openheart

Variations in current clinical practice of postoperative pericardial effusion: a questionnaire study

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► Additional supplemental material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/openhrt-2023-002271).

To cite: van Dinter S, Li W, Wollersheim L, *et al*. Variations in current clinical practice of postoperative pericardial effusion: a questionnaire study. *Open Heart* 2023;**10**:e002271. doi:10.1136/openhrt-2023-002271

Presented at the European Society of Cardiology congress 2022, 29 August 2022, Barcelona.

Received 28 January 2023
Accepted 31 March 2023

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ABSTRACT

Objective Postoperative pericardial effusion (PPE) occurs frequently after cardiac surgery, potentially leading to life-threatening cardiac tamponade. Specific treatment guidelines are currently lacking, possibly leading to variations in clinical practice. Our goal was to assess clinical PPE management and evaluate variation between centres and clinicians.

Methods A nationwide survey was sent to all interventional cardiologists and cardiothoracic surgeons in the Netherlands, regarding their preferred diagnostic and treatment modality of PPE. Clinical preferences were explored utilising four patient scenarios, each with a high/low echocardiographic and clinical suspicion of cardiac tamponade. Scenarios were also stratified by three PPE sizes (<1 cm, 1–2 cm, >2 cm).

Results In total, 46/140 interventional cardiologists and 48/120 cardiothoracic surgeons responded (27/31 contacted centres). Cardiologists favoured routine postoperative echocardiography in all patients (44%), whereas cardiothoracic surgeons preferred routine imaging after specific procedures, especially mitral (85%) and tricuspid (79%) valve surgery. Overall, pericardiocentesis (83%) was preferred over surgical evacuation (17%). Regarding all patient scenarios, cardiothoracic surgeons significantly preferred evacuation compared with cardiologists (51% vs 37%, p<0.001). This was also observed with cardiologists employed in surgical centres compared with non-surgical centres (43% vs 31%, p=0.02). Inter-rater analysis varied from poor to near-excellent (κ 0.22–0.67), suggesting varying PPE treatment preferences within one centre.

Conclusion There is significant variation in the preferred management of PPE between hospitals and clinicians, even within the same centre, possibly due to the lack of specific guidelines. Therefore, robust results of a systematic approach to PPE diagnosis and treatment are needed to formulate evidence-based recommendations and optimise patient outcome.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Clinical manifestation of pericardial effusion after cardiac surgery can vary from absence of symptoms to cardiac tamponade. Due to the lack of specific guidelines, the diagnostic workup and therapeutic management could differ between hospitals and clinicians.

WHAT THIS STUDY ADDS

⇒ Through a scenario-based questionnaire, we show that current treatment strategies of postoperative pericardial effusion differ greatly between cardiologists and cardiothoracic surgeons.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Highlighting the treatment differences between healthcare professionals, this study encourages future research to develop evidence-based guidelines to prevent unwarranted variation in care.

INTRODUCTION

Postoperative pericardial effusion (PPE) is an excess amount of fluid in the pericardial space and is encountered in 3%–64% of patients after cardiac surgery.[1–4] This incidence varies widely due to some studies reporting all effusion, while most only report symptomatic collections. Typically, PPE is observed by clinically indicated or routine transthoracic echocardiography (TTE) and can either resolve over time or progress into cardiac tamponade requiring intervention. This potentially lethal condition frequently necessitates urgent and invasive treatment, elongates hospital stay and is associated with increased mortality.[5–7]

However, detection of PPE or even cardiac tamponade after cardiac surgery can be challenging. Classical symptoms of cardiac tamponade (like dyspnoea, malaise, dizziness and fatigue[2 8]) can be frequently obscured or coincide with transient complaints during regular postoperative recovery. Additionally, some patients lack typical signs of cardiac tamponade or even stay asymptomatic. Previous studies have reported an asymptomatic clinical course in up to 66% of the patients with an echocardiographically diagnosed late cardiac tamponade eventually requiring drainage.[2 3] Unfortunately,

echocardiographic signs to predict tamponade have not been validated extensively, especially regarding loculated effusions. Also, there is no clear relationship between the clinical manifestation of PPE and the amount seen on TTE.[1 7 9 10] As such, large-sized PPE can occur on routine echocardiography without clinical symptoms and echocardiographic signs of tamponade, especially when developing gradually.[7 10 11] It is therefore a matter of debate whether to drain asymptomatic effusions or treat them conservatively.

When symptomatic PPE has been identified, varying strategies exist regarding its treatment. There is general consensus to perform surgical re-exploration for early-onset tamponades (within 24–48 hours postoperatively).[12] However, there is increasing evidence suggesting the outcome of percutaneous evacuation is comparable with that of surgical approaches for subacute and late-onset tamponades.[13 14]

This ambiguity in the manifestation of PPE and corresponding management can result in challenging decision making. Unfortunately, no guidelines are available on this subject, possibly leading to unwarranted care variations in clinical practice. The aim of this study was to investigate the preferred clinical management of PPE and evaluate variation between centres and clinicians in the Netherlands. We hypothesised that contemporary management differs widely between healthcare professionals and between centres.

MATERIALS AND METHODS

We conducted a Dutch nationwide web-based survey to assess current preferences for PPE management after cardiac surgery. A questionnaire was developed by the authors and distributed among all interventional cardiologists and cardiothoracic surgeons in the Netherlands (16 centres providing both surgery and interventional cardiology, 15 performing only interventional cardiology). Invitations were sent by email through the Dutch Working Group of Interventional Cardiology and Dutch Association for Thoracic Surgery. Initial invitations were sent in March 2021 and a reminder 2 months thereafter. Participation was voluntary and anonymous, and no compensation was granted on survey completion.

The questionnaire comprised two parts (online supplemental table 1). The first section consisted of questions regarding demographics (eg, specialist type, name of hospital) and personal preferences on evacuation technique and routine imaging modalities of PPE. The second part of the survey contained four fictional patient scenarios. The scenarios represented a 'typical' patient on the ward (eg, patient in their 60s, 5 days after uneventful cardiac surgery). Each case illustrated either high or low clinical suspicion, combined with either a high or low echocardiographic suspicion of cardiac tamponade, creating four scenarios in total. High clinical suspicion was presented as complaints of progressive dyspnoea, sinus tachycardia, oliguria and inconclusive chest X-ray and ECG. High echocardiographic suspicion was depicted as diastolic collapse of the right atrium with vena cava inferior distension with blunted inspiratory response. Echocardiography was performed demonstrating various amounts of pericardial effusion. Based on the presence of <1 cm (small), 1–2 cm (moderate) or >2 cm (large) effusion in all four scenarios, a total of 12 decision moment were presented in which participants had to choose between 'no action', 'follow-up with echocardiography', 'immediate additional imaging' or 'evacuation'.

Data were collected within an online database provided by Google Forms and statistical analysis was performed with IBM SPSS (V.27.0; IBM Corp, Armonk, New York, USA). In the first part of the survey, we compared the answers between the cardiologists and cardiothoracic surgeons to identify significant differences regarding their personal preferences of the evacuation technique and routine imaging. Open-text answers were categorised and bundled into new or existing answer categories. χ^2 test and Fisher's exact test (if number of answers was <5) were used for question analysis, and post hoc analysis using Bonferroni correction (adjusted p values) for multiple choice questions.

Regarding the part of the survey containing fictional scenarios, χ^2 analysis was used to investigate differences in scenario decisions between cardiologists and cardiothoracic surgeons. Additionally, differences were evaluated between cardiologists employed at surgical and non-surgical centres.

To examine conformity in the degree of PPE evacuation between the participating centres, 'mean evacuation rate' was calculated per centre. Mean evacuation rate was defined as the total amount of times 'evacuation' was advised by the respondents per centre (varying from 1 to 10) in all 12 decision moments, divided by the total amount of answers per centre (number of respondents per centre, multiplied by 12) multiplied by 100%.

Lastly, agreement on scenario decisions by clinicians working in the same centre was examined with Randolph's free-marginal multirater kappa test.[15] Agreement was studied among the three centres with most respondents (n=7, 9, 10) and was evaluated with the complete group of clinicians, as with the cardiologists and cardiothoracic surgeons divided. A kappa of <0.40 was considered as poor agreement, 0.40–0.75 as good and >0.75 as excellent. Cut-off value for statistical significance was p<0.05.

Patient and public involvement

Patients/the public were not involved.

RESULTS

In total, 94 clinicians completed the survey, of whom 46 interventional cardiologists (response rate 46/140=33%) and 48 cardiothoracic surgeons (response rate 48/120=40%) (table 1). Responses came from 27 different centres, 15 surgical centres (response rate

Table 1 Responses regarding preferences on routine and additional imaging

Question	Total n=94 (%)	Cardiothoracic surgeons n=48 (%)	Cardiologists n=46 (%)	P value*
Which patients after cardiac surgery will undergo routine postoperative TTE before discharge? (multiple answers possible)				
All patients	22 (24)	2 (4)	20 (44)	**<0.001**
None	14 (15)	3 (7)	11 (24)	**0.016**
After specific surgery	58 (62)	43 (46)	15 (16)	**<0.001**
Routine TTE only after specific surgery (n=58)†				
CABG surgery	0	0	0	
Aortic surgery	32 (55)	25 (58)	7 (47)	0.442
Aortic valve surgery	41 (71)	29 (67)	12 (80)	0.283
Mitral valve surgery	55 (95)	41 (95)	14 (93)	0.600
Tricuspid valve surgery	46 (79)	34 (79)	12 (80)	0.627
Preferred technique of evacuation of a subacute (>48 hours postoperatively) cardiac tamponade:				
Pericardiocentesis	78 (83)	34 (71)	44 (96)	**<0.05**
Surgical	16 (17)	14 (29)	2 (4)	
Preferred additional imaging in case of insufficient TTE quality of a non-ventilated patient with suspected tamponade:				
CT scan	40 (43)	22 (46)	18 (39)	0.511
TEE	34 (36)	14 (29)	20 (44)	0.149
MRI	1 (1)	0 (0)	1 (2)	0.304
None, imaging with TTE and clinical suspicion is sufficient	19 (20)	12 (25)	7 (15)	0.238
Preferred additional imaging in case of insufficient TTE quality of a ventilated patient with suspected tamponade:				
CT scan	4 (4)	2 (4)	2 (4)	0.965
TEE	83 (88)	44 (92)	39 (85)	0.299
None, imaging with TTE and clinical suspicion is sufficient	7 (7)	2 (4)	5 (11)	0.216

Results of the questions regarding personal preferences on postoperative routine imaging, the technique of evacuation and additional imaging.
*P value adjusted with Bonferroni correction when more than two categories were analysed. Bold values indicate statistical significance.
†This analysis excludes participants choosing routine imaging after all surgery or no routine imaging.
CABG, coronary artery bypass graft; TEE, transoesophageal echocardiography; TTE, transthoracic echocardiography.

15/16=94%) and 12 non-surgical centres (response rate 12/15=80%). The maximum number of respondents was 10, with a median of 5 and an IQR of 4 (Q_3=5, Q_1=1).

Regarding preferences for postoperative TTE investigation, 44% of the cardiologists and 4% of the cardiothoracic surgeons (24% of all respondents) preferred routine examination after all cardiac surgery. The majority of respondents (62%) preferred routine TTE only after a specific type of surgery, especially mitral (95%), tricuspid (79%), aortic valve (71%) and aortic surgery (55%). Routine TTE was not favoured after coronary artery bypass grafting (CABG). Fourteen clinicians (15%), mostly comprised of cardiologists (n=11), deemed any routine postoperative TTE redundant.

In the setting of a non-ventilated patient with clinically suspected cardiac tamponade with inconclusive TTE, most respondents preferred additional imaging by CT (43%) or transoesophageal echocardiography (TEE) (36%). In contrast, for a ventilated patient, most clinicians preferred additional TEE (88%) while only 4% favoured CT. No significant differences were found regarding preferred additional imaging between cardiothoracic surgeons and cardiologists. Regarding the evacuation of a subacute (>48 hours postoperatively) tamponade, 83% of the clinicians preferred pericardiocentesis over surgical evacuation. However, significantly more cardiologists favoured pericardiocentesis than cardiothoracic surgeons (96% vs 71%, p=0.001).

Mean evacuation rate of all respondents in all four scenarios combined (12 decisions per respondent) was 44% (figure 1). Cardiologists had a mean evacuation rate of 37% and cardiothoracic surgeons of 51% (p<0.001). Mean evacuation rates of scenarios 1–4 were, respectively, 15% (95% CI: 11% to 18%), 40% (35% to 45%), 52%

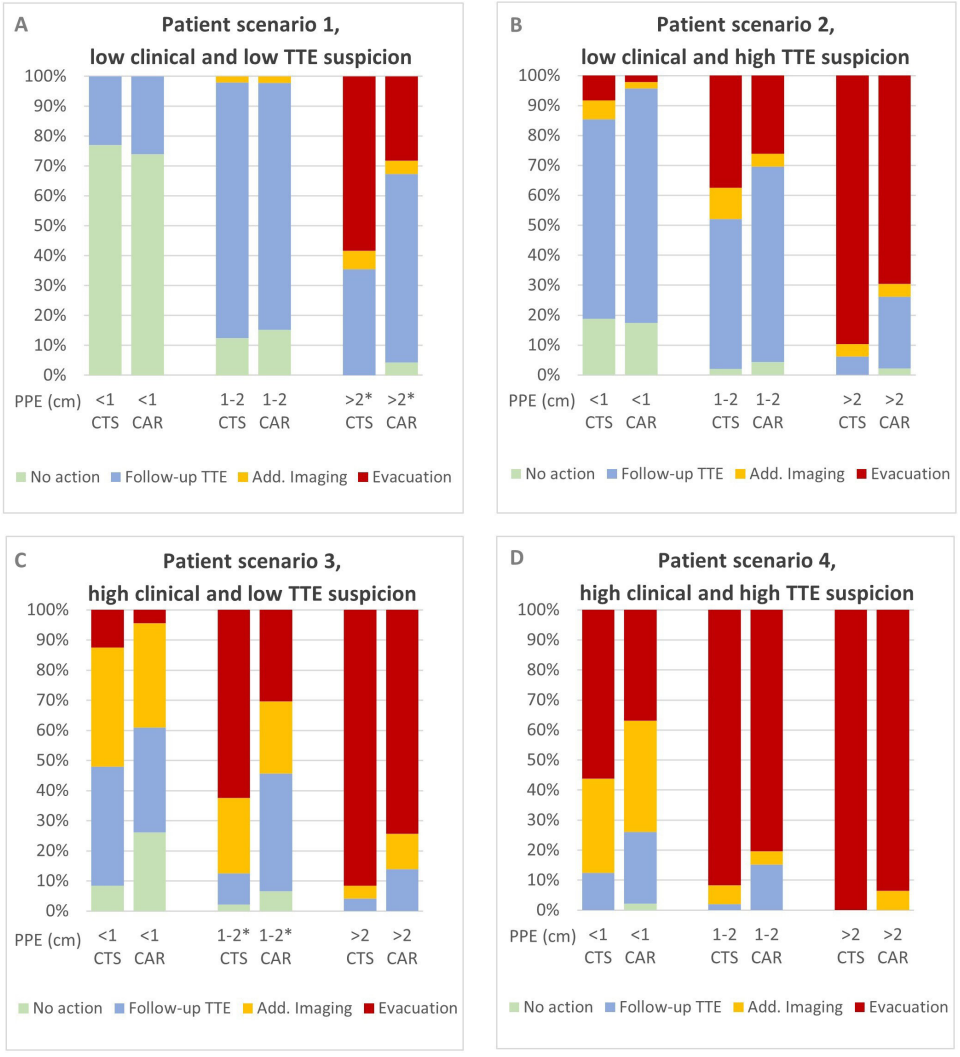

Figure 1 Responses on patient scenarios. Responses on the patient scenarios presented by bar charts. Each scenario (A–D) has a different combination of high/low clinical and echocardiographic risk for cardiac tamponade, together with three echocardiographic sizes of pericardial effusion (<1, 1–2, >2 cm). CAR, cardiologist; CTS, cardiothoracic surgeon; PPE, postoperative pericardial effusion; TTE, transthoracic echocardiography. *p<0.05.

(37% to 68%) and 77% (71% to 82%) (p<0.001). When presented a low clinical and echocardiographic suspicion of tamponade (scenario 1, figure 1A), no respondents chose evacuation with PPE<2 cm. However, even with low clinical and echocardiographic suspicion, PPE>2 cm led most cardiothoracic surgeons (58%) choose for evacuation, significantly more than the cardiologists (28%, p=0.003). With both high clinical and echocardiographic suspicion (scenario 4, figure 1D), 94%–100% of the respondents preferred evacuation with PPE>2 cm and 80%–92% for 1–2 cm.

For the scenarios with either a high clinical or high echocardiographic suspicion (scenario 2–3, figure 1B,C), most respondents advocated evacuation with PPE>2 cm (scenario 2: 70%–90%, scenario 3: 70%–92%). However, in the same scenarios with PPE<2 cm, significantly more clinicians opted for either evacuation or immediate additional imaging with a high clinical suspicion, compared with high echocardiographic suspicion (59% vs 24%, p<0.001). Conversely, more clinicians adhered to follow-up with TTE with high echocardiographic suspicion, as opposed to high clinical suspicion (65% vs 31%, p<0.001).

Regarding variation in treatment preferences between specialties, overall trend throughout all presented scenarios combined was that the cardiothoracic surgeons were more inclined to evacuate PPE compared with cardiologists (total evacuation rate 51% vs 37%, p<0.001). Furthermore, substantial differences were observed between cardiologists employed in cardiothoracic surgery centres compared with those in non-surgical centres (table 2). Especially with PPE>2 cm and low clinical suspicion for tamponade, significantly higher evacuation rates were observed by cardiologists from surgical centres (scenario 1: 52% vs 8%, p<0.05; scenario 2: 85% vs 56%, p<0.05).

The mean evacuation rate per centre differed from 8% to 75% and was 13% to 58% for centres with >2

Table 2 Scenario (>2 cm PPE) responses of cardiologists, surgical and non-surgical centres divided

Scenario	All cardiologists n=46								Adj P value
	Non-surgical centres n=25 (%)				Surgical centres n=21 (%)				
	N	FU	AI	E	N	FU	AI	E	
1 Low clinical, low TTE suspicion									
>2 cm PPE	1 (4)	20 (80)*	2 (8)	2 (8)*	1 (5)	9 (43)*	0	11 (52)*	**0.007**
2 Low clinical, high TTE suspicion									
>2 cm PPE	0	10 (40)*	1 (4)	14(56)*	1 (5)	1 (5)*	1 (5)	18 (85)*	**0.035**
3 High clinical, low TTE suspicion									
>2 cm PPE	0	5 (20)	5 (20)	15 (60)	0	1 (5)	3 (14)	17 (81)	0.227
4 High clinical, high TTE suspicion									
>2 cm PPE	0	0	2 (8)	23 (92)	0	0	1 (5)	20 (95)	1

χ^2 analysis of differences in patient scenario choices between cardiologists from non-surgical and surgical centres.
*p<0.05 with χ^2 analysis and adjusted with post hoc Bonferroni correction. Bold values indicate statistical significance.
AI, immediate additional imaging; E, evacuation; FU, follow up with echocardiography; N, no action; PPE, postoperative effusion; TTE, transthoracic echocardiography.

respondents (figure 2). The mean evacuation rate for all centres combined was 44%. From the centres with >2 respondents, one (non-surgical) centre deviated greatly from the combined mean, by 31%. Other centres deviated 0–14% from the mean.

There was varying agreement of scenario decisions between clinicians within the same centre, as shown by the outcome of the multi-rater kappa analysis (figure 3). Inter-rater agreement of clinicians from the three most responding centres (n=10, 9, 7) ranged from 56% to 67%, corresponding with near-poor (κ=0.41) to good agreement (κ=0.56). Agreement of only the cardiothoracic surgeons (n=3–7) from centre 1–3 was 60%–76%, showing a near-poor (κ=0.46) to near-excellent (κ=0.69) agreement. Analysis of the cardiologists (n=3) resulted in an agreement of 42%–75%, corresponding with very poor (κ=0.22) to near-excellent (κ=0.67) inter-rater agreement.

DISCUSSION

In our nationwide survey evaluating practice patterns on PPE after cardiac surgery, we found significant variations between cardiologists and cardiothoracic surgeons, as well as diversity within the same centre. Our results showed that cardiothoracic surgeons were significantly more inclined to evacuate PPE than cardiologists. Likewise, higher preference was observed towards evacuation by cardiologists employed at surgical centres than colleagues in non-surgical centres. Additionally, we identified widely varying treatment preferences between clinicians within a single centre, indicated by poor inter-rater agreement.

To our knowledge, our study is the first to evaluate preferences and possible practice variation in PPE management after cardiac surgery. Optimal clinical practice is an ongoing debate as previous studies have shown not

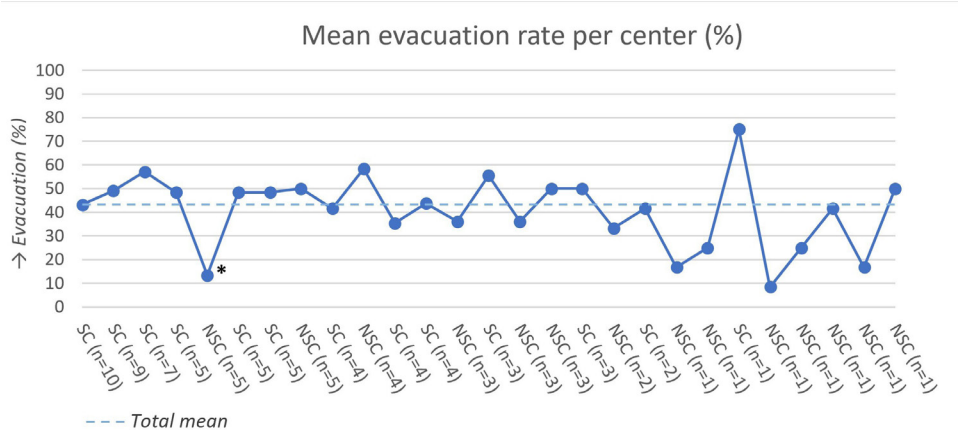

Figure 2 Mean PPE evacuation rate per centre. Mean evacuation rate (%) per centre. The dotted line depicts the mean evacuation rate of all centres combined (44%). *Centre (with >2 respondents) with greatest deviation from the mean (31%). NSC, non-surgical centre; PPE, postoperative effusion; SC, surgical centre.

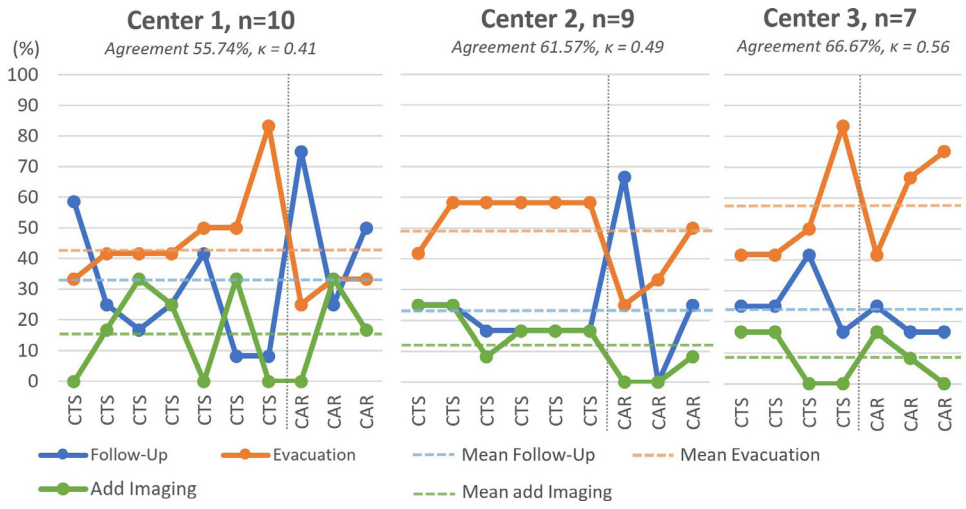

Figure 3 Scenario decision percentages and agreement in the three most responding centres. Follow-up, additional imaging and evacuation rates chosen in the patient scenarios in the most responding centres. Clinicians are categorised per centre and specialist type. The grey dotted lines display the transition from surgeon to cardiologist. The coloured dotted lines depict the mean decision rates per centre. CAR, cardiologist; CTS, cardiothoracic surgeon; k, free-marginal kappa.

all PPE progress to cardiac tamponade and subsequently need evacuation.[1 7] PPE can be present asymptomatically with natural resolution, of which routine imaging would lead to overdiagnosis and possible unnecessary interventions.[2 9] We found that most clinicians, especially cardiothoracic surgeons, would perform routine postoperative echocardiography after most non-CABG surgery. This finding is consistent with multiple studies documenting non-CABG surgery (ie, valvular and aortic surgery) as risk factor for postoperative cardiac tamponade development, as well as prolonged cardiopulmonary bypass and postoperative anticoagulant use.[3 9 16] These risk factors can be used for selecting patients appropriate for routine postoperative imaging, without causing overdiagnosis or overlooking relevant pericardial effusion.

When echocardiographic analysis of PPE remains inconclusive, additional imaging by CT or TEE can be useful, especially with high clinical suspicion for tamponade.[17] We found a clear preference for TEE in ventilated patients, while both CT and TEE were equally favoured in case of non-ventilated patients. Kamada *et al*[18] performed a retrospective analysis evaluating the efficacy of routine postoperative CT and echocardiography in assessing patients expressing symptoms of delayed (>72 hours) cardiac tamponade. With a 20 mm effusion cut-off, they found 96% specificity for ruling out a delayed tamponade with CT compared with 66% specificity with TTE. Similar results were found by Ay and Kahraman Ay,[19] who reported superior diagnostic and predictive values of CT over TTE, along with improved effusion localisation. However, other studies mentioned its overestimation of the actual PPE size compared with TTE, next to the downsides of radiation exposure and risk of contrast nephropathy in case of renal impairment.[20 21] TEE has also shown its added value in clinical assessment of PPE, especially in cases of (posteriorly) localised effusion. However, it has the disadvantage of being more invasive than conventional TTE or CT.[22] The differences in diagnostic strength of CT and TEE to examine relevant PPE when TTE yields inconclusive results are unclear and remain to be clarified in future studies.

Besides cardiothoracic surgeons favouring evacuation of PPE in all scenarios, cardiologists employed at surgical centres likewise preferred to evacuate PPE compared with their colleagues at non-surgical sites. These observed differences could be explained by the unequal clinical exposure to surgical patients, as by the dissimilar experience with subacute postoperative complications on the ward. Additionally, being employed at a surgical centre facilitates accessible collaboration with surgical colleagues, also lowering the threshold for (percutaneous) intervention given the direct availability of surgery.

Interestingly, we noted a reasonably high inter-rater variability in the scenario responses among clinicians from the three centres with most respondents. With an inter-rater agreement ranging from near-poor to good, we highlight that PPE management can be dependent on the clinician on duty, leading to unwarranted variation in care. Separated examination of either the group of cardiothoracic surgeons or cardiologists led to an increase to 77% agreement in some centres, portraying increased unanimous decision making. However, the same analysis resulted in an agreement drop to 42% in other centres. This substantial divergence could be well explained by the lack of general recommendations and guidelines on this subject.

If the decision is made to drain PPE, it can be done either percutaneously or surgically. In our study, a significant majority (83%) favoured drainage by pericardiocentesis in case of subacute (>48 hours postoperatively) cardiac tamponade. Recent studies have shown that surgical evacuation is associated with an increased odds of periprocedural complications and haemodynamic

instability.[13 14] However, the same researchers also observed no significant differences in terms of mortality between the two approaches. Recurrent PPE was, on the contrary, significantly more common after pericardiocentesis (24%–29%) compared with surgical evacuation (3%–10%).[13 14] Our observation of percutaneous drainage being generally preferred underlines its benefits of being the least invasive option for PPE evacuation. Nonetheless, percutaneous drainage can be challenging for small effusions, effusions that are localised or otherwise difficult to approach.[23] In these cases, surgical approach through subxiphoid incision, sternotomy or thoracotomy may pose favourable alternatives. A relatively novel approach is via pericardial window thoracoscopy. Latest studies showed promising results without complications and improved accessibility, in particular of (loculated) PPE which is unfavourable to approach percutaneously.[24 25] Despite studied patient populations were small and no statistical comparisons were made with conventional approaches, novel techniques may provide viable substitutes with beneficial outcomes and should therefore be analysed more extensively through prospective randomised studies.

Outcome of the patient scenarios revealed that a high clinical suspicion of cardiac tamponade resulted in a more pronounced increase of additional imaging or evacuation when compared with high echocardiographic suspicion. This highlights that most clinicians value clinical context over echocardiographic aspects. However, initially asymptomatic PPE can still progress into cardiac tamponade with relatively little symptoms.[1 9] Current hypothesis is that a slow, continuous buildup of effusion results in less stretch of the pericardium and consequently less symptoms and complications, while an immediate fluid collection causes acute symptoms.[26] This was also illustrated by Ashikhmina and colleagues[9] who noted small PPE in 43% (n=140) of their patients after 1 postoperative week, but with progression to moderate-large PPE 2 weeks later in more than half of the patients. They reported that from the patients initially discharged with clinically insignificant small or moderate-sized PPE, 52% was readmitted (averagely on postoperative day 16) to the hospital requiring pericardial drainage. Another study observed that 31% of cases with cardiac tamponade were diagnosed during readmission, possibly already having possessed small or moderate PPE on initial discharge.[6] This demonstrates the difficulty of predicting in what stage of effusion accumulation a patient resides and whether discharge, follow-up or evacuation is the correct decision.

The main limitation of our study is the limited number of responses on the questionnaire and the varying response rate per centre, making it more difficult to perform a comprehensive analysis of potential differences between centres. Also, this study is automatically subjected to a certain amount of response bias due to the survey design. Additionally, the digital depiction of scenarios inhibited respondents to interpret the cases with their clinical context to the extent that would be possible in real-life clinic. However, by making the cases more concise and universal, we were able to make an equivalent comparison of the decisions, as well as simulating the cases with different sizes of effusion and levels of suspicion. As such, we are the first to illustrate heterogeneity in decision making on this matter between cardiologists and cardiothoracic surgeons, and cardiologists from surgical and non-surgical centres. Likewise, this is the first time the varying agreement between clinicians in centres are brought to light.

To conclude, our questionnaire survey has documented significant variations between interventional cardiologists and cardiothoracic surgeons regarding diagnostic and therapeutic preferences in PPE management after cardiac surgery. Additionally, there was notable variation in preferences between clinicians from the same centre. These observed differences, between specialties overall but also between specialists within a single centre, could lead to unwarranted variation in care. Future research should focus on identification of risk factors and diagnostic red flags for significant PPE development. Doing so will provide improved risk stratification and a better estimation of intervention necessity, thereby decreasing the risk of cardiac tamponade development and preventing overtreatment of PPE. Also, prospective randomised trials are warranted to assess the influence of anti-thrombotic regimens, as well as the risk–benefit ratio of pericardial drainage in different clinical scenarios.

Acknowledgements We would like to thank the European Society of Cardiology (ESC) for having granted the opportunity to present this study at their 2022 ESC congress in Barcelona.

Contributors SvD wrote the original draft of the manuscript and led the study conceptualisation and design of the methodology, data acquisition, analysis and curation of the study. WL had an equal role in conceptualisation and methodology of the study and led to the revision and editing of the manuscript. WL and AV played a lead role in supervision and project administration of the study. LW and H-JD had an equal role in conceptualisation and methodology of the study and had a supporting role in data interpretation, supervision and revision and editing of the manuscript. LR also revised the writing of the manuscript and provided biostatistical expertise to interpret and validate statistical analyses and validation of the study. NvR and AV provided expert clinical perspective on the methodology and design of the study and critically revised the data interpretation and writing of the manuscript. AV acts as the guarantor for this study. All authors have given final approval for the version to be published.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests NvR has received multiple research grants (from Abbott, Medtronic, Philips, Biotronik) and speaker fees (Abbott, Bayer, MicroPort, RainMed) in the past 36 months.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants but was not approved by the Ethics Committee(s) or Institutional Board(s). All participants were informed prior to survey participation that their answers were (anonymously) stored in an online database, analysed and used for academical purpose. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. All data relevant to the study are included in the article or uploaded as supplementary information.

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