

1 **Title: Structure of multidisciplinary heart teams, a survey based**  
2 **heart team study.**

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28 **Abstract**

29 **Objective**

30 Multidisciplinary approach is well established in various disciplines, with  
31 evidence highlighting improved patient outcomes. The objective of this survey was to  
32 determine the real world practice of heart teams across Europe.

34 **Methods**

35 The survey was drafted after a consensus opinion from the authors. The survey  
36 was sent to cardiac surgeons and cardiologist identified through electronic search. The  
37 survey link and the information sheet were sent through email followed by survey  
38 completion reminders. The survey responses were cumulated and analysed.

40 **Results**

41 Among 2188 invited clinicians, 220 clinicians from 26 countries took part in the  
42 survey (response rate 10%). The completion rate for the survey questions was 85%.  
43 140 (64%) were cardiac surgeons and 80 (36%) were cardiologists. The heart team  
44 meeting frequency was weekly according to 104 (55%) respondents. This was  
45 conducted face to face according to 139 (73%) of the responses. Eighty seven (56%)  
46 of the respondents reported 10% – 20% of patients undergoing percutaneous coronary  
47 intervention (PCI) were discussed at the heart team meeting. Seventy nine (47%)  
48 respondents had ad hoc PCI institutional guidelines. Fifty four (32%) respondents  
49 reported an audit process for the heart team decisions.

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55 **Conclusion**

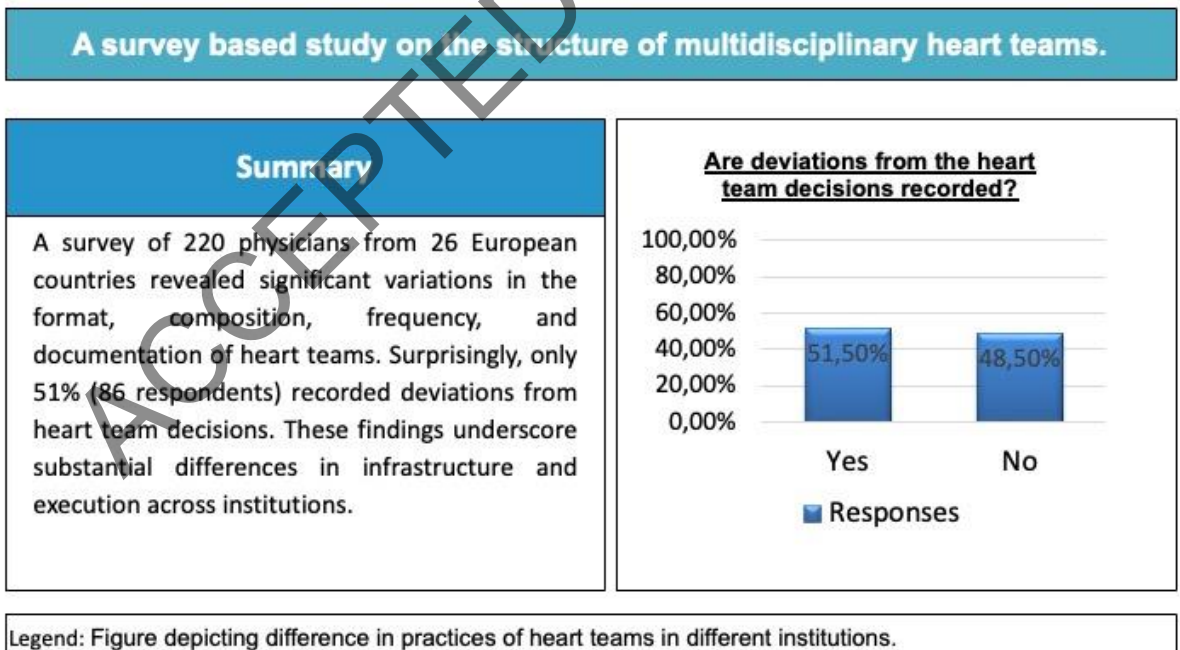
56 This survey suggests that there is marked variability in the infra-structure and  
57 execution of heart teams in different institutions. The results of the survey suggest a  
58 need to formulate guidelines on composition and execution of heart teams which may  
59 result in an increase in transparency of decision-making within different institutions in  
60 reporting and comparing outcomes.

61  
62 **Keywords**

63 Multi-disciplinary team, heart team, cardiovascular disease.

64  
65  
66 **Graphical Abstract**

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## 73 **Introduction**

74

75 The concept of multidisciplinary teams is well established (1, 2). With increasing  
76 complexity of patient with heart disease and a variety of interventions available, a  
77 multidisciplinary approach is paramount for optimizing the patient outcomes (3).  
78 Although the concept of the heart team is a class I indication in both European and US  
79 guidelines, the level of evidence is C (4). The centres that have integrated these  
80 guidelines perform as a highly functioning team with evidence of improvement in patient  
81 outcomes (5). However, the current practice regarding the ideal definition, the ideal  
82 composition, the desired goals, the means of implementation, metrics of success and  
83 unintended consequences of an optimally functioning heart team are still lacking. The  
84 aims of the heart team survey were to determine whether the heart team approach is  
85 being applied in the different institutions across Europe and to determine the real life  
86 practices of patient management in each institution (graphical abstract).

87

## 88 **Main Text**

### 89 **Methods**

90 The study represents a pilot survey of contemporary opinion-based routines at  
91 different institutions. The survey was drafted after a consensus from the authors.  
92 Approval was obtained from medical ethics committee at the Maastricht university  
93 medical centre (METC 2021-3013). Consent was obtained from participants to take part  
94 in the online survey and use of data for publication. The cardiologists and cardiac  
95 surgeons in Europe were identified through member database on cardiology and  
96 surgical societies according to the country of work, emails were then obtained by

97 searching publications of the identified clinicians using PubMed.. Invitation emails were  
98 sent with the survey link to individuals along with an information leaflet about the survey.  
99 Reminder emails were also sent to individuals who had not completed the survey.  
100 Survey Monkey was used to facilitate the completion of the survey. The survey  
101 responses were anonymous. The participants were allowed to pick multiple answers for  
102 each question. Responses to the multiple-choice questions were tabulated and  
103 presented as bar graphs, while open-ended answers were summarized in tables. The  
104 percentage in the results section refers to the respondents who have answered the  
105 question. These clinicians were contacted to answer a list of 47 questions (appendix 1)  
106 focusing on the composition of heart team in different institutions, execution of the heart  
107 team, institutional guidelines for ad hoc interventions, documentations of heart team  
108 decisions, understand the decision making progress of the heart teams and the audit of  
109 heart team decisions (appendix 1).

## 110 **Results**

### 111 **1. Participant demographics**

112 Among 2188 invited clinicians, 220 from 26 countries (from 105 different cities)  
113 (figure 1a/1b) took part in the survey (response rate 10%, the survey response does not  
114 take into consideration problems with recipient email servers or emails filtered into the  
115 junk folder). The completion rate for the survey questions was 85%. One hundred and  
116 forty (64%) were cardiac surgeons and 80 (36%) were cardiologists (figure 1c). The  
117 sub-speciality interest is shown in figure 1d. Seventy percent of the responders were >  
118 40 years of age (figure 1e). One hundred and forty one (64%) were working in university  
119 hospitals (supplemental figure 1).

### 120 **2. Composition of heart team**

121 Two hundred and one respondents (91%) had a heart team in their hospitals (figure 2a).  
122 Over 50% of the respondents reported the heart team should comprise a cardiac  
123 surgeon, general cardiologist, interventional cardiologist, imaging cardiologist and/or

124 anaesthetist (figure 2b). One-hundred and nine (109, 54%) respondents reported there  
125 should be a minimum quorum required for heart team meeting to take place (figure 2c).  
126 Over 50% of the respondents agreed at least one of the following attendees are  
127 mandatory for the heart team meeting; general cardiologist, imaging cardiologist,  
128 interventional cardiologist, cardiac surgeon and heart team co-ordinator (figure 2d).  
129 Eighty-two (41%) respondents reported the presence of a meeting chair (figure  
130 supplemental figure 2a). When the respondents were asked who chairs the meeting the  
131 answer was very variable ranging from head of department, cardiac surgeon,  
132 cardiologist or on a rotational basis (supplemental figure 2b).

### 134 **3. Conduct of the heart team**

135 One hundred and four (55%) respondents had weekly heart team meetings (figure  
136 3a). One hundred and twenty nine (66%) respondents reported the heart team meeting  
137 lasted for an hour (figure 3b) and 139 (73%) respondents had in person meetings  
138 (figure 3c). One hundred and forty five (77%) respondents reported a lack of cut off  
139 time for patients to be added to the heart team meetings (figure 3d). One hundred and  
140 six (56%) respondents circulated a patient list in advance of the heart team meetings  
141 (supplemental figure 3a). Fifty eight (54%) of the respondents acknowledged the  
142 patient list was prepared by the heart team co-ordinator (supplemental figure 3b).  
143 Ninety five (50%) of the heart teams had a regional referral system (supplemental figure  
144 3c).

### 145 **4. Type of patients discussed**

146 One hundred fifty five (90%) of the respondents acknowledged that most patients  
147 undergoing percutaneous coronary intervention (PCI) were not discussed in the heart  
148 team meeting (figure 4a). Eighty seven (56%) of the respondent considered 10-20% of  
149 the patients undergoing PCI were discussed (figure 4b). Eighty two (49%) respondents  
150 reported a lack of institutional guidelines for adhoc PCI or other ad hoc interventions

151 (figure 4c). The percentage of ad hoc PCI carried out in respondent's institution was  
152 quite variable (figure 4d).

### 153 **5. Data presentation and documentation**

154 Ninety eight (58%) respondents reported an electronic documentation process  
155 (figure 5a). Ninety six (57%) of the respondents used a patient template for clinical  
156 information at the heart team meetings(figure 5b). Sixty eight (40%) of the respondents  
157 had a video presentation of the patient during heart team discussions (figure 5c). One  
158 hundred and three (61%) respondents reported all investigations had to be completed  
159 prior to discussion in the heart team meeting (figure 5d). One hundred and forty (88%)  
160 respondents reported, patients were re-discussed if further investigations were required  
161 (supplemental figure 5a). Euroscore was the most common risk stratification scoring  
162 system used (supplemental figure 5b). According to one hundred and twelve (67%) of  
163 the respondents, SYNTAX score was not calculated for coronary artery disease patients  
164 (supplemental figure 5c). Frailty assessment tool was used by 75 (44%) respondents  
165 (supplemental figure 5d). Dementia screening was sparingly used (supplemental figure  
166 5e). One hundred and forty seven (88%) of the respondents acknowledged heart team  
167 decisions were communicated to the general practioners (supplemental figure 5f).

### 168 **6. Dedicated heart teams.**

169 Majority of the respondents acknowledged the presence of dedicated heart teams  
170 including transcatheter aortic valve implantation (TAVI), surgical valve replacement or  
171 repair, infectious endocarditis, complex or high risk case and adult congenital (figure  
172 6a). The frequency of dedicated heart teams was weekly as per 105 (62%) of the  
173 respondents (figure 6b). In the cases of dedicated heart team meetings majority of the  
174 respondents reported that the cases were done jointly by cardiologist and cardiac  
175 surgeons (figure 6c). In case of complex cases 70 (41%) of the respondents reported  
176 anaesthetist were the additional team members who were invited to the heart team  
177 meetings (figure 6d).

178

## 179 **7. Decision making and auditing process for the heart team.**

180 One hundred and thirty nine (83%) respondents reported the decision making  
181 process of the heart team was guideline directed (figure 7a). The respondents reported  
182 a combination of factors that would influence the treatment modality including; risk  
183 score, co-morbidities, clinical expertise, patient choice (figure 7b). One hundred and  
184 twenty nine (77%) acknowledged lack of re-imbursements for the heart team meetings  
185 (figure 7c). Respondents were asked about resolution process for lack of consensus for  
186 patient management, the answers ranged from majority opinion, opinion of the referring  
187 cardiologist, going back to the patient, decision of chair, etc (supplemental figure 7a).  
188 One hundred and thirteen (60%) respondents reported a lack of auditing process for  
189 heart team decisions (supplemental figure 7b). One hundred and twenty (70%) of the  
190 respondents reported lack of use of a quality indicator tool for heart team decision  
191 outcomes (supplemental figure 7c).

192

## 193 **Discussion**

194 The heart team concept stems from two landmark papers, the SYNTAX and the  
195 PARTNER studies where an interventional cardiologist and a cardiac surgeon  
196 determined the eligibility of the trial patients (6). Since these trials, both European and  
197 US guidelines have identified the requirements for a collaborative heart team approach  
198 as a class I indication in management of cardiovascular disease (4, 7). Multiple studies  
199 have highlighted the importance of the heart team approach in the management of  
200 increasingly complex patients with a wide variety of different treatment options in the  
201 armamentarium (3, 6, 8, 9). Despite the passage of over a decade since the inception  
202 of heart team for management of cardiovascular pathologies, the complete  
203 implementation is still lacking.

204



205 The current survey was carried out to establish the functionality of the heart team  
206 in different institutions. Over 201 (90%) respondents had a heart team in their hospitals.  
207 There was a wide variation in opinions of the conduct of the heart team in different  
208 institutions. Although the European guidelines highlighted the composition of the heart  
209 team to comprise of clinical cardiologist, interventional cardiologist, cardiac surgeon,  
210 imaging specialist and cardiovascular anaesthesiologist, only 50% of respondents  
211 related to it. Similarly, only 109 (54%) respondents reported the presence of a minimum  
212 quorum for heart team meeting to take place. Archbold et al have highlighted the  
213 importance of the meeting chair in the conduct of heart team meetings, particularly in  
214 complex cases and where difference of opinion existed (3). However, in the survey only  
215 82 (41%) respondents reported the presence of a meeting chair at their heart teams.  
216 Fifty one (25%) respondents identified the presence of a heart team coordinator (figure  
217 2a). The importance of the heart team coordinator cannot be over stressed as  
218 highlighted by Luckraz et al (9), in particular to ensure the smooth referral process,  
219 documentation and implementation of the heart team decisions (3). Similar to the  
220 recommendations of Luckraz et al, the survey found over 60% of the respondents had  
221 weekly heart team meetings that last for an hour (figure 3). There was marked variability  
222 in the documentation process, clinical information template used and the completeness  
223 of investigations to be available prior to patient discussion (figure 5) highlighting the  
224 need for consensus heart team guidelines.

225  
226 Not all patients undergoing PCI were discussed in the heart team meeting (figure  
227 4a). There was also a lack of institutional guidelines for adhoc PCI or other ad hoc  
228 interventions if a prior heart team discussion had not taken place as per 82 (49%)  
229 respondents (figure 4c). Archbold et al also highlighted consideration of a model for  
230 daily and mini heart team meetings in the context of urgent and emergency referrals (3).

231 With increasing patient complexities, advances and emergence of new therapies for  
232 cardiac pathologies, the importance of dedicated heart teams cannot be overstated.  
233 The rationale behind dedicated heart team is to bring clinicians on the table who are  
234 experts in same pathology but with different skill sets. The survey highlighted the  
235 presence of dedicated heart teams for different cardiac pathologies (figure 6). This  
236 allows a more patient centered approach and tailor the therapy to the requirement of  
237 the patient. Similarly, Sardari Nia et al highlighted and re-enforced the impact of a well-  
238 functioning dedicated mitral heart team on patient management with resultant  
239 improvement in patient survival (5).

241 The decision making process of the heart team was based on several factors  
242 including risk score, co-morbidities, patient choice and clinical expertise (figure 7b).  
243 Continuous evaluation of outcomes with quality review and/or local/external audit is a  
244 requirement of an ideal heart team. Most respondents reported a lack of auditing  
245 process or use of a quality indicator tool for the heart team decision outcomes (figure  
246 6e/6f). This is important of 2021 ESC-EACTS valvular guidelines in which the heart  
247 team approach is mentioned over 60 times and many controversial decision-makings  
248 are referred to the heart team.

250 There are several limitations of the survey, the lack of a randomise control study  
251 including the low response rate of the survey. The responses may be individual  
252 viewpoints rather than departmental practices. There may be a lack of complete  
253 representation of heart team centres across Europe. Nevertheless, the survey highlights  
254 marked variability in the infra-structure, execution of the heart team meetings in different  
255 institutions which have been echoed in the literature. The survey identifies the need for  
256 Heart team guidelines to be formulated. These guidelines may help to reduce the  
257 marked variation seen in practices as seen in this survey. The ultimate goal is a patient

258 centred approach to management of cardiovascular pathology to improve both short  
259 term and long-term outcomes.

260

261

## 262 **Funding**

263 The study was supported and coordinated by Heart Team Academy

264 ([www.heartteamacademy.org](http://www.heartteamacademy.org))

## 265 **Conflict of interest**

266 None declare

267

## 268 **Author contributions statement**

269

270 All authors were involved in the concept, designing, drafting, critical revision, and  
271 approval of the article. UIA and PSN were involved also in execution of the survey.

272

273

## 274 **Data Availability Statement**

275 The survey data presented in this manuscript can be obtained by the journal upon  
276 request.

277 Figure legends:

278 Graphical abstract: Figure depicting difference in practices of heart teams in different  
279 institutions.

280 Figure 1: Selection of questions regarding participant demographics.

281 a: Map representing origin of respondents from different countries as depicted by  
282 different shades of green.

283 b: Pie chart representing origin of respondents from different countries.

284 c. position as subspeciality

285 d. the main practice area

286 Figure 2: Selection of questions regarding composition of the heart team.

287 Figure 3: Selection of questions regarding conduct of the heart team.

288 Figure 4: Selection of questions regarding types of patients discussed.

289 Figure 5: Selection of questions regarding data presentation and documentation.

290 Figure 6: Selection of questions regarding dedicated heart teams.

291 Figure 7: Selection of questions regarding decision making and auditing process of the  
292 heart teams,

293

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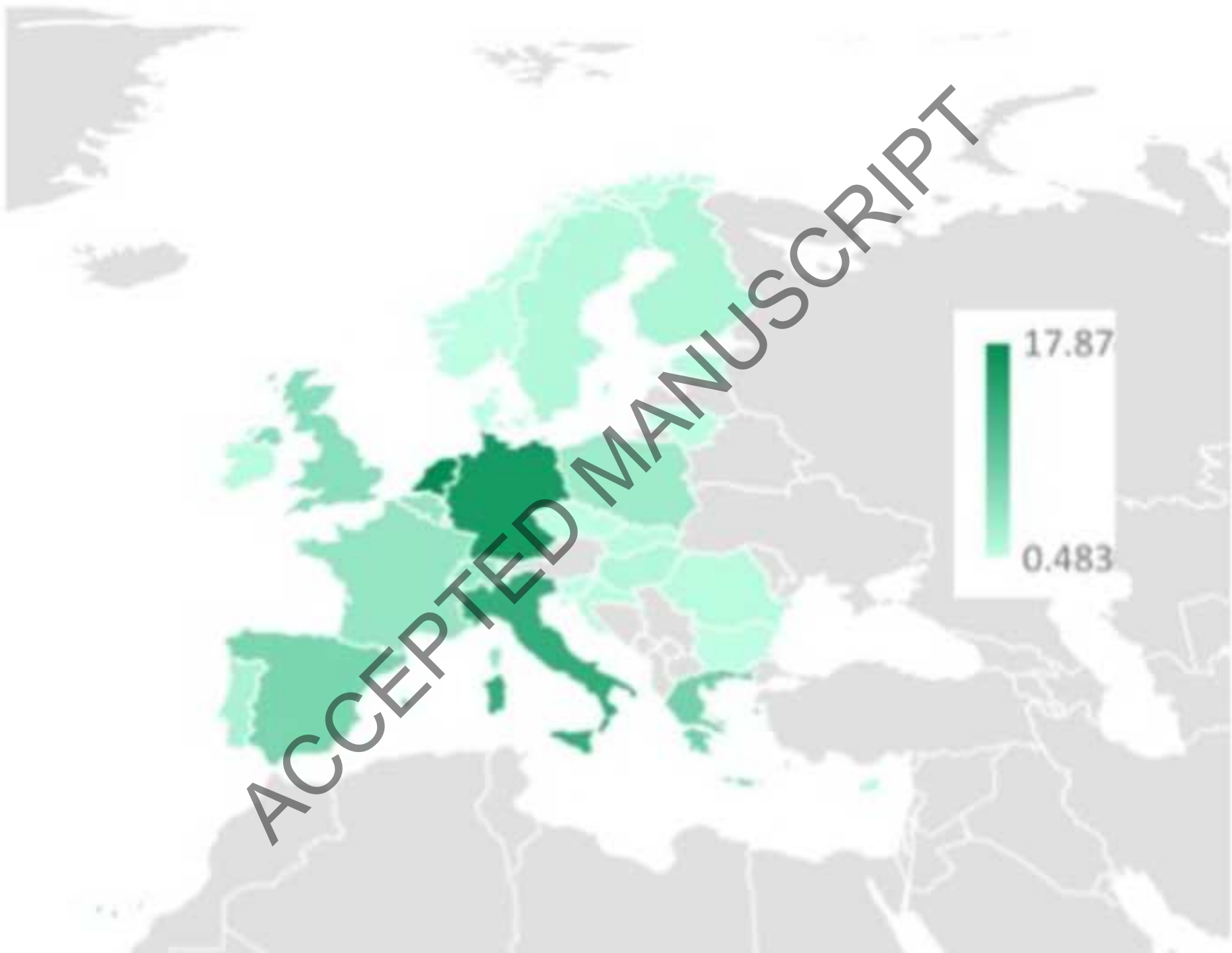
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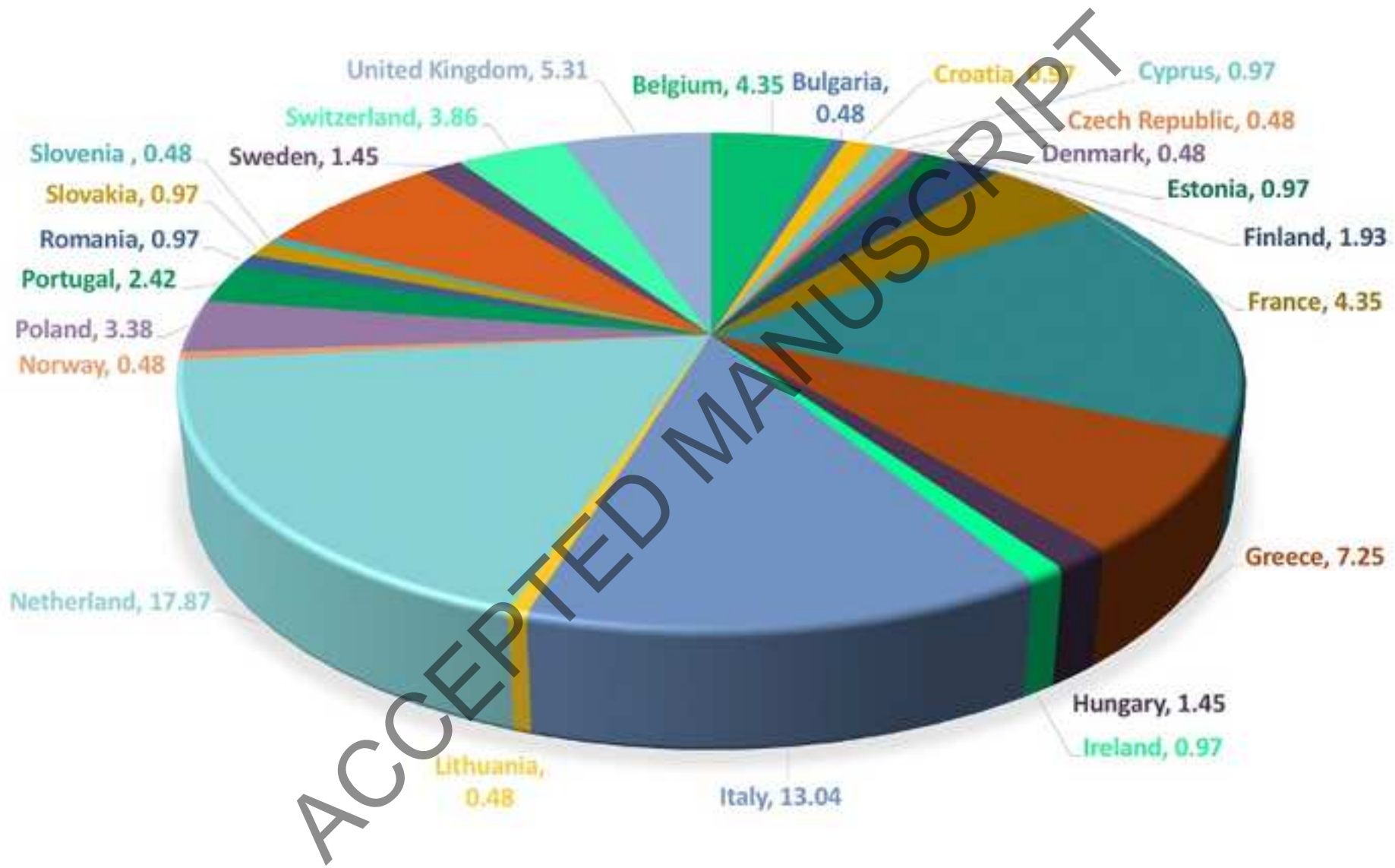
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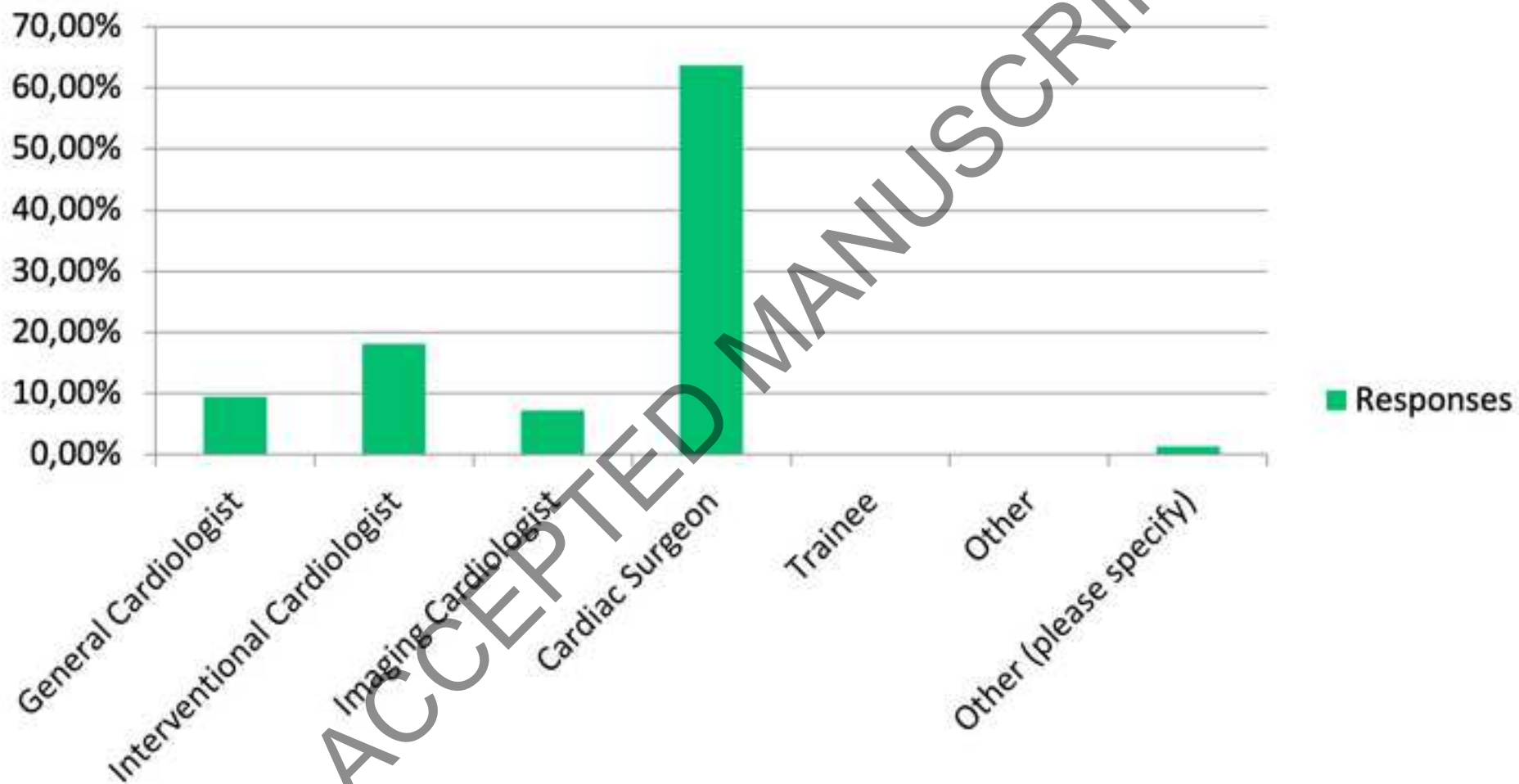
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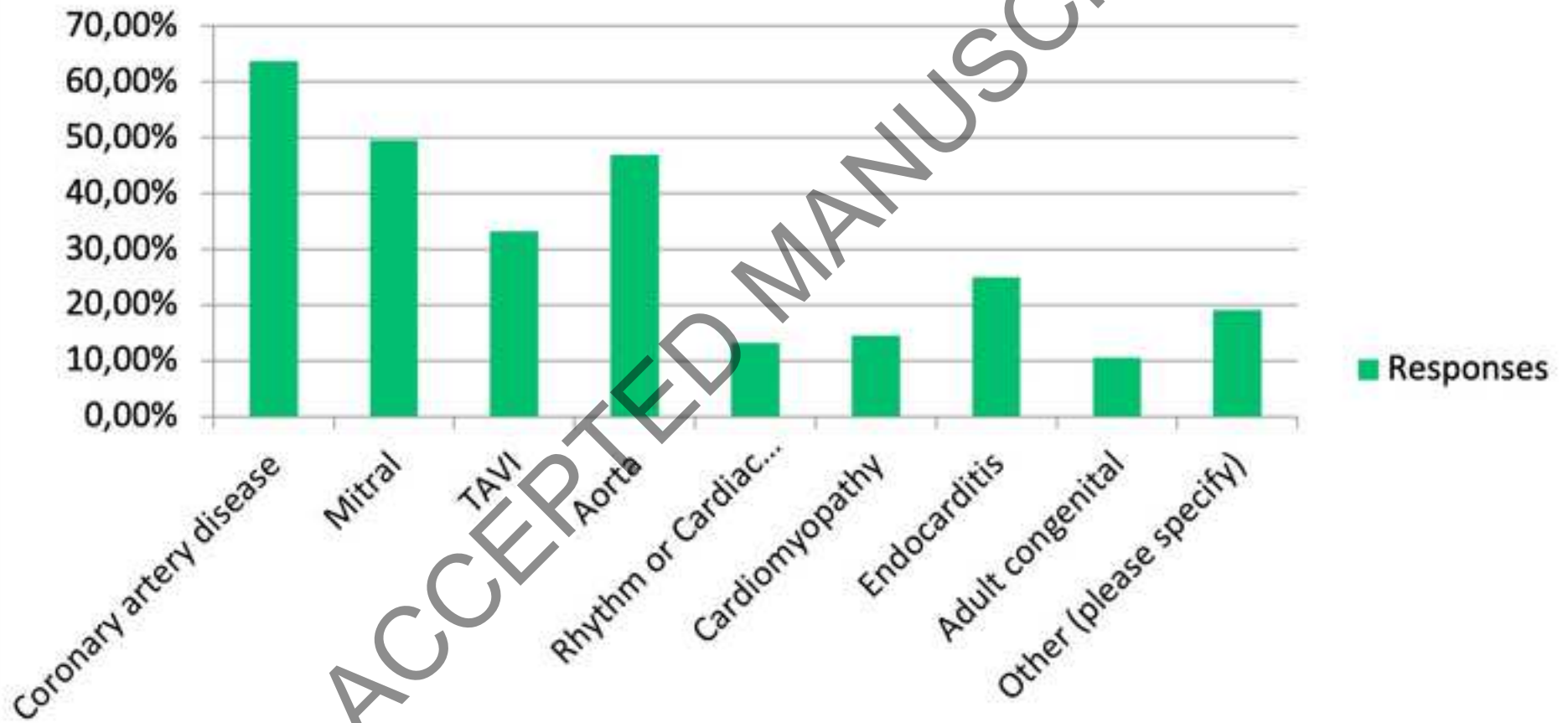




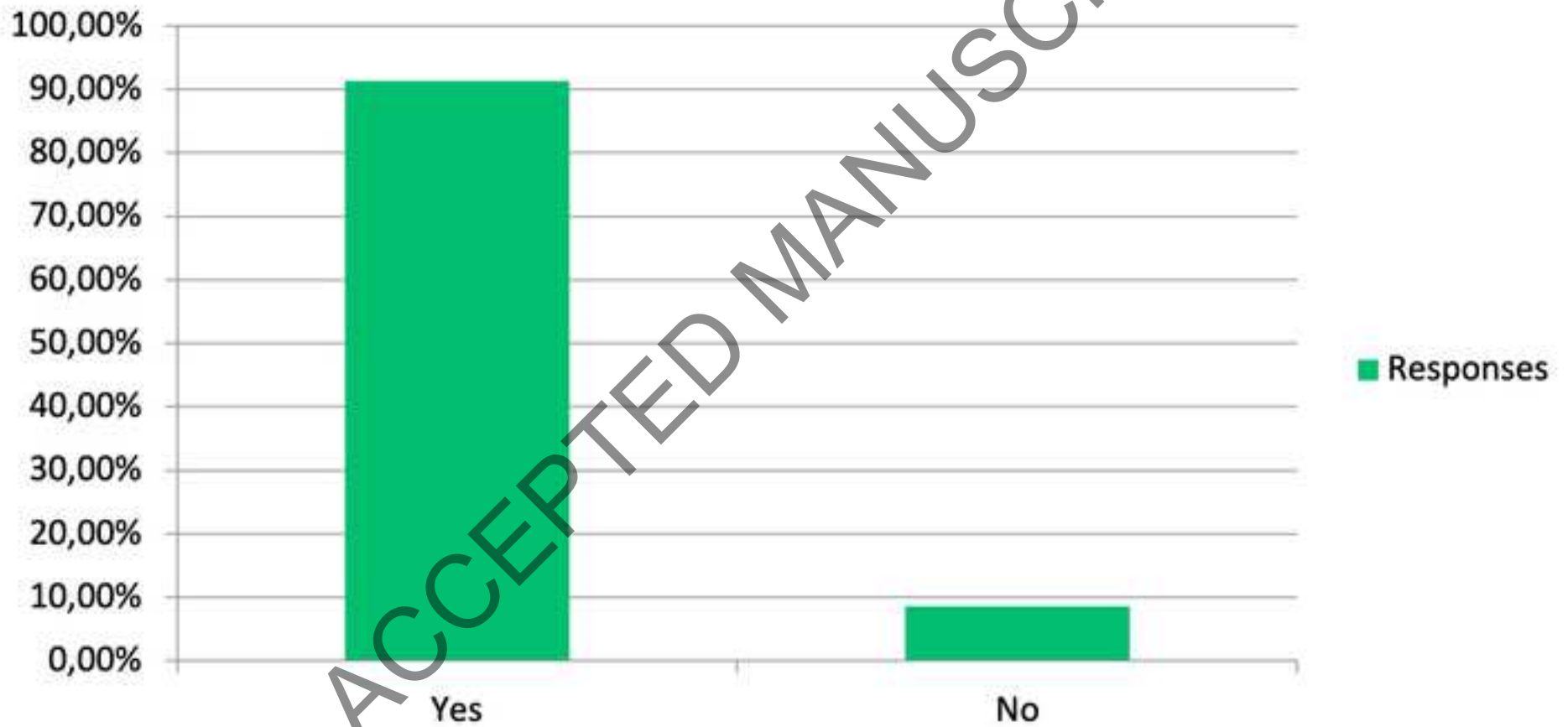
# What is your current position?



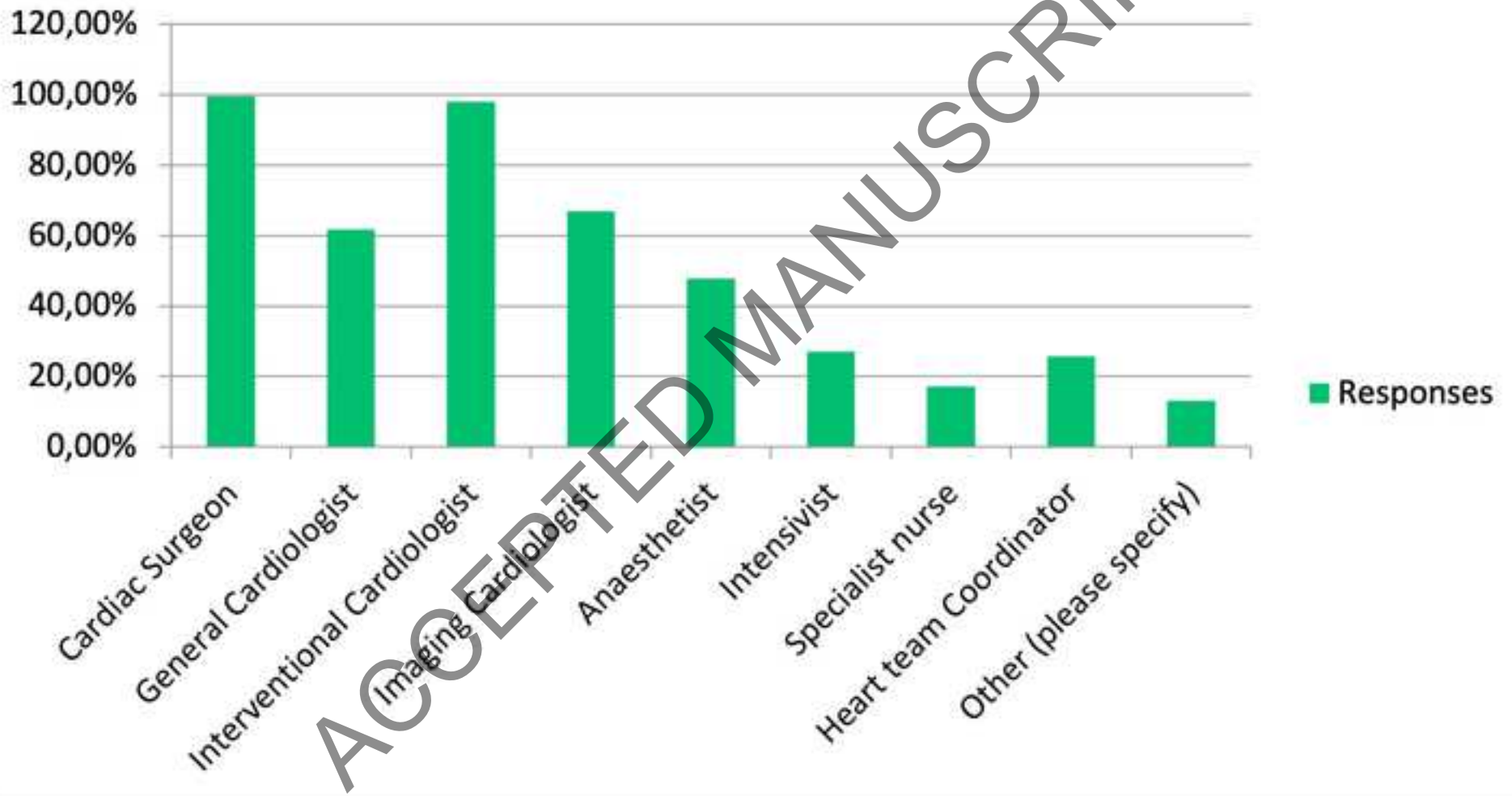
# What subspecialty interest best describes your practice?



# Do you have a heart team at your hospital?



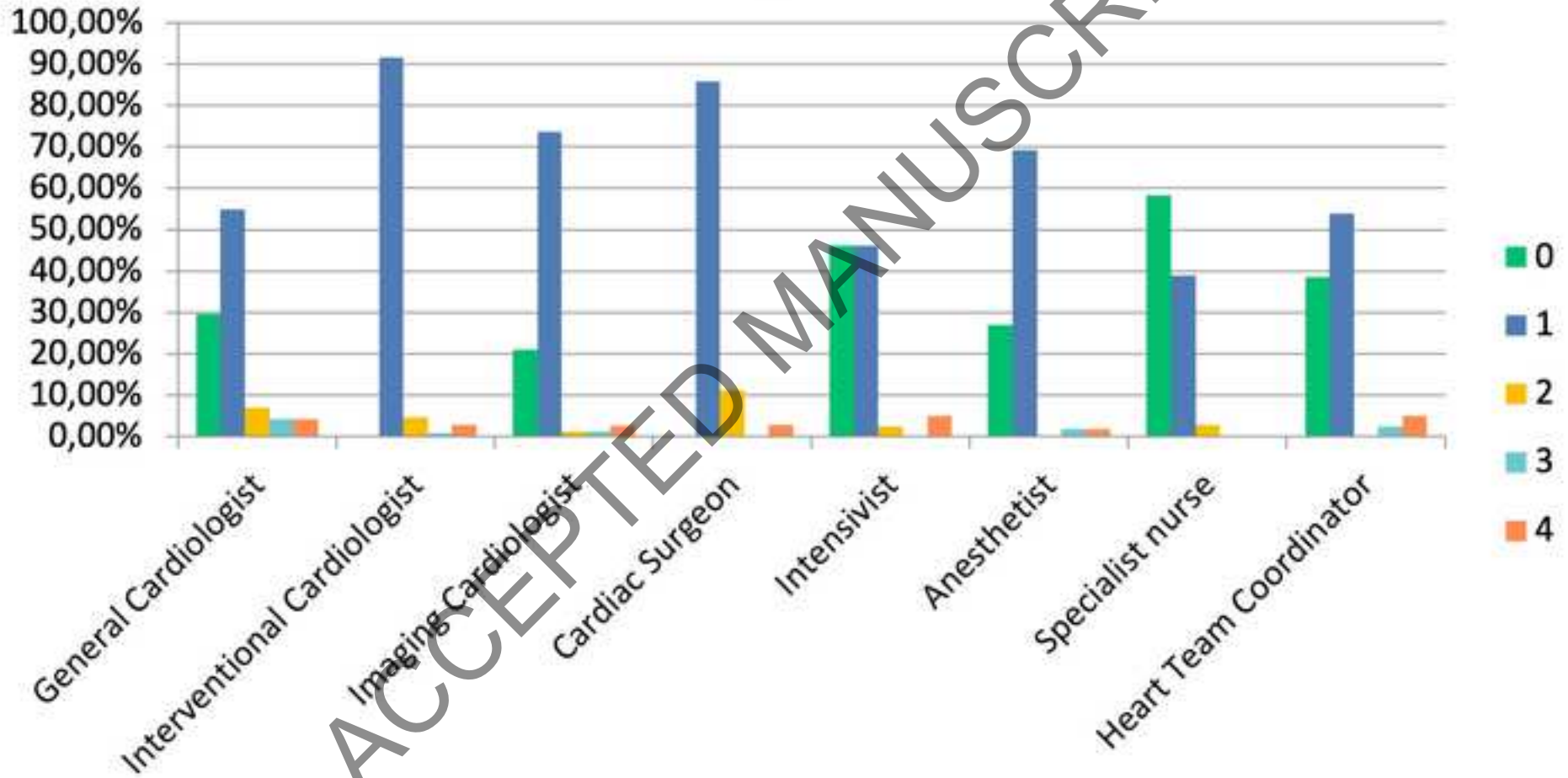
# Composition of the heart team?



# Is there a minimum requirement of attendees for the heart meeting to convene?



### If yes how many of the following attendees are mandatory for the meeting to convene?

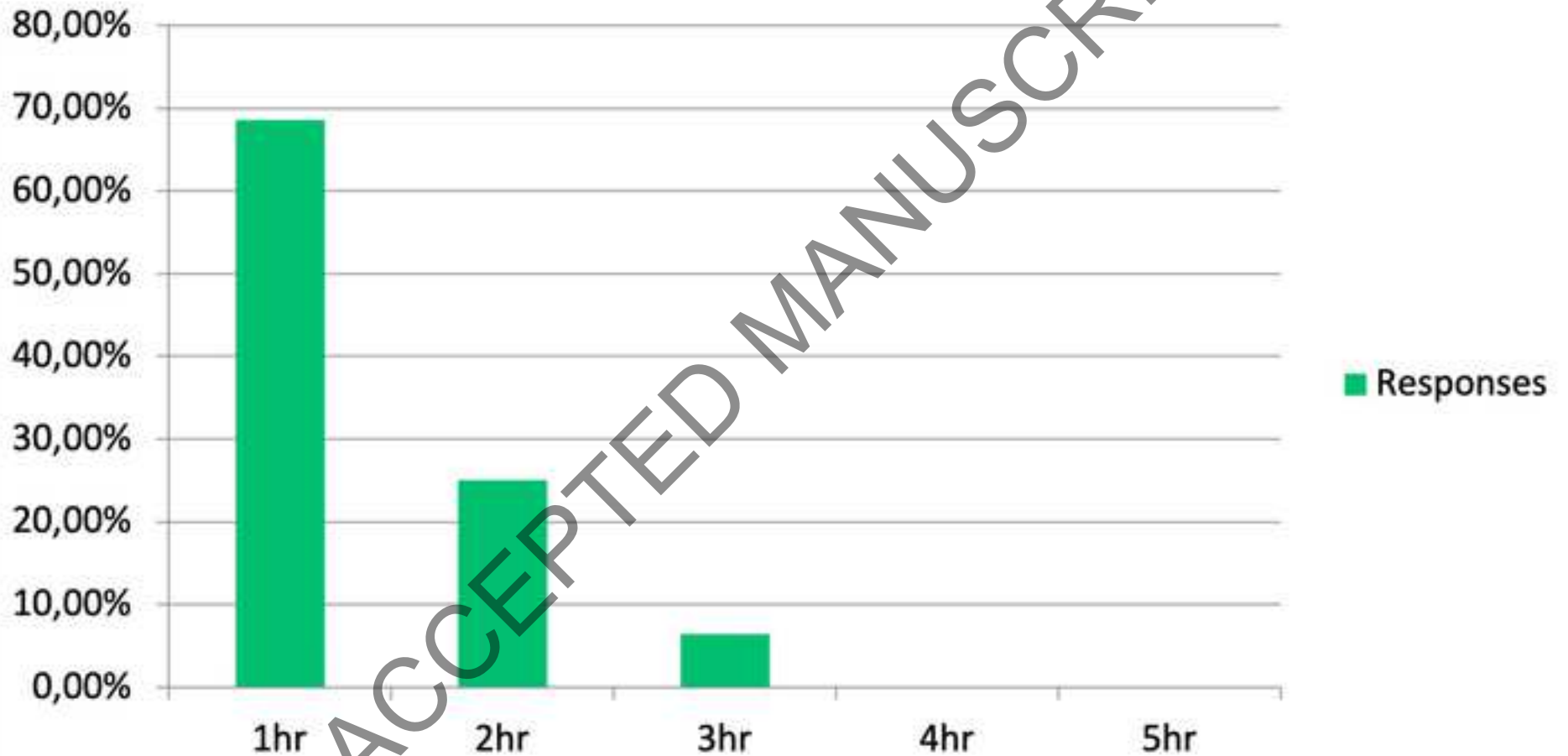


# What is the frequency of the heart team meeting?



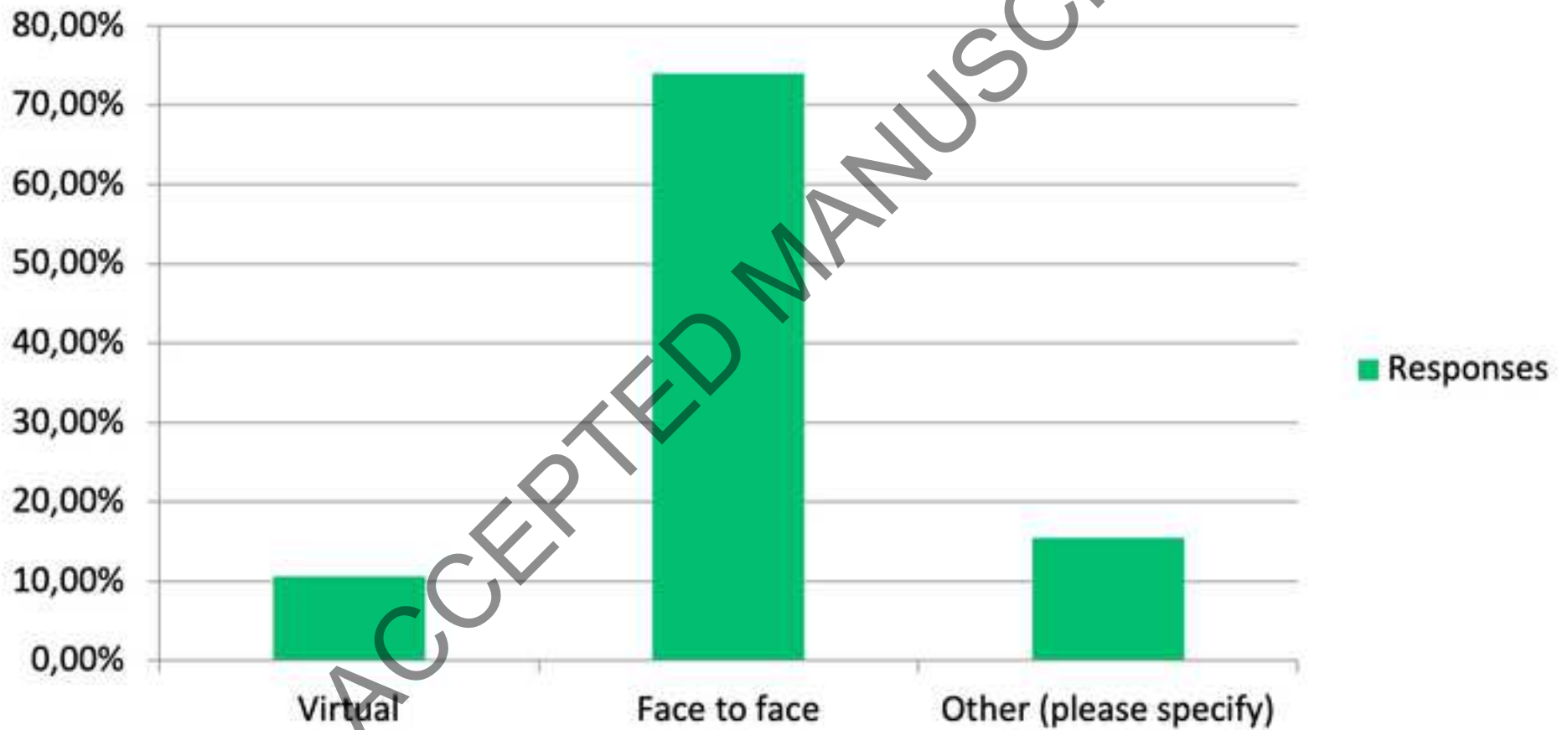


## Duration of the heart team meeting?

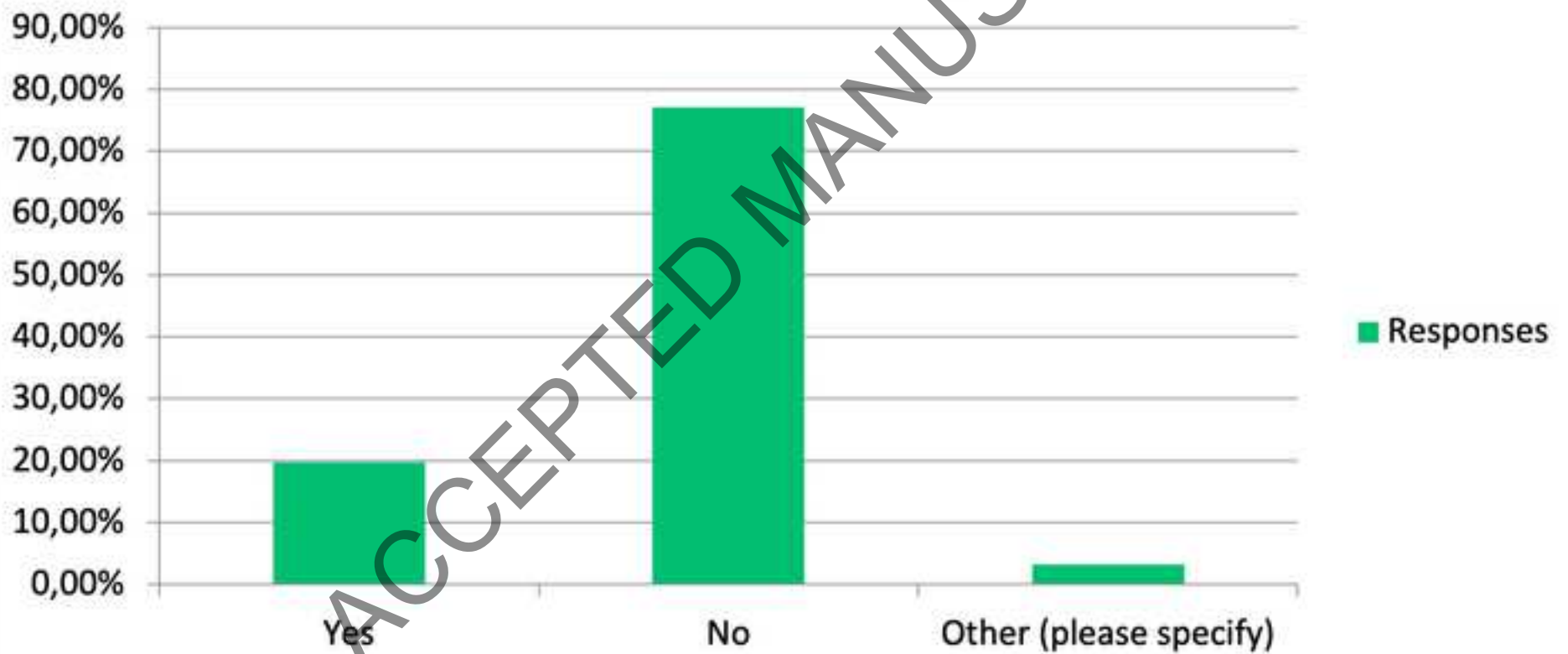




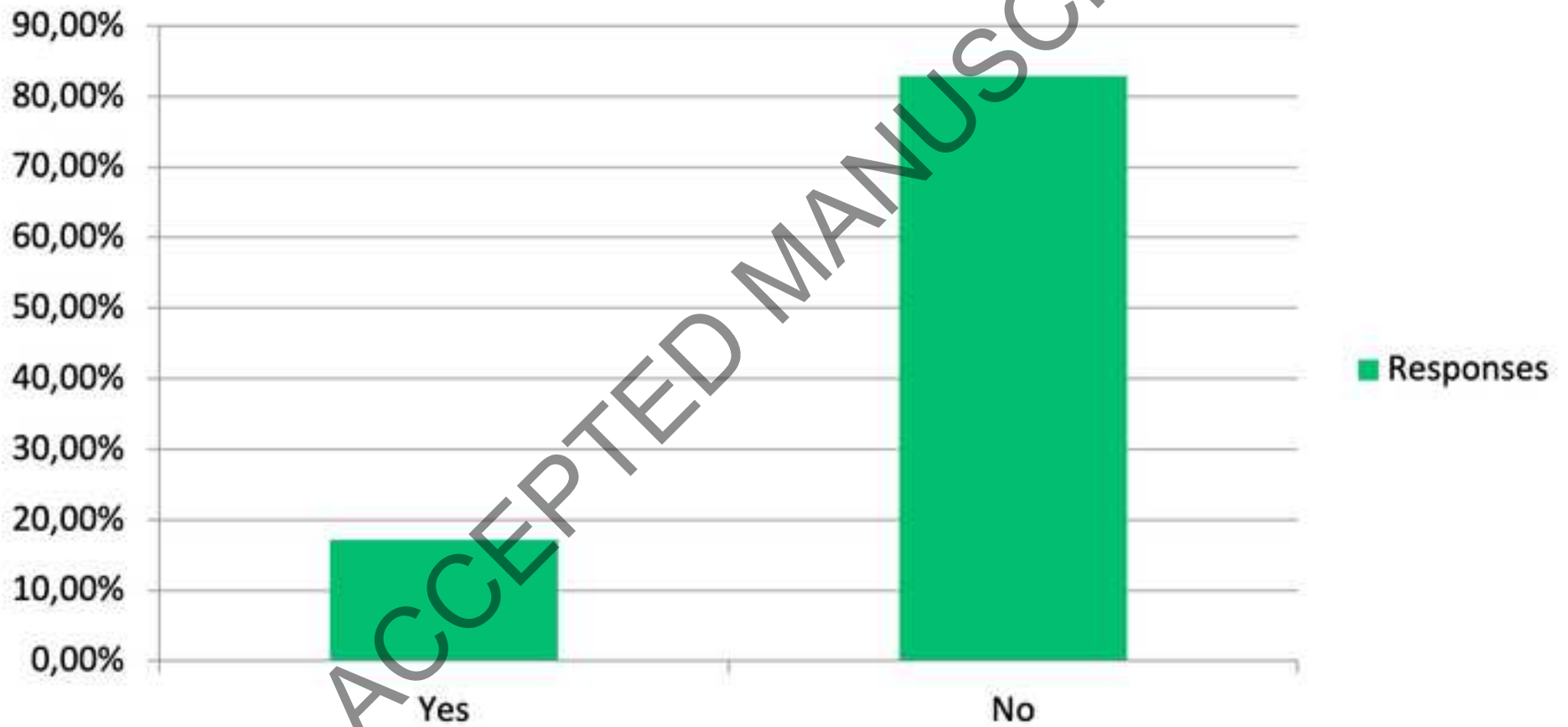
# How is the heart team meeting conducted?



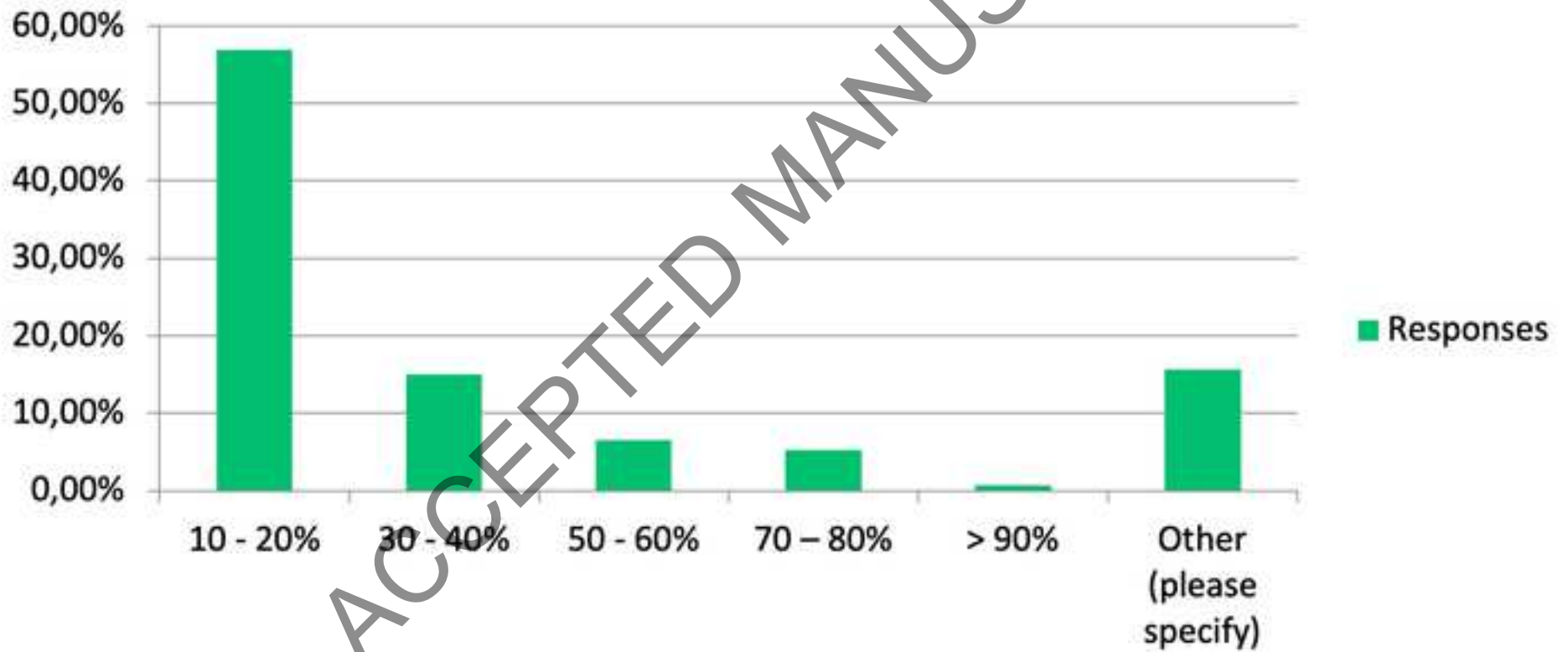
Is there a cut off time after which further patients cannot be added to the heart team meeting?



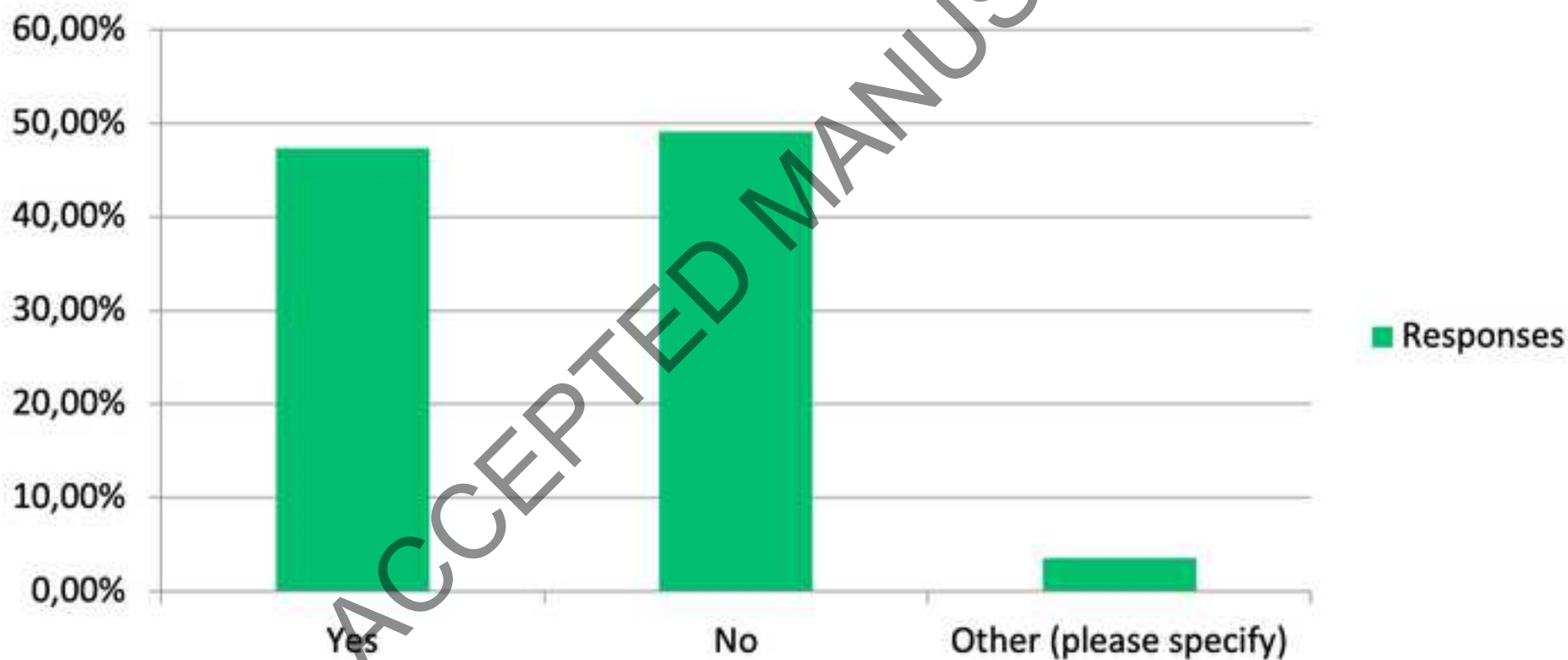
# Are all patients undergoing PCI discussed in the heart team meeting?



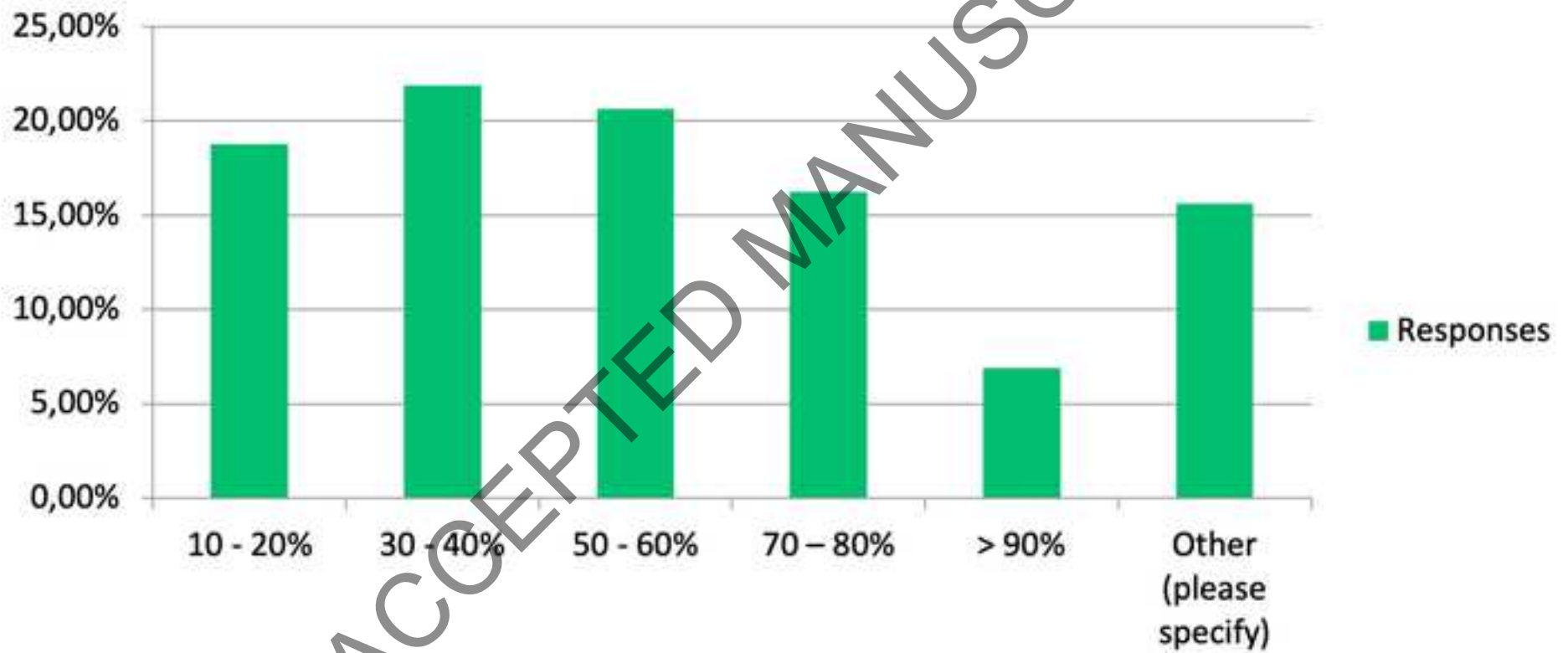
# If no what percentage of patients undergoing PCI are discussed at the heart team meeting?



# Are there institutional guidelines for ad hoc PCI or other interventions to be done without the consent of the Heart Team?

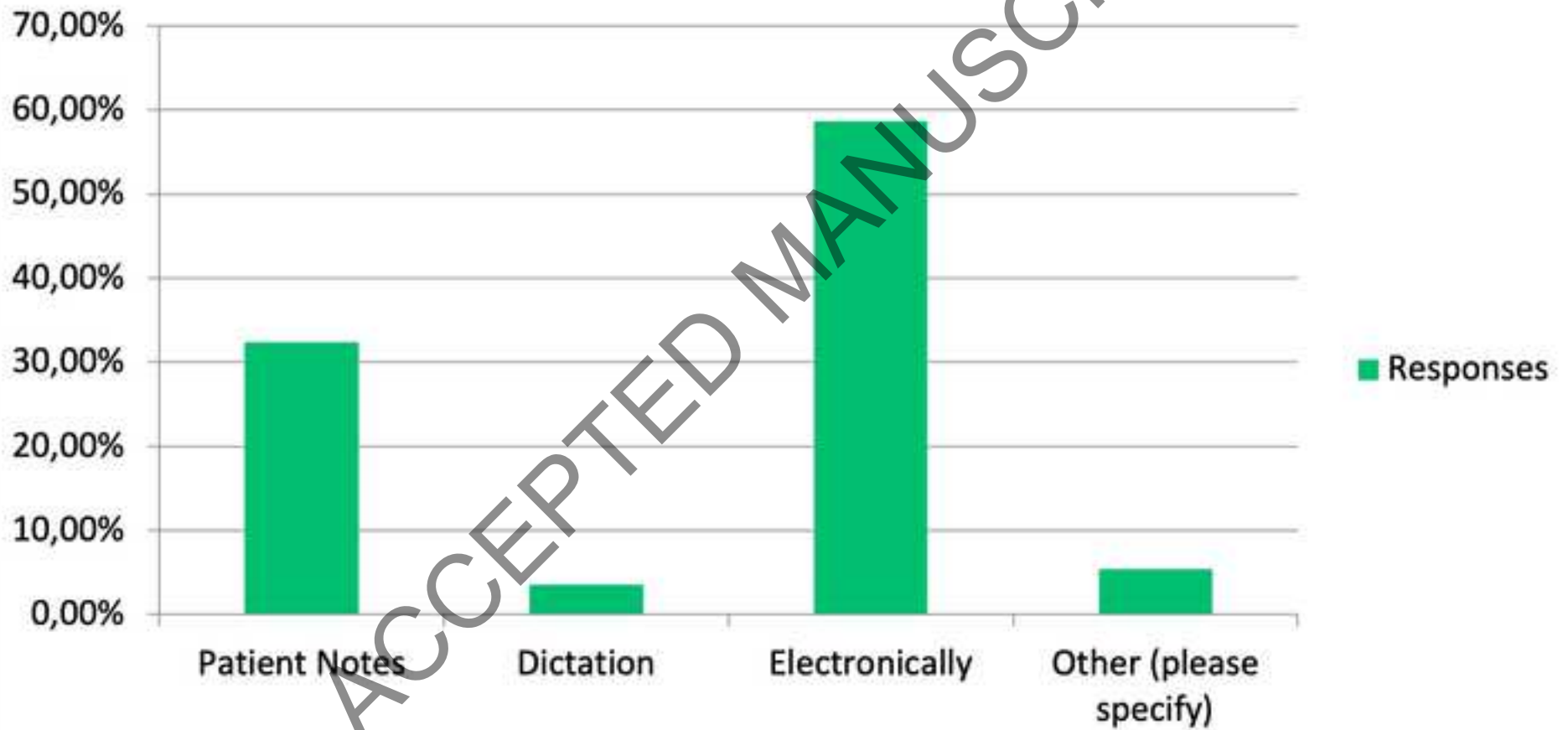


# What percentage of ad hoc PCI are done at your institution?



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## Where are the patient discussions documented?

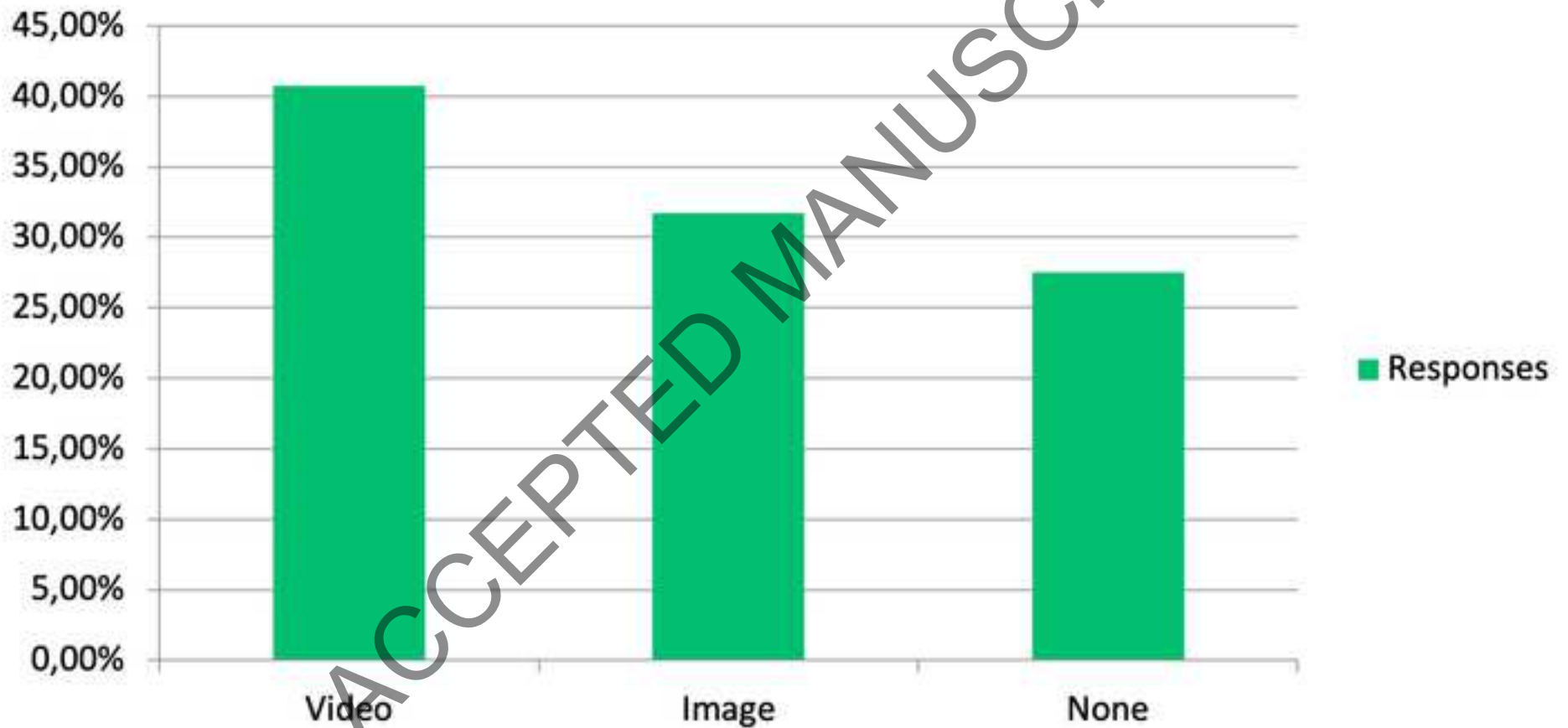


# Is there a template used for patient clinical information for discussion at the meeting?

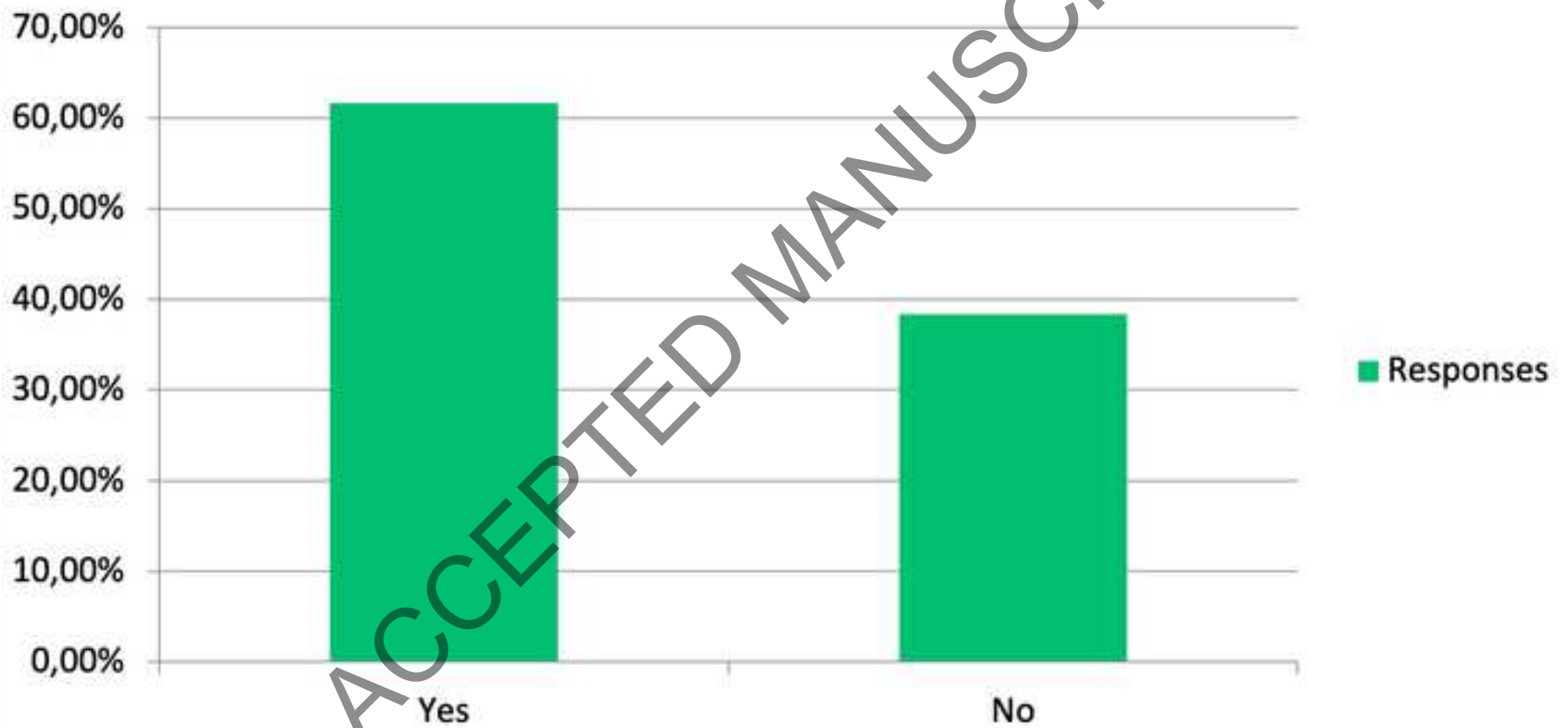




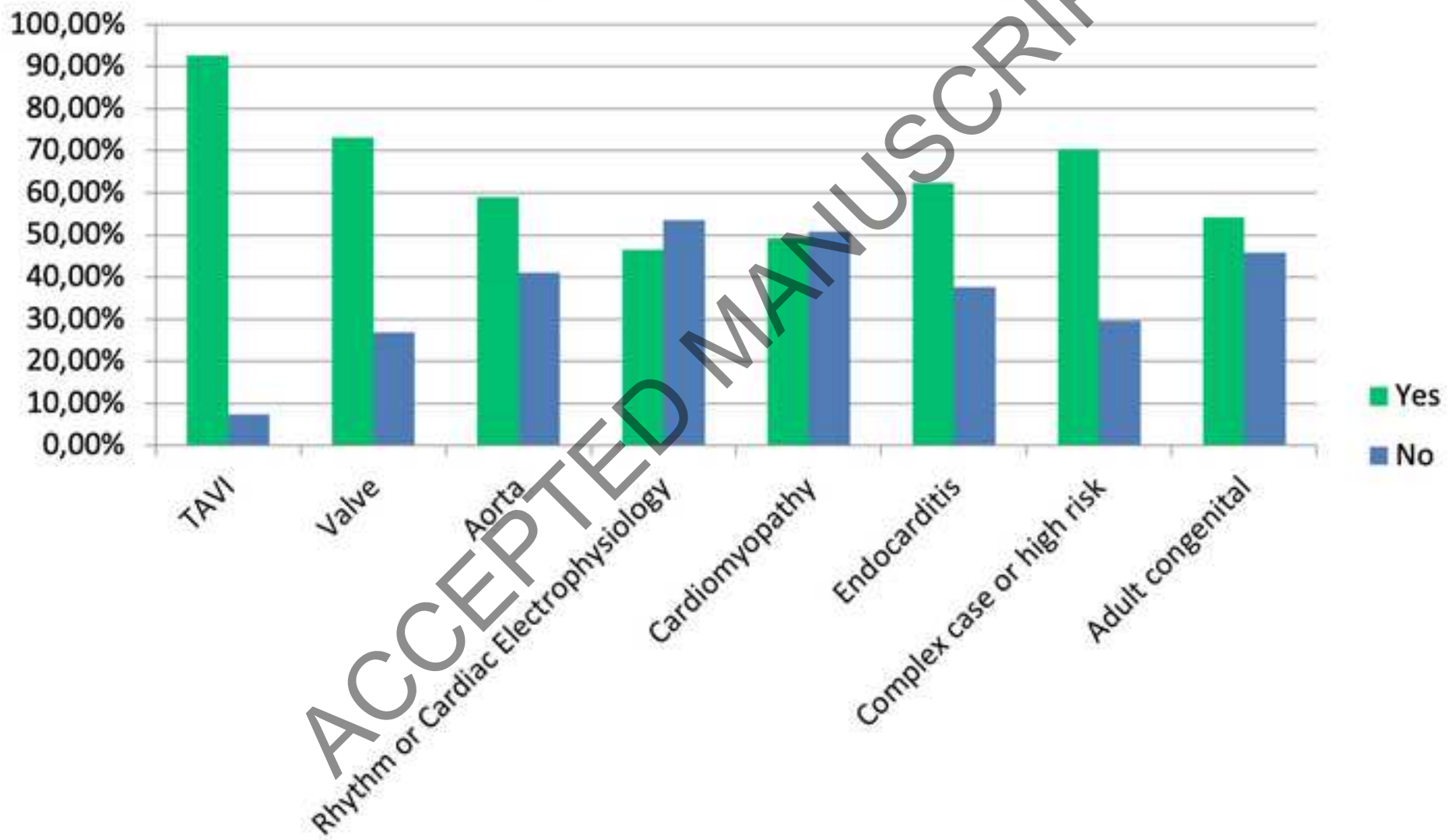
# Is there a media presentation of the patient?



# Is there a requirement of all investigations to be available prior to discussion?

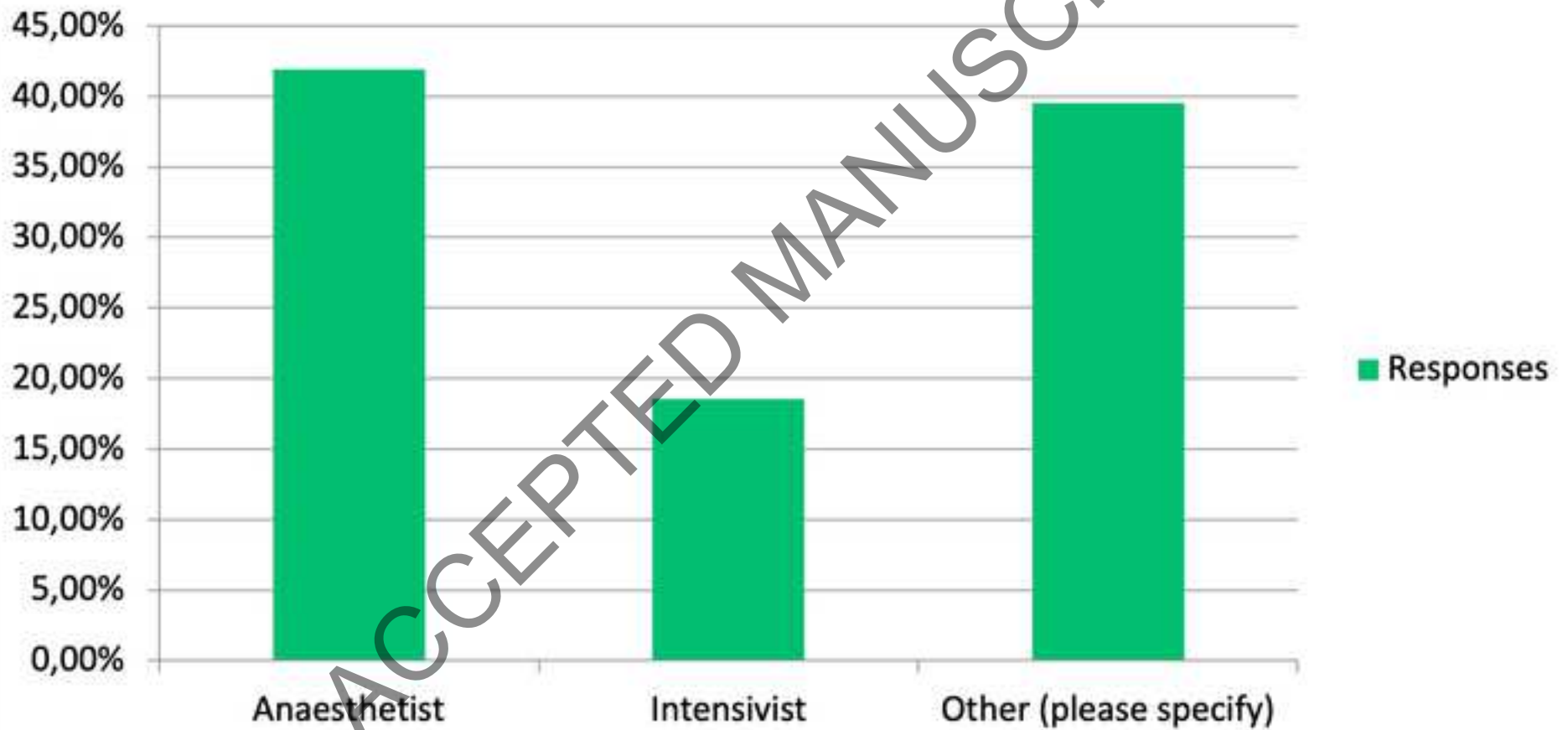


# Are there dedicated heart teams for the following cardiac pathologies?

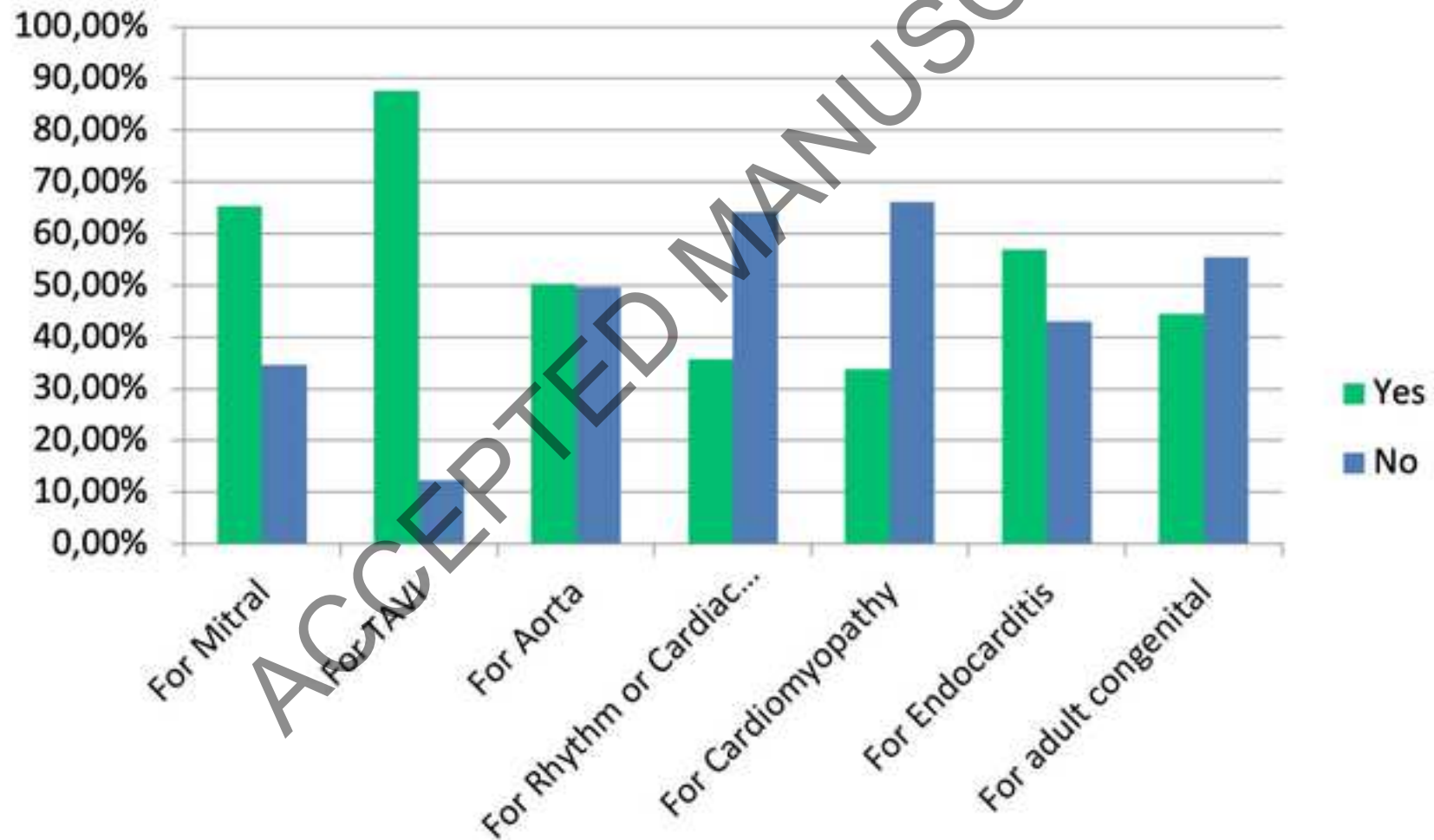


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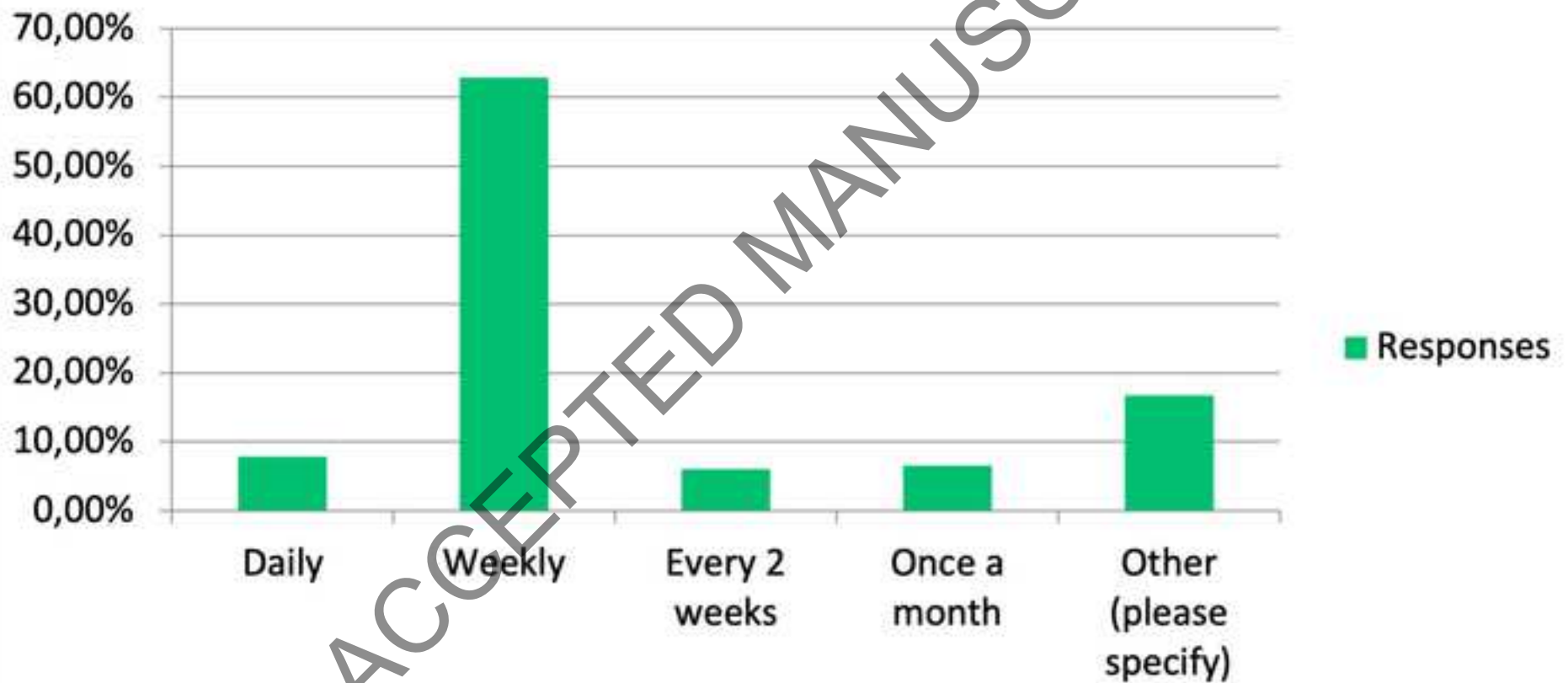
## In the complex case heart team meetings are additional team members invited?



In the case of dedicated heart team meetings, are the cases treated (operation or intervention) jointly with surgeons and cardiologist?

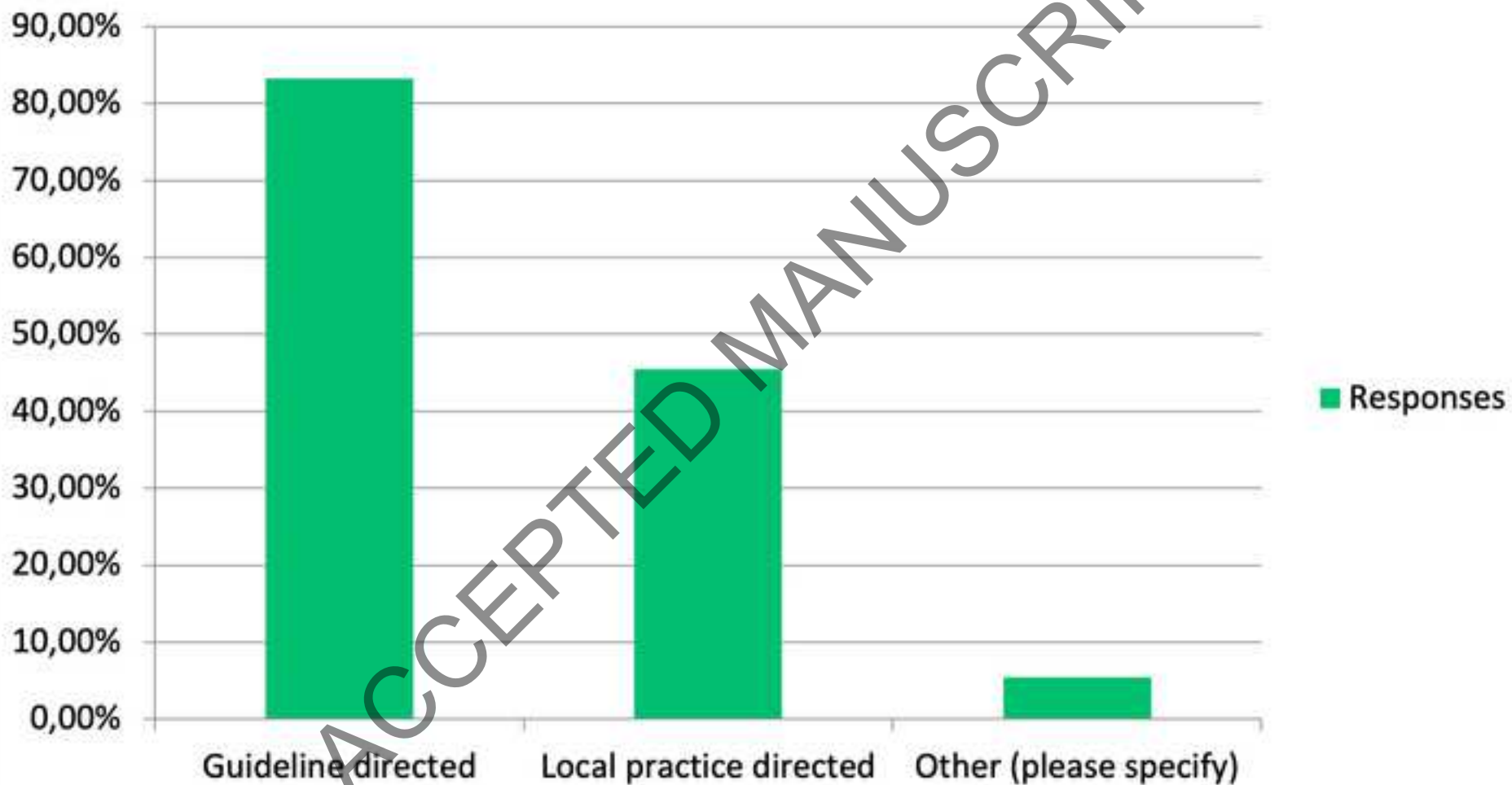


# What is the frequency of the dedicated heart team meeting?

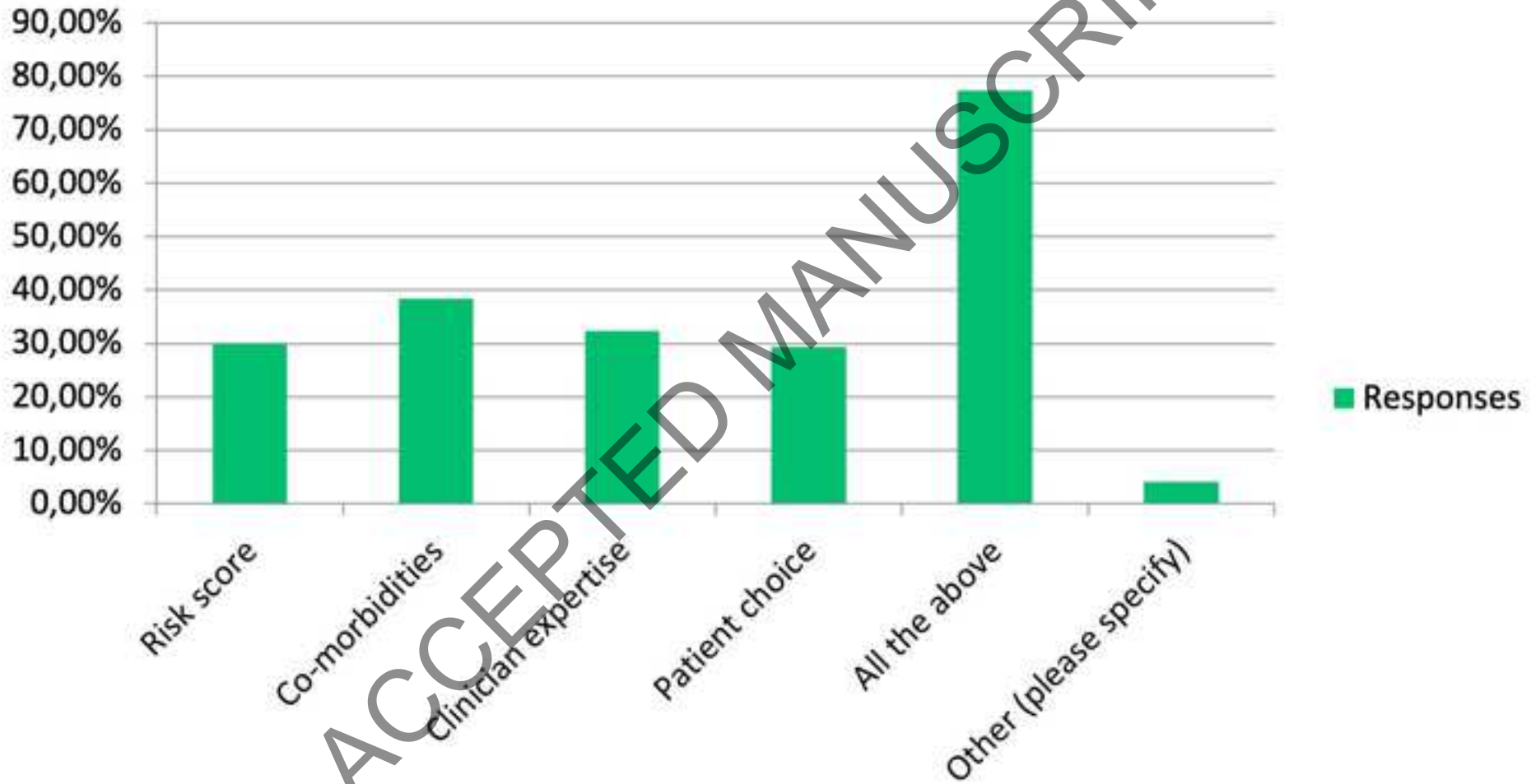




## Are the decisions of the heart team?



# What influences the treatment modality?





# Is there re-imburement for the heart team meetings?

