

## Factors influencing achievement of adequate bowel preparation: analysis of the European Colonoscopy Quality Investigation Group (ECQI) procedure questionnaire

Gabriele Wurm Johansson<sup>m</sup>, Pedro Amaro<sup>a</sup>, Cristiano Spada<sup>b</sup>, Anurag Agrawal<sup>c</sup>, Lene Brink<sup>d</sup>, Wolfgang Fischbach<sup>e</sup>, Matthias Hüniger<sup>f</sup>, Rodrigo Jover<sup>g</sup>, Urpo Kinnunen<sup>h</sup>, Anastasios Koulaouzidis<sup>i</sup>, Akiko Ono<sup>j</sup>, Árpád Patai<sup>k</sup>, Lucio Petruzzello<sup>l</sup>, Ervin Toth<sup>m</sup>, Valentina Curran<sup>n</sup>, Jürgen Riemann<sup>o</sup>

### Introduction

Assessment and rate of adequate bowel preparation are important quality measures for colonoscopy according to European Society of Gastrointestinal Endoscopy (ESGE) guidelines.<sup>1</sup> We aimed to assess factors influencing the likelihood of adequate bowel preparation for colonoscopy.

### Aims and Methods

The development of the European Colonoscopy Quality Investigation Group (ECQI) online questionnaire has been previously described.<sup>2,3</sup> We analysed data collected between 2/6/16 and 31/1/18. Univariate logistic regression analyses were performed to assess which factors influence achievement of adequate bowel preparation, defined as a Boston Bowel Preparation Scale (BBPS) score  $\geq 6$ .

### Results

Data from 4447 completed questionnaires were analysed. 126 procedures were excluded due to insufficient information to establish adequacy of bowel cleanliness; of the remainder, 3726 (86%) procedures scored BBPS  $\geq 6$  and 595 (14%) BBPS  $< 6$ . The achievement of adequate bowel cleansing was significantly affected by age ( $< 50$  vs.  $\geq 50$  odds ratio (OR) 2.05; 95%CI 1.58, 2.66;  $p < 0.001$ ), gender (male vs. female OR 0.77; 95%CI 0.65, 0.92;  $p = 0.004$ ), inpatient status (inpatient vs. outpatient OR 0.42; 95%CI 0.34, 0.52;  $p < 0.001$ ) (Figure 1). Reason for procedure also had a significant affect ( $p < 0.001$ ), with screening due to familial risk increasing the likelihood of BBPS  $\geq 6$  (vs. clinical signs and symptoms OR 2.02; 95%CI 1.25, 3.27;  $p = 0.004$ ) (Figure 2).

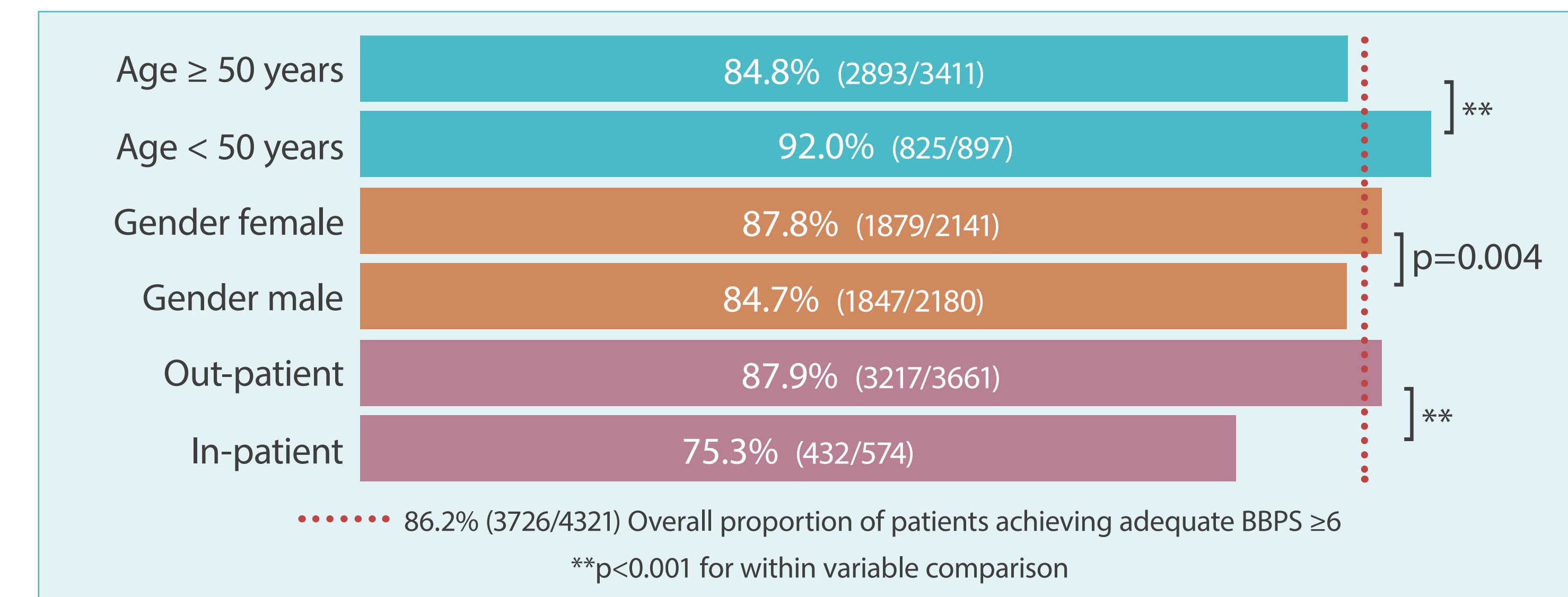


Figure 1. Variables affecting adequate BBPS  $\geq 6$

Body mass index and the time of procedure (am vs. pm) had no significant impact.

Regarding bowel preparation, total quantity of fluid consumed ( $p < 0.001$ ), dosing regimen ( $p < 0.001$ ), the quantity of bowel preparation consumed ( $p < 0.001$ ), whether the patient followed instructions ( $p < 0.001$ ), and the duration between procedure and the last intake of bowel preparation ( $p < 0.001$ ) significantly impacted the achievement of adequate bowel cleansing (Table 1).

### Conclusion

Adequacy of bowel preparation can be affected by age, gender and in/outpatient status. Indication can also influence adequacy of bowel clearance, along with both the total quantity of fluid and the quantity of bowel preparation consumed. In addition, using a split-dosing regimen with the last dose taken within 5 hours of the procedure appears to increase the likelihood of a BBPS  $\geq 6$ . Ensuring good explanation of how to take the bowel preparation and stressing the importance of following instructions to the patient could also improve bowel clearance.

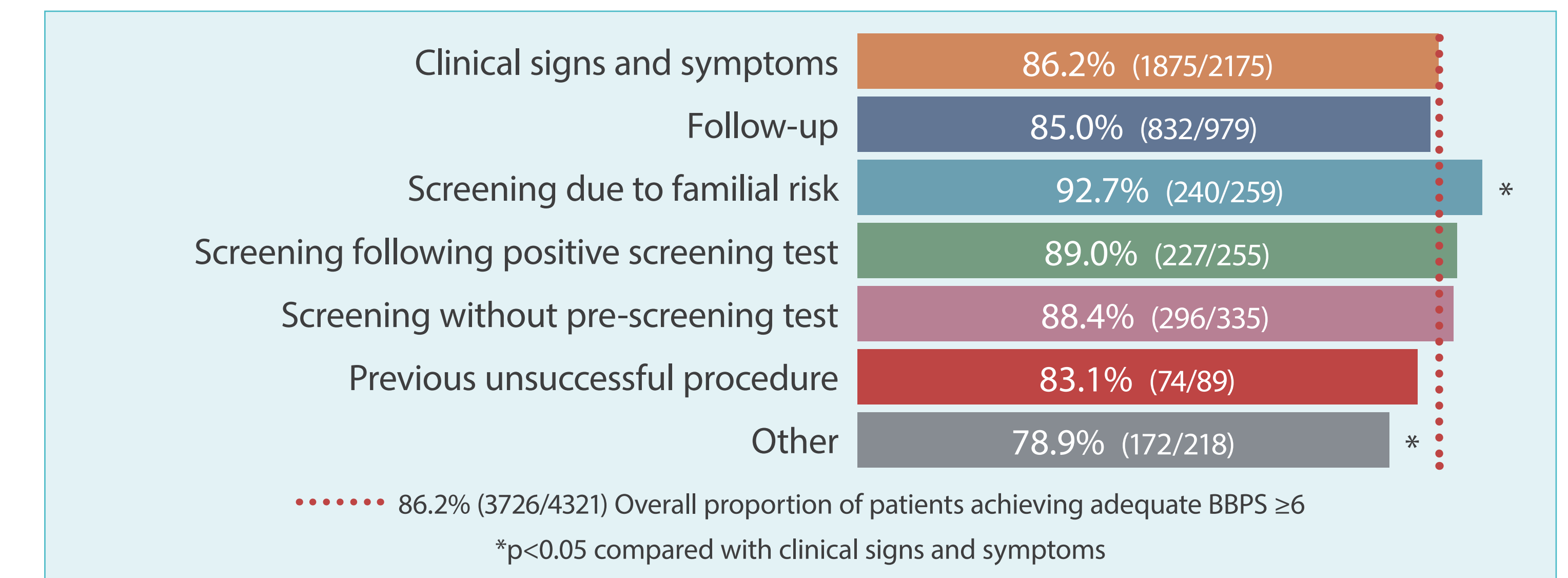


Figure 2. Reason for procedure: proportion of patients achieving BBPS  $\geq 6$

Variable	Proportion of patients achieving BBPS $\geq 6$	Odds ratio (95% CI)	p value
<b>Dosing regimen</b>			
Evening	598/805 (74.3%)	Reference	<0.001
Same day	647/754 (85.8%)	2.09 (1.62, 2.71)	<0.001
Split	2428/2694 (90.1%)	3.16 (2.58, 3.87)	<0.001
<b>Did the patient follow the bowel preparation instructions?</b>			
No	153/290 (52.8%)	Reference	<0.001
Yes	3465/3904 (88.8%)	7.07 (5.50, 9.08)	<0.001
<b>How much bowel preparation was consumed?</b>			
0–50%	7/27 (25.9%)	Reference	<0.001
50–75%	53/116 (45.7%)	2.40 (0.94, 6.12)	0.066
75–99%	430/549 (78.3%)	10.32 (4.26, 24.99)	<0.001
100%	3174/3548 (89.5%)	24.24 (10.18, 57.71)	<0.001
<b>How much fluid was consumed in total, including additional products?</b>			
Less than 1 litre	70/96 (72.9%)	Reference	<0.001
1–3 litres	888/1067 (83.2%)	1.84 (1.14, 2.97)	0.012
3–6 litres	2643/3011 (87.8%)	2.67 (1.68, 4.24)	<0.001
>6 litres	61/69 (88.4%)	2.83 (1.19, 6.72)	0.018
<b>Time period between last intake of bowel preparation and procedure</b>			
Less than 5 hours	1903/2095 (90.8%)	Reference	<0.001
5–10 hours	897/1048 (85.6%)	0.60 (0.48, 0.75)	<0.001
10–15 hours	786/985 (79.8%)	0.40 (0.32, 0.49)	<0.001
Over 15 hours	49/84 (58.3%)	0.14 (0.09, 0.22)	<0.001

Table 1. Influence of individual variables on achieving adequate bowel preparation (BBPS  $\geq 6$ )

References: 1 Kaminski et al. Endoscopy 2017; 49: 378–397. 2 Riemann JF et al. Poster P0160: UEGW 2015 Oct 24–28: Barcelona. 3 Jover R et al. Poster P0165: UEGW 2016 Oct 15–19: Vienna.

<sup>a</sup>Coimbra University Hospital, Coimbra, Portugal; <sup>b</sup>Fondazione Poliambulanza, Brescia, Italy; <sup>c</sup>Doncaster Royal Infirmary, Doncaster, UK; <sup>d</sup>Herlev Hospital, Herlev, Denmark; <sup>e</sup>Aschaffenburg Hospital, Aschaffenburg, Germany; <sup>f</sup>Private Practice for Internal Medicine, Würzburg, Germany; <sup>g</sup>Hospital General Universitario de Alicante, Alicante, Spain; <sup>h</sup>Tampere University Hospital, Tampere, Finland; <sup>i</sup>The Royal Infirmary of Edinburgh, Edinburgh, UK; <sup>j</sup>Virgen de la Arrixaca University Hospital, Murcia, Spain; <sup>k</sup>Markusovszky University Teaching Hospital, Szombathely, Hungary; <sup>l</sup>Fondazione Policlinico Universitario A. Gemelli, Rome, Italy; <sup>m</sup>Skåne University Hospital, Malmö, Sweden; <sup>n</sup>Norgine Ltd, Uxbridge, UK; <sup>o</sup>Director em. Klinikum Ludwigshafen, Chairman, LebensBlicke Foundation for the Prevention of Colorectal Cancer, Ludwigshafen, Germany. This project is supported by Norgine.

Further information on the ECQI Group initiative can be found on [www.ecqigroup.eu](http://www.ecqigroup.eu) ECQI is a collaborative group seeking cooperation and input from all those involved in colonoscopy.