Screening and management for malnutrition and related gastro-intestinal disorders in systemic sclerosis: recommendations of a North American expert panel

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ABSTRACT

Objectives. *To develop a set of recommendations for clinicians caring for patients with systemic sclerosis (SSc) to guide their approach to the patient with malnutrition and possible malabsorption.*

Methods. *The Canadian Scleroderma Research Group convened a meeting of experts in the areas of nutrition, speech pathology, oral health in SSc, SSc and gastroenterology to discuss the nutrition-GI paradigm in SSc. This meeting generated a set of recommendations based on expert opinion.*

Results. *Physicians should screen ALL patients with SSc for malnutrition. The physician should ask a series of questions that pertain to GI involvement. Patients who screen positive for malnutrition should be referred to a dietitian and gastroenterologist. Referral to a patient support group should be considered and if screening reveals oral health problems, referral to a dentist, preferably with expertise in treating patients with SSc, should be done. All SSc patients should weigh themselves monthly and report any sudden significant changes in weight. They should be assessed by a rheumatologist once a year for signs of malnutrition.*

Conclusions. *Malnutrition may be common in SSc and a multidisciplinary approach is important.*

Introduction

Malnutrition has been defined as "a state of nutrition in which a deficiency, excess or imbalance of energy, protein, and other nutrients causes measurable adverse effects on tissue/body form (body shape, size, composition) and function and clinical outcome" (1). Although the diagnosis of malnutrition is sometimes difficult to make, it is clear that patients with SSc and GI involvement are at risk for malnutrition (2, 3). In some cases, this may be related to malabsorption secondary to bacterial overgrowth (4). In addition, motility disorders of the gastrointestinal tract may lead to early satiety and persistent nausea and vomiting. Malnutrition is prevalent in SSc, with a recent study by the Canadian Scleroderma Research Group (CSRG) reporting that almost 30% of an unselected population of SSc patients was at a medium to high risk of malnutrition[5]. Moreover, malnutrition in SSc may be severe, as is evidenced by the fact that parenteral nutrition is at times necessary in SSc patients (4, 6-8).

In June 2008, the CSRG convened a meeting of experts in the areas of nutrition (PB, LC, LJH, DS, LW), speech pathology (GF), oral health in SSc (MG), SSc (rheumatologists MB, MH, DK) and gastroenterology (MD-(nutrition), GF, WGP-(motility), PPT-(malabsorption)), to discuss the nutrition-GI paradigm in SSc and develop recommendations, based on expert consensus, that would be useful to physicians caring for SSc patients. The specific objectives of the meeting were to develop recommendations for 1) screening for malnutrition in SSc, and 2) management of malabsorption in SSc.

A. Assessment

1. Screening for malnutrition

Although malnutrition may include an excess of certain nutrients, in the context of SSc it was agreed that malnutrition usually refers to undernutrition. The expert panel agreed that physicians should screen ALL patients with SSc for malnutrition. The initial screening procedure should include an assessment of general appearance, eliciting

a history of involuntary, significant weight loss and utilising an easy-to-administer screening tool such as the "Malnutrition Universal Screening Tool" (MUST) (1, 9, 10) or one of the many other screening tools available (9-37). Some of these tools, however, were directed at specific patient populations such as cancer (17), the elderly (18, 19, 22, 24, 26, 27, 29, 31, 32, 38, 39) or hospitalised patients (17, 30-32). Only the MUST has been studied in SSc (5). Although it was not specifically validated, for example by comparing it to a nutritionist's assessment, it did correlate well what one might expect to find in malnourished patients such as more gastrointestinal complaints, diffuse disease, worse physician global assessment of disease severity, lower haemoglobin, smaller oral aperture, abdominal distension on physical examination, and physician-assessed possible malabsorption. This suggests good construct validity.

Body weight loss is the most sensitive indicator of malnutrition and should be performed at regular intervals A general rule of thumb for significant weight loss was identified as follows: 1%–2% in the previous week, >5% in the previous month, >7.5% in the previous 3 months, and >10% in the previous year (40). A body mass index <18.5 kg/m^2 is suggestive of protein-energy malnutrition (PEM) (41).

In addition, the panel agreed that a set of basic laboratory tests pertinent to malnutrition should be obtained for all patients with SSc. These should include: serum hemoglobin (may indicate nutritional deficiency such as iron, folic acid or vitamin B12), serum carotene (indicative of fat malabsorption and inexpensive although limited sensitivity or specificity), serum folate (elevated in bacterial overgrowth but not valid if the patient is on folic acid supplements) (42). Serum albumin is commonly used to screen for malnutrition but it is a negative acute phase reactant that is neither sensitive nor specific for PEM. Serum albumin is commonly normal in prolonged "adapted" energy malnutrition (marasmus) but when levels falls below 35g/L (or 3.5 mg/dl), PEM must be ruled out.

The physician should also ask a series of questions that pertain to GI involvement and which may imply underlying disease that could be the cause of the patient's malnutrition. These questions could be in the form of a validated questionnaire (43, 44) (available from author DK at dkanna@mednet.ucla.edu) or a series of questions such as the 14 questions used by the CSRG (Appendix). Finally, the physician should briefly screen for oral health (presence of teeth, ability to chew without pain, changes in taste), saliva production and depressive symptomatology.

Any screening test suggesting malnutrition should be confirmed by a full nutritional evaluation to confirm the diagnosis and determine its severity. There has never been a validation of the clinimetric properties of any particular malnutrition screening tool specifically in SSc.

2. Evaluation of malnutrition

If malabsorption is suspected, the following tests should be considered for further confirmation: serum methylmalonic acid (MMA) (elevated in malabsorption), zinc (decreased in malabsorption), 25-OH vitamin D levels, vitamin K level or prothrombin time (PT) and a C^{14} xylose breath test or a hydrogen breath test. Although the xylose breath test may be superior to the hydrogen breath test, the latter may be more readily available to some health care providers (45). Furthermore, although the hydrogen breath test is not as sensitive or specific it can be helpful since most SSc patients have such severe bacterial overgrowth when malabsorption occurs that the hydrogen breath test will likely be abnormal (46).

Patients who screen positive for malnutrition should be referred to a dietitian for a full nutritional evaluation to determine the type and severity of malnutrition and to begin appropriate treatment. Patients who have signs of weight loss, dysphagia, malabsorption, esophageal dysmotility, GERD, gastroparesis, or bacterial overgrowth but are not clinically malnourished could also benefit from nutritional intervention and should be referred to the dietitian to prevent vitamin or mineral deficiencies and progression to PEM. If treatment for PEM is contemplated, baseline and periodic serum pre-albumin sampling could be useful to monitor improvement in nutritional status, especially if it is abnormally low at baseline (47-49).

B. Interventions

1. For every patient in whom malnutrition is suspected based on initial assessment

a. Most cases of suspected malnutrition should be referred to both a dietitian and a gastroenterologist. The dietitian and gastroenterologist should have the expertise to assess and manage nutrient malabsorption and other issues specific to SSc such as delayed gastric emptying, dysphagia and abdominal distention. Use of dietary supplements including commercial meal replacement products may be included into a comprehensive nutritional plan formulated by a dietitian. Although there are no specific studies of their use in SSc, the use of enteral supplements in those who have SSc should be the same as other chronic diseases (50, 51) until a swallowing abnormality precludes drinking. Similarly, there are no studies regarding specific diets. However, the opinion of the experts is that there is no indication to restrict the intake of fats or sugars. Patients should be encouraged to eat a mixed balanced diet that meets their requirements for both macro and micro nutrients (assuming there are no other medical contraindications).

b. Consider referral to a patient support group. These may be good sources of educational material and support.

c. If screening uncovers depressive symptomatology, referral to a mental health worker should be done.

d. If screening reveals oral health problems, referral to a dentist, preferably with expertise in treating patients with SSc, should be done.

e. Consider referral to a speech pathologist if screening reveals problems with the oropharyngeal phase of swallowing.

2. Special situations

a. Xerostomia. Rule out true Sjögren's syndrome through serology and, if appropriate, minor salivary gland biopsy. Biotine products and artificial saliva

could be prescribed for symptomatic treatment. A trial of pilocarpine 5 mg or Evoxac 30 minutes before meals could also be considered.

b. Esophageal disease. Most of the panel agreed that PPI therapy should be used first line for symptoms of heartburn and dyspepsia (52-55). Doubling of the dose could be considered in refractory disease, as could the addition of H2 blockers at bedtime (55, 56). One panel member recommended step up therapy for acid reflux disease: H2 blockers (still adequate in 50%) or low dose PPI (*e.g.* Rabeprazole 10-20 mg qd-q2d) before full dose PPI because of the risk of exacerbating small bowel bacterial overgrowth with PPI therapy (57). Most of the other experts however preferred PPI despite possible side effects and also noted that tolerance can develop to H2 blockers (58).

c. Gastric emptying disorder. If symptoms of gastroparesis such as early satiety, nausea and vomiting are present, a radionuclide gastric emptying study should be ordered and the patient should be referred to a gastroenterologist to rule out gastric outlet obstruction. Pro-motility agents such as erythromycin 100-150 mg qid, azithromycin 400 mg/d, metoclopramide 10-15 mg qid, and domperidone 10-20 mg qid may be helpful, although there is very limited data from controlled clinical trials demonstrating efficacy. Cisparide and tegaserod are also useful gastrokinetic agents, but their use is now restricted in North America.

d. Malabsorption. If bacterial overgrowth is suspected, irrespective of the results of breath testing, a 10-day course of a selective antibiotic could be tried (59). Some authors give an initial course of antibiotics for 21 days and then a 10-14 days course, as needed (60). The following antibiotics may be considered:

Agent	Dose
Tetracycline	250 mg qid
Doxycycline	100 mg bid
Minocycline	100 mg bid
Amoxicillin-clavulanic acid	875 mg bid
Cephalexin +	250 mg qid
Metronidazole	250 mg tid
Ciprofloxacin	500 mg bid
Norfloxacin	400 mg bid
Chloramphenicol	250 mg qid
Rifaximin	400 mg tid
Nitazoxanide	500 mg bid

If there is a symptomatic response but the patient quickly relapses, use the selective antibiotic for the first 10 days of each of 4 consecutive months. Some patients continue to relapse whenever antibiotics are stopped. In these individuals continuous antibiotic therapy may required. Alternatively, adding a probiotic when antibiotics are withdrawn should be considered.

In cases with refractory symptoms due to small bowel involvement, consider therapy with octreotide 50 mcg sc at bedtime (61, 62). This agent induces propulsive contractile activity throughout the small bowel. The physician should be aware of possible disadvantages including inhibitory effects on gastric emptying, pancreatic secretions and gallbladder contractions. In addition, octreotide is costly and requires parenteral administration.

e. For situations which do not respond to the above therapies. The group recommends that in these cases treatments such as parenteral nutrition or enteral nutrition via a jejunostomy may be considered. In patients with intact small bowel function enteral nutrition should always be attempted first as parenteral nutrition can be associated with complications including catheter sepsis, vascular thrombosis and liver failure. This decision should be individualised and should depend on close communication between the rheumatologist, gastroenterologist and the dietitian.

C. Follow-up

All SSc patients should weigh themselves monthly and report any sudden significant changes in weight as defined above in Section A.1. They should be assessed by the rheumatologist once a year for signs of malnutrition.

For all patients treated with dietary manipulation or specific GI measures for underlying malnutrition, the patient's nutritional status should be re-assessed longitudinally with the same tools that demonstrated abnormalities before therapy. It should not be assumed that apparently successful treatment of an underlying GI problem will necessarily be successful in treating the nutritional abnormality. Malnutrition, although a common problem of the SSc patient, can be detected and treated in a stepwise manner if nutritional assessment and therapy are incorporated into the overall care plan of the patient.

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References

1. STRATTON RJ, HACKSTON A, LONGMORE D *et al*.: Malnutrition in hospital outpatients and inpatients: prevalence, concurrent validity and ease of use of the 'malnutrition universal screening tool' ('MUST') for adults. *Br J Nutr* 2004; 92: 799-808.
2. LUNDBERG AC, AKESSON A, AKESSON B: Dietary intake and nutritional status in patients with systemic sclerosis. *Ann Rheum Dis* 1992; 51: 1143-8.
3. JAOVISIDHA K, CSUKA ME, ALMAGRO UA, SOERGEL KH: Severe gastrointestinal involvement in systemic sclerosis: report of five cases and review of the literature. *Semin Arthritis Rheum* 2005; 34: 689-702.
4. BROWN M, TEUBNER A, SHAFFER J, HERRICK AL: Home parenteral nutrition--an effective and safe long-term therapy for systemic sclerosis-related intestinal failure. *Rheumatology* (Oxford) 2008; 47: 176-9.
5. BARON M, HUDSON M, STEELE R: Malnutrition is common in systemic sclerosis: results from the canadian scleroderma research group database. *J Rheumatol* 2009; 36: 2737-43.
6. LEVIEN DH, FIALLOS F, BARONE R, TAFFET S: The use of cyclic home hyperalimentation for malabsorption in patients with scleroderma involving the small intestines. *JPEN J Parenter Enteral Nutr* 1985; 9: 623-5.
7. GRABOWSKI G, GRANT JP: Nutritional support in patients with systemic scleroderma. *JPEN J Parenter Enteral Nutr* 1989; 13: 147-51.
8. STAFFORD-BRADY FJ, KAHN HJ, ROSS TM, RUSSELL ML: Advanced scleroderma bowel: complications and management. *J Rheumatol* 1988; 15: 869-74.
9. GODFREY K: Implementation of the Malnutrition Universal Screening Tool. *Nurs Times* 2004; 100: 61.
10. STRATTON RJ, KING CL, STROUD MA, JACKSON AA, ELIA M: 'Malnutrition Universal Screening Tool' predicts mortality and length of hospital stay in acutely ill elderly. *Br J Nutr* 2006; 95: 325-30.

11. GERASIMIDIS K, DRONGITIS P, MURRAY L, YOUNG D, MCKEE RF: A local nutritional screening tool compared to malnutrition universal screening tool. *Eur J Clin Nutr* 2007; 61: 916-21.
12. SIEBER CC: Nutritional screening tools--How does the MNA compare? Proceedings of the session held in Chicago May 2-3, 2006 (15 Years of Mini Nutritional Assessment). *J Nutr Health Aging* 2006; 10: 488-92 (discussion 92-4).
13. KYLE UG, KOSSOVSKY MP, KARSEGARD VL, PICHARD C: Comparison of tools for nutritional assessment and screening at hospital admission: a population study. *Clin Nutr* 2006; 25: 409-17.
14. MALNUTRITION ADVISORY GROUP: A consistent and reliable tool for malnutrition screening. *Nurs Times* 2003; 99: 26-7.
15. JONES JM: Validity of nutritional screening and assessment tools. *Nutrition* (Burbank, Los Angeles County, CA) 2004; 20: 312-7.
16. BARROCAS A, BELCHER D, CHAMPAGNE C, JASTRAM C: Nutrition assessment practical approaches. *Clin Geriatr Med* 1995; 11: 675-713.
17. BAUER J, CAPRA S: Comparison of a malnutrition screening tool with subjective global assessment in hospitalised patients with cancer--sensitivity and specificity. *Asia Pac J Clin Nutr* 2003; 12: 257-60.
18. BOUILLANNE O, MORINEAU G, DUPONT C *et al*.: Geriatric Nutritional Risk Index: a new index for evaluating at-risk elderly medical patients. *Am J Clin Nutr* 2005; 82: 777-83.
19. CHARLTON KE, KOLBE-ALEXANDER TL, NEL JH: The MNA, but not the DETERMINE, screening tool is a valid indicator of nutritional status in elderly Africans. *Nutrition* 2007; 23: 533-42.
20. COPE KA: Nutritional status: a basic 'vital sign'. *Home Healthc Nurse* 1994; 12: 29-34.
21. DELEGGE MH, DRAKE LM: Nutritional assessment. *Gastroenterol Clin North Am* 2007; 36: 1-22, v.
22. DONINI LM, SAVINA C, ROSANO A, CANNELLA C: Systematic review of nutritional status evaluation and screening tools in the elderly. *J Nutr Health Aging* 2007; 11: 421-32.
23. GREEN SM, WATSON R: Nutritional screening and assessment tools for use by nurses: literature review. *J Adv Nurs* 2005; 50: 69-83.
24. GREEN SM, WATSON R: Nutritional screening and assessment tools for older adults: literature review. *J Adv Nurs* 2006; 54: 477-90.
25. GUIGOZ Y: The Mini Nutritional Assessment (MNA) review of the literature--What does it tell us? *J Nutr Health Aging* 2006; 10: 466-85; discussion 85-7.
26. HARRIS D, HABOUBI N: Malnutrition screening in the elderly population. *J R Soc Med* 2005; 98: 411-4.
27. HRNCIARIKOVA D, JURASKOVA B, ZADAK Z, HRONEK M: Present state of evaluating malnutrition in the elderly - analysing indicators. *Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub* 2006; 150: 217-21.
28. JONES JM: The methodology of nutritional screening and assessment tools. *J Hum Nutr Diet* 2002; 15: 59-71; quiz 3-5.
29. KELLER HH: The SCREEN I (Seniors in the Community: Risk Evaluation for Eating and Nutrition) index adequately represents nutritional risk. *J Clin Epidemiol* 2006; 59: 836-41.
30. KRUIZENGA HM, SEIDELL JC, DE VET HC, WIERDSMA NJ, VAN BOKHORST-DE VAN DER SCHUEREN MA: Development and validation of a hospital screening tool for malnutrition: the short nutritional assessment questionnaire (SNAQ). *Clin Nutr* 2005; 24: 75-82.
31. LAPORTE M, VILLALON L, PAYETTE H: Simple nutrition screening tools for healthcare facilities: development and validity assessment. *Can J Diet Pract Res* 2001; 62: 26-34.
32. LAPORTE M, VILLALON L, THIBODEAU J, PAYETTE H: Validity and reliability of simple nutrition screening tools adapted to the elderly population in healthcare facilities. *J Nutr Health Aging* 2001; 5: 292-4.
33. MACKINTOSH MA, HANKEY CR: Reliability of a nutrition screening tool for use in elderly day hospitals. *J Hum Nutr Diet* 2001; 14: 129-36.
34. NURSAL TZ, NOYAN T, ATALAY BG, KOZ N, KARAKAYALI H: Simple two-part tool for screening of malnutrition. *Nutrition* 2005; 21: 659-65.
35. NURSAL TZ, NOYAN T, TARIM A, KARAKAYALI H: A new weighted scoring system for Subjective Global Assessment. *Nutrition* 2005; 21: 666-71.
36. VELLAS B, VILLARS H, ABELLAN G *et al*.: Overview of the MNA--Its history and challenges. *J Nutr Health Aging* 2006; 10: 456-63; discussion 63-5.
37. WELLS JL, DUMBRELL AC: Nutrition and aging: assessment and treatment of compromised nutritional status in frail elderly patients. *Clin Interv Aging* 2006; 1: 67-79.
38. HARRIS DG, DAVIES C, WARD H, HABOUBI NY: An observational study of screening for malnutrition in elderly people living in sheltered accommodation. *J Hum Nutr Diet* 2008; 21: 3-9; quiz 10-2.
39. KELLER HH, GOY R, KANE SL: Validity and reliability of SCREEN II (Seniors in the community: risk evaluation for eating and nutrition, Version II). *Eur J Clin Nutr* 2005; 59: 1149-57.
40. BLACKBURN GL, BISTRIAN BR, MAINI BS, SCHLAMM HT, SMITH MF: Nutritional and metabolic assessment of the hospitalized patient. *JPEN J Parenter Enteral Nutr* 1977; 1: 11-22.
41. TORUN B, CHEW F: Protein-energy malnutrition. *In*: SHILS M, OLSON J, SHIKE M, ROSS A, eds. *Modern Nutrition in Health and Disease*. Baltimore: Williams and Wilkins; 1998.
42. CAMILO E, ZIMMERMAN J, MASON JB *et al*.: Folate synthesized by bacteria in the human upper small intestine is assimilated by the host. *Gastroenterology* 1996; 110: 991-8.
43. KHANNA D, HAYS RD, MARANIAN P *et al*.: Reliability and validity of the university of california, los angeles scleroderma clinical trial consortium gastrointestinal tract instrument. Arthritis Rheum 2009; 61: 1257-63.
44. KHANNA D, HAYS RD, PARK GS *et al*.: Development of a preliminary scleroderma gastrointestinal tract 1.0 quality of life instrument. *Arthritis Rheum* 2007; 57: 1280-6.
45. KING CE, TOSKES PP: Comparison of the 1-gram [^{14}C]xylose, 10-gram lactulose-H2, and 80-gram glucose-H2 breath tests in patients with small intestine bacterial overgrowth. *Gastroenterology* 1986; 91: 1447-51.
46. MARIE I, DUCROTTE P, DENIS P, MENARD JF, LEVESQUE H: Small intestinal bacterial overgrowth in systemic sclerosis. *Rheumatology* (Oxford) 2009; 48: 1314-9.
47. BECK FK, ROSENTHAL TC: Prealbumin: a marker for nutritional evaluation. *Am Fam Physician* 2002; 65: 1575-8.
48. DEVOTO G, GALLO F, MARCHELLO C *et al*.: Prealbumin serum concentrations as a useful tool in the assessment of malnutrition in hospitalized patients. *Clin Chem* 2006; 52: 2281-5.
49. KUSZAJEWSKI ML, CLONTZ AS: Prealbumin is best for nutritional monitoring. *Nursing* 2005; 35: 70-1.
50. DE LUIS ROMAN DA, BACHILLER P, IZAOLA O *et al*.: Nutritional treatment for acquired immunodeficiency virus infection using an enterotropic peptide-based formula enriched with n-3 fatty acids: a randomized prospective trial. *Eur J Clin Nutr* 2001; 55: 1048-52.
51. MILLER MD, CROTTY M, WHITEHEAD C, BANNERMAN E, DANIELS LA: Nutritional supplementation and resistance training in nutritionally at risk older adults following lower limb fracture: a randomized controlled trial. *Clin Rehabil* 2006; 20: 311-23.
52. PAKOZDI A, WILSON H, BLACK CM, DENTON CP: Does long term therapy with lansoprazole slow progression of oesophageal involvement in systemic sclerosis? *Clin Exp Rheumatol* 2009; 27 (Suppl. 54): 5-8.
53. SUTO G, CZIRJAK L: Oesophageal involvement in scleroderma. *Clin Exp Rheumatol* 2009; 27 (Suppl. 54): 2-4.
54. MURO Y, SUGIURA K, NITTA Y *et al*.: Scoring of reflux symptoms associated with scleroderma and the usefulness of rabeprazole. *Clin Exp Rheumatol* 2009; 27 (Suppl. 54): 15-21.
55. KHAN M, SANTANA J, DONNELLAN C, PRESTON C, MOAYYEDI P: Medical treatments in the short term management of reflux oesophagitis. *Cochrane Database Syst Rev* 2007: CD003244.
56. MAINIE I, TUTUIAN R, CASTELL DO: Addition of a H2 receptor antagonist to PPI improves acid control and decreases nocturnal acid breakthrough. *J Clin Gastroenterol* 2008; 42: 676-9.
57. WILLIAMS C, MCCOLL KE: Review article: proton pump inhibitors and bacterial overgrowth. *Aliment Pharmacol Ther* 2006; 23: 3-10.
58. FURUTA K, ADACHI K, KOMAZAWA Y *et al*.: Tolerance to H2 receptor antagonist correlates well with the decline in efficacy against gastroesophageal reflux in patients with gastroesophageal reflux disease. *J Gastroenterol Hepatol* 2006; 21: 1581-5.
59. TOSKES P: *In*: WARRELL D, COX T, FIRTH J, BENZ E, eds. Oxford Textbook Of Medicine: Oxford University Press; 2003:580-4.
60. KHANNA D: Gastrointestinal Involvement in Systemic Sclerosis. In: FONT J, RAMOS-CASALS M, RODÉS J (Eds.) *Digestive Involvement in Systemic Autoimmune Diseases*. New York: Elsevier: 51-61.
61. PERLEMUTER G, CACOUB P, CHAUSSADE S, WECHSLER B, COUTURIER D, PIETTE JC: Octreotide treatment of chronic intestinal pseudoobstruction secondary to connective tissue diseases. *Arthritis Rheum* 1999; 42: 1545-9.
62. SOUDAH HC, HASLER WL, OWYANG C: Effect of octreotide on intestinal motility and bacterial overgrowth in scleroderma. *N Engl J Med* 1991; 325: 1461-7.

Appendix
GI questions used by the Canadian Scleroderma Research Group

1. I have (or have had) **a poor appetite**, on most days	❑ Yes	❑ No
2. I have (or have had) **difficulty in swallowing – food or liquids sometimes get stuck behind my breastbone on the way down**	❑ Yes	❑ No
3. I have (or have had) **food or acid-tasting liquid that comes back up into my mouth or nose**	❑ Yes	❑ No
4. I wake up (or have woken up) at night **choking**	❑ Yes	❑ No
5. I have (or have had) **a burning feeling rising from my stomach or lower chest up towards my neck**, on most days	❑ Yes	❑ No
6. I have (or have had) **a feeling of being full shortly after starting a meal**, on most days	❑ Yes	❑ No
7. I have (or have had) **visible swelling of my abdomen (stomach) or bloating** (the feeling that one must loosen one's clothes), on most days	❑ Yes	❑ No
8. I have (or have had) **nausea and/or vomiting**, on most days	❑ Yes	❑ No
9. I have (or have had) **constipation**, on most days	❑ Yes	❑ No
10. I have (or have had) **diarrhea**, on most days	❑ Yes	❑ No
11. I require (or have required) **antibiotics to control my diarrhea**	❑ Yes	❑ No
12. I have (or have had) **greasy, foul smelling stools**	❑ Yes	❑ No
13. I have (or have had) **fecal incontinence** (soiled my pants with stool)	❑ Yes	❑ No
14. I require (or have required) **feeding (for nutrition - not just intravenous water) through my veins**	❑ Yes	❑ No