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## Clinical Features and Management of Equine Postoperative Ileus (POI)

Survey of Diplomates of the American Colleges of Veterinary Internal Medicine (ACVIM), Veterinary Surgeons (ACVS) and Veterinary Emergency and Critical Care (ACVECC)

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1 **Clinical Features and Management of Equine Postoperative Ileus (POI): Survey of**  
2 **Diplomates of the American Colleges of Veterinary Internal Medicine (ACVIM),**  
3 **Veterinary Surgeons (ACVS) and Veterinary Emergency and Critical Care**  
4 **(ACVECC)**

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19 **Key words for publication:** horse, ileus, colic, lidocaine, intestine

20 **Word count:** 3850

21 **Ethical considerations:** The University of Edinburgh School of Veterinary Medicine Ethical Review  
22 Committee approval was sought and granted for this study; the only potential ethical issues that this study  
23 might have raised laid in the proprietary information about the participants and data protection. To palliate  
24 to this, the researchers have ensured that the data collected from the survey were encrypted and remained  
25 anonymous.

26 **Competing interests:** No competing interest is to be reported.

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31 **Authorship:** All authors contributed to the study design, data analysis and manuscript preparation.  
32 Dominique Lefebvre, Yvonne Elce, Anthony Blikslager, Thomas Divers, Scott Pirie and Neil Hudson were  
33 involved in the study execution.

34 **Owner informed consent:** N/A: See ethical considerations above. This study surveyed clinicians regarding  
35 their perceptions and experiences with equine postoperative ileus; as such it did not examine individual  
36 case details/records and accordingly owner informed consent was not applicable.

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57 **Summary:**

58 **Reasons for performing the study:** A recent survey of European Colleges (ECEIM and  
59 ECVS) revealed the different strategies implemented by, and some of the challenges  
60 facing, European clinicians presented with cases of POI. It was concluded that further  
61 comparative analysis of opinions, canvassed from additional colleges of equine  
62 veterinary specialism worldwide, would provide valuable additional insight into current  
63 POI knowledge on a more global scale.

64 **Objectives:** To report and compare the current strategies favoured by American  
65 veterinary specialists when managing postoperative ileus (POI) in horses that underwent  
66 emergency colic surgery.

67 **Methods:** Electronic invitations were sent to 814 Large Animal specialists, including 3  
68 colleges: the ACVIM, the ACVS and the ACVECC.

69 **Results:** The response rate was 14% (115/814). The most common prevalence range of  
70 POI reported was 11 to 20%. The presence of reflux on nasogastric intubation was the  
71 main criterion used to define POI. A lesion involving the small intestine was considered  
72 the main risk factor for POI. Anti-inflammatory drugs, intravenous fluids and  
73 antimicrobial drugs were the primary strategies used when managing POI. Flunixin  
74 meglumine and intravenous (IV) lidocaine were the drugs most commonly used in the  
75 treatment of horses with POI. Supplementary management strategies targeted mainly the  
76 prevention of postoperative adhesions, infection and inflammation.

77 **Conclusions:** There is a lack of consensus on the clinical definition of POI. Prospective  
78 and objective clinical assessment of the effectiveness of the different strategies contained

79 within this and the European survey is necessary in order to identify a standardized  
80 approach to the management of equine POI.

81 **Introduction:**

82 This study constitutes an extension of work, previously targeting specialist European  
83 equine veterinary clinicians (ECVS and ECEIM diplomates)<sup>1</sup>, which investigated the  
84 different strategies used to define, prevent, and treat equine POI and the variation in  
85 awareness of the published risk factors for this condition. A general article detailing that  
86 original survey was published in 2014 in the Equine Veterinary Journal<sup>1</sup>. The data  
87 derived from that original study revealed valuable information on the different strategies  
88 implemented by, and some of the challenges facing, European clinicians presented with  
89 cases of POI. It was concluded that further comparative analysis of opinions, canvassed  
90 from additional colleges of equine veterinary specialism worldwide, would provide  
91 valuable additional insight into current POI knowledge on a more global scale.

92 This survey was aimed at identifying and assessing the opinions and practices of  
93 specialist American equine veterinary clinicians in relation to POI. The principal areas  
94 which were investigated included the following: (a) an assessment of respondents'  
95 awareness of underlying pathophysiological mechanisms and associated risk factors; (b)  
96 estimated incidence of POI; (c) the adopted clinical definitions; (d) preferred  
97 pharmacological and non-pharmacological management strategies.

98 This study also permitted a more detailed assessment of opinions relating to certain  
99 factors previously identified in the European survey<sup>1</sup> which were considered to be  
100 important contributors to POI prevention, diagnosis and treatment.

101 When considered in isolation, the data derived from this survey provides an overview of  
102 the opinions and practices of American equine specialists. When compared with the

103 results of the European<sup>1</sup> survey, it highlights specific areas of commonality and  
104 heterogeneity in those opinions and practices. When combined with the results of the  
105 European survey, it provides a robust international perspective on the opinions and  
106 practices of equine veterinary specialists.

107

## 108 **Material and methods**

109 Ethical approval for this study was granted by the University of Edinburgh, School of  
110 Veterinary Medicine Ethical Review Committee.

111 The original European survey's questionnaire was tested with 3 American surgeons and  
112 internists. Minor adjustments were implemented and consisted mainly of adapting certain  
113 medication nomenclature from the European to the American practice environment (e.g.  
114 lignocaine to lidocaine). The questionnaire (see Supplementary Information) consisted of  
115 27 open-ended (e.g. comments, descriptions) and closed (e.g. Likert scales, multiple  
116 choices) questions and was designed to permit completion within a period of 10-15  
117 minutes. The questions addressed the same general items as in the original European  
118 survey.

119 The survey was integrated in a web-based proprietary software<sup>a</sup> program. An invitation to  
120 participate was sent by e-mail to 814 Large Animal specialist veterinary clinicians,  
121 Diplomates of one (or two) of the, following 3 colleges: the ACVIM (n=531), ACVS  
122 (n=283) and the ACVECC (n=43; all with dual membership of either ACVIM or ACVS).

123 First, second and third reminders were sent at 2 weekly intervals if a response was not  
124 obtained. Responses were included in this report only if the questionnaire was fully  
125 completed within an 8-week period.

126 Statistical analysis was generated from the online survey software program<sup>a</sup>. These  
127 included respondent numbers, percentages and frequency tables. Some common themes  
128 were identified based on the responses provided to specific open questions. The most  
129 common comments originating from the open ended questions were categorized and  
130 tabulated in the results section. Unless stated otherwise, the percentages expressed in the  
131 results reflected the proportion of the total number of responses obtained and were  
132 rounded up to the nearest whole number.

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## 134 **Results**

135 *Respondent data and practice demographics:* Responses were obtained from 115 out of  
136 the 814 invited participants (response rate = 14%). These comprised those with sole  
137 ACVS (n=55) or ACVIM membership (n=44) and those with dual ACVIM and ACVS  
138 (n=1), ACVIM and ACVECC (n=4) and ACVS and ACVECC (n=11) membership. The  
139 median range of annual equine caseload at the respondents' clinic was between 2001-  
140 3000 cases. Almost a third of respondents (29%) reported between 300 and 399  
141 combined medical and surgical colic cases *per annum*. The number equine colic surgery  
142 *per annum* was almost evenly divided between the six different categorical answer  
143 options from 1-20 to > 100 (see Supplementary Information, Figure 1).



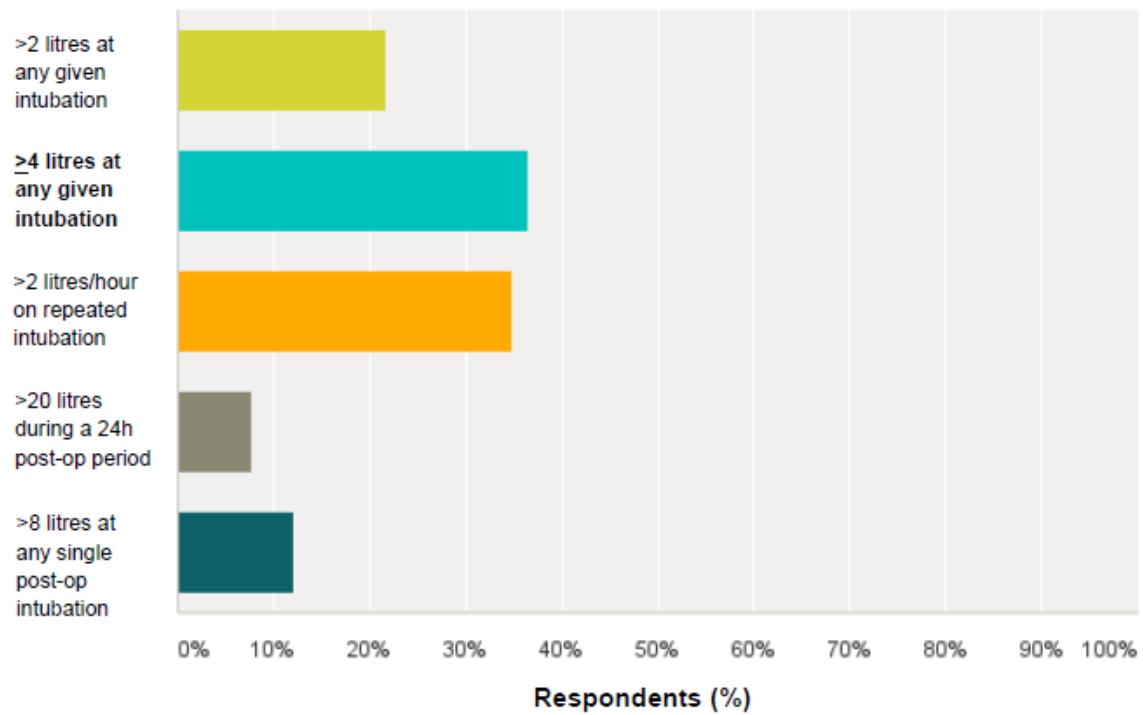
144 *Estimated POI prevalence and definition criteria:* Sixty eight per cent of respondents  
 145 (68%) estimated the prevalence of POI following colic surgery at their respective clinics  
 146 to be in the range of 0-20%. There were fewer than 5% of respondents reporting a  
 147 prevalence of POI > 40% (See Supplementary Information, Figure 2). Sixty four percent  
 148 of respondents (64%) ‘do not’ use a hospital/practice protocol for the definition of POI.  
 149 Ninety-four percent (94%) of respondents considered that presence of reflux on  
 150 nasogastric intubation was extremely important in classification of a horse having POI  
 151 (Table 1), with volumes of  $\geq 4$  litres at any given intubation (37% of respondents) and >2  
 152 litres/hour on repeated intubations (35% of respondents) representing the most commonly  
 153 applied criteria with respect to POI definition (Figure 1).

154 **Table 1: ACVS, ACVIM and ACVECC Diplomates’ rating of the importance of different parameters**  
 155 **in the diagnostic classification of POI from an online questionnaire of the Clinical Features and**  
 156 **Management of Equine POI, completed by 115 respondents**

Diagnostic classification of POI parameter	% ‘Extremely Important’	% ‘Quite Important’	% ‘Not very Important’	% ‘Not important at all’
Presence of reflux on nasogastric intubation	<b>94</b>	6	0	0
Ultrasonographic evidence of multiple fluid distended SI bowel loops	<b>67</b>	28	3	2
Evidence of multiple fluid distended SI loops on rectal examination	<b>45</b>	45	10	0
Mild to moderate signs of abdominal discomfort	28	<b>48</b>	24	2
Deterioration of cardiac parameters (tachycardia)	21	<b>48</b>	28	2
Ultrasonographic evaluation of the motility of other SI parts	38	<b>42</b>	19	3
Ultrasonographic evaluation of duodenal motility	29	<b>41</b>	26	4
Fever	4	17	<b>59</b>	22
Absence of GI sounds	12	39	<b>43</b>	6

157 **Bolded:** Most common answer

158 **Figure 1:** ACVS, ACVIM and ACVECC Diplomates' postoperative reflux volume corresponding most to  
159 respondents' own working definition of POI from an online questionnaire of the Clinical Features and  
160 Management of Equine POI completed by 115 respondents



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170 *Perceived risk factors:* A lesion involving the small intestines (SI) (70% of respondents)  
 171 was considered ‘*extremely important*’ as a pre- and intra-operative risk factor for  
 172 developing POI (Table 2) with the presence of SI distension (69% of respondents) and  
 173 inflammation (57%) considered the most important postoperative risk factors (Table 3).

174 **Table 2: ACVS, ACVIM and ACVECC Diplomates’ rating of the importance of potential pre- and**  
 175 **intra-operative risk factors for the development of POI from an online questionnaire of the Clinical**  
 176 **Features and Management of Equine POI, completed by 115 respondents**

<b>Pre- and intra-operative risk factors</b>	<b>% ‘Extremely Important’</b>	<b>% ‘Quite Important’</b>	<b>% ‘Not very Important’</b>	<b>% ‘Not important at all’</b>
Lesions involving the SI	<b>70</b>	27	3	0
Intestinal resection and anastomosis	<b>64</b>	29	7	0
Degree of bowel distension at surgery	<b>62</b>	36	3	0
Increased amount of bowel handling	<b>60</b>	33	7	0
Presence of discolored bowel at surgery	<b>52</b>	41	7	0
Endotoxaemia (clinical or lab evidence of)	29	<b>61</b>	11	0
Increased blood lactate level pre-op	15	<b>57</b>	25	4
Increased packed cell volume (PCV) at admission	10	<b>48</b>	36	6
Long anaesthesia and surgery duration	35	<b>46</b>	19	0
Abnormal bowel motility observed at surgery	34	<b>45</b>	20	1
Long-time between referral and admission of colic case	36	<b>43</b>	18	3
Administration of opioids as pain medication	4	13	<b>54</b>	29

177 **Bolded:** Most common answer

178 **Table 3: ACVS, ACVIM and ACVECC Diplomates' rating of the importance of potential**  
 179 **postoperative risk factors for the development of POI from an online questionnaire of the Clinical**  
 180 **Features and Management of Equine POI, completed by 115 respondents**

Postoperative risk factors	% 'Extremely Important'	% 'Quite Important'	% 'Not very Important'	% 'Not important at all'
SI distention	<b>69</b>	31	0	0
Inflammation	<b>57</b>	40	3	0
Abdominal pain	21	<b>61</b>	17	2
Interval to commencement of post-op feeding	16	<b>50</b>	30	6
Gastric distention	27	<b>47</b>	26	0
Postoperative adhesions	35	<b>46</b>	18	2
Infection	29	<b>42</b>	29	2
Leaving NG tube indwelling	7	25	<b>59</b>	8
Volume and type of intravenous fluids given	5	28	<b>57</b>	10
Postoperative pain medication (opioids)	7	25	<b>57</b>	11
Interval to commencement of post-op exercise	5	28	<b>53</b>	13

181 **Bolded:** Most common answer

182

183 *Preventive strategies:* Approximately half of respondents (52%) stated that their  
 184 hospital/practice used a defined protocol in an attempt to prevent POI intra- and  
 185 postoperatively. Anti-inflammatory drugs (99% of respondents), intravenous fluids  
 186 (92%), antimicrobial drugs (87%), electrolyte supplementation of fluids (68%), early  
 187 exercise (47%) and early feeding (32%) were the most commonly employed POI  
 188 preventive strategies *'in all surgical colic cases'*, whereas over half (56%) of respondents  
 189 stated that opioid administration was used *'only in the minority of cases considered at*  
 190 *risk for POI'*. Flunixin meglumine (72% of respondents *'in all surgical colic cases'*) and

191 intravenous (IV) lidocaine (40% *'in all surgical colic cases considered at risk for POI'*)  
192 were the drugs most commonly used intra-operatively in surgical colic cases to prevent  
193 POI. Similarly, flunixin meglumine (87% *'in all surgical colic cases'*) and IV lidocaine  
194 (57% *'in all surgical colic cases considered at risk for POI'*) were the drugs most  
195 commonly used postoperatively in surgical colic cases to prevent POI. Although 31% of  
196 respondents used polymixin B postoperatively *'in the majority of cases considered at risk*  
197 *for POI'*, the same percentage (31%) only used this approach *'in the minority of surgical*  
198 *colic cases considered at risk for POI'*. Similarly, metoclopramide (53%), butorphanol  
199 (46%), xylazine (44%) and plasma containing anti-lipopolysaccharide (LPS) antibodies  
200 (37%) were mostly used postoperatively *'in the minority of surgical colic cases*  
201 *considered at risk for POI'*.

202 *Treatment strategies:* Just over half of the respondents (55%) followed a hospital/practice  
203 protocol for the treatment of surgical cases that developed POI. When asked about the  
204 pharmacological management of such cases, the respondents again favored flunixin  
205 meglumine (77%) and IV lidocaine (69%) *'in all POI cases'*. In comparison,  
206 metoclopramide (57%), butorphanol (50%), heparin (49%), plasma containing anti –LPS  
207 (43%) and polymyxin B (41%) were the most common choices *'in a few POI cases'*.

208 The majority of respondents (90%) favored flunixin meglumine as their nonsteroidal anti-  
209 inflammatory drug of choice. Forty six percent of these respondents (36/78) specified a  
210 dosage of 1.1 mg/kg IV, and 33% (26/78) administered at this dose rate twice daily.  
211 Other dose rates used included 0.5 mg/kg IV (14%, 11/78) and 0.25 mg/kg IV (9%, 7/78),  
212 at varying frequencies (twice, three or four times daily).

213 When asked about their favored dosage regimen when using lidocaine in the  
214 postoperative treatment of POI cases, most of the 115 respondents commented: 1.3mg/kg  
215 bolus followed by a constant rate infusion (CRI) rate of 0.05 mg/kg/min (60%); a lower  
216 proportion (11%) used the same CRI rate but '*with no loading dose*'. Twelve per cent of  
217 the respondents (12%) mentioned that they use IV lidocaine '*as indicated/published*'.

218 *Supplementary strategies:* Comments about supplementary strategies used to avoid or  
219 minimise exposure to intra-operative risk factors for POI or other colic surgery-related  
220 complications included the prevention of postoperative adhesions (105 comments),  
221 infection (77 comments) and inflammation (62 comments). Adhesion prevention  
222 protocols included the use of intra-abdominal carboxymethylcellulose (59% of  
223 comments, 62/105), abdominal lavage ± heparin (39%, 41/105) and careful/minimal  
224 manipulation of the bowel (9%, 10/105). Infection prevention protocols included the use  
225 of systemic antimicrobials (61% of comments, 47/77) and abdominal lavage with  
226 antimicrobial-containing fluids (34%, 26/77). Comments about inflammation prevention  
227 protocols included the use of anti-inflammatory drugs (44% of comments, 25/62);  
228 specifically flunixin meglumine (35%, 22/62), careful handling/surgical technique (13%,  
229 8/62), IV lidocaine (11%, 7/62) and dimethyl sulfoxide (DMSO), (10%, 6/62).

230 *The supplementary postoperative strategies* utilized to prevent and manage POI were, in  
231 decreasing order of frequency: gastric decompression via nasogastric intubation (86% of  
232 respondents), judicious timing of feeding (85%), hand-walking exercise (84%), use of  
233 antibiotics (83%), control of endotoxaemia (76%), fluid therapy (69%) and other  
234 strategies (26%). In relation to gastric decompression via nasogastric intubation of POI  
235 cases, 58% of respondents left the tube indwelling; although 57% (38/66) of those

236 commented that it was *'case dependent'* and 41% (27/66) mentioned: *'only if the patient*  
237 *is refluxing'*.

238 When asked to comment further on the 'judicious timing of feeding', most of the  
239 respondents (85%, 98/115) stated: 'start slowly/in small quantities' (32%, 31/98), 'within  
240 24 hours postoperatively' (29%, 28/98), 'grazing/grass is best' (28%, 27/98), 'feeding as  
241 soon as possible' (21%, 20/98), 'feed when no more reflux' (12%, 12/98) and 'place hay  
242 net outside the stall' (11%, 11/98). More detailed comments relating to the introduction  
243 of hand-walking exercise (97) included: 'as soon as possible along with early feeding'  
244 (28%, 27/97), 'within 24 hours postoperatively' (24%, 23/97), 'implemented routinely'  
245 (10%, 10/97) and 'start 2 days postoperatively' (9%, 9/97).

246 *Fluid therapy and parenteral nutrition:* In POI cases, the majority of respondents (67%)  
247 opted for the administration of fluid therapy at maintenance rates and most (59%) used  
248 polyionic resuscitation fluids *'in all POI cases'*. The most common intravenous fluid  
249 supplements used in cases that have developed POI were: calcium (64% of respondents)  
250 and potassium (64%) *'routinely'* and magnesium (60%) *'depending on clinical pathology*  
251 *results'*. In POI cases, 52% of respondents used total parenteral nutrition (TPN) *'only in*  
252 *a few cases'*, 46% of respondents *'never'* used TPN and 67% used partial parenteral  
253 nutrition (PPN), but only *'in a few cases'*. Of the 48 comments relating to the use of TPN  
254 and PPN, 88% (42/48) included the use of dextrose, 67% (32/48) the addition of amino  
255 acids and, 23% (11/48) mentioned the high cost limitations of such therapy.

256 *Repeat surgery:* In POI cases, the majority of respondents (91%) said they would  
257 consider a second laparotomy. Of those respondents, 38% (40/104) expressed their

258 preferred inter-operative time interval to be 2 to 4 days, closely followed by 4-6 days  
259 (29%, 30/104).

260

## 261 **Discussion**

262 This survey is based on the opinions of 115 Diplomates of three American veterinary  
263 medicine and surgery colleges on the description, prevention and treatment of equine  
264 POI. With the aim to include as many specialist opinions as possible, the population's  
265 criteria for this study consisted of all Diplomates of the ACVS, ACVIM and ACVECC  
266 listed under large animal (LA). Although our response rate may be considered low, a  
267 significant proportion of contacted Diplomates would be ineligible for our study. Despite  
268 recognising that the survey's specific theme (i.e. POI following emergency colic surgery)  
269 would render a proportion of the 814 Diplomates ineligible, no alternative means were  
270 implemented in order to specifically focus on eligible Diplomates. Hence, in addition to  
271 eligible surgeons and clinicians that failed to respond, the non-responders for this study  
272 may have included farm animal specialists, field-service or general practitioners,  
273 orthopaedic surgeons, and diplomates with a primarily research-based career. The  
274 absolute number of respondents from this current survey (115: 67 ACVS + 48 ACVIM)  
275 was comparable with similar published surveys and target audiences; e.g. Lefebvre *et al.*  
276 2014 survey (100 respondents from the ECVS and ECEIM; 30% response rate) and the  
277 Van Hoogmoed 2004 survey (58 respondents from the ACVS; 52% rate) <sup>1,2</sup>.

278 Consequently, it could be argued that the responses obtained were not representative of  
279 the entire population surveyed but rather represent the opinions of a subgroup of



280 veterinary clinicians and surgeons actively involved in equine abdominal surgery and  
281 POI management.

282 Comparisons made between the American and European<sup>1</sup> surveys largely revealed a high  
283 level of agreement in the responses obtained which further highlighted a number of areas  
284 in which there is potential for improvement in the understanding and knowledge of  
285 equine POI.

286 Firstly, the most commonly estimated POI prevalence range in both surveys (European -  
287 71%; American - 68%) was 0 to 20%. This “estimated” prevalence range falls within the  
288 lower ranges of “measured” prevalence derived from various other studies (i.e. 10%-  
289 50%)<sup>2,3,4,5</sup>. Although this finding could indicate a decline in incidence of POI it may  
290 also reflect inaccuracies in the prevalence estimates provided by the respondents.

291 Then, there was inconsistency among respondents with regard to the specific criteria used  
292 to define POI. Although the presence of gastric reflux was still regarded as the most  
293 important criterion for defining POI<sup>6,7</sup>, there was variation amongst respondents in  
294 relation to the volume and rate of yield of fluid considered to be diagnostic. Similar to the  
295 European study<sup>1</sup>, almost three quarters of respondents applied the criteria of either  $\geq 4$   
296 litres at any given intubation or a rate of  $>2$  litres/hour on repeated intubations, with  
297 almost one quarter applying the criterion of  $> 2$  litres at any given intubation. Matter-of-  
298 factly, the latter criterion was applied by 34% (13/38) of the respondents who reported an  
299 estimated prevalence rate  $>20\%$ , a finding which may highlight the significant influence  
300 of varied POI definition criteria on reported prevalence.

301 Also, the pre-, intra- and postoperative factors considered as '*extremely important*' with  
302 respect to their contribution to POI were identical to those identified in the European  
303 study<sup>1</sup>, indicative of a general awareness of the risk factors published in the veterinary  
304 literature<sup>1,3,8,9,10,11</sup>. Likewise, the administration of opioids as an analgesic in the pre-  
305 and/or intra-operative as well as in the postoperative periods was largely perceived as  
306 '*not very important*' in both studies with respect to its contribution to POI. Moreover, this  
307 survey also demonstrated overall support amongst clinicians for the development and use  
308 of general 'in-house' guidelines for perioperative care strategies aimed at preventing and  
309 treating POI, similar to those applied in human medicine<sup>12</sup>.

310 There was also agreement between studies in relation to the preferred drugs of choice.  
311 Both survey studies, and that of Van Hoogmoed *et al.* (2004), identified IV lidocaine as  
312 the most common prokinetic drug of choice, with relative consistency in the dosage  
313 regimen used<sup>1,2</sup>. Similarly, both studies identified metoclopramide as the second most  
314 common prokinetic drug of choice for either intra-operative preventive or postoperative  
315 therapeutic use, a finding in contrast to the results of the Van Hoogmoed *et al.* (2004)  
316 survey<sup>2</sup>, whereby erythromycin lactobionate was the second most popular choice.  
317 Although both studies identified lidocaine and flunixin as the 2 most popular drugs for  
318 the prevention and treatment of POI, when compared to the European survey (IV  
319 lidocaine 78% vs flunixin 78%), IV lidocaine appeared to be less popular (68%) relative  
320 to flunixin (77%) in the American survey for the treatment of POI cases. The use of  
321 flunixin concurs with the general perception amongst both European and American  
322 respondents that inflammation is an '*extremely important*' postoperative risk factor for  
323 the development of POI, second only to the presence of SI distension. This likely reflects

324 an awareness of the increasing body of published evidence supporting a pivotal role for  
325 inflammation in equine POI pathogenesis<sup>3,13,14,15,16</sup>. Similarly, it is likely that the  
326 reported anti-inflammatory effects of lidocaine<sup>17,18,19</sup>, in addition to its perceived  
327 prokinetic effects<sup>2</sup>, also contributed to the high frequency with which this drug was used,  
328 both intra- and postoperatively. Furthermore, in addition to inflammation, pain is  
329 recognised as an important risk factor for POI in both humans and horses<sup>1,2,6,9,12,19</sup>. The  
330 specific reasons why flunixin was the preferred non-steroidal anti-inflammatory drug  
331 (NSAIDs) remain uncertain; however, its reportedly greater potency against the systemic  
332 effects of endotoxaemia<sup>17</sup>, compared with other NSAIDs, may be a contributing factor in  
333 light of the respondents perception that endotoxaemia was “*quite important*” as a risk  
334 factor for the development of POI.

335 Despite the many similarities in results between the European and American surveys,  
336 there were certain areas where the responses differed. Firstly, although anti-inflammatory  
337 drugs were selected in both surveys as those most commonly used for POI  
338 prevention/management, in the American survey they were followed in decreasing  
339 frequency of use by intravenous fluid administration, antimicrobial drugs and electrolyte  
340 supplementation; whereas, in the European study, they were followed by antimicrobial  
341 drug administration and, to a lesser extent, prokinetic drugs<sup>1</sup>. Secondly, the American  
342 survey revealed a tendency for clinicians to retain an indwelling nasogastric tube after  
343 surgery (58% of respondents), although further comments clarified that this decision was  
344 case-dependant, e.g. only if the patient is refluxing or according to clinical signs. In  
345 comparison, the majority of European respondents (70%) preferred to pass the  
346 nasogastric tube only as required<sup>1</sup>. Thirdly, despite the American survey revealing that

347 parenteral nutrition was used ‘*only in a few POI cases*’, in such cases, approximately half  
348 and two thirds of the respondents stated that they would use TPN and PPN, respectively.  
349 This is in contrast to the European survey<sup>1</sup> in which approximately half of the  
350 respondents stated that they would consider the use of PPN ‘*only in a few POI cases*’ and  
351 almost three quarters of respondents stated that they would “*never use TPN*”. Lastly,  
352 despite an almost identical proportion of respondents from each survey stating that they  
353 would consider a repeat laparotomy in refractory cases (European - 88% vs American -  
354 91%), a comparatively lower proportion of respondents in the American survey (38%),  
355 relative to the European survey (46%) opted for 2 to 4 days and a comparatively higher  
356 proportion of respondents in the American survey (29%) relative to the European survey  
357 (15%) opted for 4-6 days as the preferred timing of the second surgery relative to the  
358 first. The specific reasons for these apparent geographical differences remain unclear;  
359 however, it is possible that they are largely attributable to factors such as financial  
360 constraints and the presence of established practice policy. However the authors can find  
361 no evidence base within the veterinary literature which will preferentially support one  
362 approach over another.

363 The analysis of data derived from this survey of Equine Veterinary Diplomates of  
364 American Colleges has provided an overview of the commonly held perceptions related  
365 to various aspects of equine POI. Furthermore, comparative analysis has confirmed that  
366 the opinions and practices of clinicians in America and Europe are generally very similar  
367 and largely informed by knowledge of the relevant veterinary literature. However, the  
368 survey results have also helped to confirm that a universal approach to the management  
369 of POI does not exist and significant variation remains in relation to some of the

370 preventative and therapeutic practices being adopted. It should be emphasized that these  
371 results are only a measure of current practice and opinions and does not provide evidence  
372 about best practice. Further research into ways in which POI can be prevented or  
373 attenuated is essential. Recognition of these areas of research is the first step in  
374 identifying and prioritising specific areas which may benefit from future study.

375 **Footnote list:**

376 <sup>a</sup> Survey Monkey®, Palo Alto, California, USA.

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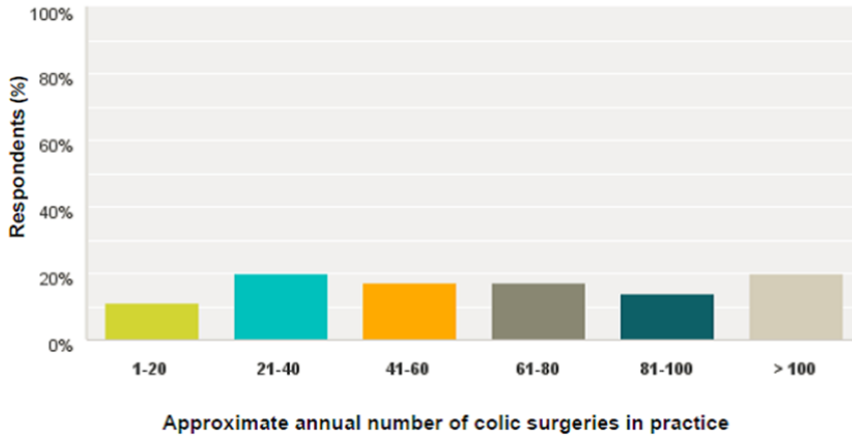
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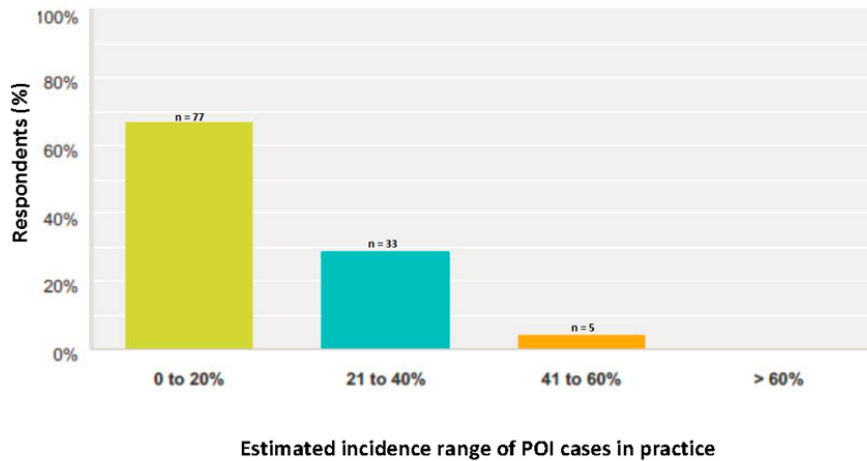
429 **Supplementary Information**

**Figure 1:** ACVS, ACVIM and ACVECC Diplomates' approximate annual number of colic surgeries in practice from an online questionnaire of the Clinical Features and Management of Equine POI completed by 115 respondents



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**Figure 2:** ACVS, ACVIM and ACVECC Diplomates' estimated incidence (%) of POI cases in practice from an online questionnaire of the Clinical Features and Management of Equine POI, completed by 115 respondents



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