

明的理解。因而成为肠道准备不足的高风险群体之一,且在准备过程中耐受性比普通人群更差^[6]。提供翻译支持在一定程度上可减轻语言沟通受限影响对准备流程的理解与执行。但英国等发达国家数据显示,仅约 2% 语言障碍人群能够获得专业语言协助,80% 仍依赖非专业的家庭翻译,甚至部分人群完全未获得协助^[7]。这一情况在非发达国家可能更加严峻。随着全球化进程推进及人工智能技术的发展,结合多语种翻译工具与智能化教育手段具有较大潜力,但相关研究仍然不足。

1.3 老年人 胃肠道疾病的风险随着年龄的增长而增加,老年人是结肠镜筛查的重要人群,但其肠道准备不足率可高达 56.4%,且随年龄增加而升高^[8]。行动受限是老年人肠道准备不足的最强独立预测因素,可使风险增加近 6 倍^[9]。长期运动不足不仅减弱结肠蠕动、增加粪便滞留,还会因如厕困难而减少泻药的摄入量。此外,老年人常合并多种慢性病,对肠道准备相关不良反应(如低血容量、电解质紊乱)的耐受性较差,因此需选择低剂量、安全、耐受性良好的方案。传统 4L 聚乙二醇(Polyethylene glycol, PEG)剂型因其剂量大、耐受性差,不适合老年人。近期研究显示低容量 PEG 制剂如 2L 或 1L PEG 加抗坏血酸盐(ascorbate, Asc)可显著提升依从性,且改善右半结肠清洁效果^[10,11]。口服硫酸盐溶液(Oral sulfate solution, OSS)效果与 PEG 类似,但易出现呕吐、口渴等不良反应^[12]。口服硫酸盐片(Oral sulfate tablets, OST)清洁效果和耐受性均不劣于 2L-PEG+Asc^[13,14],且全结肠高质量准备率、腺瘤检出率及耐受性方面表现更佳,未发现明显肾功能及电解质异常^[15]。磷酸钠盐虽清洁效果较佳,但其高渗性易引发癫痫、肾病及电解质紊乱等严重并发症,老年人尤其合并高血压、心力衰竭、肝硬化或慢性肾病者应慎用。对于正在服用 ACEI、ARB、NSAIDs 药物者应避免使用或停药 24~48 小时后使用^[16]。

1.4 儿童 结肠镜检查在儿童胃肠道疾病的鉴别诊断中起着不可替代的作用。四分之一的儿童结肠镜前肠道准备不足^[17]。且年龄越小,准备质量越差,3 岁以下及营养不良患儿尤为突出(38.6% 和 45.9%)^[17]。目前儿童肠道准备方案尚无统一标准,存在年龄和地区差异。3 岁以下婴幼儿以灌肠为主,但近端结肠清洁效果有限。日本常采用甘油

灌肠(glycerin enema, GE)^[18],也可使用 PEG 或生理盐水灌肠(100 ml/岁,最大 1L)。1~3 岁可逐步过渡至口服 PEG-ELS[20 ml/(kg·h),最大 1L/h,总量 50~100 ml/kg]。若口服困难(特别是 1~2 岁幼儿),可考虑经鼻胃管使用 PEG 电解质溶液(PEG-ELS)(80 ml/kg,总量不超过 1000 ml)^[19]。3 岁以上以口服 PEG-ELS 为主要推荐方案(剂量同前)^[20]。磷酸钠可能导致严重并发症因此不推荐用于儿童^[21]。新型低剂量匹克硫酸钠+枸橼酸镁因为剂量小(300~500 ml),耐受性好,可作为 9 岁以上儿童替代方案^[6,20],但安全性尚需验证。近年来在日本 13-15 岁儿童中枸橼酸镁的使用逐渐增多,其远端结肠清洁效果优于 PEG 4000,但可能引起腹泻、低钾、低钙等^[6]。此外,分次服药可提高清洁度(尤其右半结肠)和依从性,减少副作用及鼻胃管使用率^[6,20]。使用智能手机应用程序等加强准备指导有助于提升肠道准备质量^[6]。

1.5 其他社会人口学因素 多因素分析发现,男性、未婚状态、医疗补助保险覆盖、低收入及黑人种族等社会人口学因素均是肠道清洁不充分的重要预测因素^[22]。尽管目前缺乏针对这些高风险人群的相关研究,但基于普通人群的证据表明,强化肠道准备指导措施如视觉辅助工具(图片或视频)^[5]、短信或电话提醒及数字化平台(如微信指导)^[4]等,相比于单一书面指导可显著提升准备质量,并在一定程度上改善依从性、降低焦虑水平及恶心等不良反应发生率^[4]。此外,人工智能辅助系统等智能技术在提升肠道清洁效果方面也显示出良好应用前景^[23]。这些研究结果为制定针对特定社会经济障碍人群的个体化肠道准备策略提供了重要依据。

2 与合并症相关的危险因素

2.1 慢性便秘 便秘人群基数庞大,排便≤2 次/周的患者,肠道准备不足风险增加 12.6 倍^[24]。高容量 PEG 方案(4L)或加用 2L-PEG 预处理在便秘人群中的清洁效果最佳,但因剂量大,恶心、腹胀、呕吐的发生率较高。研究表明,联合药物方案可显著提升肠道清洁效果。相比单一制剂,联合用药能达到更优准备质量。临床上推荐优先使用 2L-PEG 或磷酸钠联合益生菌、膳食纤维或乳果糖,联合用药可将清洁充分率提高 7.37 倍,且依从性更佳。对于重度便秘或伴肠道动力障碍患者,联合促动力药(如莫沙比利)可进一步改善清洁效果,但轻度腹痛风险略增。联合使用刺激性泻药(如番泻叶、比沙可啶)亦可有效提升清洁度,其中比沙可啶还可减少肠内气泡。但刺激性泻药可诱发肠痉挛性腹痛和电解质紊乱,老年人及肾功能减退者应慎用^[25]。

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联合促肠道分泌剂利那洛肽在清洁效果、耐受性及不良反应方面均优于单用 4 L PEG^[26]。联合鲁比前列酮也显示出提升准备质量的潜力^[27],但尚需进一步研究。

2.2 脊髓损伤 (spinal cord injury, SCI) SCI 脊髓损伤患者在肠道准备过程中面临的诸多挑战。其肠道准备时间更长,需要额外的灌肠比例更高 (77.1% vs 1.9%),且腹胀、腹痛、恶心等不良反应也更常见,甚至可能诱发自主神经反射障碍 (autonomic dysreflexia, AD) 发作^[28]。因此 SCI 患者肠道清洁效果通常不理想,准备不充分率为普通人两倍以上^[29]。针对 SCI 人群的个体化准备策略可有效提升清洁质量。高容量 PEG-ELS 方案中,若末次排泄物仍不够清洁时追加 2 L 泻药,可使 89% 的患者达到足够的肠道准备水平,且耐受性良好^[30]。低容量 PEG 联合静脉给予新斯的明和格隆溴铵也显示出较好效果 (85% vs 50%),但可能引起短暂口干、腹胀等轻微症状^[31]。此外,近期研究显示肠道冲洗辅助技术水交换技术有不错的清洁质量,但相关胃肠不适和腹胀发生率较高,需进一步研究支持^[32]。

2.3 下消化道出血 (lower gastrointestinal bleeding, LGIB) LGIB 患者不推荐无肠道准备的结肠镜检查,准备不充分会降低诊断准确性、增加漏诊及穿孔等并发症风险,而充分的肠道准备可显著提高诊断阳性率^[33]。传统高容量制剂方案 (4~6 L PEG) 易引起恶心、腹痛等不适,耐受性较差。虽可采用经鼻胃管给药,但有吸入性肺炎、容量过负荷及电解质紊乱 (如低钠) 等风险^[34]。多项随机研究发现 2L-PEG 与 4L-PEG 的清洁效果相当,且腹痛、恶心发生率更低,依从性更高^[35,36]。此外,300 ml 口服硫酸盐 (OSS) 也能在提高耐受性的同时保持与 2 L 或 4L-PEG 相当的清洁质量^[37]。联合止吐药 (如多潘立酮、舒必利) 也能提高准备质量且减少不适症状、提高肠道准备完成率,但需更多证据支持^[38]。对于无法耐受口服制剂或病情严重的患者,紧急情况下可使用非口服方案作为替代选择,如 PEG 逆行灌洗技术显示出较高达盲率及出血源检出率,且缩短了住院时间^[39]。

2.4 炎症性肠病 (inflammatory bowel disease, IBD) IBD 患者易发生结直肠癌,需定期进行结肠镜复查。然而,IBD 患者肠道准备不足率约 7.1%,甚至低于普通人群^[40]。但 IBD 患者在肠道准备过程中更易出现不良反应,尤以腹痛最为常见。不同制剂不良反应发生率存在差异,且与疾病活动度有关^[41]。在制剂选择上,低容量方案对 IBD 患者可能更具优势。多项 RCT 显示,多种低容量制剂在清洁

效果上均与传统 4L PEG 方案相当。2L-PEG+Asc 或比沙可啶不良反应更少、接受度更高^[42]。西甲硅油和 OSS 均能减少泡沫、改善视野,且 PEG 加西甲硅油组恶心和睡眠干扰更少。在缓解期的溃疡性结肠炎患者中,OSS 与 2L-PEG+Asc 清洁效果相当,虽偶见轻度恶心,但整体不良反应发生率无明显差异,对疾病活动进展无负面影响^[43]。OST 在清洁度、耐受性方面均优于 2L-PEG+Asc,且恶心率更低^[44]。此外,有研究发现匹克硫酸钠可能改变克罗恩病患者粪便微生物群^[45],肠道准备对疾病进展的潜在影响需进一步验证。目前缺乏长期、多次肠道准备对肠道炎症状态影响的高质量证据。

2.5 其他合并症因素 多项研究评估了多种临床合并症与肠道准备不足的关联。结果显示,精神障碍、肝硬化、美国麻醉医师学会分级 ≥ 3 、功能状态较差、慢性便秘、糖尿病及既往腹盆腔手术史等均为肠道准备不充分的独立危险因素。帕金森病亦被认为可能是导致肠道准备不足的潜在预测因素。而充血性心力衰竭、冠状动脉疾病、痴呆、脑卒中、高血压、慢性肾病及慢性阻塞性肺疾病等疾病与肠道准备不足之间的相关性未达到统计学显著性^[22]。

3 药物相关的危险因素

部分药物的使用可显著增加结肠镜前肠道准备不足的风险。常被认为与肠道准备不足 (IBP) 相关的药物类别包括三环类抗抑郁药 (TCAs)、一般抗抑郁药、阿片类药物、非 TCA 类抗抑郁药以及钙通道阻滞^[22]。其中,阿片类药物因减缓胃肠蠕动、增加液体重吸收,是导致 IBP 的重要因素,使准备不足风险增加约 70%^[46]。值得注意的是,在糖尿病和阿片类药物使用患者中观察到协同效应,两者合用可显著降低准备充分率 (38% vs 54%)^[47]。此外,三环类抗抑郁药 (TCA) 也被证实为独立风险因素,使用 TCA 人群的风险是未使用者的 4.25 倍,这可能与 TCA 的抗胆碱能抑制肠平滑肌收缩、延缓结肠传输的作用有关^[48]。但目前关于不同药物对肠道准备质量的影响、机制以及如何在慢性用药患者中平衡疾病控制与肠道准备质量的研究仍较为有限。

4 总结与展望

结肠镜检查的质量受到患者、设备及医生多方面因素的影响。为了提高息肉和腺瘤的检出率、降低进展期结直肠癌的风险,已有大量文献提出了许多改进检查质量的方法,以如升级内镜设备以提高图像清晰度、人工智能辅助、加强内镜医师培训等。但提升肠道准备是所有改进方法中最重要的一环,若肠道准备不充分,任何先进方法和设备都难以使检查质量获得根本性提升。

在实际工作中,肠道准备不足往往并非由单一因素造成,而是多种风险因素交织的结果。针对单一风险因素的改进措施,如优化制剂剂型剂量、改善口感或强化准备前宣教,均可有效提升部分人群的准备质量,但对整体人群的准备质量提升有限。对于同时存在多重风险因素的患者群体,仅针对某一因素进行干预,难以实现全面改善。

因此,未来的研究与实践应从单点优化迈向全链条管理,在肠道准备的前期评估、实施监测与后期反馈等各环节建立个体化、多因素、全流程的管理体系。例如:在准备前阶段基于患者临床特征(如既往病史、药物使用等)进行风险分层并制定个体化方案;在准备过程中进行监测与实时评估并对准备方案的动态调整;此外,对准备前的恐惧、焦虑等心理状态进行系统的心理干预也可能提高肠道清洁状态。通过整合多维度危险因素进行风险分层及持续质量改进,方能真正解决肠道准备不足这一制约结肠镜质量的关键问题,推动肠道准备向更安全、更高效、更精准的方向发展。

【参考文献】

- [1] 郑荣寿,陈茹,韩冰峰,等. 2022 年中国恶性肿瘤流行情况分析[J]. 中华肿瘤杂志, 2024, 46(3): 221-231.
- [2] Hassan C, East J, Radaelli F, et al. Bowel preparation for colonoscopy: European Society of Gastrointestinal Endoscopy (ESGE) guideline- update 2019[J]. Endoscopy, 2019, 51(8): 775-794.
- [3] Schottinger JE, Jensen CD, Ghai NR, et al. Association of physician adenoma detection rates with postcolonoscopy colorectal cancer [J]. JAMA, 2022, 327(21): 2114-2122.
- [4] Zhao X, Yang L, Hu X, et al. Enhancing bowel preparation quality and tolerability in a low health literacy population in Western China: a multicenter randomized trial[J]. Journal of Cancer Research and Clinical Oncology, 2023, 149(20): 17957-17971.
- [5] Ray-Offor E, Jebbin N. Risk factors for inadequate bowel preparation during colonoscopy in nigerian patients[J]. Cureus, 2021, 13(8): e17145.
- [6] Mamula P, Nema N. Bowel preparation for pediatric colonoscopy [J]. Frontiers in Pediatrics, 2021, 9: 705624.
- [7] Essex R, Cucos M, Dibley L. The impact of language and ethnicity on preparation for endoscopy: A prospective audit of an east london hospital ward[J]. Journal of Evaluation in Clinical Practice, 2021, 27(4): 877-884.
- [8] Occhipinti V, Soriani P, Vavassori S, et al. Risk factors for inadequate bowel preparation in patients using high- and low-volume cleansing products [J]. European Journal of Gastroenterology & Hepatology, 2023, 35(2): 159-166.
- [9] Kumar A, Lin L, Bernheim O, et al. Effect of functional status on the quality of bowel preparation in elderly patients undergoing screening and surveillance colonoscopy[J]. Gut and Liver, 2016, 10(4): 569-573.
- [10] Maida M, Facciorusso A, Sinagra E, et al. Predictive factors of adequate bowel cleansing for colonoscopy in the elderly: a retrospective analysis of a prospective cohort[J]. Diagnostics, 2022, 12(11): 2867.
- [11] Yoon JY, Kim HG, Cho YS, et al. 1 L- versus 2 L-polyethylene glycol with ascorbic acid for bowel preparation in elderly patients: a randomized multicenter study[J]. Surgical Endoscopy, 2022, 36(8): 5724-5733.
- [12] Nam S, Park SC, Lee SJ, et al. Randomized trial of oral sulfate solution versus polyethylene glycol-ascorbic acid for bowel cleansing in elderly people[J]. Journal of Gastroenterology and Hepatology, 2022, 37(2): 319-326.
- [13] Di Palma JA, Bhandari R, Cleveland MVB, et al. A safety and efficacy comparison of a new sulfate-based tablet bowel preparation versus a peg and ascorbate comparator in adult subjects undergoing colonoscopy[J]. American Journal of Gastroenterology, 2021, 116(2): 319-328.
- [14] Lee SE, Oh DJ, Nam JH, et al. Taking oral sulfate tablets with simethicone for bowel preparation leads to higher adenoma detection rate than polyethylene glycol: a propensity score analysis[J]. Digestive Diseases and Sciences, 2023, 68(3): 867-876.
- [15] Kang HS, Na SY, Yoon JY, et al. Efficacy, tolerability, and safety of oral sulfate tablet versus 2 L-polyethylene glycol/ascorbate for bowel preparation in older patients: prospective, multicenter, investigator single-blinded, randomized study[J]. Journal of Gastroenterology, 2024, 59(5): 402-410.
- [16] Connor A, Tolan D, Hughes S, et al. Consensus guidelines for the safe prescription and administration of oral bowel-cleansing agents [J]. Gut, 2012, 61(11): 1525-1532.
- [17] Reddy P, Mencin A, Lebowitz B. Risk factors for suboptimal bowel preparation for colonoscopy in pediatric patients[J]. Journal of Pediatric Gastroenterology and Nutrition, 2021, 73(1): e1-e6.
- [18] Morita M, Takedatsu H, Yoshioka S, et al. Utility of diagnostic colonoscopy in pediatric intestinal disease[J]. Journal of Clinical Medicine, 2022, 11(19): 5747.
- [19] Tringali A, Thomson M, Dumonceau JM, et al. Pediatric gastrointestinal endoscopy: European Society of Gastrointestinal Endoscopy (ESGE) and European Society for Paediatric Gastroenterology Hepatology and Nutrition (ESPGHAN) guideline executive summary[J]. Endoscopy, 2016, 49(1): 83-91.
- [20] Fang S, Song Y, Liu Y, et al. Randomized clinical trial: efficacy and tolerability of two different split dose of low-volume polyethylene glycol electrolytes for bowel preparation before colonoscopy in hospitalized children[J]. Pediatric Research, 2021, 90(1): 171-175.
- [21] Nam S, Choi I, Park K, et al. Risk of hemorrhagic gastropathy associated with colonoscopy bowel preparation using oral sodium phosphate solution[J]. Endoscopy, 2010, 42(2): 109-113.
- [22] Beran A, Aboursheid T, Ali AH, et al. Risk factors for inadequate bowel preparation in colonoscopy: A comprehensive systematic review and meta-analysis[J]. American Journal of Gastroenterology, 2024, 119(12): 2389-2397.
- [23] Mahmud N, Mehta SJ. Colonoscopy bowel preparation—is there an app for that[J]. Clinical Gastroenterology and Hepatology, 2021, 19(2): 235-237.
- [24] Paik N, Kim ER, Kim TJ, et al. Usefulness of personal bowel

- habits as a predictive factor for inadequate bowel preparation for colonoscopy: a prospective questionnaire-based observational study [J]. *Gut and Liver*, 2019, 13(2): 169-175.
- [25] Ding L, Duan J, Yang T, et al. Advanced intestinal regulation improves bowel preparation quality in patients with constipation: A systematic review and network meta-analysis [J]. *Frontiers in Pharmacology*, 2023, 13: 964915.
- [26] Wang L, Zhang Y, Li J, et al. Efficacy of polyethylene glycol electrolyte powder combined with linaclotide for colon cleansing in patients with chronic constipation undergoing colonoscopy: a multicenter, single-blinded, randomized controlled trial [J]. *Clinical and Translational Gastroenterology*, 2024, 15(6): e1.
- [27] Banerjee R, Chaudhari H, Shah N, et al. Addition of Lubiprostone to polyethylene glycol (PEG) enhances the quality & efficacy of colonoscopy preparation: a randomized, double-blind, placebo controlled trial [J]. *BMC gastroenterology*, 2016, 16(1): 133.
- [28] Calder KB, Estores IM, Krassioukov A. Autonomic dysreflexia and associated acute neurogenic pulmonary edema in a patient with spinal cord injury: a case report and review of the literature [J]. *Spinal Cord*, 2009, 47(5): 423-425.
- [29] Blanco Belver A, Aach M, Schmiegell W, et al. Similar adenoma detection rates in colonoscopic procedures of patients with spinal cord injury compared to controls [J]. *Digestive Diseases and Sciences*, 2020, 65(4): 1197-1205.
- [30] Song SH, Svircev JN, Teng BJ, et al. A safe and effective multi-day colonoscopy bowel preparation for individuals with spinal cord injuries [J]. *The Journal of Spinal Cord Medicine*, 2018, 41(2): 149-156.
- [31] Korsten MA, Spungen AM, Radulovic M, et al. Neostigmine administered with moviprep improves bowel preparation for elective colonoscopy in patients with spinal cord injury: a randomized study [J]. *Journal of Clinical Gastroenterology*, 2015, 49(9): 751-756.
- [32] Brechmann T, Aach M, Schildhauer TA, et al. Water exchange technique improves colonoscopy in patients with spinal cord injury: Results of a matched cohort study [J]. *Endoscopy International Open*, 2024, 12(3): e394-e401.
- [33] Frazzoni L, Radaelli F, Spada C, et al. The diagnostic yield of colonoscopy in hospitalized patients. An observational multicenter prospective study. [J]. *Digestive and Liver Disease*, 2021, 53(2): 224-230.
- [34] Triantafyllou K, Gkolfakis P, Gralnek IM, et al. Diagnosis and management of acute lower gastrointestinal bleeding: European Society of Gastrointestinal Endoscopy (ESGE) Guideline [J]. *Endoscopy*, 2021, 53(8): 850-868.
- [35] Saviano A, Petruzzello C, Riccioni ME, et al. Lower gastrointestinal bleeding in the emergency department: high-volume vs. low-volume peg bowel preparation for colonoscopy: a randomized trial [J]. *Reviews on Recent Clinical Trials*, 2023, 18(1): 76-81.
- [36] Malik A, Inayat F, Goraya MHN, et al. Severe acute colonic diverticular bleeding: the efficacy of rapid bowel preparation with 1 l polyethylene glycol ascorbate solution and direct endoscopic hemoclipping for successful hemostasis [J]. *Journal of Investigative Medicine High Impact Case Reports*, 2021, 9: 2324709621994383.
- [37] Hernandez PV, Horsley-Silva JL, Snyder DL, et al. Effect of bowel preparation volume in inpatient colonoscopy. Results of a prospective, randomized, comparative pilot study [J]. *BMC Gastroenterology*, 2020, 20(1): 227.
- [38] Yan XJ, Xu P, Qiu HY, et al. Antiemetics improve the tolerance of polyethylene glycol for colonoscopy preparation: A randomized clinical trial [J]. *Medicine*, 2021, 100(10): e24947.
- [39] Gül Utku Ö, Karatay E. Immediate unprepared polyethylene glycol-flush colonoscopy in elderly patients with severe lower gastrointestinal bleeding [J]. *Geriatrics & Gerontology International*, 2020, 20(6): 559-563.
- [40] Maida M, Morreale GC, Sferrazza S, et al. Effectiveness and safety of 1L PEG-ASC preparation for colonoscopy in patients with inflammatory bowel diseases [J]. *Digestive and Liver Disease*, 2021, 53(9): 1171-1177.
- [41] Mohsen W, Williams AJ, Wark G, et al. Prospective single-blinded single-center randomized controlled trial of Prep Kit-C and Moviprep: Does underlying inflammatory bowel disease impact tolerability and efficacy [J]. *World Journal of Gastroenterology*, 2021, 27(11): 1090-1100.
- [42] Manes G, Fontana P, De Nucci G, et al. Colon cleansing for colonoscopy in patients with ulcerative colitis: efficacy and acceptability of a 2-l peg plus bisacodyl versus 4-L PEG [J]. *Inflammatory Bowel Diseases*, 2015, 21(9): 2137-2144.
- [43] Lee JM, Lee KM, Kang HS, et al. Oral sulfate solution is as effective as polyethylene glycol with ascorbic acid in a split method for bowel preparation in patients with inactive ulcerative colitis: a randomized, multicenter, and single-blind clinical trial [J]. *Gut and Liver*, 2023, 17(4): 591-599.
- [44] Kim KO, Kim EY, Lee YJ, et al. Efficacy, safety and tolerability of oral sulphate tablet for bowel preparation in patients with inflammatory bowel disease: A multicentre randomized controlled study [J]. *Journal of Crohn's and Colitis*, 2022, 16(11): 1706-1713.
- [45] Bacsur P, Rutka M, Asbóth A, et al. Effects of bowel cleansing on the composition of the gut microbiota in inflammatory bowel disease patients and healthy controls [J]. *Therapeutic Advances in Gastroenterology*, 2023, 16: 175628482311742.
- [46] Gandhi K, Tofani C, Sokach C, et al. Patient characteristics associated with quality of colonoscopy preparation: a systematic review and meta-analysis [J]. *Clinical Gastroenterology and Hepatology*, 2018, 16(3): 357-369.
- [47] Madhoun MF, Bitar H, Bhatti O, et al. Diabetics on narcotics are less likely to achieve excellent bowel preparation than are patients with either condition [J]. *Digestive Diseases and Sciences*, 2017, 62(3): 723-729.
- [48] Gimeno-García A, Baute J, Hernandez G, et al. Risk factors for inadequate bowel preparation: a validated predictive score [J]. *Endoscopy*, 2017, 49(6): 536-543.

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