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RESEARCH

# Joint survey by AIMN, AIOM, AIRO, SIU, SIUrO, and Meet-URO about the use of PSMA PET imaging in prostate cancer in Italy: technical aspects and primary staging setting

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## Abstract

**Background** Prostate-specific membrane antigen PET/CT (PSMA PET/CT) has become a cornerstone in the imaging of prostate cancer (PCa), supported by growing evidence and international guideline endorsements. However, real-world adoption and clinical integration of PSMA PET/CT in Italy remain poorly characterised.

**Methods** A multidisciplinary national cross-sectional survey was developed and distributed between November 4–29, 2024, with endorsement from six major Italian scientific societies. The survey included 93 questions addressing availability, technical aspects, clinical use across disease phases, and professional practices. Separate sections were tailored to clinicians and nuclear medicine physicians.

**Results** A total of 238 validated responses were analysed (169 clinicians, 69 nuclear medicine physicians). Nuclear medicine respondents were affiliated mainly with high-volume centres, while clinicians reported greater variability in institutional access. PSMA PET/CT was perceived as insufficiently available by 58% of clinicians at the institutional level, with 36.1% stating that waiting times led to changes in imaging strategy. [$^{68}$Ga]Ga-PSMA-11 was the preferred tracer among clinicians (57.4%), while nuclear medicine physicians expressed more balanced preferences driven by logistics. Divergent views also emerged regarding the clinical relevance of biodistribution differences. For primary staging, PSMA PET/CT was used by 50% of clinicians for high-risk patients and by 20% for intermediate-risk patients, whereas 87% of nuclear medicine physicians identified PSMA PET/CT as the optimal imaging modality for intermediate-to-high-risk PCa. In cases of discordant imaging findings, multidisciplinary discussion was the preferred strategy for resolution.

**Conclusion** Access to, usage of, and perceptions about PSMA PET/CT differ between clinicians and nuclear medicine physicians, highlighting the need for improved availability and enhanced interdisciplinary coordination.

**Keywords** Prostate-specific membrane antigen · Positron emission tomography · Prostate cancer · Survey · Italy

## Introduction

Prostate cancer (PCa) is one of the most prevalent malignancies among men worldwide [1–3] and represents a significant health burden in Italy [3]. In Italy, prostate cancer incidence has risen by 16% over the past five years, with around 40,500 new cases annually and over 560,000 men currently living with a diagnosis, reflecting both increased detection and improved survival (AIRTUM data [4]). In recent years, prostate-specific membrane antigen positron emission tomography (PSMA PET) imaging has emerged as a transformative diagnostic tool for staging and restaging

Matteo Bauckneht and Laura Evangelista first coauthorship shared.

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PCa, owing to its superior sensitivity and specificity compared to conventional imaging (CI) modalities. The integration of PSMA PET into clinical practice has the potential to significantly influence therapeutic decision-making across the entire disease spectrum, from initial diagnosis to advanced stages.

Although international guidelines have increasingly endorsed the use of PSMA PET imaging [5], regulatory authorities remain largely anchored to CI as the reference standard for staging and for defining endpoints in registration trials. This misalignment fuels ongoing debate over PSMA PET integration and perpetuates interpretative challenges where decisions still rely on CI-derived criteria. Moreover, PSMA PET real-world implementation across clinical settings has not been uniformly assessed in either European or non-European countries [6–8]. In Italy, the extent of PSMA PET utilisation, its integration into multidisciplinary workflows, and its perceived value across different specialities remain largely undocumented.

To address this gap, a national survey was developed and disseminated to all healthcare professionals involved in the management of PCa, aiming to capture a comprehensive snapshot of current practices. The survey was designed to compare the use of PSMA PET imaging with CI techniques across the various phases of the natural history of PCa, including primary staging, detection of biochemical recurrence, and assessment of metastatic disease.

The survey was structured to reflect the perspectives of different professional backgrounds. Two dedicated sections were developed: one targeting clinicians, including urologists, radiation oncologists, and medical oncologists, and another focused on nuclear medicine physicians. This approach was intended to ensure a nuanced and multidisciplinary understanding of PSMA PET use, while accounting for variability in clinical settings, geographic regions, and speciality-specific practices. This joint initiative—endorsed by six major Italian scientific societies—aimed to provide a detailed overview of PSMA PET adoption in Italy, identify areas of divergence or consensus, and support the development of harmonised, evidence-based strategies for optimal patient care.

In this paper, we present and discuss the results of survey questions addressing PSMA PET availability, waiting lists, and technical aspects, as well as the use in the primary staging setting. A separate paper will report the findings related to the remaining survey topics, such as detection of biochemical recurrence and assessment of metastatic disease.

## Materials and methods

### Survey distribution

The survey consisted of 93 questions, including both multiple-choice and open-ended formats. It was prepared using Google Forms (https://forms.gle/ycJTGCgwrSAfNXzq7) and distributed starting on November 4th, 2024, via email newsletters from the Italian Association of Nuclear Medicine (AIMN), the Italian Association of Medical Oncology (AIOM), the Italian Association of Radiotherapy and Clinical Oncology (AIRO), the Italian Society of Urology (SIU), the Italian Society of Uro-Oncology (SIUrO), and the Italian Network for Research in Urologic Oncology (Meet-URO). The invitation included an introductory text to explain the purpose of the survey and encourage participation. Recipients were also asked to share the link within their professional networks. The survey closed on November 29th, 2024. Participation was voluntary and without economic incentives. Each respondent could complete the survey only once. Electronic informed consent was obtained at the start of the survey. All responses were stored in XLS format and transferred to the authors for data analysis.

### Survey structure

The survey included two categories: Section A (for clinicians) and Section B (for nuclear medicine physicians). Each section contained questions addressing general information on the use of PSMA PET, as well as specific subsections focused on different phases of the disease, including primary staging, biochemical recurrence (BCR) and prostate-specific antigen (PSA) persistence, metastatic hormone-sensitive prostate cancer (mHSPC), and metastatic castration-resistant prostate cancer (mCRPC).

A detailed list of the survey questions addressed in this manuscript is available in the Supplementary Materials.

### Data collection and analysis

Overall, 339 independent survey responses were submitted. In cases where multiple responses were received from the same site and professional role, only one entry was retained, selecting the response from the professional with the longest clinical experience. Based on this criterion, 238 completed surveys were analysed.

### Reporting results and discussion

We report average values of numeric entries per category and present key results in a graphical format. Entries that

permitted free-text were summarised in categories highlighting key phrases.

The discussion of the results was conducted through a structured, multidisciplinary process endorsed by the scientific societies AIMN, AIOM, AIRO, SIU, SIUrO, and Meet-URO. These societies nominated expert representatives to participate in dedicated working groups to interpret the collected data. The analysis was organised into four thematic working groups, each focusing on a specific topic: (i) Technical Aspects; (ii) Primary Staging; (iii) BCR, PSA Persistence, and mHSPC; and (iv) mCRPC.

Each group included experts from various disciplines—nuclear medicine, oncology, urology, and radiation oncology—to ensure a comprehensive clinical and technical perspective. The discussions were based on slide decks summarising the survey results, pre-organised by theme and shared with participants ahead of the meetings. Group coordinators were responsible for convening online meetings and guiding the discussions.

The insights gathered from these discussions informed the initial draft of the manuscript's discussion section. This draft circulated among panellists for internal review and was then submitted to the endorsing societies for further feedback. Details of the composition of the two working groups focused on the topics presented in this manuscript are provided in the Supplementary Materials.

The present manuscript reports and discusses the results related to technical aspects and the primary staging setting, which represent the first two thematic areas of the questionnaire. The findings from the remaining sections—BCR, PSA persistence, mHSPC, and mCRPC—will be presented in a separate manuscript.

## Results

### General data about survey responders

Survey respondents included 69 nuclear medicine physicians (29%) and 169 clinicians (71%). Respondents were affiliated with research institutions or universities (41%), public hospitals (48%), and private hospitals (11%). In terms of professional experience (across all respondents), 44.4% had more than 15 years of experience, 31.1% had 5–15 years, 13.7% had less than 5 years, and 10.8% were fellows. A map showing regional survey participation across Italy is provided in Supplementary Fig. 1.

Among clinicians, there was a relatively balanced distribution across urologists (21.6%), radiation oncologists (34%), and medical oncologists (44.4%).

We also examined the facilities available within the nuclear medicine departments affiliated with the participating nuclear medicine physicians. Single-photon imaging, PET imaging, on-site cyclotron, on-site germanium/gallium generator, and radioligand therapy (RLT) services were available in 64 (92.8%), 68 (98.6%), 25 (36.2%), 41 (59.4%), and 48 (69.6%) cases, respectively. Regarding PET scanner availability, 42 respondents (60.9%) reported access to one scanner, 23 (33.3%) to two scanners, and 2 (2.9%) to more than three. Only two respondents (2.9%) indicated that their institution did not have a PET scanner. The median number of PET examinations (using any tracer) performed per day at sites with at least one PET scanner was 15. Interestingly, 48 nuclear medicine physicians (70%) reported being core members of the genitourinary tumour multidisciplinary team (GU-MDT), 7 (10%) reported being not involved in the core team, but always present at meetings, while 9 (13%) indicated that they participated upon request (Fig. 1). Most nuclear medicine physician respondents (54.1%) reported having interpreted more than 300 PSMA PET scans—a validated threshold for PSMA PET expertise [9, 10]. In comparison, 30.6% reported having read 30–300 PSMA PET scans, while 15.3% had read fewer than 30. Additionally, 49% of respondents stated that they use a standardised reporting method in clinical practice, with the most used being E-PSMA [11]. These findings suggest that nuclear medicine physicians who responded to the survey were more likely to be affiliated with high-volume nuclear medicine centres.

### Perceived availability of PSMA PET in Italy

From the clinicians' perspective, PSMA PET is still not widely available in Italy (Fig. 2). Specifically, 58% of respondents reported that their institution provides an insufficient number of PSMA PET scans for patients, while 44.8% indicated the same at the regional level. In 48.1% of cases, the waiting time for a PSMA PET scan was perceived as longer than one month. By contrast, the maximum tolerable waiting time for a PSMA PET/CT scan was reported as four weeks (median value among replies). Notably, 36.1% of clinicians stated that the waiting time was long enough to prompt a change in imaging strategy, for example, switching from PSMA PET to choline PET or CI. Of note, significant heterogeneity was observed when a region-based analysis was conducted. In particular, disparities in access were evident, with longer waiting times generally reported in the Italian southern areas (Supplementary Fig. 2).

Waiting times were perceived as slightly more favourable by the nuclear medicine physician respondents. Specifically, 32.7% reported an average waiting time of one month, 37.8% reported a waiting time of more than one month, and only 29.6% indicated a waiting time of weeks or days. From the nuclear medicine physicians' perspective, the most

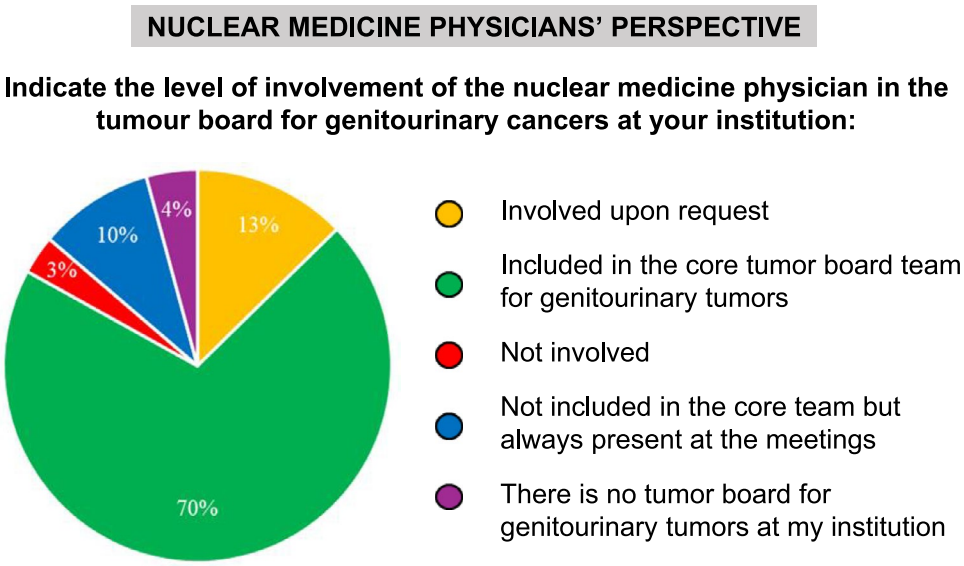


**Fig. 1** Involvement of nuclear medicine physicians in genito-urinary tumour multidisciplinary teams (GU-MDTs). The figure shows the distribution of nuclear medicine physicians based on their level of involvement in GU-MDTs: core members, regularly participating without being core members, participating upon request, or not involved

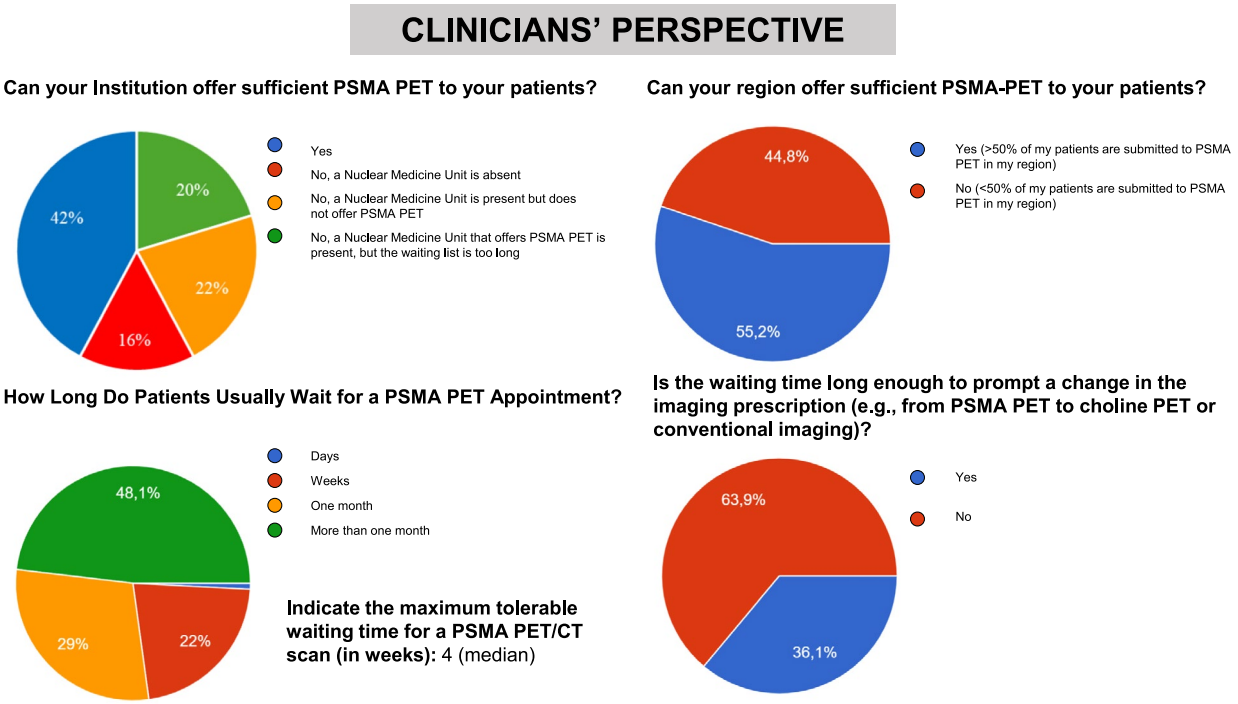


**Fig. 2** Perceived availability of PSMA PET in Italy from the clinicians' perspective. The figure illustrates clinicians' responses regarding the availability of PSMA PET scans at their institutions and within their regions, as well as the impact of waiting times on imaging modality selection

frequent clinical indication for PSMA PET was biochemical recurrence (BCR), reported by 82% of respondents. This was followed by primary staging (13%), response assessment in metastatic patients undergoing systemic treatments (4%), and patient selection for RLT (1%).

## Differences between PSMA ligands and biodistribution-related challenges

Clinicians participating in the survey reported exposure to all three PSMA-targeted PET tracers currently available for clinical use in Italy. Specifically, 36.7% declared regular use of [$^{18}$F]PSMA-1007, 33.6% of [$^{68}$Ga]Ga-PSMA-11, and 28.1% of [$^{18}$F]DCFPyL in clinical practice. Only 1.6% of respondents indicated they were unable to specify

which tracer is routinely used for PSMA PET scans in their patients. Despite this widespread exposure, a clear preference for one specific ligand emerged (Fig. 3). When asked to indicate their preferred PSMA ligand, 57.4% of clinicians selected [$^{68}$Ga]Ga-PSMA-11, followed by [$^{18}$F]PSMA-1007 (13.5%) and [$^{18}$F]DCFPyL (1.7%). Notably, 27.4% of respondents reported no specific preference. The main reasons cited for these preferences were differences in diagnostic accuracy (57%), followed by logistical factors and tracer availability (29%), biodistribution characteristics (11%), and robustness of supporting scientific evidence (11%). In response to a targeted question exploring the clinical relevance of biodistribution differences among PSMA tracers, 69% of clinicians stated that these differences are clinically relevant and that nuclear medicine physicians should be responsible for selecting the most appropriate tracer based on the specific clinical context.

In contrast, the perspective of nuclear medicine physicians appeared substantially different (Fig. 3). Respondents in this group reported a balanced exposure to all three tracers, with [$^{18}$F]PSMA-1007, [$^{68}$Ga]Ga-PSMA-11, and [$^{18}$F]DCFPyL being used in 37.1%, 33.9%, and 29.0% of cases, respectively. Notably, 30.6% indicated that the most frequently used tracer in their practice had changed over the past five years. However, unlike clinicians, nuclear medicine physicians reported a much more distributed preference among the available tracers: 35.3% preferred [$^{18}$F]PSMA-1007, 35.3% [$^{68}$Ga]Ga-PSMA-11, and 29.4% [$^{18}$F]DCFPyL. The underlying reasons for these preferences were overwhelmingly related to logistical factors, costs, or local availability (overall 86%), whereas biodistribution characteristics were cited in 13% of cases and diagnostic accuracy in only 1%.

Nuclear medicine physicians expressed a balanced view on the clinical relevance of biodistribution differences among PSMA tracers (Fig. 4). Just over half of respondents (53%) considered these differences to be of limited importance compared to other factors, such as cost and logistical constraints, whereas 47% deemed them clinically relevant and reported choosing the tracer based on the specific clinical scenario. Despite this divergence, most respondents (73%) indicated that they do not routinely implement protocol adjustments—such as modified acquisition timing or the use of diuretics—to mitigate biodistribution variability. These strategies are instead applied selectively, depending on the clinical scenario.

Regarding unspecific bone uptakes (UBU) (Fig. 4), most nuclear medicine physicians (89%) reported that, when confident in the non-specific nature of an uptake, they include it in the report and explicitly describe it as non-specific. A smaller proportion (7%) stated that, under the same conditions, they do not mention the finding in the report. The primary criteria used to distinguish UBU from skeletal metastases were the presence of a corresponding morphological

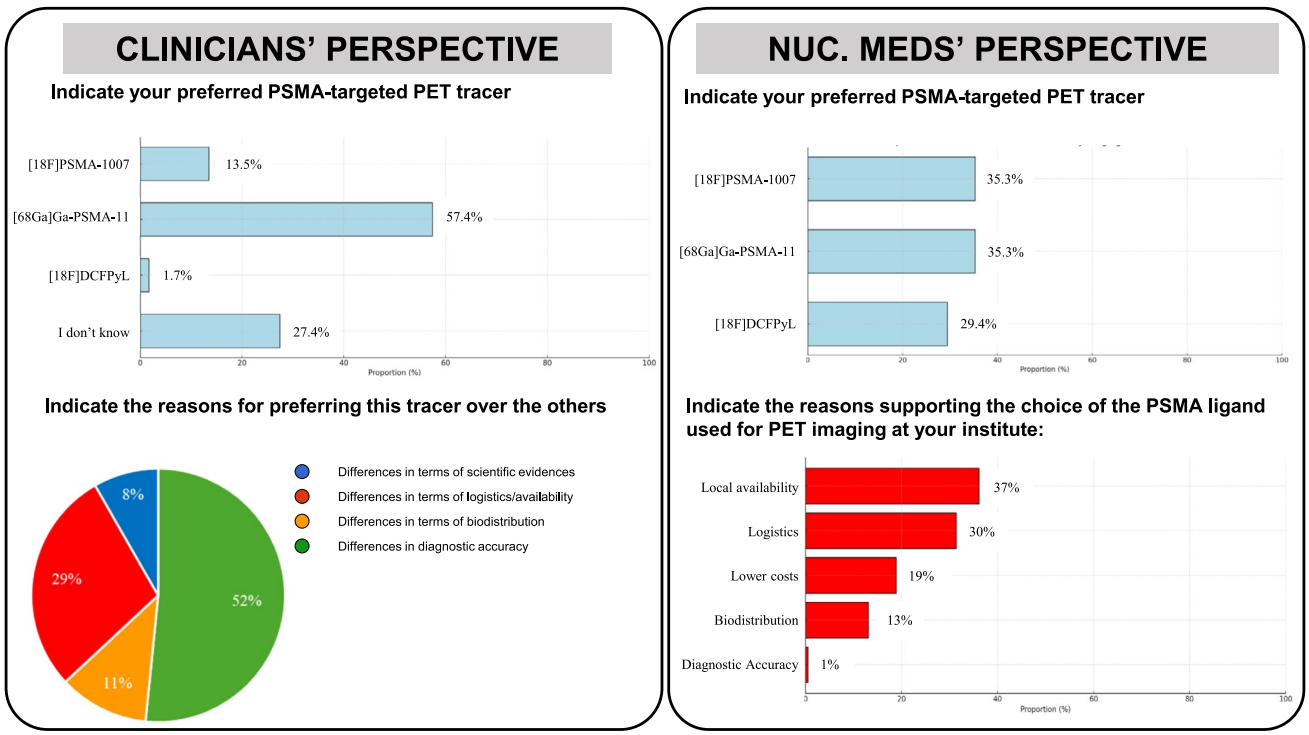


**Fig. 3** Comparison of clinicians' and nuclear medicine physicians' preferences and rationale for PSMA-targeted PET tracers. This figure highlights the differing preferences and decision-making factors between clinicians and nuclear medicine physicians in selecting PSMA-targeted PET tracers for prostate cancer imaging

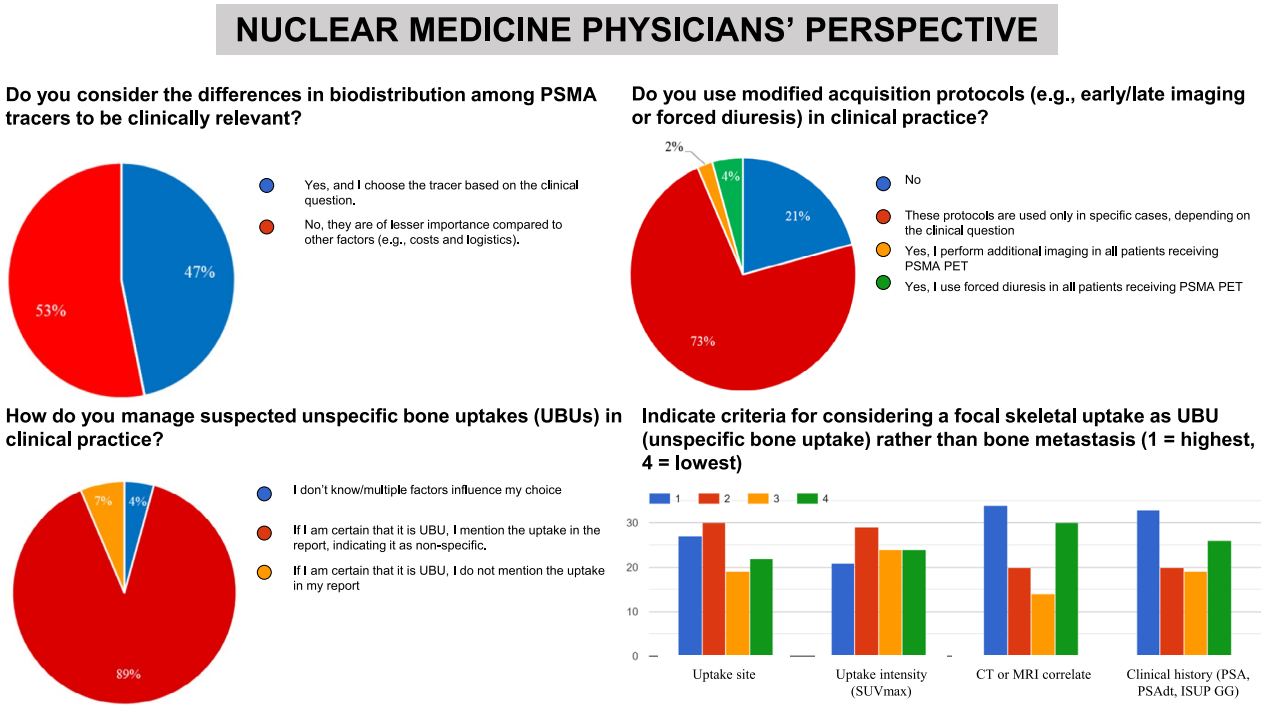


**Fig. 4** Perspective of nuclear medicine physicians on biodistribution-related challenges. This figure summarizes responses from nuclear medicine physicians on various aspects of PSMA PET imaging in prostate cancer, focusing on biodistribution relevance, protocol modifications, and the handling of unspecific bone uptakes (UBUs)

correlate and the anatomical site of the uptake. These were followed in importance by the patient's clinical history and the intensity of radiotracer uptake. When further imaging was required to clarify indeterminate skeletal findings, MRI was the most frequently employed modality.

### Primary staging setting

Approximately 50% of clinicians reported using PSMA PET in the primary staging of high-risk patients, and only 20% employed it for intermediate-risk cases (Fig. 5). No use was reported for low-risk patients. Among clinicians, the main reason for selecting PSMA PET at initial staging was its perceived superior diagnostic accuracy, whereas local availability played a secondary role. In contrast, CI was preferred primarily due to better accessibility, endorsement by clinical guidelines, and lower associated costs. When faced with discordant findings between PSMA PET and CI, 67.6% of clinicians reported relying on PSMA PET results, while 23.7% opted for additional diagnostic investigations (Fig. 6). Alternative imaging techniques, including choline PET, fluciclovine PET, and whole-body magnetic resonance imaging (wbMRI), were considered by 38% of respondents, primarily in the case of discordance between PSMA PET and CI results, followed by issues of local availability or long waiting lists.

Conversely, 87% of nuclear medicine physicians identified PSMA PET as their preferred imaging modality regarding the initial staging of intermediate- to high-risk prostate cancer (Fig. 7). In cases of discordant findings between PSMA PET and CI, the majority (70.4%) indicated that discussion within a GU-MDT was the most appropriate strategy for resolving discrepancies.

## Discussion

In this manuscript, we present and discuss the survey findings on technical aspects and the primary staging setting, which constitute the first two thematic areas of the national questionnaire. The findings of our national survey offer valuable insights into current clinical practices regarding the use of PSMA PET in PCa management in Italy. Several key themes emerged from the analysis, reflecting both the opportunities and challenges associated with integrating PSMA-targeted imaging into routine care. These national-level observations are broadly in line with those of a recent regional survey conducted in northeastern Italy, which explored the use of next-generation imaging in PCa, including PSMA PET [12]. Although geographically limited, the results of that study support the broader trends identified here, particularly regarding access barriers and adoption

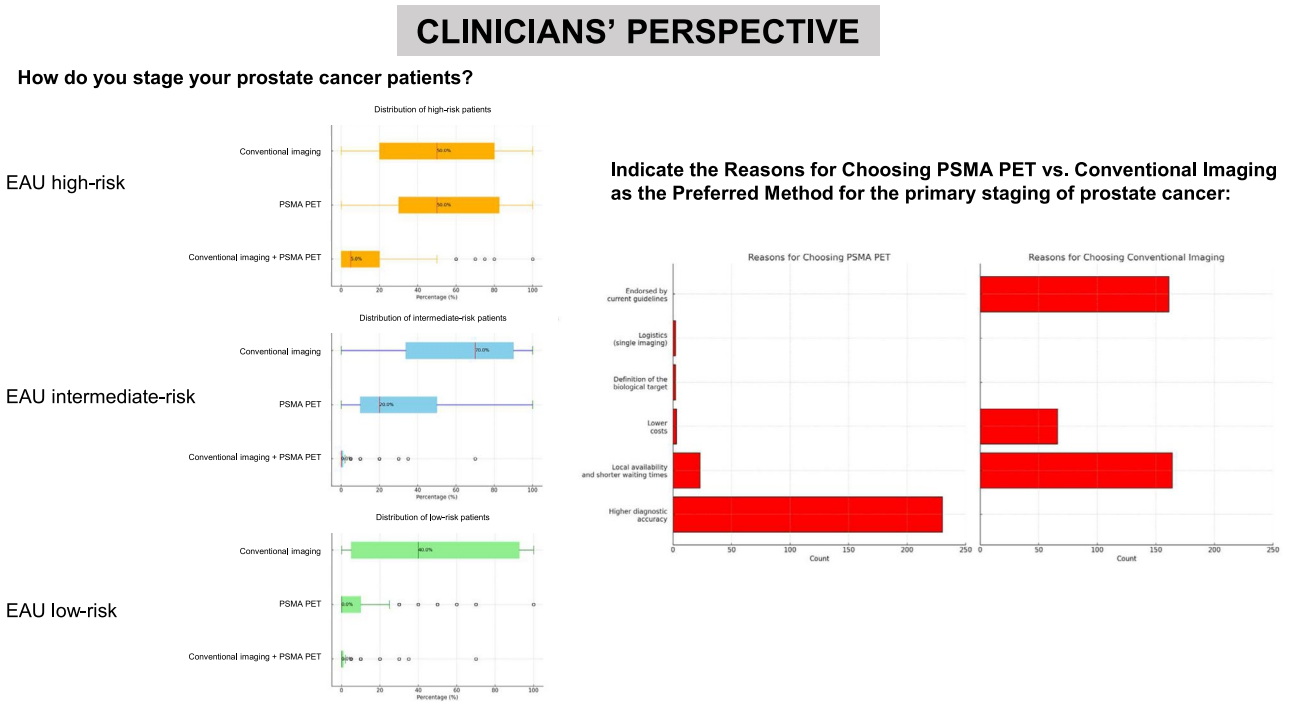


**Fig. 5** Clinicians' preferences for staging prostate cancer and reasons for choosing PSMA PET vs. conventional imaging. This figure illustrates how clinicians stage prostate cancer patients across EAU risk categories and their reasons for preferring PSMA PET or conventional imaging

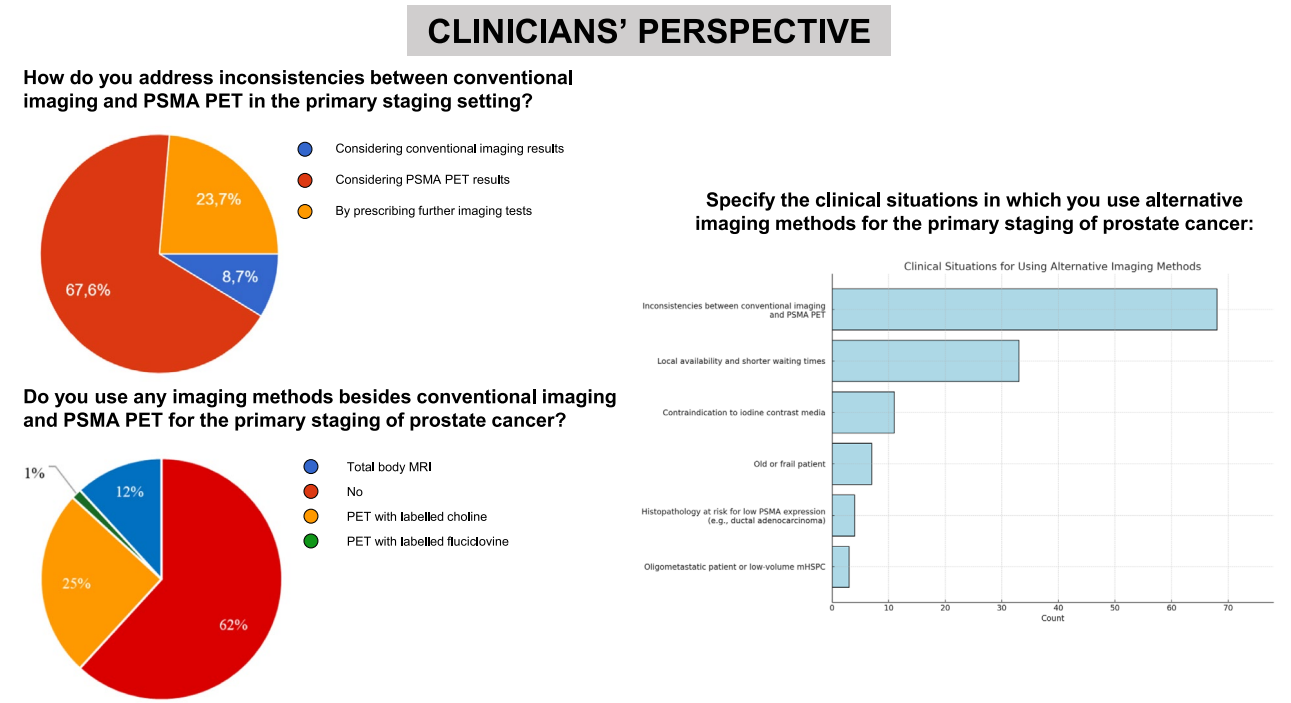


**Fig. 6** Clinicians' use of alternative imaging and approaches to address inconsistencies in prostate cancer staging. This figure presents clinicians' responses on managing discrepancies between PSMA PET and CI, and their use of alternative methods for primary prostate cancer staging

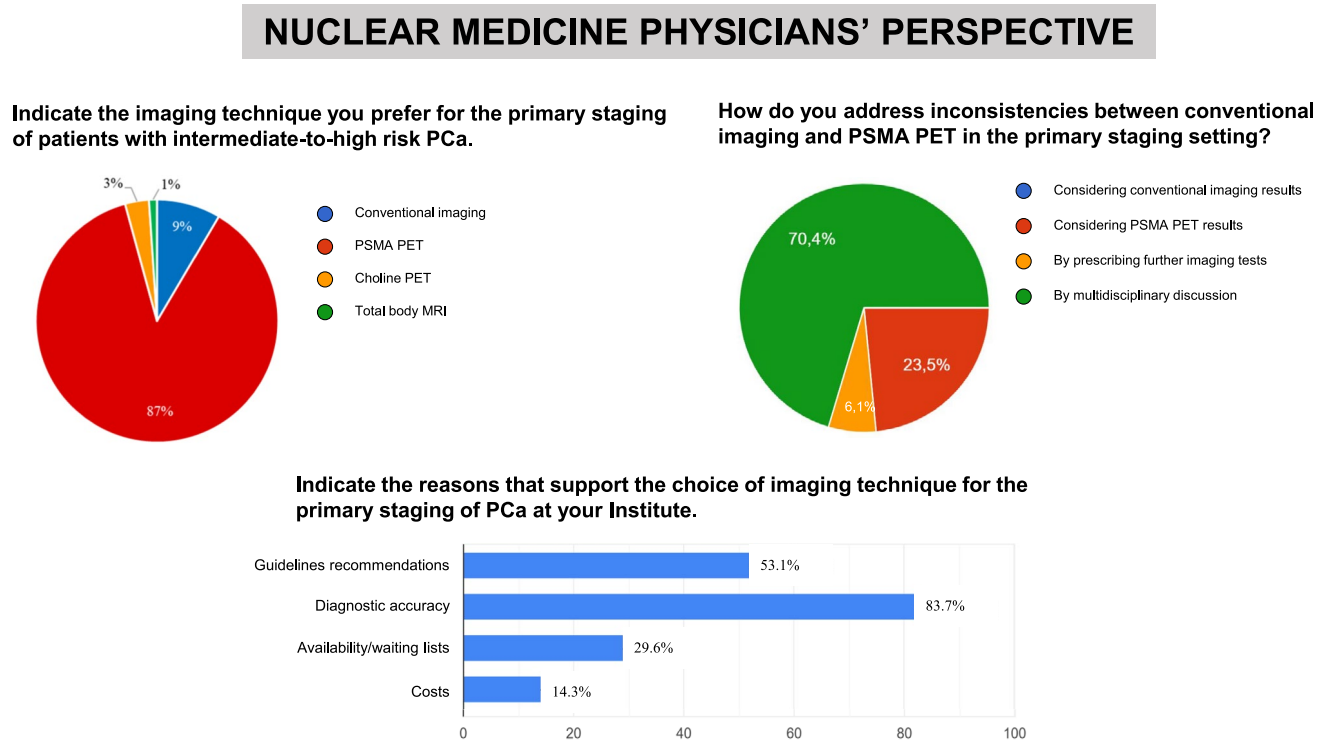


**Fig. 7** Nuclear medicine physicians' preferences and decision factors for primary staging imaging in intermediate-to-high risk prostate cancer. This figure presents the preferences and rationale of nuclear medicine physicians regarding imaging for prostate cancer staging

patterns. Together, these findings reinforce the need for national-level strategies to improve access, promote guideline-based use, and integrate PSMA PET more consistently across different care settings.

A point of interest concerns the composition of the respondent sample: the proportion of participants affiliated with universities or IRCCS (41%) was higher than expected for a nationwide survey of this kind. This high representation of highly specialised, research-oriented centres may have influenced certain responses, potentially leading to a more favourable perception of PSMA PET availability, greater familiarity with less widely used tracers, and a stronger integration of nuclear medicine into multidisciplinary teams compared with settings of lower complexity.

Of particular interest is the high degree of involvement reported by nuclear medicine physicians in GU MDTs. This represents a meaningful shift compared with the composition of GU-MDTs outlined in earlier national models. Notably, in 2015, seven Italian scientific societies jointly proposed the core elements for establishing prostate cancer units in Italy. In that framework, nuclear medicine specialists were not included as part of the core GU-MDT [13]. The present data suggest that this paradigm is evolving, with nuclear medicine becoming increasingly integrated into multidisciplinary PCa care, at least within high-volume institutions. This trend likely reflects the expanding role of molecular imaging in PCa management, and the growing contribution of nuclear medicine from the diagnosis to the therapeutic choice, including RLT [14]. These findings highlight the need to revisit and update the definition of GU-MDT core teams to reflect current clinical practice better and to formally recognise the central role of nuclear medicine in the multidisciplinary management of PCa.

Our data reveal a significant discrepancy in the perception of PSMA PET availability between clinicians and nuclear medicine physicians. Differences in the volume and structure of the respective centres may partially explain this divergence. Most nuclear medicine physicians' respondents were affiliated with medium- to high-volume departments, as evidenced by the number of available PET scanners and the widespread presence of advanced infrastructure (e.g., on-site cyclotrons and RLT services). In contrast, clinicians operated across a broader spectrum of institutions, including lower-volume or peripheral hospitals with more limited access to PSMA PET. This imbalance likely contributes to differing perspectives on waiting times, with clinicians reporting longer delays and more substantial access challenges compared to their nuclear medicine counterparts. Importantly, clinicians' dissatisfaction appears to follow a gradient: 58% reported insufficient availability at the institutional level, 44.8% at the regional level, and only 36.1% reported changing the imaging modality due to waiting

times. This suggests that, while access limitations are widespread, the threshold at which they lead to a modification in the clinical workflow becomes progressively narrower. The high demand for PSMA PET, also driven by its use across various clinical phases (e.g., BCR), may contribute to current waiting times and potentially delay the initiation of salvage treatments [15]. In this context, risk-adapted prioritisation for primary staging could help optimise access and align with guideline recommendations [5], yet in many centres PET-PSMA scheduling still follows a chronological order, without a structured mechanism for clinical prioritisation. Further analyses of PSMA PET utilisation in the BCR and advanced disease settings will be presented in a subsequent paper.

The survey highlights a clear divergence between clinicians and nuclear medicine physicians regarding PSMA tracer preferences. Clinicians' inclination toward [$^{68}$Ga]Ga-PSMA-11 likely reflects its prominent representation in landmark trials such as proPSMA [16] and VISION [17], as well as its broader presence in the literature. This greater familiarity may reinforce the perception of superior diagnostic reliability compared with other renally excreted tracers such as [$^{18}$F]DCFPyL and [$^{18}$F]rhPSMA-7, despite the absence of comparative evidence demonstrating superiority of any single ligand [18, 19]. In contrast, nuclear medicine physicians tend to adopt a more pragmatic approach, selecting tracers based mainly on availability and logistical considerations. These findings underscore the need for clearer communication and for educational initiatives to align expectations regarding the generally minimal biodistribution differences among these tracers.

An additional factor potentially contributing to this divergence is the occurrence of UBU [20, 21], which has been more frequently associated with [$^{18}$F]PSMA-1007 [22]. Over time, a learning curve in interpreting these findings has improved reporting accuracy among nuclear medicine physicians, leading to greater confidence in the clinical use of [$^{18}$F]PSMA-1007 [23, 24]. However, early false positives likely shaped clinician perceptions, reinforcing scepticism toward this ligand. Managing UBU is not only a technical matter but also a communication challenge: standardised reporting, transparency, and multidisciplinary discussion are essential to reduce uncertainty and ensure consistent decisions. Explicitly noting UBU as non-specific in reports reassures clinicians that the finding has been recognised and properly interpreted, preventing doubts about oversight or dismissal. Such clarity is particularly important when using tracers more prone to UBU-related artefacts. In our survey, 89% of nuclear medicine respondents reported including non-specific uptake in their reports, and 50% routinely used a standardised format.

The survey revealed a broader perceived use of PSMA PET in the primary staging setting among nuclear medicine physicians compared to clinicians, particularly for intermediate-risk PCa. Its use in low-risk cases was negligible across both groups. This pattern reflects a generally selective and guideline-consistent application of PSMA PET [5, 25]. On the other hand, it may reflect the ongoing debate on the optimal staging modality for patients with intermediate risk [26]. The survey design did not explicitly include an option for unfavourable intermediate-risk patients, a clinically important subgroup in which PSMA PET is often considered appropriate [27]. This omission may have contributed to an underestimation of PSMA PET use within this population.

The reported 50% utilisation rate of PSMA PET in high-risk patients likely also reflects regional disparities in tracer availability and access to PET facilities. Several respondents highlighted cost as a significant limiting factor for the broader adoption of PSMA PET in the initial staging setting. Notably, although formal pharmacoeconomic evaluations are currently lacking in Italy, preliminary evidence suggests that appropriate use of PSMA PET may lead to cost savings, particularly by avoiding unnecessary surgical interventions, such as prostatectomy, in patients with metastatic disease [28–31]. Logistical constraints, including restricted access to specific radiopharmaceuticals, were also frequently cited as barriers to wider implementation. The continued use of choline or fluciclovine PET in some settings, particularly for initial staging, also likely reflects local issues of tracer availability rather than a preference for older imaging approaches.

From a diagnostic standpoint, PSMA PET was generally perceived as more reliable than CI in cases with discordant findings. However, additional imaging was still requested in 23.7% of such cases, particularly when PSMA PET results were equivocal. In our survey, we did not assess the specific reasons underlying the request for additional imaging approaches (such as choline or fluciclovine PET). However, UBUs emerged as a frequent source of indeterminate findings, potentially leading to discrepancies between PSMA PET and conventional imaging. Aside from UBUs, we hypothesise that another clinically relevant source of discordance may relate to the small subset of prostate cancers (approximately 5%) characterised by low or absent PSMA expression [32, 33]. In these PSMA-negative phenotypes, PSMA PET may underestimate disease extent compared with CI, prompting clinicians to complement PSMA PET with other functional tracers that are less dependent on PSMA expression. Notably, 70% of nuclear medicine physicians reported routinely discussing imaging results within GU-MDT meetings when discrepancies between PSMA PET and CI arise. In contrast, clinicians expressed higher

diagnostic confidence in PSMA PET in 67.6% of cases, compared to only 8.7% for CI. Nevertheless, 23.7% of clinicians also reported ordering additional examinations to resolve uncertainty. This discrepancy in approach underscores a critical issue: improved communication and shared understanding between nuclear medicine and clinical teams are essential to enhance diagnostic consistency and optimise patient management.

A likely explanation for this perception gap is the different levels of direct exposure to PSMA PET interpretation. Nuclear medicine physicians routinely manage tracer-specific biodistribution patterns, artefacts, and technical nuances, whereas clinicians rely mainly on report summaries and selected images. This difference in practical familiarity may lead clinicians to perceive greater variability in diagnostic accuracy across tracers or institutions. Moreover, opportunities for structured educational exchange and interdisciplinary training are uneven across Italy, and participation of nuclear medicine specialists in GU-MDTs remains variable. These factors may contribute to divergent perceptions of PSMA PET performance. Strengthening collaborative and educational pathways could help narrow this gap and promote more consistent clinical decision-making.

This study has several limitations that should be acknowledged. First, the respondent sample was skewed toward medium- and high-volume centres, particularly among nuclear medicine physicians. This may have resulted in an overestimation of PSMA PET/CT availability, expertise, and the use of standardised reporting practices compared with lower-volume or peripheral institutions. As a result, some findings—especially those related to waiting times, technical capabilities, and MDT involvement—may not fully represent the national landscape. Second, the survey did not include an assessment of economic factors, such as imaging costs or reimbursement policies, which are known to substantially influence access to advanced imaging and may partly account for the regional disparities observed. At present, reimbursement pathways for PSMA PET/CT differ markedly across Italian regions, contributing to significant variability in local access and clinical workflows; this rapidly evolving and highly heterogeneous scenario was one of the reasons why these aspects were not incorporated into the technical section of the survey. Future studies combining real-world utilisation data with cost-effectiveness and reimbursement analyses will be essential to provide a more comprehensive understanding of the structural barriers affecting PSMA PET implementation in Italy.

**Table 1** Key actions to foster harmonised adoption of PSMA PET/CT in prostate cancer care in Italy

| Domain | Recommended actions | Expected impact |
|---|---|---|
| Clinical prioritization | Define access criteria based on oncologic risk | Optimise use, avoid delays, align with guidelines |
| Health economics | Conduct national pharmacoeconomic studies | Assess sustainability, inform reimbursement |
| Infrastructure & RF distribution | Invest in PET capacity and establish radiopharmaceutical distribution networks | Reduce territorial disparities, ensure tracer consistency |
| Reporting & communication | Adopt standardised reporting guidelines, with explicit handling of UBU | Improve transparency, reduce uncertainty |
| Multidisciplinary integration | Formalise nuclear medicine as GU-MDT core member at all levels of care | Harmonise staging and therapeutic pathways |

## Conclusion

Overall, the results underscore a progressive alignment of clinical practice with current evidence and guideline recommendations for PSMA PET/CT. Nonetheless, heterogeneity in access, resource availability, and regional implementation strategies continues to shape its adoption across the country. Effective implementation will require investment in infrastructure, training, standardised reporting, and stronger multidisciplinary integration. To support this process, we propose a set of actionable measures (Table 1) addressing clinical prioritisation, equitable access, and health-economic evaluation. Notably, soon after the survey's conclusion, the same scientific societies released joint guidance in early 2025 with the explicit aim of standardising and harmonising PSMA PET/CT use in Italy [34]. A follow-up survey is planned within the next two to three years to assess the real-world impact of these measures and the extent to which national guidance is being translated into clinical practice.

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**Author contribution** M.B., L.E., L.S., P.A.Z., and G.F. conceived and designed the study. M.B., L.E., L.S., M.M., A.F., M.L.D.R., O.C., C.M., M.M., G.P., M.K., A.M., R.S., S.B., R.M.D., A.L., P.A.Z., and G.F. contributed to survey development, data interpretation, and manuscript drafting. M.B. performed data analysis and coordinated manuscript preparation. All authors participated in data review, contributed to the critical revision of the manuscript for important intellectual content, and approved the final version for submission. M.B. supervised the overall project. The PSMA PET Italian Survey Collaborators contributed to data collection and validation across participating centers,

and their names and affiliations are provided in the Supplementary Materials.

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**Data availability** Data is provided within the manuscript or supplementary information files.

## Declarations

**Conflict of interest** Matteo Bauckneht reports personal fees outside the present work for advisory roles, speaker engagements, and travel and accommodation expenses from Bayer, Johnson & Johnson, Novartis, Telix Pharmaceuticals, and Recordati. Marco Maruzzo reports outside the submitted work personal fees for advisory role from Merck Sharp & Dohme (MSD), Astellas, Janssen, Recordati, Ipsen, Bristol Meyer Squibb, AstraZeneca, Merck Serono, and Bayer. Marco Krengli reports fees from advisory board roles from Novocure and Servier. Rolando M. D'Angelillo reports personal fees outside the present work for advisory roles, speaker engagements or travel and accommodation expenses from Astellas, Bayer, Elekta, Ipsen, Johnson and Johnson, Orion, Recordati, Tecnologie Avanzate, Tema Sinergie. Paolo Andrea Zucali reports outside the submitted work personal fees for advisory role, speaker engagements and travel and accommodation expenses from Merck Sharp & Dohme (MSD), Astellas, Janssen, Sanofi, Ipsen, Pfizer, Novartis, Bristol Meyer Squibb, Amgen, Astra Zeneca, Roche, and Bayer. Angelina Filice reports, outside the submitted work, personal fees for advisory roles, speaker engagements, travel and accommodation expenses from Novartis, GE Healthcare and Bayer.



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