

# Awareness, access, and adoption of natriuretic peptides for diagnosis of heart failure

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## Abstract

**Aims** This survey investigates natriuretic peptide (NP) testing in community and hospital settings, assessing awareness, accessibility, and utilization.

**Methods and results** This investigator-initiated survey, conceived within the HFA of the European Society of Cardiology, comprised 14 questions. It underwent validation and pilot testing to ensure question readability and online system functionality. The survey was accessible for 87 days, from 5 April 2023 to 1 July 2023 via a web platform. There were 751 healthcare professionals across 99 countries who responded. Of them, 92.5% had access to NPs testing in hospital whereas 34.3% had no access to NTproBNP in community settings. Access to point of care NP testing was uncommon (9.6%). Public insurance fully covered NPs testing in 31.0% of cases, with private insurance providing coverage in 37.9%. The majority (84.0%) of participants believed that the medical evidence supporting NPs testing was strong, and 54.7% considered it cost-effective. Also, 35.8% found access, awareness, and adoption to be in favour of NPs testing both in hospital and community settings. Strategies to optimize NP testing involved regular guideline updates (57.9%), prioritizing NPs testing for dyspnoea assessment (36.4%), and introducing clinician feedback mechanisms (21.2%). Notably, 40% lacked a community-based HF diagnostic pathway for referring high-NP patients for echocardiography and cardiology evaluation.

**Conclusions** This survey reveals NP awareness, access, and adoption across several countries. Highlighting the importance of community-based early heart failure diagnosis and optimizing HF diagnostic pathways remains a crucial, unmet opportunity to improve patient outcomes.

**Keywords** Natriuretic peptides; Primary care; Awareness; Access; Adoption

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[Correction added on 18 September 2024, after first online publication: Carlo Gabriele Tocchetti's family name has been corrected in this version.]

## Introduction

A recent roadmap focusing on enhancing awareness, access, and adoption of natriuretic peptides (NPs) in the community emphasized its significance in improving the management of heart failure patients.<sup>1</sup> While the Heart Failure Association (HFA) Atlas has previously provided valuable information

about the varied use of NPs in European emergency departments, there remains a significant gap in real-life evidence concerning the challenges encountered in both community and hospital settings across different countries.<sup>2</sup>

Addressing this gap, the HFA of the European Society of Cardiology has taken the initiative to conduct a survey. This survey aims to gain comprehensive insights into the current

levels of awareness, accessibility, and utilization of NPs in both community and hospital environments. By gaining a better understanding of these aspects, the HFA seeks to facilitate the effective implementation of NPs in clinical practice, ultimately leading to improved management of heart failure patients.

## Methods

This survey was an investigator-initiated survey designed within the HFA of the European Society of Cardiology. The survey was designed in English and was optimized and refined with input from multiple HFA and ESC members with long-lasting experience in survey design.

The survey material comprised of 14 individual questions is available in *Supporting information, Data S1*. To ensure its effectiveness, the survey underwent validation and pilot testing to assess both the readability of the questions and the functionality of the online system. The survey was published on the SurveyMonkey platform and shared via email with the HFA mailing list. Additionally, the survey link was posted on various social networks. It was available for participation over 87 days (from 5 April 2023 to 1 July 2023) on the web platform. Throughout this period, successive invitations were sent out to all networks to encourage participation. No personal information was collected during the process.

Basic descriptive statistics for all items [counts and percentages for categorical variables; median (interquartile range) (IQR) for numerical variables] are reported.

## Results

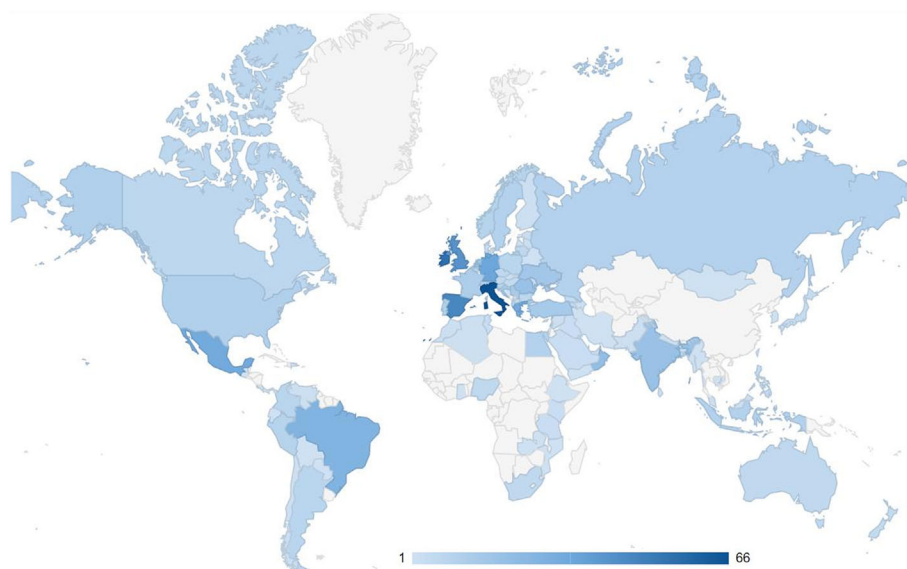
The survey was completed by 751 respondents from 99 countries with a median number of answers per country of 4 (IQR: 2–9) (*Figure 1*). Of the respondents, 66% were from Europe, 13% Latin America, 10% Middle East, and 9% Africa and Middle East. Most were cardiologists (82%) and 9% from family medicine. *Data S2* shows all the responses to the survey.

Of the participants, 93.3% ( $n = 701$ ) answered all the questions. Information about respondents is described in *Table 1*. At the hospital level, NPs were accessible in 92.5% of cases, and 61% acknowledged their cost-effectiveness for diagnosing and ruling out heart failure in the hospital setting. More than one third of the participants, in 79 (80%) different countries, stated that they have no access to NPs testing in the community ( $n = 257$ , 34.3%). Only 9.6% ( $n = 72$ ) of participants have access to point-of-care NPs testing in the community. Reimbursement of NPs testing in the community setting is fully covered by public insurance in 31.0% ( $n = 233$ ) of cases, and private insurance can provide additional coverage in 37.9% ( $n = 285$ ) of cases. In 31.0% ( $n = 233$ ) of cases, there is no public nor private coverage of NPs testing in the community setting.

Participants were requested to evaluate their training regarding NPs testing. The majority of respondents (69.8%,  $n = 522$ ) expressed confidence in their level of training for NPs testing in both hospital and community settings. However, 24.5% ( $n = 183$ ) believed they were trained only for NPs use in the hospital, and 5.7% ( $n = 43$ ) felt untrained for both hospital and community settings.

Participants were asked to assess the evidence supporting NPs testing in the community: 84.0% ( $n = 629$ ) of the partic-

**Figure 1** Country distribution of survey participants.



**Table 1** Characteristics of respondents

	N (%)
Location	747 (100)
Europe	490 (65.6)
Africa and Middle East	73 (9.8)
Asia Pacific	68 (9.1)
North America	18 (2.4)
Central and Latin America	98 (13.1)
Medical specialty	751 (100)
Cardiology	619 (82.4)
Internal medicine	8 (1.1)
Emergency medicine	26 (3.5)
Family medicine	70 (9.3)
Other	28 (3.7)
Practice settings	747 (100)
In the hospital only	441 (59.0)
In the community only	114 (15.3)
In both	192 (25.7)
A structured heart failure pathway is available from the community setting	443 (59.4%)

ipants deemed the level of medical evidence as strong. Furthermore, a majority of participants ( $n = 410$ , 54.7%) consider NPs testing in the community setting to be cost-effective (see *Table 2*). For a more comprehensive understanding of the benefits of NPs testing, refer to *Figure 2*, which provides a detailed description.

Participants declared that access, awareness, and adoption were all aligned to support NPs testing in the community setting in 35.8% ( $n = 269$ ). The detailed cascade analysis is displayed in *Figure 3*. When questioned about how to optimize NPs testing for ruling-in/ruling-out heart failure (HF) in the community, participants highlighted several key strategies. The most prevalent suggestion, mentioned by 57.9% ( $n = 435$ ) of respondents, was the provision of regular information on guidelines and best practices. Additionally, 36.4% ( $n = 273$ ) of participants advocated for NPs testing to be the default choice when evaluating dyspnoea patients. Further recommendations included proposing NPs testing in conjunction with ordering or scheduling an echocardiography, as suggested by 29.6% ( $n = 222$ ) of participants. Additionally, 21.2% ( $n = 159$ ) of respondents proposed implementing regular audits or feedback by groups of clinicians. Lastly, incentivizing clinicians to adhere to NPs testing guidelines was mentioned by 16.8% ( $n = 126$ ) of participants as a potential strategy to optimize its usage in the community.

Notably, 40% of survey participants worked in settings where there was no established HF diagnostic pathway from the community setting to secondary care.

## Discussion

The importance of NPs in diagnosing HF is highlighted by international guidelines and the universal definition.<sup>3–5</sup> Never-

**Table 2** Respondents' grading of the level of evidence supporting natriuretic peptides testing for ruling in or ruling out heart failure in the community

	N (%)
Medical evidence	749 (100)
Evidence is strong	629 (84.0)
Evidence is neutral	67 (8.9)
Evidence is weak	45 (6.0)
There is no evidence	8 (1.1)
Cost effectiveness	749 (100)
NPs are cost-effective	410 (54.7)
NPs are neutral in terms of cost-effectiveness	72 (9.6)
NPs are not cost-effective	55 (7.3)
There is no evidence	43 (5.2)
Do not know	169 (22.6)

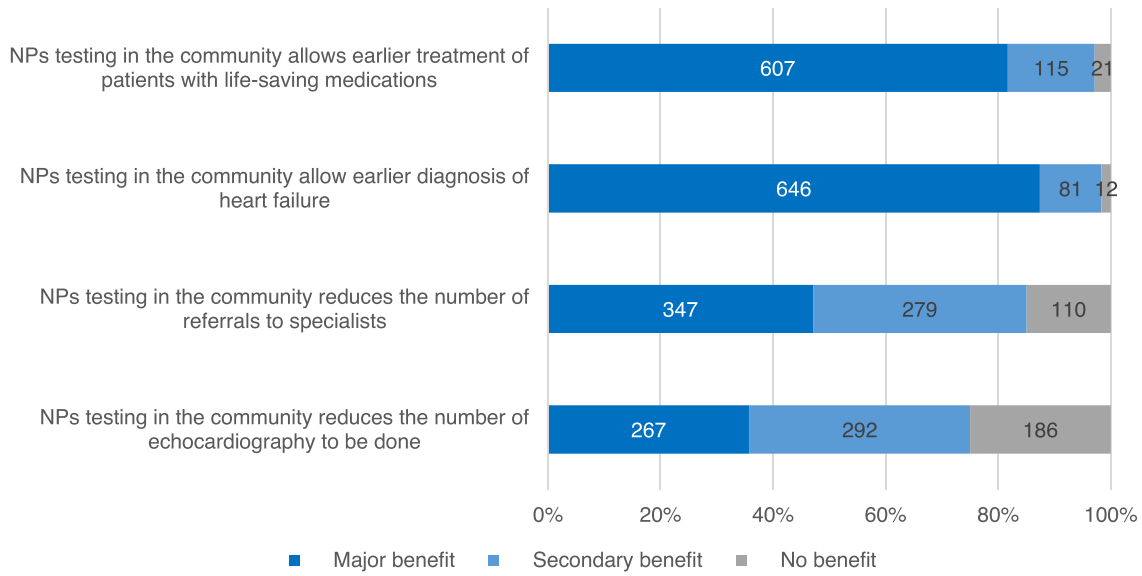
theless, their use in both hospital and community settings may be inadequate, likely due to a combination of factors.<sup>1</sup> To address this matter, the HFA of the European Society of Cardiology has conducted this survey, just 2 years after publishing the 2021 ESC guidelines on HF.<sup>3</sup> The primary objective of the survey was to assess the level of knowledge, accessibility, and adoption of NPs in both community and hospital settings. The response to the survey was remarkable, with over 751 active contributors representing 99 countries, who participated in the process over a span of 87 days. This widespread engagement underscores the importance of the topic and demonstrates a keen interest in exploring the utilization of NPs for diagnosing HF in real-world clinical practice.

Regarding awareness, approximately two-thirds of respondents expressed confidence in their level of training for NP in both hospital and community settings while 25% indicated that they were trained only for NPs use in the hospital. These findings are not surprising given the extensive evidence on the use of NPs in hospital emergency departments for over two decades. For BNP, a recommended single cut-point of 100 pg/mL exists whereas for NT-proBNP, age-adjusted cut-points have shown improved diagnostic accuracy: 450 pg/mL for patients <50 years, 900 pg/mL for those between 50–75 years, and 1800 pg/mL for patients over 75 years.<sup>6</sup>

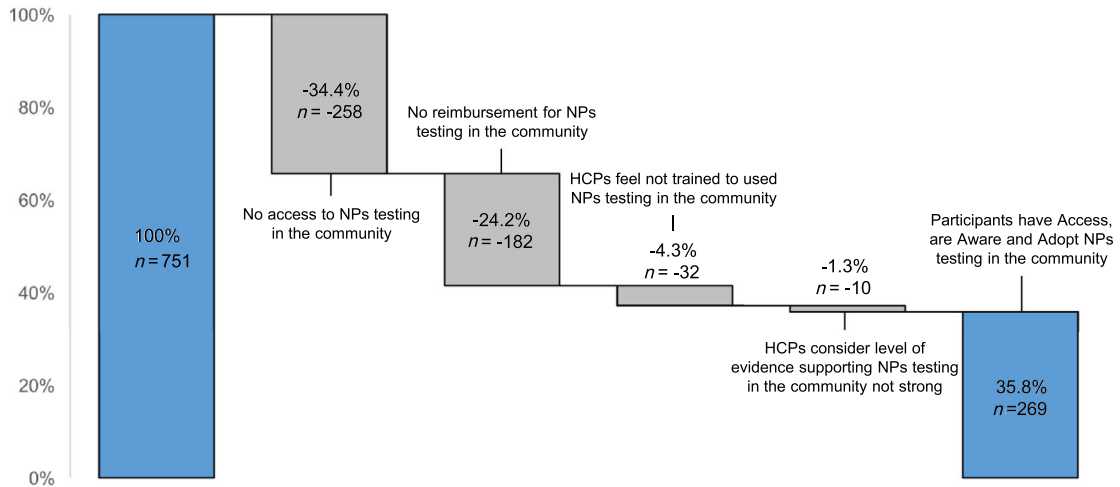
At the community level, there is less robust evidence on cut-points, and most guidelines suggest a cut-point of 35 pg/mL for BNP and 125 pg/mL for NT-proBNP.<sup>3,4</sup> It should be noted that both BNP and NT-proBNP can be influenced by comorbidities, which adds complexity to their interpretation, especially in the presence of renal insufficiency, obesity, and advanced age.<sup>6</sup> To address these challenges, a recent consensus document from the Heart Failure Association (HFA) provides dedicated algorithms for the optimal use of NT-proBNP, both in the emergency department and in the community.<sup>7</sup>

To increase awareness of NPs in the community, education needs to be provided across multiple specialties, including cardiology, internal medicine, and primary care physicians. Furthermore, implementing a dedicated diagnostic pathway has proven to be effective, allowing clinicians in the commu-

**Figure 2** Detailed description and grading of the benefits of NPs testing in the community setting. NPs, natriuretic peptides.



**Figure 3** Cascade of access, awareness, and adoption of natriuretic peptides testing in the community setting. HCP, healthcare providers; NPs, natriuretic peptides.



nity to refer patients with elevated NPs to a secondary care HF diagnostic service for echocardiography and cardiology review.<sup>1</sup> Surprisingly, our data reveal that 40% of the participants lack such diagnostic pathways in their area. Addressing this issue should be prioritized by the HFA, National HF Societies, and local regulators.

According to the survey, around one-third of the participants lack access to NPs testing in the community setting. To address this issue, it is essential to bolster the diagnostic infrastructure and expand diagnostic capabilities in primary care.<sup>8</sup> Achieving this objective involves providing dedicated

funding and increasing physical capacity for diagnostics, including point-of-care testing. By doing so, clinicians can make faster and more precise diagnoses, even in remote or rural areas, thereby reducing disparities in HF diagnosis and management.<sup>1,8</sup>

Reimbursement policies significantly impact the availability and utilization of NP testing in primary care. Our study revealed that in 31.0% of cases, there is no public or private coverage for such testing. While reimbursement policies exist for guideline-directed medical therapy in HF treatment, they may not comprehensively cover essential diagnostics for

early HF diagnosis in primary care across all countries. Countries and regions that fully reimburse NP testing offer primary care physicians easy access to this diagnostic tool.<sup>9,10</sup> Consequently, earlier detection and treatment of HF become possible, resulting in improved patient outcomes and potential long-term reductions in healthcare costs. To motivate primary care physicians to dedicate sufficient time and resources to the HF diagnostic process, healthcare systems should establish policies aligned with this objective.

It appears that the adoption of NP testing is not a major concern, as a significant majority of the participants (84.0%) believe in the strong medical evidence supporting its use in the community. Additionally, over half of the respondents find NPs testing in the community setting to be cost-effective. When asked about potential solutions to improve NP testing adoption, the participants offered valuable suggestions. Of the respondents, 57.9% emphasized the importance of regularly providing information on guidelines and best practices. This continuous education can help healthcare professionals stay updated and confident in using NPs testing as part of their diagnostic approach. Approximately 36.4% of participants advocated for making NPs testing the default choice when evaluating patients with dyspnoea. By doing so, NPs testing can become a standard and routine part of the diagnostic process, leading to more consistent use.<sup>11</sup> Around 21.2% of the participants proposed implementing regular audits or feedback by groups of clinicians. These audits can serve as a monitoring mechanism to ensure appropriate and effective utilization of NPs testing while identifying areas for improvement. Furthermore, 16.8% of the participants mentioned providing incentives to adhere to NPs testing guidelines. Overall, these suggestions highlight the potential for further integrating NPs testing into routine clinical practice, leading to improved diagnostic accuracy and better management of HF.

The interpretation of this survey comes with certain limitations. The major limitation is that the survey was an HFA survey, which was likely to have been completed by HF specialists. If it had been sent to general cardiologists or internal medicine or primary care, the results would have been very different. Another limitation is that respondents are mostly from Europe. Another potential limitation could arise from participants who accessed information about the survey through social networks.

## References

1. Bayes-Genis A, Rosano G. Unlocking the potential of natriuretic peptide testing in primary care: a roadmap for early heart failure diagnosis. *Eur J Heart Fail* 2023; **25**:1181–1184. doi:10.1002/ejhf.2950
2. Seferović PM, Vardas P, Jankowska EA, Maggioni AP, Timmis A, Milinković I, et al. National Heart Failure Societies of the ESC member countries (see appendix). The heart failure association atlas: heart failure epidemiology and management statistics 2019. *Eur J Heart Fail* 2021; **23**:906–914. doi:10.1002/ejhf.2143
3. McDonagh TA, Metra M, Adamo M, Gardner RS, Baumbach A, Böhm M,

## Conclusions

This survey offers a current perspective on the global (99 countries) awareness, access, and adoption of NPs. Significant efforts have been made in recent years to prioritize the central role of NPs in healthcare. The focus has primarily been on emergency departments, where NPs testing has proven valuable in diagnosing patients with acute dyspnoea. Now, it is the right time to shift our focus towards improving the situation at the community level.<sup>12</sup> By doing so, we can achieve earlier and more accurate diagnoses of HF, ultimately leading to an improved quality of life for our patients. Building on the existing evidence and ensuring better access and adoption of NPs will play a vital role in achieving this goal and making a positive impact on HF management.<sup>1</sup>

## Conflict of interest

A. B. -G. reports personal fees or advisory boards from Abbott, AstraZeneca, Boehringer Ingelheim, Bayer, Novartis, Novo Nordisk, Roche Diagnostics, and Vifor Pharma.

G. S. reports grants and personal fees from Vifor, grants and personal fees from Boehringer Ingelheim, grants and personal fees from AstraZeneca, personal fees from Servier, grants and personal fees from Novartis, grants and personal fees from Cytokinetics, personal fees from Medtronic, grants from Boston Scientific, grants and personal fees from Pharmacosmos, grants from Merck, grants from Bayer, personal fees from TEVA, and personal fees from INTAS, outside the submitted work.

B. M. reports speaker or advisory fees from AstraZeneca, Bayer, Boehringer Ingelheim, Eli Lilly, Vifor Pharma, Novartis, Servier, and Viartris.

## Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

**Data S1.** Survey details.

**Data S2.** Survey responses.

- et al.* ESC guidelines for the diagnosis and treatment of acute and chronic heart failure: developed by the task force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC). With the special contribution of the Heart Failure Association (HFA) of the ESC. *Eur J Heart Fail* 2021;**24**:4–131. doi:10.1002/ejhf.2333
4. Heidenreich PA, Bozkurt B, Aguilar D, Allen LA, Byun JJ, Colvin MM, *et al.* AHA/ACC/HFSA guideline for the management of heart failure: executive summary: a report of the American College of Cardiology/American Heart Association joint committee on clinical practice guidelines. *J Am Coll Cardiol*. 2022;**79**(17):1757–1780. doi:10.1016/j.jacc.2021.12.012doi:10.1016/j.jacc.2021.12.012  
 Revuelta-López E, Barallat J, Cserkőová A, Gálvez-Montón C, Jaffe AS, Januzzi JL, Bayes-Genis A. Pre-analytical considerations in biomarker research: focus on cardiovascular disease. *Clin Chem Lab Med* 2022;**59**:1747–1760. doi:10.1515/cclm-2021-0377
  5. Bozkurt B, Coats AJS, Tsutsui H, Abdelhamid CM, Adamopoulos S, Albert N, *et al.* Universal definition and classification of heart failure: a report of the Heart Failure Society of America, Heart Failure Association of the European Society of Cardiology, Japanese Heart Failure Society and Writing Committee of the Universal Definition of Heart Failure: Endorsed by the Canadian Heart Failure Society, Heart Failure Association of India, Cardiac Society of Australia and New Zealand, and Chinese Heart Failure Association. *Eur J Heart Fail* 2021;**23**:352–380. doi:10.1002/ejhf.2115
  6. Mueller C, McDonald K, de Boer RA, Maisel A, Cleland JGF, Kozhuharov N, *et al.* Heart Failure Association of the European Society of Cardiology practical guidance on the use of natriuretic peptide concentrations. *Eur J Heart Fail* 2019;**21**:715–731. doi:10.1002/ejhf.1494
  7. Bayes-Genis A, Docherty KF, Petrie MC, Januzzi JL, Mueller C, Andreson L, *et al.* Practical algorithms for early diagnosis of heart failure and heart stress using NT-proBNP: a clinical consensus statement from the Heart Failure Association of the ESC. *Eur J Heart Fail* 2023;**25**:1891–1898. doi:10.1002/ejhf.3036
  8. Fleming KA, Horton S, Wilson ML, Atun R, DeStigter K, Flanigan J, *et al.* The Lancet Commission on diagnostics: transforming access to diagnostics. *Lancet* 2021;**398**:1997–2050. doi:10.1016/S0140-6736(21)00673-5
  9. Arulmuruganathavadiel A, Holt A, Parveen S, Lamberts M, Gislason GH, Torp-Pedersen C, *et al.* Importance of diagnostic setting in determining mortality in patients with new-onset heart failure: temporal trends in Denmark from 1997 to 2017. *Eur Heart J Qual Care Clin Outcomes* 2022;**8**:750–760. doi:10.1093/ehjqcco/qcab073
  10. Heart Failure Policy Network. Heart failure policy and practice in Europe. Accessed 3 August 2023.
  11. Bayes-Genis A, Januzzi JL, Richards AM, Arfsten H, de Boer RA, Emdin M, *et al.* The ‘peptide for life’ initiative: a call for action to provide equal access to the use of natriuretic peptides in the diagnosis of acute heart failure across Europe. *Eur J Heart Fail* 2021 Sep;**23**:1432–1436. doi:10.1002/ejhf.2293
  12. Bayes-Genis A, Coats AJS. ‘Peptide for life’ in primary care: work in progress. *Eur Heart J* 2021;**13**:ehab829. doi:10.1093/eurheartj/ehab829