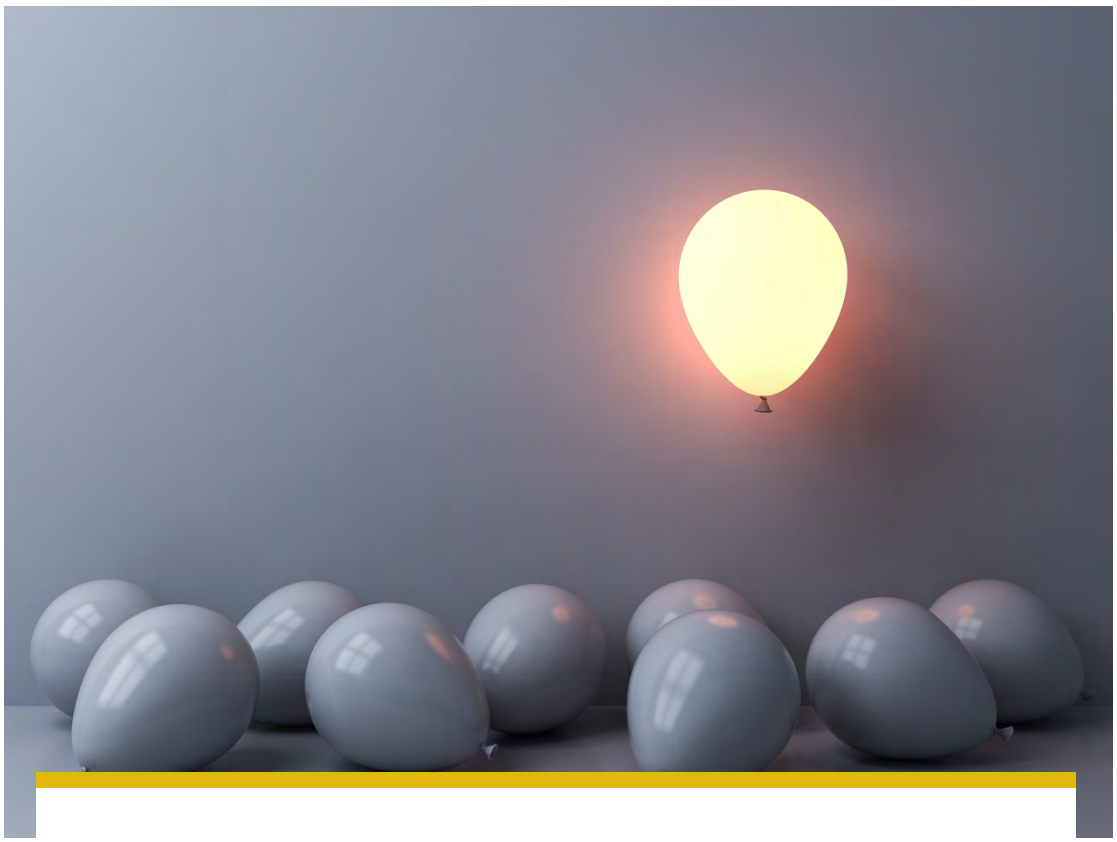
CANCER CENTER AMSTERDAM

Research Evaluation 2017-2022

February 2024



COLOPHON

This report was commissioned by the executive boards of Vrije Universiteit Amsterdam and University of Amsterdam on behalf of Cancer Center Amsterdam.

Process coordination and text editing by Floor Meijer, www.floor-meijer.com.

12 February 2024

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PREFACE

Merging two large medical centres and lateralization of all oncological research and care to one location is a complex process. The committee realized it had to deal with the mere size of CCA, necessitating many sessions to make optimal use of the time. Also, the report includes various non-quantitative topics to be assessed, which requires absolutely open and unbiased communication.

Looking back at the actual site visit, I feel confident that we have succeeded in meeting these challenges, thanks to meticulous preparation and organization, and to remarkable transparency and openness of the host institution enabling an effective and engaging visit. The interviews with management and academic representatives, PhD candidates and stakeholders of the universities, were all highly constructive and informative.

In this report we present our evaluation of the scientific research of CCA. We were impressed by the quality, the quantity and the relevance of the research carried out by many departments. Needless to say, this does not imply that nothing can be improved, and it is not finished yet. Therefore, we sincerely hope that CCA will make use of our findings and reflections when discussing its current and future research strategy. If that happens – and there is no reason to doubt this – the joint effort of CCA collaborators and committee members has been worthwhile. Special thanks go to Floor Meijer, the independent secretary of the committee. She guided us smoothly through all stages of the review.

We wish the CCA all the best and are confident that it will continue to pursue excellence in basic translational and clinical research.

Kees Verhoef, committee chair, CCA
Amsterdam, 12 February 2024

EVALUATION METHOD & PROCEDURES

In 2023, Vrije Universiteit Amsterdam and the University of Amsterdam initiated the research evaluation of the Cancer Center Amsterdam to enhance research quality and accountability. The review, spanning 2017-2022, involved an external committee of peers and followed the Strategy Evaluation Protocol 2021-2027.

EVALUATION METHOD & PROCEDURES

Cancer Center Amsterdam (CCA) is one of eight research institutes of Amsterdam UMC, a medical centre that encompasses two medical faculties, Vrije Universiteit Amsterdam and University of Amsterdam. In 2023, the executive boards of Vrije Universiteit Amsterdam (VU) and the University of Amsterdam (UvA) commissioned an evaluation of the Cancer Center Amsterdam (CCA) as part of the universities' regular six-year quality assurance cycle. This evaluation had the dual purpose of improving the quality and relevance of research, and providing accountability to the executive board, funding bodies, the government and society as a whole. The review covered the 2017-2022 period.

Composition of the committee

The executive boards appointed an evaluation committee (hereafter: 'committee') of eight external peers, including a PhD candidate.

- Prof. Kees Verhoef, Erasmus UMC, the Netherlands;
- Prof. Karin Vanderkerken, VUB, Belgium;
- Dr. Sir Richard Treisman, The Francis Crick Institute, United Kingdom;
- Prof. Sigrid Stroobants, UZA Antwerpen;
- Prof. Yvette van der Linden, LUMC, the Netherlands;
- Dr. Leila Akkari, NKI/AvL, the Netherlands;
- Wendy Nagel BBA, KWF, the Netherlands;
- Laura van Poppel MSc, ASAP chair Amsterdam UMC, Amsterdam.

Dr. Floor Meijer was appointed independent secretary to the committee. Short bios of the committee members can be found in appendix 1.

To ensure a transparent and unbiased assessment process, all members of the committee signed a statement of impartiality and confidentiality. Prior to the site visit, existing professional relationships between committee members and CCA were discussed. The committee concluded there was no risk in terms of bias or undue influence.

Assessment criteria

The research evaluation followed the aims and methods described in the Strategy Evaluation Protocol 2021-2027 ('SEP'). This protocol for the evaluation of publicly funded research in the Netherlands was drawn up and adopted by the Universities of the Netherlands (UNL), the Dutch Research Council (NWO), and the Royal Netherlands Academy of Arts and Sciences (KNAW).

Under the Terms of Reference issued by VU and UvA, the committee was required to evaluate the quality of research conducted by CCA as well as to offer recommendations in order to improve its quality of research and strategy. Specifically, the committee was asked to judge the performance of the unit on SEP's three main

assessment criteria (Quality, Relevance, Viability), and offer its written conclusions as well as recommendations based on considerations and arguments. Four additional aspects also listed in SEP (Open Science, PhD Policy and Training, Academic Culture and Human Resources Policy) were to be taken into consideration when evaluating the three main criteria.

Besides these SEP criteria and aspects, Cancer Center Amsterdam specified the following additional topics for the evaluation:

1) Position of Cancer Center Amsterdam in regional cancer research;
2) Clinical, economic, and social valorization efforts of Cancer Center Amsterdam.

The committee has chosen to integrate these additional topics in its evaluation of the SEP criteria.

Documentation

Prior to the site visit, the committee received the self-evaluation report of the institute, including the information and appendices required by the SEP. The committee also received the Strategy Evaluation Protocol 2021-2027 and Terms of Reference for the research evaluation. Upon the committee's request additional information on staff composition, finances and publications was made available some weeks prior to the site visit.

Working method

Leading up to the site visit, the committee members were asked to study the documentation and formulate preliminary findings and questions. During an online kick-off meeting on 22 September 2023, the committee discussed its initial impressions. Moreover, it considered procedural matters and agreed upon a working method.

The site visit took place on 9 and 10 November 2023. It started with a committee meeting during which the committee prepared for its subsequent conversations with staff. This was followed by a meeting with the deans and the CCA directors. Subsequently, the committee spoke with representatives of the three CCA research programmes, the Doctoral School and OOA, PhD candidates and young researchers. Thematic discussions covered business development, valorization, regional science, societal impact, open science, and future perspectives. The visit concluded with a session where the committee shared its findings with CCA directors and a plenary presentation by the committee chair. The detailed schedule is available in appendix 2.

After the site visit, the secretary drafted a first version of the committee report, based on assessments drawn up by the committee members. This draft report was circulated to all committee members for comments. Subsequently, the draft report was presented to CCA for factual corrections and comments. After considering this feedback in close consultation with the chair, the secretary finalized the report. The final report was presented to the executive boards of VU and UvA on 12 February 2024.

EVALUATION

The committee has subdivided its evaluation of Cancer Center Amsterdam in five chapters:

- Organization & Strategy
- People & Community
- Quality
- Societal relevance
- Viability

ORGANIZATION & STRATEGY

The Cancer Center Amsterdam (CCA) was founded in 2016 at VUmc, predating the 2018 merger of VUmc and AMC to form Amsterdam UMC. It is currently one of the eight research institutes within Amsterdam UMC, coordinating all cancer-related research and services. Its formation has instantly established CCA as a key player in the Dutch oncological research landscape, covering everything from basic science to translational, clinical, and quality of life research. Its dimensions align with those of global comprehensive cancer centres.

However, like the other Amsterdam UMC research institutes, CCA deviates from the traditional research institute model, lacking independent facilities, personnel, and financial autonomy. Instead, it functions as a networking organization, dedicated to facilitating and integrating the research efforts of its 1200 affiliated researchers, including 240 staff of professorial grade, >150 postdoctoral researchers, and 600 PhD candidates, spread across 38 Amsterdam UMC departments and 9 divisions. Researchers are employed at specific departments, and some hold dual affiliations with more than one research institute.

Research programmes

With the central motto 'connecting science and care', CCA has since its establishment aimed to encompass the entire spectrum of cancer research. To streamline the existing activities of its affiliates and foster collaboration around common research themes, the institute has opted to categorize them into three distinct research programmes, each featuring two to three associated sub-themes:

1. Cancer Biology and Immunology (Cancer biology; Cancer immunology; Target & therapy discovery), involving 540 staff
2. Imaging & Biomarkers (Imaging; Biomarkers), involving 360 staff
3. Clinical Therapy & QoL (Therapy; Supportive care), involving 250 staff

In the committee's opinion, the research programmes have proven to be a good way to bring related interests at the two centres under a single umbrella at the outset of the merger. Choosing topic-specific programmes over categorizing research based on tumour types was a deliberate strategic decision aimed at facilitating the seamless integration of pre-clinical and clinical scientists, thus underscoring CCA's networking function. Additionally, the subdivision into seven themes with a broad scope and some overlap in terms of personnel enabled the incorporation of research across multiple themes.

Governance

In its governance structure, CCA is committed to broad representation from its underlying research domains. Following the model of other Amsterdam UMC research institutes, CCA is led by two scientific directors, one of whom holds a seat on Amsterdam UMC's scientific board (Amsterdam Research Board, ARB). This board serves as an advisory body to the Amsterdam UMC board of directors. The scientific directors are supported by a daily board and dedicated support staff. The three programmes and their associated sub-themes were initially co-led by representatives from the merging partners. However, in 2020, with the consolidation of CCA's activities onto a single site, they were integrated into a unified leadership structure. Together, the programme leaders and the two

CCA directors form the CCA research board, which plays a crucial role in decision-making and investment control, with individual members overseeing their specific portfolios.

As noted, CCA currently has limited decision-making authority regarding staff recruitment, and lacks resource to implement its vision. In order to make the most of the Amsterdam UMC model of virtual institutes cutting across departments and divisions, effective collaboration of CCA with divisions, departments, other institutes, and Amsterdam UMC is in the committee's opinion indispensable. The committee considers that there is a critical need to establish robust mechanisms to uphold the interests of the different institutes and coordinate their activities, while maintaining the commitment to delivering high-quality patient care and effective AUMC administration. This will involve an increased mandate for research institutes, including CCA, with an appropriate budget and steering power at the level of its underlying programmes, allowing them to make strategic choices in terms of research direction and focus while maintaining coordination across Amsterdam UMC. Observed balance issues across institutes and departments could be resolved through more collaborative planning, particularly when the physical merges occur. Planned meetings, local seminars and budget encouraging in-house interaction would facilitate such integration.

Funding

CCA has an annual turnover of around €70 M, including direct funding for staff salaries and external funding acquired by researchers. Out of this, approximately €5 M falls directly under the institute's control. It is earmarked for short-term projects, equipment investments, and other necessities, with a key strategic decision made to channel most of its budget into facilities that foster collaboration among scientists.

Amsterdam UMC annually contributes €0.5 M directly, with an additional average sum of €3-4 M coming from the dedicated 'Stichting CCA'. This foundation has as its single goal to fund oncological research at CCA by attracting private funds. It specifically supports expensive infrastructure, equipment, and start-up financing for promising collaborative projects. To enhance funding optimization, CCA has appointed a dedicated grant support officer and invested in business development, reflecting a commitment to securing sustainable growth for its research initiatives.

The committee acknowledges that CCA has been fortunate to acquire supplementary foundation funds, to some extent mitigating the limitations of the modest budget provided by central funds. In light of CCA's notable achievements and increased international visibility, the committee however strongly recommends allocating a more substantial share of the total Amsterdam UMC budget of €2.3 billion to CCA. This strategic adjustment would enable the institute to further optimize its accomplishments, support emerging teams and research programmes, boost the acquisition of large grants, speed up clinical trial development and bench to bedside discovery and provide comprehensive support for its ongoing research initiatives and essential facilities.

Mission and strategy

In line with its dedication to pioneering treatment advancements through research, CCA's mission is articulated as 'to provide the best possible care for cancer patients today and tomorrow'.

Acknowledging the importance of a multidisciplinary approach, the institute emphasizes innovation through excellent patient-centred research, the generation of relevant biological insights, and the development of diagnostic tools. Additionally,

its mission reflects a commitment to nurturing the next generation of clinicians and researchers.

At CCA's onset, six clear strategic priorities for building the research institute were established:

1. Building research programmes and themes
2. Branding CCA and its researchers
3. Providing means to connect
4. Building a community
5. Translation of novel insight
6. Providing education to upcoming talent

Prompted by the merger, the majority of cancer research has been relocated to the VUmc location. As the merger proceeded, a strategic decision was made to closely connect science and care in a more comprehensive cancer centre (the future 'RDC building') in order to achieve translational goals. This meant that four additional priorities were identified, building on the first steps, to allow CCA to emerge as an integrated institute:

7. Establishing patient research groups
8. Regional, (inter)national collaboration
9. Investing in the local merger of CCA
10. Business development and grant support

The formulated CCA strategy for the evaluation period can be summarized as 'integrate, facilitate, translate, educate'. The committee notes that this strategy has demonstrated considerable success, providing a solid foundation for CCA's future strategy, as further discussed in the 'Viability' section of this report. Particularly in its initial years, the institute strategically prioritized inclusion, successfully bringing together researchers across various domains, including basic scientists and clinicians at different career stages. This was an appropriate course of action for the young institute.

Additionally, CCA made direct investments in infrastructure and excellent teams using its allocated budget and funds provided by the associated foundation. The committee acknowledges that CCA's adept use of existing financial opportunities has significantly accelerated the process of merging ongoing research efforts at VUmc and AMC. It is noteworthy that CCA has, in many respects, outpaced Amsterdam UMC itself in this transformative process, with the formal completion of the Amsterdam UMC merger occurring on January 1st, 2024 when the merged medical centres finally became one legal entity.

Patient Research Groups and stakeholder representation

A new development is that CCA has introduced Patient Research Groups (PRGs) focusing on different tumour types to align with translational chains. PRGs involve both caregivers and preclinical researchers and are expected to contribute to bench-to-bedside-to-bench research lines. At the moment, PRGs are specifically connected to programme 3 (Clinical Therapy & QoL), with the goal to initiate PRGs for at least 80% of patient groups. The present implementation phase differs across various tumour groups.

The committee applauds the introduction of Patient Research Groups (PRGs) as a means to facilitate interaction, discussion and co-creation between clinical and preclinical researchers. It would, however, prefer to see more preclinical researchers from programmes 1 and 2 involved in PRGs. In the committee's opinion, PRGs may well be the way to further connect the programmes, and CCA could play a facilitating role in this. Furthermore, within PRGs a platform needs to be created where all stakeholders from bench to bedside are present, not just researchers but also other relevant participants, including those that represent the patient perspective, either patients themselves or nurses

(by proxy). All of this means that a template for PRGs is needed, a baseline of what a PRG should be and do, including a proposed meeting structure.

With respect to overall patient representation, the committee underscores the necessity for CCA to (help) create structures that better incorporate the patient's voice in research, recommending the use of the patient participation ladder by *Patiëntenfederatie Nederland*. Establishing a CCA patient council for research participation, beyond the Amsterdam UMC's patient council, is proposed to make it easier to obtain patient input when writing grant proposals.

Relatedly, the committee observes that within all programmes, but especially within programme 3, where such is appropriate, there seems to be a limited role for other health care professionals, e.g., nurses, VS/PA, physical therapists, dieticians, medical psychologists, chaplains etc. The committee advocates for their structural involvement, in particular where nurse-researchers are concerned. Interviews highlighted that nursing research is an important and growing field; however, establishing a connection with CCA poses challenges. The majority of nurse researchers remain unfamiliar with CCA and with what it can offer them. According to the committee, a crucial step forward is the structural inclusion of nurse researchers in PRGs. This would facilitate practical insights, particularly regarding the feasibility of research proposals.

These topics will be revisited in the subsequent section on research quality within Programme 3.

PEOPLE & COMMUNITY

Since HR policies are set by Amsterdam UMC and executed at division/department level, CCA lacks formal authority over its 1200 affiliated researchers. The institute's influence on hiring and promotions is indirect, with hiring decisions at the PI level made by the Amsterdam UMC Board of Directors and promotion decisions subject to the Commission Talent Amsterdam's (CTA) evaluation. The committee acknowledges the challenges associated with developing a strategic research agenda when lacking decision power over hiring or promotion. This underscores the necessity for having, at least, a seat at the table where such pivotal decisions are made, preferably not just in an advisory capacity.

The committee advocates for a reconsideration of the process for proposing candidates for professorship, increased support for junior investigators setting up independent lines of research, promotion of high-risk high-reward project funding, and the provision of mid to long-term opportunities for in-house research staff. The CTA's apparent willingness to reorganize its working method presents an opportunity for CCA to exert more influence on HR decisions, complementing the existing 'soft power' that it already holds over various aspects related to people & community. This includes initiatives to nurture talent, cultivate an academic community, and facilitate discussions on ethics and integrity.

Talent management

The committee was pleased to observe that CCA aims to play a constructive role in talent management. Despite its current limited involvement in the direct career planning of its affiliated staff, the institute has implemented a mentoring programme spanning all career stages. Moreover, it has demonstrated commitment to nurturing young PIs by identifying talent and facilitating their acquisition of research funds through dedicated support in writing proposals. Notably, CCA has taken the initiative to introduce internal funding calls specifically designed for young PIs (€1,5 M per year in total).

In the committee's view, this represents a clear added value of the institute. The young scientists interviewed expressed positive sentiments about the opportunities provided by CCA and particularly acknowledged the value of the institute's network, which is seen as advantageous to their research endeavours. For example: basic scientists described the network as instrumental in facilitating access to patient materials, which would be challenging to obtain independently.

From staff interviews, the committee also identified several talent management challenges that it hopes can be addressed by the institute in dialogue with the departments/divisions. One notable issue is the prevalence of temporary contracts, leading to job insecurity. The committee found that this is a situation that particularly affects postdocs, who in the past were shuffled back and forth on fixed term AMC/VUmc contracts in response to restrictions imposed by Dutch labour law, causing them significant stress. Even some post-docs who were very successful in acquiring funded projects find themselves on temporary contracts. This situation makes it challenging to attract and, more notably, retain talented postdocs.

Recognizing the significant contributions of postdocs to CCA's research, the committee advocates for a more substantial effort to attract, nurture, and retain them. It recommends

that CCA develops a comprehensive vision on postdocs (in parallel to the existing programme for PhD candidates), including proposed strategies for attracting postdocs with external funding and improving the appeal of postdoc positions. This could involve initiatives such as extending stays, providing comprehensive support, and offering robust training and mentoring through dedicated seminars or personal meetings. Special attention should be given to career guidance and equipping individuals with the tools needed to become effective supervisors.

The committee also encourages CCA to participate in shaping procedures for talent promotion. The interviews underscored the importance of clear and transparent communication about promotion, including well-defined promotion criteria. Presently, temporary staff members face uncertainty about the criteria required for promotion to assistant professor, and a similar lack of clarity exists for promotions within tenure tracks to associate and full professor. This lack of clarity contributes to challenges in retaining talent, as individuals may leave for better offers and contracts elsewhere. Another concern raised by interviewed staff was the limited involvement of nurse researchers, which is detailed below under 'research quality', and the lack of career paths for nurse researchers after their PhD. This situation runs counter to CCA's aspiration of fostering a multidisciplinary research environment and the committee therefore suggests that CCA could play a stimulating role in addressing the issue. For instance, it could consider incorporating a cross-link for nursing research in its organigram and/or involve nurse researchers in every Patient Research Group.

Relatedly, the committee identified the absence of a general vision on how to involve junior clinicians who are either in residency (AIOS) or not (yet) in specialist training (ANIOS) and are enthusiastic about pursuing a combined research/clinical career. As a recommendation, the committee suggests initiating a young researcher-clinician programme that includes pep talks, addresses barriers and opportunities, and provides guidance on do's and don'ts. This programme could commence during the master's year and extend to the ANIOS/AIOS stages, inviting young clinicians to contemplate and plan for combined careers in research and clinical practice. The programme should also provide clinic-free protected time for research.

Workload

As is common in academia, staff face a high workload, with research coming on top of significant other duties. This proves particularly challenging for clinicians. An issue that came up repeatedly is the absence of a policy providing dedicated research time for clinicians, an issue that was previously raised at the time of the mid-term review of CCA. Often, clinicians find themselves undertaking research tasks in their personal time, despite research performance being included in annual performance reviews. The committee recommends promoting transparency in discussions about research time: incoming residents should be given clear expectations regarding research commitments and clearly defined allocations of dedicated research time.

The Amsterdam UMC merger itself has also been a significant factor contributing to increased workloads, proving to be time-consuming and demanding for the staff involved. A specific issue highlighted is that staff members are currently contributing to two separate curricula of the associated medical faculties of VU and UvA, which may not necessarily increase workload but rather creates inconvenience and ambiguity. Streamlining teaching duties through the merger of the curricula is suggested as a preferable solution.

Diversity

Amsterdam UMC is actively trying to address imbalances through the development of a diversity and inclusion policy, as explicitly outlined in the organization's strategic plan. The current state of diversity at Amsterdam UMC reveals acknowledged gender gaps among professors, while diversity beyond gender is also characterized by significant disparities. Although foreign PhD candidates are present, their progression to staff levels is limited, partly due to Dutch language requirements for medical staff. Cultural diversity, especially at the professorial level, is identified as an area requiring improvement.

In the committee's perspective, diversity is integral to achieving a world-leading position in healthcare provision, medical research, and teaching. Recognizing that differences complement each other and contribute to collective strength, the committee emphasizes the importance of diversity in fostering new perspectives, creativity, and healthy discussions. While the committee acknowledges that CCA may not directly set overarching policies or influence HR decisions, it suggests taking a proactive stance by setting examples within its own ranks and establishing diverse role models. An associated recommendation is to enhance the representativeness of the research board, currently all-white and male dominated, to accommodate a broader range of perspectives.

Academic culture

Recognizing the importance of promoting a vibrant academic culture, CCA has undertaken commendable initiatives to integrate affiliated researchers and cultivate a sense of community. The annual retreat, hosting approximately 400 participants, plays a pivotal role in exposing researchers to the diverse spectrum of cancer research. For junior talents the OOA organizes a dedicated retreat, where all CCA PhD candidates convene to socialize and engage in scientific discussions. Multiple seminar series and thematic symposia, such as CCA-Next and CCAII, further enhance the academic environment. Staff feedback underscores the value of regular PI meetings for improving communication and awareness, and the networking opportunities between different programmes were described as highly rewarding. The sharing of labs, equipment, and patient materials as well as research facilities accessible to all of CCA (most co-funded by CCA itself) further contribute to a cooperative and creative atmosphere, with anticipated growth in synergy upon the move to a common building. The committee recommends an additional focus on nurturing a vibrant postdoc community, suggesting the allocation of a modest budget for self-organized postdoc events to enhance collaboration and cohesion.

Social safety, inclusivity and research integrity

Amsterdam UMC has implemented initiatives and structures to prioritize openness, social safety, inclusivity, and research integrity, including the establishment of an ombudsman and mandatory e-learning for all employees. Additionally, the institute has formulated a Research Code aligned with the national Code of Conduct for Research in the Netherlands. CCA adheres to this code and – notably – requires all starting PhD candidates, both from VU and UvA, to take a mandatory course on research integrity. In contrast, at other Amsterdam UMC research institutes this requirement is limited to VU candidates. The board of directors has also appointed several independent confidants with a specific focus on research integrity.

Interviewed PhD candidates reported some variations in lived experiences related to research integrity. Pressure regarding authorship is apparently not uncommon, with some supervisors proposing additional authors whose actual contribution to the publication was

minimal. The extent to which open discussions on authorship take place seems to vary between research groups. Relatedly, a recent survey on workplace inclusion revealed diverse experiences among staff, including encounters with micro-aggression and exclusive practices. The committee sees an opportunity for CCA to play a constructive role in addressing such issues, for instance by ensuring adherence to the research code and expressing clear expectations on authorship to PIs supervising PhDs. This would nicely fit CCA's stated intention to emphasize openness and create opportunities to discuss integrity and ethics during PI meetings and conferences.

PhD programme

CCA hosts a considerable cohort of over 550 PhD candidates, with approximately a quarter of them being international. Most of these candidates are formally employed within Amsterdam UMC, predominantly holding externally funded positions that typically span 4-5 years.

Training

The committee was pleased to learn that as of 2021, all CCA PhD candidates complete a mandatory Training and Supervision Plan (TSP) at the start of their projects. The TSP encompasses a predefined course and credit plan, providing a flexible structure with room for adjustments. While this approach is appreciated, the committee notes that, in practice, TSPs are not yet consistently used as living documents that are monitored and adjusted as projects progress. Here, the committee sees an important opportunity for improvement.

Since 2022, all Amsterdam UMC PhD candidates have been integrated into one Doctoral School (DS), extending the previous AMC graduate school to both faculties. The DS plays a key role in project administration, providing information and support, and offering 30 skills courses to registered PhD candidates free of charge. In addition to the transferable skills training provided by the DS, CCA PhD candidates have the considerable added benefit of topical training offered by the Oncology Graduate School Amsterdam.

Oncology Graduate School Amsterdam

The Oncology Graduate School Amsterdam (OOA) is a longstanding collaboration between AMC and VUmc (currently Amsterdam UMC) and NKI-AvL. For CCA PhD candidates it effectively serves as an extension to the Amsterdam UMC Doctoral School. All CCA PhD candidates are also enrolled in OOA which focuses on training the next generation of oncological researchers through topical meetings, courses, and a successful annual PhD retreat for 200 PhD candidates. Both NKI and CCA staff contribute to a high-quality range of topical OOA courses.

The committee recognizes that OOA makes a high-quality contribution to PhD training at CCA (and NKI). Interviewed PhD candidates confirmed that they value the support, training and the networking opportunities offered by OOA. Acknowledging that soft skills are mainly addressed by the DS and are not the primary focus of OOA, PhD candidates express appreciation for the skills courses that are offered by OOA. However, there is a collective desire among PhD candidates for an even broader range of skills courses. The committee recommends that CCA work with OOA to implement this vision.

The committee was pleased to learn that, in addition to training PhD candidates, OOA has also invested in talent programmes, including the successful NWO-sponsored Diamond programme that allowed four master students to develop their own projects, and masterclasses for 6th-grade high school students to spark interest in cancer research. The committee

hopes that these valuable initiatives can be extended into the future.

A point that urgently needs to be addressed by CCA is that OOA is facing a shortage of teaching staff for courses due to budget constraints, with some staff having to teach courses in their own time. Additionally, increasing the number of supporting staff could help to alleviate this burden. CCA is urged to take necessary actions to rectify this situation.

Supervision

While many PhD candidates express satisfaction with their supervisors, the committee found that supervision arrangements were overly reliant on relations with the primary supervisor, and makes a number of recommendations concerning this. The first recommendation is to address the dependency in the supervisor-PhD candidate relation by establishing an external PI Committee, similar to the "thesis committee" model already in place at the Nederlands Kanker Instituut (NKI). Integration and communication between CCA programmes could be further enhanced by mandating membership to include one member from each of the three programmes. Frequent, at least annual, meetings between this committee and the PhD candidate should take place to review research progress and future plans, and to ensure that appropriate skills training and career planning is place. Thesis committees would also allow students to signal issues with supervision. Importantly, the committee should be made available to the candidate if need be, outside of these annual meeting, as potentially the committee members can serve as mentors and advisors in case of conflict or issue of communication with the PhD supervisor.

Secondly, the committee encourages CCA to introduce a mandatory supervision course for PIs that supervise PhD candidates to enhance their management skills, ensure active participation in TSP follow-ups, and improve awareness of PhD requirements for accurate student guidance. Thirdly, the committee was surprised to note that while some OOA/DS training is provided to help PhD candidates prepare for their future careers, not all supervisors actively address this topic with their PhD candidates. The committee recommends that CCA takes measures to ensure that all PIs actively support their PhDs candidates' career planning.

Graduation criteria and project duration

Uniform graduation standards have been set for all Amsterdam UMC PhDs, requiring the completion of a minimum of four articles. The committee observes that amongst PhDs this system is widely perceived as inflexible and contributing to elevated stress levels among PhD candidates. Furthermore, requirements are often not clearly communicated at the start. The committee recommends that, for its own PhD candidates, CCA ensures the inclusion of clear thesis completion guidelines in the initial TSP plan. Additionally, it advises making PhD candidates aware that exceptions to the four-article criterion are possible, acknowledging the differing pressures on clinical and lab-based PhDs.

In the past six years, an impressive total of 506 PhD candidates have successfully graduated from CCA, with 51% pursuing clinical careers and 27% choosing to continue their journey as researchers. The average time to graduation is 69 months, surpassing the national average by 8 months. An associated concern is that PhDs who are not granted project extensions end up doing unpaid work beyond the designated deadline. This underscores the importance of CCA cultivating a culture of timely completion. Initiatives could involve initiating discussions with supervisors, emphasizing the need to optimally facilitate timely completion, and promoting a more hands-on approach towards progress monitoring, ensuring that regular and structured check-ins by external thesis committees take place to verify that PhD candidates are on track.

Representation and wellbeing

At OOA, a PhD council represents enrolled PhD candidates and advises management. At the Amsterdam UMC level, the Association of Amsterdam UMC PhD Candidates (ASAP) collaborates with the Doctoral School, representing Amsterdam UMC PhD candidates in the Amsterdam Doctoral School Board and national PhD candidate associations.

Many PhD candidates face challenges related to work-life balance, stress, and mental health, which seem to have been exacerbated during the Covid-years. The committee is pleased to note an increasing focus on PhD well-being at Amsterdam UMC and CCA. PhD candidates can seek guidance from a PhD advisor and a confidential counsellor in case of problems. Additionally, there is a mentorship programme, while regular trainings, and an Amsterdam UMC mental health flowchart are also in place.

The introduction of a start-up package for future PhD candidates is well-received, and the committee recommends enhancing the onboarding process by including an introduction course, presentations by PIs and a tour of the facilities in this package.

SCIENTIFIC QUALITY

Below, the committee provides its assessment of the scientific quality of CCA, addressing both the institute's overall performance and that of its three research programmes. The committee notes that some of the figures on impact that it was presented with rely on the journal impact factor, a metric with known flaws, urging caution in interpretation. Additionally, the committee identified a lack of specificity in the figures provided in the self-evaluation report and the absence of clear quality indicators. To address these issues, it recommends normalizing data based on factors like academic staff, research groups, financial investment, and authorship position. Establishing clear quality criteria is also suggested to enhance CCA's analysis, facilitating effective (inter)national benchmarking with other institutes at Amsterdam UMC, Dutch medical centres, and within the Oncode Institute.

Overall research quality

The committee observes that CCA has made an extensive quantitative contribution to the scientific body of knowledge, as evidenced by a substantial output of 6744 peer-reviewed publications from 2017 to 2022. CCA's contribution to gastrointestinal oncology is particularly significant, especially in the upper and lower-GI domains, although the average impact in these areas is somewhat below average. In contrast, hemato- and neuro-oncology publications, while fewer in quantity, respectively achieve very high and quite high average impact factors compared to global peers.

A citation analysis reveals that CCA's overall output receives significantly more citations than the world average. An internationally competitive overall mean normalized citation score (MNCS) of 2.28 for the 2019-2022 period represents further improvement from the 2017-2019 MNCS score of 2.02. Of the publications from 2017-2020, less than 3.5% remain uncited, with an average of over 15 citations per paper. The top 25 papers have garnered over 700 citations each.

Notably, CCA has achieved significant success in initiating impactful clinical studies, several of which changed the standard of clinical care. This included the implementation of neoadjuvant therapy in pancreatic, metastatic colorectal, and oesophageal cancer treatments. Additionally, CCA research has influenced shared decision-making practices. Also, much used R2 and CRISPR platforms have been built. The committee expects that these achievements will further enhance international competitiveness for the organization in the foreseeable future.

CCA PIs received recognition in the form of prizes, awards and invited memberships, including a prestigious Spinoza prize and 4 Oncode memberships. Furthermore, CCA researchers have demonstrated a commendable track record in securing funding, acquiring over €240 M in competitive grants during the evaluation period. This includes both individual NWO, ERC, and KWF grants, as well as coordinatorships of consortium grants from organizations such as KWF and the EU. While achieving notable success with 3 ERC consolidators and 4 ERC PoC grants, there appears to be room for improvement at the level of ERC grants. To enhance future fundraising success, it could be advantageous to develop a strategy aimed at attracting external ERC grantees to Amsterdam UMC/CCA. Additionally, offering increased support for, and better facilitating the preparation of, (ERC) grants could prove beneficial.

The establishment of internal, regional and (inter)national collaborations is a key element in CCA's strategy. The committee found evidence of successful collaborations at various levels. At the institute level, CCA strategically allocated some of its budget to funding calls that support collaborative projects, fostering integration between AMC and VUmc researchers. Notably, this approach has yielded proficient local collaborations. In the realm of regional cancer research CCA is actively involved in creating a scientific network of 13 participating hospitals, which is further discussed in the paragraph on Viability. On the (inter)national stage, CCA has established strategic partnerships through longstanding collaborations with renowned institutes both in the Netherlands (e.g., ErasmusMC, UMCU, NKI-AvL) and abroad (e.g., Gustav Roussy Cancer Center, Johns Hopkins Institute, Harvard Medical Center, and Dana Farber Cancer Institute). For now, Amsterdam UMC and CCA's visibility seem strong at the national level, but less so at the international level. The committee suggests further enhancing international recognition through activities such as hosting conferences and pursuing international consortium grants beyond ERC initiatives.

In conclusion, the committee notes that CCA has a strong record in translational cancer research and patient care, with particular strengths in the hemato-oncology, gastro-intestinal and neuro-oncology domains. Its researchers attract substantial research funding, prestigious personal awards and grants, and are productive in terms of research publications, contributions to therapeutic advances and patient care. International visibility and grant success can be further enhanced.

Quality at programme level

Programme 1: Cancer Biology & Immunology

Programme 1 is responsible for a significant portion of CCA's fundamental and preclinical research and covers three sub-themes: cancer biology, immunology, and target discovery/ validation. As the largest programme, it boasts a substantial staff (540) and a prolific publication output (over 1600 papers, with approximately 90% open access). There is a strong emphasis on translation and application to therapy. To further enhance focus and direction, the committee recommends the establishment of strategic research lines, based either on tumour types or methodologies. This would provide a more structured approach to research efforts, aligning with the programme's emphasis on translation and application to therapy. In addition to the translational research presented, there should also be attention for development of interdisciplinary research (with for example engineering).

Programme staff exhibit a collaborative spirit. Individual PIs try to work together, thus bridging divides between the older generation that is used to the pre-merger system and younger staff who have adjusted to the new reality. Coherence within this large programme could, nonetheless, be improved further. Organizing (bi) monthly PI meetings and seminars at programme level could help to further increase communication, physical closeness and awareness.

Programme 1 has a good track record in terms of citations, with an average citation count of 17 and around 3% of publications exceeding 100 citations. Notably, the programme's MNCS decreased from 1.95 to 1.66 during the review period, and the reasons behind this decline warrant further examination by CCA. The programme had several key achievements that were well documented, indicating the scientific

impact of results. Highlight publications address stem cell competition, expression-based tumour subtyping, chimeric antibody development, and CAR-T cell therapy; and a number of clinical trials, including stem cell competition, combination therapies.

The programme's academic reputation is excellent, with internationally recognized team members and impactful publications featuring senior authors from the centre. Strong collaborations and publications with international groups underscore an exceptional global network. Programme 1 secures extensive external funding, averaging €11-14 M per year, including prestigious grants like 3 CCA ERC Consolidator grants, 9 of the 11 NWO investigator awards, including all 5 VENIs, and 6 of the 10 CCA KWF Youngs investigator awards. Programme 1 also includes 3 of the 4 CCA Oncode Investigators and the Spinoza prize winner.

Programme 1 boasts comprehensive methodologies and infrastructure. Notable strategic initiatives in which the programme was involved include the establishment of the CRISPR Expertise Centre (2018), impacting Amsterdam UMC and beyond, and the Immunotherapy Centre (2022), promoting common approaches across 65 scientists, focusing on immune phenotyping, tumour cell biobanking, tissue imaging, and mass cytometry.

Programme 2: Imaging & Biomarkers

This programme is dedicated to advancing research in the development and translation of prognostic/predictive biomarkers and imaging techniques, aiming to support precision medicine. It is divided into two distinct themes: Imaging and Molecular Biomarkers. Research is, in part, bottom-up and driven by clinical needs and methodological advancements.

The committee established that the programme effectively serves as a vital link between programmes 1 and 3, facilitating the translation of scientific discoveries into clinical care and thereby significantly contributing to CCA's overarching mission. However, its role appears more facilitative than initiatory, and there is room for improvement in clarifying how Imaging and Biomarkers collaboratively function. Active collaboration between the Imaging and Biomarkers themes is presently limited, suggesting a need for strengthened ties and cross-pollination, both internally and at CCA/Amsterdam UMC levels, through active collaboration in PRGs, and in future collaborations with ADORE labs.

Although it is the smallest of the three programmes with around 200 staff members, Imaging & Biomarkers has an impressive research output, producing approximately 1500 articles, of which 75-80% are open access. The programme's MNCS has shown consistent improvement, rising from 1.73 in 2017-2019 to 2.41 in 2019-2022. Key achievements include the substantial contribution of the Imaging theme to PET imaging and radiomics, particularly in lymphoma; notable advancements in immunoPET, the development of novel radiotracers; the analysis of platelets and vesicles from liquid biopsies for cancer detection; screening efforts in colorectal, oesophageal, head and neck, cervical, and endometrial cancer. The programme secured an annual average of €11.5 M in competitive funding, which notably included two substantial KWF consortium grants and coordinating roles in two EU consortia, suggesting a good (inter)national reputation of associated researchers. However, personal grants (ERC, NWO) are comparatively underrepresented, and there seems to be limited visibility within Oncode.

CCA has made significant investments in cutting-edge infrastructure to support programme 2, evident in the establishment of the Liquid Biopsy Center (LBC) and 17 associated biobanks to advance the potential of liquid biopsies, along with the recent integration of novel imaging modalities like total PET-CT in the Imaging Centre. The presence of gallium68 generators for tracers also adds to the programme's technological resources. The future ADORE building on the Boelelaan Campus is envisioned to support research in Programme 2, extending its reach into neuroscience. The committee also underscores the importance of the LBC and biobanks in supporting regional care, emphasizing the need to facilitate the linkage between biobank data, imaging, and clinical information.

Some challenges were reported with respect to the sustainability and continuity of facilities, given the high operational costs for personnel, maintenance, and data storage, which are currently covered from PIs own funding. The committee recommends strategic investment in technical staff and AI equipment (data storage) to address these challenges. Additionally, the committee identifies overarching challenges regarding the future sustainability of care and urges the programme to establish explicit links between the sustainability of care and biomarker development.

The committee identified programme 2 as having a particularly high valorization potential, especially in the biomarkers research area. However, existing opportunities may be underused due to a lack of awareness and a valorization process that was described as complex and time-consuming. This point will be further explored in the chapter on 'societal relevance'.

Programme 3: Clinical Therapy & QoL

Programme 3 is a comprehensive and multidisciplinary programme that covers a significant portion of CCA's clinical research, spanning various fields such as surgery, internal medicine, and trials based on radiotherapy, and extending into quality-of-life (QoL) studies. It brings together two distinct themes: Therapy and Supportive Care. Within the Therapy theme, there are significant ongoing studies on important topics, spearheaded by programme leaders. These are largely grouped by tumour type. The Supportive Care theme, which is also linked to other Amsterdam UMC research institutes, presents a somewhat less clear-cut picture. The committee notes that the majority of studies are seemingly medication-driven and there is a notable shortage of studies focusing on enhancing the quality of care, understanding the impact of cancer, integrating a palliative care approach into oncology, and exploring patient and family perspectives, especially within specific diseases. To truly embody a patient-focused research approach, such studies are mandatory and may serve an overarching purpose, as they are likely to be implemented in various TWGs for different primary tumours. Furthermore, the establishment of prospective cohorts may be considered, enrolling a majority of patients to gather Patient-Reported Outcome Measures (PROMS) and Patient-Reported Experience Measures (PREMS), alike POCOP for patients with oesophageal cancer and PACAP for patients with pancreatic cancer.

Relative to its staff size of 250 researchers, programme 3 demonstrates a remarkable productivity, generating nearly 4000 publications, including a substantial presence in prestigious medical journals like Lancet, JAMA, and NEJM, with 36 publications in 2022 alone. Several of its publications have garnered over 1000 citations – although the programme also produced a relatively large number of uncited articles. Overall, the programme exhibits an

impressive and rising MNCS, reaching 2.32 in 2019-2022, while the share of open access publications increased to 80% in 2021. Despite these achievements, the committee suggests that the programme could further enhance its performance by concentrating on a limited number of high-impact topics (those with an MNCS currently over 2) and prioritizing quality over quantity. Associated staff members include globally recognized experts in specific fields who produce impactful research. This translates to staff of programme 3 securing the largest amount of competitive funding, averaging €15 M per year. Individual grant success is evident with three young investigator grants from KWF and a VIDI. Additionally, there are consortia grants from KWF and the EU, as well as funding for multicentre trials.

The committee found that the current research predominantly targets diseases characterized by low volume but high complexity. Given the significant share of first-stream funding in the budget, the committee also sees an opportunity for the programme to foster research in high-volume, low-complexity diseases. Additionally, the sustainability of care should be firmly placed on the programme's agenda, to address and withstand the foreseen challenges and changes in healthcare.

While patient-centeredness is included in CCA's vision and mission, its implementation in programme 3 (and even more so in the other two programmes) appears more aspirational than realized, as evidenced by the absence of the patient perspective in the presented output. The committee emphasizes the importance of increasing patient participation to enhance care, suggesting an active role for patients beyond the use of PROMs. While the committee acknowledges the commendable initiative of establishing Patient Research Groups (PRGs) within programme 3, interviews suggest that these groups are still in the process of maturation, particularly in terms of conceptualizing patient involvement. Staff members highlighted the obligatory nature of involving patients but in practice faced challenges in securing the participation of patients or their representatives. As an alternative, the committee proposes considering the inclusion of nurses who, being attuned to a broader spectrum of patient needs beyond the physical, could serve as effective spokespersons.

Regarding PRG structure, the committee suggests establishing supportive and palliative care as an overarching theme above all PRGs. This can facilitate the acquisition of PROMs for individual patient care and population-based research. Moreover, creating a structured approach to PROMs within PRGs would facilitate addressing overarching topics in symptom management, allowing for the implementation of interventions across multiple PRGs. For instance, studies on preventing delirium, pain, or fatigue could be coordinated. Moreover, the committee suggests establishing a clear vision on which questionnaires to use for PROMs (exclusively use tools like EORTC, EQ5D, HADS, or also consider evaluating the patient's care experience and end-of-life aspects).

Finally, the committee observed limited engagement in collaborative research with academic nursing within programme 3, and insufficient investment in evidence-based practice as a means to implement research outcomes into clinical care. This will also require the programme's (and the institute's) attention.

SOCIETAL RELEVANCE

CCA is dedicated to advancing research that enhances the quality of care, making a tangible contribution to society and specific target groups. Below, the committee highlights some key outcomes. At the request of CCA, it has focussed specifically on advances made in terms of (economic) valorization and business development.

While recognizing CCA's commitment and the outcomes achieved, the committee suggests that there is something to gain from a more structured institute-wide approach to enhancing societal relevance. It recommends the development of a comprehensive impact strategy, outlining key focus areas such as valorization & business development, outreach and stakeholder involvement. To measure success, CCA is advised to establish clear quality indicators for impact.

Key outcomes

In its self-evaluation report CCA has given many examples of research results and activities that benefit societal stakeholders and society at large. Key achievements include CCA's strong relevance through clinical trials, particularly at the forefront of novel anti-cancer therapies like neoadjuvant immunotherapy, screening programmes, and initiatives related to QoL. Trials conducted by CCA researchers have contributed to changing the standard-of-care in various areas. Also noteworthy are developed products that link research on QoL with the patient population, providing patients with means to cope with disease and treatment. These include Oncokompas, a web tool for QoL monitoring that has been used by nearly 4000 patients, shared decision-making tools, and projects that use art to improve QoL, such as 'Staging Cancer' and 'In search of stories'. There are also products that are used by industry partners.

A clear strength is the establishment of multiple alliances with stakeholders, particularly patients and patient organizations. Progress has been made in involving patients and the public in research, with most cancer domains now hosting (annual) patient-information days. Several PIs have actively engaged in outreach, participating in national or local fundraising initiatives, such as Stand-Up to Cancer, Marathon of Amsterdam, Lymph & Co, and Darm to Darm Ride, and raising awareness about national screening programmes for colorectal and cervical cancer, as well as the HPV vaccination campaign.

Notably, a dashboard developed to quantify and benchmark the impact made through policy documents revealed that CCA has had a substantial influence on policy documents on upper/lower-GI cancers and hepato-pancreato-biliary cancers. The committee applauds this initiative to evaluate impact and recommends expanding the set of indicators to include other specific measures that can effectively determine the societal relevance of CCA's research.

Business development

Recognizing current challenges in the funding climate, CCA strategically prioritizes (economic) valorization, urging researchers to translate their work into inventions for patient benefit. The institute actively fosters collaborations with industrial partners and aims to raise 'valorization awareness', by providing guidelines, information and support for negotiations and financial expertise. Foreseeing the growing strategic importance of business development, CCA has proactively invested in hiring two dedicated business developers. While part of the larger Amsterdam UMC tech transfer office ('IXA'), these developers exclusively serve CCA PIs, facilitating them in establishing connections to create economic or societal impact, securing

funding through collaborations or novel granting schemes.

CCA acknowledges the necessity for a cultural shift among researchers to ensure the success of the business development push, as there appears to be a lingering negative connotation associated with economic valorization. In a conversation with the committee, business developers (BDs) highlighted specific hurdles that contribute to missed intellectual property (IP) opportunities. These challenges include researchers' lack of 'patent awareness', unfamiliarity with the IP process, uncertainty about where to start, and competing responsibilities such as patient care, research, teaching, and valorization. Researchers themselves highlighted legal support as a critical bottleneck, impacting all three programmes, but particularly programme 3 where clinicians have additional responsibilities. As reported by researchers, centralization within Amsterdam UMC led to capacity issues and long waiting times.

To tackle existing challenges, CCA's business developers started rolling out a dedicated BD model starting in mid-2022. Their approach includes providing training and organizing quarterly meetings with PIs to identify opportunities, answer questions and rectify misgivings about business development. BDs rightfully emphasize that all research has IP potential, and they encourage PIs to set up their research with IP considerations in mind, even if the researcher is not personally focussed on entrepreneurship.

Thus far, the emphasis on business development has resulted in 6 licenses of intellectual property, 30 CCA inventions filed as patents, 12 Amsterdam UMC public-private partnership (PPP-TKI) grants, and a total of 132 research collaborations. Additionally, CCA has initiated or licensed 3 start-up companies, CIMCURE, Qurin, and LAVA therapeutics. The committee notes that, given CCA's size, these outcomes may seem relatively modest, but recognizes that this focus is recent, and further development requires more time.

The committee supports suggestions from BDs and researchers to (1) expand the overstretched BD team by embedding additional IP screening experts in the programmes/themes, ensuring a more focused approach, (2) involve patent attorneys earlier in the research process to minimize waiting times, and (3) offer direct rewards to researchers as incentives. Additionally, the committee recommends organizing even more frequent monthly BD meetings with PIs, fostering collaboration with reputable valorization teams, such as the one at the Oncode Institute, and the use of standardized templates for various agreements (CTA, CATs, DSAs, etc.).

Visibility and branding

The (external) visibility of CCA was an important topic during conversations, with staff indicating a number of opportunities for improvement. Currently, CCA lacks its own brand identity and operates without a dedicated communication department, instead relying on the broader Amsterdam UMC Communication Department. The CCA webpages on the Amsterdam UMC website provide limited functionality, partly due to restrictions imposed by Amsterdam UMC while it was building its own corporate identity.

The committee reached the overall conclusion that strengthening communication strategies is crucial for CCA to achieve increased visibility and increase its engagement with the broader community. Now that the Amsterdam UMC merger is reaching completion, it strongly recommends that CCA collaborates with Amsterdam UMC to craft a unique public profile and branding. This should comprise both web-based and real-world elements, and would

ensure increased recognition of CCA research excellence among patients, clinicians, scientists, and funders. A comprehensive Dutch/English-language CCA website that offers easy access to affiliated staff profiles, research interests, and publications is a prerequisite for this. Establishing a dedicated CCA communications team will help to address internal and external communication challenges.

Open science

Amsterdam UMC is committed to the open science principles, endorsing stakeholder involvement, full open access (OA) publishing, and data sharing through FAIR data options. Support for OA publishing is provided by the Medical Library for UvA and the UBVU, while the Research Data Management department facilitates data sharing. Amsterdam UMC researchers can use the open data repository DataverseNL to share metadata and publish their research FAIR data sets, open or under conditions for reuse.

The committee found that CCA primarily plays an informative and advisory role for its affiliated researchers. During PI meetings it actively promotes open access publishing and data sharing options. Additionally, CCA has made specific investments in data sharing platforms, such as the R2 platform for sharing and navigating (gen)omics data and the in-house developed FigLinq platform that facilitates data management, analysis, visualization, and publishing. The committee also commends CCA for its efforts toward achieving full open access, reaching 83% Gold OA in 2020.

A potential weakness that resonated in interviews with researchers is that the recently implemented open data policy has not yet had the chance to fully mature. Getting all clinicians on board will require a sustained effort in years to come. The committee recommends addressing this by creating awareness and providing training across staff levels. It is suggested to offer (potentially mandatory) training to PhD candidates and extend training options, especially on open data and FAIR principles, to more senior clinicians. Additionally, the committee emphasizes the importance of properly informing patients about the open data policy and its applications, underscoring the potential use of their data in future research without specifying the research question in advance.

VIABILITY

Over the review period CCA has focussed on making the merger process a success and establishing a new Amsterdam UMC identity for cancer researchers and clinicians. Despite the complexity and duration of the merger involving two large medical centres and the centralization of oncological research and care, a robust foundation for future developments has been established. CCA has produced scientifically sound and highly relevant research that underscores its viability. During the coming review period, CCA will face new challenges and opportunities, as staff relocate into its new building, located adjacent to hospital patient care and advanced imaging facilities. While CCA is still very much a work in progress, the leadership is to be commended on achievements so far during a period of uncertainty and change.

Strategy for the future

In a previous section, the committee highlighted that the definition of clear strategic priorities played a crucial role in allowing CCA to emerge as an integrated institute, with additional priorities identified as the merger progressed. These additional priorities now form the core of the institute's future strategy, which includes innovation through insight, connecting science and care, connecting with the region and beyond, detecting cancer early and personalized monitoring of treatment response, and reaching out to make an impact. The committee acknowledges the significance of these strategic objectives, affirming that they will guide CCA in taking the logical next steps on its path.

An additional aspect that the committee suggests should be emphasized in the strategy is the necessity for creating more focus in CCA's research efforts. Now that CCA is successfully established, there is a need to develop its research portfolio. Going forward, the institute must decide whether to maintain its current relatively broad clinical and scientific focus or to narrow it down and further advance areas in which it excels. It will need to develop mechanisms to achieve this, and to further enhance its scientific output and profile, and the quality of its trainees. In the committee's opinion, new recruitments for the RDC building present an outstanding opportunity. An interview with management revealed an awareness of the need to make strategic choices. The committee recommends translating this awareness into action by developing a comprehensive research agenda that outlines all CCA focus areas.

Furthermore, the committee suggests that CCA integrates the sustainability of care as a key focal point in the strategic plan for the coming period. The institute should acknowledge the anticipated significant increase in healthcare costs in the coming years, necessitating a strategy for cost reduction, downsizing treatments, and ensuring a seamless connection between care and science to address these imminent challenges.

Infrastructure and support

The committee learned that the funding, organization, and long-term planning for core facilities is managed centrally at the Amsterdam UMC level. While CCA is not directly responsible for core facilities, it strategically invests in facilities crucial to the institute's functioning. This investment is guided by surveys conducted among researchers. Notably, investments focus on facilities enhancing translational efforts, including the CRISPR core facility, the liquid biopsy center, and the imaging center. The institute aims to strengthen the connections between such facilities and its research

programmes 1 and 2, which the committee finds an appropriate approach.

Some challenges related to facilities and support services were mentioned during conversations with researchers. Notably, shortages of technical staff result in facilities not running at maximum capacity. As this is obviously detrimental to research efforts, swift action to address this issue is needed. Additionally, discussions underscored the growing recognition of the need for enhanced data collection (omics) paired with optimized mining using artificial intelligence (AI). Since the absence of a centralized facility for AI equipment was noted, the committee recommends implementing AI in a supportive role across programmes, identifying overarching themes, and making strategic investments in technical staff and AI equipment. Furthermore, the establishment of a clinical trial unit with legal and ethics support is essential. Centralization processes within Amsterdam UMC were repeatedly cited as having negative effects on the accessibility of support services, especially in the realm of legal support. Urgent action is needed to address this situation.

During the evaluation period, cancer researchers were (re)located to VUmc but the aging building was suboptimal for accommodating them. In response, Amsterdam UMC together with CCA's private partners made a substantial strategic investment in a research and diagnostic center (RDC) that is currently being built at the VUmc campus, adjacent to the existing immunology building. This future research hub is tied to the new ADORE (Amsterdam Oncology and Neuroscience Research) initiative which aims to build on the mutual strengths of both research domains and facilitate crossovers. The €106M ADORE/RDC building will house most of CCA's preclinical research, pathology and human genetics, alongside PET-CT, iPSC, imaging, GMP, proteomics, and other core facilities.

While the new building will accommodate the majority of CCA researchers at the VUmc campus from 2025, the committee was disappointed to learn, however, that capacity issues have necessitated the placement of cancer immunology research in the adjacent O2 building.

The committee recognizes that the new ADORE/RDC building will provide a focus for translational oncology research alongside work in neurosciences and will be instrumental in the future development of CCA as a coherent (and more physical rather than virtual) research institute. Interviews highlighted that preparations for the move have accelerated the establishment of a new shared culture, since it required a deep understanding of each group's activities and their requirements in terms of facilities. Apart from opportunities, the move also presents some challenges, including accommodating diverse departmental interests and ambitions while creating a coherent, ambitious and high-performing cancer institute. Dual affiliations of researchers with other Amsterdam UMC research institutes may pose integration challenges. The committee recommends that CCA develop proactive strategies to promote interactions between cancer researchers on different parts of the VUmc campus.

Regional science

The committee appreciates that CCA is transitioning from an individual researcher-dependent approach to regional collaboration, aiming for a more collective effort. This involves not only harmonization of infrastructure and processes, but also facilitating the initiation of studies, thereby increasing patient enrollment through the identification of potential candidates and promoting referrals for phase I/II. However, in discussions with representatives from CCA, the committee has predominantly

focused on aligning infrastructure and streamlining processes.

CCA representatives shared plans to strengthen regional collaboration as part of the institute's future strategy. Along with Antoni van Leeuwenhoek Ziekenhuis, CCA is initiating a collaboration with 13 regional hospitals in North Holland and Flevoland to create a centralized network for translational cancer research that will be seamlessly integrated within the oncology network OncoNoVo+. This collaborative effort aims to facilitate the sharing of resources (including patient data and tissues stored in a central biobank) and knowledge, thereby expediting the development of, and patient access to, improved cancer treatments and diagnostic tests. The 4-year project 'Run for the region', supported by a €2.4M grant from KWF, began its pilot phase in December 2022, with the goal to start building a collective infrastructure and harmonize protocols. An initial and commendable outcome of this initiative is the development of an app accessible to all clinicians in the region.

The committee strongly endorses the establishment of regional scientific collaboration and recommends its ongoing prioritization. It emphasizes the importance of inclusion extending to all regional hospitals and clinicians, advocating for a step-by-step approach to enable a widespread participation of patients : 1) inclusion of PROMS and PREMS, 2) participation in prospective studies, and 3) initiation of studies. Additionally, the committee suggests the development of an infrastructure that allows data utilization for care evaluation.

OVERVIEW OF RECOMMENDATIONS

For the reader's convenience, the committee provides an overview of its most important recommendations.

Recommendations

To support the ongoing development of CCA, the committee provides the following recommendations to both the institute and Amsterdam UMC:

Organisation & Strategy

1. **Funding**: Increase CCA's budget from central funds to capitalize on achievements and support research and facilities adequately.
2. **Governance**: Collaborate with divisions, departments, institutes, and Amsterdam UMC to establish robust mechanisms ensuring the interests of developing institutes are considered without compromising patient care.
3. **Inter-Institute Collaboration:** Resolve balance issues across institutes and departments through collaborative planning.
4. **Organization of Patient Research Groups**: Ensure proactive involvement of preclinical researchers in programmes 1 and 2 in organizing patient research groups by programme 3. Develop a template and meeting structure for Patient Research Groups. Strengthen collaboration between programmes, themes and (future) ADORE labs through structured meetings and active involvement in PRGs.

People & Community

1. **Professorship Appointment**: Engage with Amsterdam UMC to reconsider the process for proposing candidates for professorship, giving CCA a seat at the table.
2. **Transparent Promotion Criteria**: Clearly define and transparently communicate promotion criteria, particularly for temporary staff.
3. **Clinician Research Support**: Provide more support for clinicians to engage in research to enhance talent retention. Dedicate time for clinicians to be involved in research, initiate conversations at the start of residencies.
4. **Curriculum Streamlining**: Merge separate curricula of faculties to streamline teaching duties of staff.
5. **Communication Enhancement**: Organize regular PI meetings to improve communication and awareness.
6. **Research Integrity**: Ensure Research Code adherence and foster open communication on authorship.
7. **Strengthening Postdoc Community**: Make postdoc positions more attractive. Create a strategy for attracting talented postdocs. Facilitate regular interaction between post-docs, including discussions on research and non-research themes. Allocate a modest budget to postdocs for self-organization, provide clear guidelines, and optimize meeting structures.
8. **Strengthening PhD Supervision & Training:**
   - Provide a mandatory leadership/supervision course for PIs.
   - Introduce external thesis committees.
   - Improve transparency in publishing expectations and PhD thesis regulations.
   - Ensure PIs actively support PhD's career development.
   - Introduce clear requirements for graduation and address issues of unpaid work post-contract.
   - Include an introduction course and offer a variety of soft skills courses for PhD candidates.

Research Quality

1. **External Grants:** Formulate strategies to attract external ERC grantees and provide dedicated support for these grantees, considering exemption from teaching duties where necessary to enhance grant acquisition.
2. **Patient Council and Nurse Inclusion**: Establish a CCA patient council, include nurses in PRGs, and define career paths for nurse researchers.

3. **Quality Benchmarking:** Benchmark with other cancer centres nationally and internationally for quality determination factors.
4. **Societal Impact Awareness:** Increase awareness regarding the importance of societal impact, emphasizing regional network building.

Societal Relevance

1. **Brand Identity**: Collaborate with Amsterdam UMC for a clear communication strategy to build CCA's brand identity. Enhance the website, paying special attention to English pages for international visibility. Establish a dedicated CCA communications team to address internal and external communication challenges.
2. **Business Development and Legal Support**: Assist PIs in overcoming business development challenges, increase the BD team. Recognize that easily accessible legal support is equally crucial in this respect.
3. **Open Science Awareness and Training**: Create awareness and organize training for Open Science across all levels, including clinicians and patients. Include Open Science training in the OOA curriculum, eventually making it compulsory. Inform patients about the open data policy and potential future use.

Viability

1. **Increase Strategic Focus**: Develop a comprehensive strategy for the next evaluation period, outlining all focus areas of CCA.
2. **AI Integration**: Implement AI in a supporting role across programmes, identify overarching themes, and invest strategically in technical staff and AI equipment.
3. **Biobank-Imaging-Clinical Data Link**: Facilitate the link between biobank-imaging and clinical data.
4. **Clinical Trial Unit**: Establish/empower a clinical trial unit with legal and ethical support.
5. **Technical Investment**: Strategically invest in technical staff and AI equipment, emphasizing data storage.
6. **Sustainability of Care**: Integrate sustainability of care as a focal point in the strategic plan for the next period. Prioritize and make visible the sustainability agenda, especially in manpower and costs. Link sustainability of care to biomarker development

APPENDICES

1. CVs of committee
2. Programme site visit

Appendix 1: CVs of committee

Kees Verhoef (chair)

After visits in Salt Lake City/Utah/USA, Asan Medical Center/Seoul/South Korea and Kyoto University Hospital/ Kyoto/Japan, Verhoef settled in the Daniel den Hoed Cancer Center, Rotterdam, the Netherlands. After a merger with Academic Hospital Dijkzigt, he now heads the department of Surgical Oncology and Gastrointestinal Surgery at the Erasmus MC University Hospital Cancer Institute in Rotterdam, the Netherlands, where he has been appointed as professor of Surgical Oncology. His translational and clinical studies are in patients with advanced colorectal cancer, melanoma, advanced sarcoma and breast cancer. Common focus; 1; Determination of new biomarkers/prognostic factors and 2; New treatment modalities and 3; Sustainable Oncology. Verhoef is a member of several (inter)national guideline committees and member of (inter)national working groups.

Leila Akkari

Leila Akkari is an associate professor and group leader at the Netherlands Cancer Institute in Amsterdam and a senior member of the Oncode Institute. She performed her PhD studies in Cell Biology at the Institute of Molecular Genetics of Montpellier, CNRS - French National Research Center, France, and completed her postdoctoral training in cancer biology, immunology and genetics, first at the Memorial Sloan Kettering Cancer Center in New York City, USA, and then at the Ludwig Cancer Center in Lausanne, Switzerland. In 2017 she joined the Netherlands Cancer Institute in Amsterdam, where she established her research laboratory focusing on the role of innate immune cells in tumor maintenance and therapeutic resistance in brain and liver cancer, in order to harness these cells in personalized anti-cancer treatments.

Yvette van der Linden

Yvette van der Linden is professor in Palliative Medicine, and radiation oncologist, specialised in Radiation Therapy for Palliative Indications and for Gastro Intestinal Upper and Lower Cancers, senior staff member at the Department of Radiation Oncology at Leiden University Medical Center, the Netherlands. The chair is partly installed by IKNL. She is founder and head of the Centre of Expertise in Palliative Care. She initiates and contributes on a national level on innovations in palliative care, education and governance. Her scientific and educational activities are consistent with her specialisations in Palliative Radiotherapy and Palliative Care. She has been one of the initiators of the Dutch Platform on Palliation and Radiotherapy (founded in 2014), which she chaired until 2020, and of PALZON, the Dutch Palliative Care Research Study Group. She has been the representative for ESTRO in the ASTRO-ESTRO-TROG-NCIC international collaboration on bone metastases since 2001. She initiated and chairs the international ESTRO teaching course on Radiotherapy and Palliative Care.

Wendy Nagel

Wendy Nagel is lead (international) Partnerships at KWF (Dutch Cancer Society). She was country director at Laureus Sport for Good Foundation and Aflatoun International. She studied International Business and Languages at the University of Alicante and Hogeschool Holland. She worked in the Board of Directors of AFC Ajax. Furthermore, she was Board Member at Bont voor Dieren.

Laura van Poppel

Laura van Poppel is a PhD candidate at the department of Biomedical Engineering and Physics and the department of Radiology in the Amsterdam UMC, location AMC, Amsterdam, the Netherlands. She obtained her MSc in Biomedical Engineering at the University of

Technology in Delft. She conducts research for the project "Artificial intelligence for early imaging based patient selection in acute ischemic stroke". Furthermore, she is chair of the association for PhD students at Amsterdam UMC (ASAP). Moreover, she is a member the Amsterdam Medical Research works council (*ondernemingsraad*).

Sigrid Stroobants

Sigrid Stroobants is full professor at the University of Antwerp and head of the Nuclear Medicine department of the university hospital Antwerp (UZA). She is chair of the Molecular Imaging and Radiology (MIRA) research group, a multidisciplinary team of preclinical researchers, method developers and clinicians with access to a preclinical Imaging facility (μMRI, μPET and BLI) and cyclotron facility). Her research focuses on the development and validation of new imaging biomarkers in neurology (amyloid, huntingtin, PDE, GLU and neuroinflammation) and oncology (proliferation markers, activity based probes and novel apoptosis tracers). Recently, development of new tracers suitable for theranostics has become a new important research. She also takes on several governing roles such as vice-chair research council faculty/university, board member of the Antwerp Doctoral School for biomedical sciences, chair of the expert panel Kom-op-tegen-Kanker, board member of the Royal academy of Medicine of Belgium.

Richard Treisman

Richard Treisman is director of research at the Francis Crick Institute in London. Prior to that, he was Director of the Cancer Research UK London Research Institute, which was incorporated in the Crick upon its foundation in 2015. Richard's research has focussed on molecular mechanisms of gene activation by growth factors. He identified gene regulatory elements, and their cognate transcription factors, and characterized the signal pathways that control them. His current interests centre on the connection between actin dynamics and cell regulation, in particular the RPEL family of G-actin binding proteins. Richard is a member of EMBO, a Fellow of the Royal Society, the Academy of Medical Sciences, and the European Academy of Cancer Sciences. He was knighted in 2016.

Karin Vanderkerken

Karin Vanderkerken is full professor at the Vrije Universiteit Brussel (VUB), Belgium. She is chairman of the research group of hematology and immunology and also president of the Oncology Research Center (of both faculty and hospital). Besides her role in research and education she is vice rector (since 2016) at the VUB. Since 30 years her research focuses on the (patho) biology of multiple myeloma, the second most prevalent hematological malignancy. The focus has shifted from the role of the bone marrow microenvironment in the homing of the cells towards the role of the bone marrow in the induction of therapy resistance. Currently, her major focus is on the epigenetic regulation of the myeloma cells & influence on therapy response; on the bilateral communication between myeloma cells and the microenvironment through exosomes. And finally, how immunotherapy (mainly with CAR T) can benefit the treatment of the patients. The experiments are performed in vitro using human cell lines and primary purified tumor and in vivo using a unique syngeneic model of myeloma.

Appendix 2: Programme site visit

When	Time	What
Thursday 9 November	08.00 – 08.30	Arrival all committee members at Amsterdam UMC location VUmc (Boelelaan Amsterdam)
	08.30 – 09.30	Meet & greet during breakfast
	09.30 – 09.45	Welcome by the deans
	09.45 – 10.30	Introduction to CCA and dialogue with directors
	10.30 – 11.00	Coffee & discussion time for committee
	11.00 – 11.40	Program 1
	11.40 – 11.55	Discussion time for committee
	11.55 – 12.35	Program 2
	12.35 – 12.50	Discussion time for committee
	12.50 – 13.30	Lunch
	13.30 – 14.10	Program 3
	14.10 – 14.25	discussion time for committee
	14.25 – 15.05	Doctoral school/OOA
	15.05 – 15.20	Coffee & Discussion time for committee
	15.20 – 16.00	PhD students
	16.00 – 16.15	Discussion time for committee
	16.15 – 16.55	Postdocs/Young clinical researchers
	16.55 – 17.10	Discussion time for committee
	17.10 – 17.50	BD & Valorization
	17.50 – 19.00	Wrap up day 1 for committee
Friday 10 November	08.30 – 09.10	Regional science
	09.10 – 09.25	Discussion time for committee
	09.25 – 10.05	Societal impact
	10.05 – 10.20	Discussion time for committee
	10.20 – 11.00	Open science
	11.00 – 11.15	Coffee & discussion time for committee
	11.15 – 12.15	Future perspectives & dialogue with (new) directors
	12.15 – 16.00	Committee meeting (writing time) & lunch
	16.00 – 16.30	First findings and conclusions shared with directors
	16.30 – 17.00	Presentation conclusions and closure