phys Med Rehabil* 66 (1985): 420-26.
- Muller-Lissner, S.A., C. Fraas, and A. Hartl. Cisapride offsets dopamine-induced slowing of fasting gastric emptying. *Dig Dis Sci* 31 (1986): 807-10.
- Muller-Lissner, S.A., and the Bavarian Constipation Study Group. Treatment of chronic constipation with cisapride and placebo. *Gut* 28 (1987): 1033-38.
- Muller-Lissner, S.A. Effect of wheat bran on weight of stool and gastrointestinal transit time: A meta-analysis. *Br Med J* 296 (1988): 615-17.
- National Research Council. *Water and electrolytes*. In *Recommended Dietary Allowances* (Tenth Edition), 249. Washington, DC: National Academy Press, 1989.
- Nelson, A., P. Malassigné, T. Amerson, et al. Descriptive study of bowel care practices and equipment in spinal cord injury. *SCI Nurs* 10 (1993): 65-67.
- Nelson, A.L., P. Malassigné, and J. Murray. Comparison of seat pressures on three bowel care/shower chairs in spinal cord injury. *SCI Nurs* 11 (1994): 105-7.
- Nino-Murcia, M., J.M. Stone, P.J. Chang, et al. Colonic transit in spinal cord-injured patients. *Invest Radiol* 25 (1990): 109-12.
- Pietsch, J.B., H.M. Shizgal, and J.L. Meakins. Injury by hypertonic phosphate enema. *Can Med Assoc J* 116 (1977): 1169-70.
- Puet, T.A., L. Phen, and D.L. Hurst. Pulsed irrigation enhanced evacuation: New method for treating fecal impaction. *Arch Phys Med Rehabil* 72 (1991): 935-36.
- Rajendran, S.K., J.R. Reiser, W. Bauman, et al. Gastrointestinal transit after spinal cord injury: Effect of cisapride. *Am J Gastroenterol* 87 (1992): 1614-17.
- Rasmussen, O.O. Anorectal function. [Review] *Dis Colon Rectum* 37 (1994): 386-403.
- Reynolds, J.C. Prokinetic agents: A key in the future of gastroenterology. [Review] *Gastroenterol Clin North Am* 18 (1989): 437-57.
- Sackett, D.L. Rules of evidence and clinical recommendations on the use of antithrombotic agents. *Chest* 95 (2 Suppl) (1989): 2S-4S.
- Saltzstein, R.J., and J. Romano. The efficacy of colostomy as a bowel management alternative in selected spinal cord injury patients. *J Am Paraplegia Soc* 13 (1990): 9-13.
- Saltzstein, R.J., E. Quebbeman, and J.L. Melvin. Anorectal injuries incident to enema administration: A recurring avoidable problem. *Am J Phys Med Rehabil* 67 (1988): 186-188.
- Sarna, S.K. Physiology and pathophysiology of colonic motor activity, part I. [Review] *Dig Dis Sci* 36 (1991): 827-62.
- Sarna, S.K. Colonic motor activity. [Review] *Surg Clin North Am* 73 (1993): 1201-23.
- Schuster, M.M. The riddle of the sphincters. *Gastroenterology* 69 (1975): 249-62.
- Schweiger, M. Method for determining individual contributions of voluntary and involuntary anal sphincters to resting tone. *Dis Colon Rectum* 22 (1979): 415-16.
- Segal, J.L., N. Milne, S.R. Brunnemann, et al. Metoclopramide-induced normalization of impaired gastric emptying in spinal cord injury. *Am J Gastroenterol* 82 (1987): 1143-48.

- Shafik, A. Electromyogram study of the neuropathic rectum. *Paraplegia* 33 (1995): 346–49.
- Smout, A.J., J.W. Bogaard, A.C. Grade, et al. Effects of cisapride, a new gastrointestinal prokinetic substance, on interdigestive and postprandial motor activity of the distal esophagus in man. *Gut* 26 (1985): 246–51.
- Snape, W.J., Jr., S.H. Wright, W.M. Battle, et al. The gastrocolic response: Evidence for a neural mechanism. *Gastroenterology* 77 (1979): 1235–40.
- Staas, W.E., Jr., and P.M. DeNault. Bowel control. *Am Fam Physician* 7 (1973): 90–100.
- Stiens, S.A. Reduction in bowel program duration with polyethylene glycol-based bisacodyl suppositories. *Arch Phys Med Rehabil* 76 (1995): 674–77.
- Stiens, S.A., S.B. Bergman, and L.L. Goetz. Neurogenic bowel dysfunction after spinal cord injury: Clinical evaluation and rehabilitative management. [Review] *Arch Phys Med Rehabil* 78 (1997): S86–S102.
- Stiens, S.A., and L.L. Goetz. Neurogenic bowel dysfunction. In *PM&R Secrets*, edited by B. O'Young, M.A. Young, and S.A. Stiens, 460–64. Philadelphia: Harley and Belfus, 1997.
- Stone, J.M., M. Nino-Murcia, V.A. Wolfe, et al. Chronic gastrointestinal problems in spinal cord injury patients: A prospective analysis. *Am J Gastroenterol* 9 (1990a): 1114–19.
- Stone, J.M., V.A. Wolfe, M. Nino-Murcia, et al. Colostomy as treatment for complications of spinal cord injury. *Arch Phys Med Rehabil* 71 (1990b): 514–18.
- Stover, S.L., and P.R. Fine. The epidemiology and economics of spinal cord injury. *Paraplegia* 25 (1987): 225–28.
- Stover, S.L., J.A. DeLisa, and G.G. Whiteneck. *Spinal Cord Injury: Clinical Outcomes from the Model Systems*, 21–25. Gaithersburg, MD: Aspen, 1995.
- Stratton, M.D., L.W. McKirgan, T.P. Wade, et al. Colorectal cancer in patients with previous spinal cord injury. *Dis Colon Rectum* 39 (1996): 965–68.
- Subbarao, J.V., B.A. Nemchansky, J.J. Niekelski, et al. Spinal cord dysfunction in older patients—rehabilitation outcomes. *J Am Paraplegia Soc* 10 (1987): 30–35.
- Sullivan, R.A., and M. Rago. Specialized care of the spinal cord injured patient. Part II: Bowel and bladder programs. *J Pract Nurs* 26 (1976): 36–38.
- Sun, W.M., R. MacDonagh, D. Forster, et al. Anorectal function in patients with complete spinal transection before and after sacral posterior rhizotomy. *Gastroenterology* 108 (1995): 990–98.
- Szurszewski, J., and B.F. King. Physiology of prevertebral ganglia in mammals with special reference to inferior mesenteric ganglion. In *Handbook of Physiology: The Gastrointestinal System I*, edited by J. Wood, 519–92. Bethesda, MD: American Physiological Society, 1989.
- Tolleson, P.O., J. Cassuto, G. Rimack, et al. Treatment of postoperative paralytic ileus with cisapride. *Scand J Gastroenterol* 26 (1991): 477–82.
- Tramonte, S.M., M.B. Brand, C.D. Mulrow, et al. The treatment of chronic constipation in adults: A systematic review. *J Gen Intern Med* 12 (1997): 15–24.
- Tudor, L.L. Bladder and bowel retraining. *Am J Nurs* 70 (1970): 2391–93.
- U.S. Department of Agriculture and U.S. Department of Health and Human Services. *Nutrition and Your Health: Dietary Guidelines for Americans* (Fourth edition). Washington, DC: U.S. Government Printing Office, 1995.
- U.S. Bureau of the Census. *Current Population Reports, Series P23–189*. Washington, DC: U.S. Government Printing Office, 1995.
- U.S. Preventive Health Services Task Force. *Guide to Clinical Preventive Services: An Assessment of the Effectiveness of 169 Interventions*. Baltimore, MD.: Williams and Wilkins, 1989.
- U.S. Preventive Health Services Task Force. *Guide to Clinical Preventive Services*, Second Edition. Baltimore: Williams and Wilkins, 1996.
- Wald, A. Colonic and anorectal motility testing in clinical practice. [Review] *Am J Gastroenterol* 89 (1994): 2109–15.
- Weems, W.A., and J.H. Szurszewski. Modulation of colonic motility by peripheral neural inputs to neurons of the inferior mesenteric ganglion. *Gastroenterology* 73 (1977): 273–78.
- White, J.C., M.G. Verlot, and O.E. Ehrenthel. Neurogenic disturbances of the colon and their investigation by the colonmetrogram. *Ann Sur* 112 (1940): 1042–57.
- White, M.J., D.H. Rintala, K.A. Hart, et al. Sexual activities, concerns, and interests of women with spinal cord injury living in the community. *Am J Phys Med Rehabil* 72 (1993): 372–78.
- Whiteneck, G.G., S.W. Charlifue, H.L. Frankel, et al. Mortality, morbidity, and psychosocial outcomes of persons spinal cord injured more than 20 years ago. *Paraplegia* 30 (1992): 617–30.
- Winawer, S.J., R.H. Fletcher, L. Miller, et al. Colorectal cancer screening: Clinical guidelines and rationale. *Gastroenterology* 112 (1997): 594–642.
- World Health Organization. *International Classification of Impairments, Disabilities, and Handicaps: A Manual of Classification Relating to the Consequences of Disease*. Geneva: World Health Organization, 1980.
- Wrenn, K. Fecal impaction. [Review] *N Engl J Med* 321 (1989): 658–62.
- Wyndaele, J.J., and B. Van Eetvelde. Reproducibility of digital testing of the pelvic floor muscles in men. *Arch Phys Med Rehabil* 77 (1996): 1179–81.
- Wysowski, D.K., and J. Bacsanyi. Cisapride and fatal arrhythmia. *New Engl J Med* 335 (1996): 290–91.
- Zejdlík, C.P. Reestablishing bowel control. In *Management of Spinal Cord Injury*, Second Edition, edited by C.P. Zejdlik, 397–416. Boston, MA.: Jones and Bartlett, 1992.
- Zeman, F.J. *Clinical Nutrition and Dietetics*, Second Edition. New York: MacMillan Publishing, 1991.

Glossary of Terms

anticholinergic: antagonistic to the action of parasympathetic or other cholinergic nerve fibers.

areflexic bowel: a lower motor neuron bowel produced by an injury at the sacral segments in which no spinal cord-mediated reflex occurs.

autonomic dysreflexia: also known as hyperreflexia, an uninhibited sympathetic nervous system response to a variety of noxious stimuli occurring in people with spinal cord injury at the thoracic 6 level and above.

bowel care: the process of assisted defecation, which includes one or more of the following components: rectal stimulation, positioning and assistive techniques, and adaptive equipment.

bowel program: treatment plan designed to minimize or eliminate the occurrence of unplanned or difficult evacuations; to evacuate stool at a regular, predictable time within 60 minutes of bowel care; and to minimize gastrointestinal complications. Components include a routine schedule for bowel care, diet and fluid management, physical activity, rectal stimulation, and oral medication.

chemical rectal stimulation: the use of chemical agents inserted rectally in the form of suppositories or enemas.

***Clostridium difficile* toxin:** a species of anaerobic bacteria found in the feces. Excessive use of certain antibiotics can contribute to *C. difficile* overgrowth, causing colitis and diarrhea.

constipation: infrequent or incomplete defecation (even with rectal stimulation) characterized by small amounts of hard, dry stool that is difficult to pass.

delayed evacuation: passage of stool more than 60 minutes after initiating rectal stimulation.

digital stimulation: the insertion of a gloved, lubricated finger into the rectal vault followed by rotation to relax the internal anal sphincter. The procedure is used to facilitate evacuation for a reflexic bowel.

evidence-based guidelines: clinical practice guidelines that have been developed using research findings that have been graded for scientific strength.

evidence tables: charts developed by methodologists that outline the scientific literature and the type and quality of the research used to develop clinical practice guidelines.

extrapyramidal: brain structures affecting bodily movement, excluding the motor neurons, motor cortex, and the pyramidal (corticobulbar and corticospinal) tract.

fecal impaction: a large mass of stool in the distal or proximal colon that cannot be evacuated. A finding of diarrheal stool may indicate the presence of an impaction.

functional electrical stimulation: modality for several methods of improving motor function in paralyzed limbs by stimulation of the nerves and muscles.

gastroesophageal reflux: backward flow of contents of the stomach up into the esophagus.

giant migratory contraction (GMC): a peristaltic wave that advances stool in the colon following physical activity or eating.

ileus: an adynamic state of the intestine precipitated by infection, injury, or medication.

incontinence: inability to control defecation to achieve voluntary and predictable fecal evacuation.

manual evacuation: digital removal of stool from the rectum, which is the usual bowel care treatment choice for an areflexic bowel.

mechanical rectal stimulation: manual procedures to remove stool from the rectum or to facilitate evacuation of stool.

megacolon: a condition of extreme dilation and hypertrophy of the colon that may result in rupture.

meta-analysis: a statistical process for aggregating the results of topic-specific research projects, particularly controlled clinical trials, to provide more conclusive information.

osmotic laxative: a laxative that contains dissolved products that are not absorbed by the gut and that retain water to moisten stool and promote peristalsis.

peristalsis: the movement of the intestine, characterized by waves of alternate circular contraction and relaxation by which contents are propelled forward.

prokinetic medication: chemical agents that stimulate gastrointestinal motility.

pulsed irrigation evacuation: intermittent propulsion of a small volume of water into the rectum through a speculum to break up fecal impaction.

reflexic bowel: an upper motor neuron bowel produced by a spinal cord injury above the sacral segments in which defecation cannot be initiated by voluntary relaxation of the external anal sphincter.

tetraplegia: impairment or loss of motor and/or sensory function below the cervical segments of the spinal cord due to damage of the neural elements within the spinal cord.

unplanned bowel evacuation: an incontinence episode in which stool is passed outside of a regular bowel care session.

Valsalva maneuver: any forced expiratory effort (strain) against a closed glottis.

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