VINTURA

Innovation for sustainable cancer care

Addressing urgent workforce shortages

VINTURA

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Citation: Vintura 2023. Innovation for Sustainable Cancer Care.

This report was commissioned and financed by the EFPIA Oncology Platform.

This report is explicitly endorsed by the following organisations:

ALAN Acute Leukaemia Advocates Network

All.Can Changing cancer care together

DIGESTIVE CANCERS EUROPE

efpia European Federation of Pharmaceutical Industries and Associations

eit Health Co-funded by the European Union

EUROPA UOMO The Voice of Men with Prostate Cancer in Europe

eahp european association of hospital pharmacists

European Cancer Patient Coalition

euregha European Regional and Local Health Authorities

evita

HNHCP Haematology Nurses & Healthcare Professionals Group

LYMPHOMA COALITION

NETHERLANDS CANCER INSTITUTE ANTONI VAN LEEUWENHOEK

Sharing Progress in Cancer Care

TU Delft

See the list of contributors for a complete overview of contributors to this report

Executive Summary

This report highlights the urgent need to rethink cancer care delivery and support the oncology healthcare workforce to safeguard a sustainable and equitable oncology care future. Healthcare, and oncology care, faces a critical challenge in Europe: growing demand for cancer care is surpassing the growth of the healthcare workforce. Experts estimate that we will have a shortage of 4.1 million healthcare workers by 2030[1]. This situation places significant pressure on oncology care, resulting in 1) delayed diagnoses and decreased health outcomes for patients, 2) pressured healthcare staff impacting mental health and well being, and 3) staff shortages and long waiting lists reducing stability of care providing institutions.

To address this challenge, a comprehensive approach is necessary, focusing on three key root causes:

A. Rapidly increasing demand for oncology care
B. Increasing effort to treat each patient
C. Stagnant growth in the healthcare workforce

Innovation in healthcare is a key enabler for addressing these 3 root causes and mitigating current and future healthcare workforce shortages. Select innovation examples across five categories of healthcare innovation – care delivery, therapeutics, screening & diagnostics, wellness & disease prevention, and research & development – provide ample opportunity to improve the situation.

In collaboration with an international multi-stakeholder group we carefully selected 10 cases to demonstrate how innovation positively impacts healthcare workforce challenges. These cases highlight substantial potential for reducing healthcare workload, creating efficiencies, and improving patient outcomes. In addition, our research estimates the quantitative impact on workforce efficiencies of 4 innovation cases, illustrating that innovation, when adopted at scale, has the potential to compensate healthcare workforce shortages.

However, realising the full impact of innovation is only possible when it is implemented at scale. This is where we see critical gaps and huge untapped opportunity. Our call to action to local decision makers is to adopt efficiency realising innovations now. To do so, we propose 5 key Success Factors to bridge 5 local hurdles we identified in our research:

1. Efficiency objectives & incentives

By adding efficiency as a healthcare objective alongside the delivery of high-quality care, policymakers can align hospital incentives and rewards with efficiency goals.

2. Sustainable financing & reimbursement

Establish national implementation budgets to fund the implementation of care innovations that drive efficiency, acting as a bridge to a long term goal of full reimbursement for innovations that have proven benefit in the real-world setting.

3. Implementation & training support

Create national teams or local hospital task forces whose goal is to reduce the burden on the workforce by implementing innovations and delivering the necessary user training.

4. Data to support continuous improvement

Establish national efficiency metrics as well as a measurement system to quantify the impact of innovations, to be used as a basis for ongoing assessment and continuous improvement.

5. Adoption at scale

Define a clear progression pathway for the broad implementation of innovations, supported by national and/or regional guidelines and learning networks.

Europe must take immediate action to transform cancer care through innovation. Implementing efficiency-realising innovations now can mitigate short term workforce shortages. Meanwhile, creating an environment that fosters innovation will ensure sustainable, equitable, and high-quality cancer care in the long term. This collaborative effort will benefit patients, healthcare professionals, and society as a whole, advancing cancer care for the decades to come.

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1. Sustainability under pressure

An urgent need to rethink how we deliver cancer care and support the oncology healthcare workforce

This chapter illustrates the urgent need to rethink how we deliver cancer care to keep care sustainable. We highlight that there is an increasing gap between the care we need to deliver, versus the care we can deliver in the future. We dissect this challenge to understand the main factors driving this gap, and what will happen if we do not act. We showcase several initiatives that are addressing this challenge and describe how innovation is a key tool at our disposal to keep high quality care sustainable.

The widening care gap

The continuous improvement of survival rates for various types of cancer[2] is a testament to the significant advances in diagnosis and treatment. For instance, the survival rates for prostate cancer have risen from 68% in 1995 to 88% in 2014, while breast cancer survival rates have increased from 75 to 84% during the same period. Similar positive trends have been observed for melanoma, ovarian, and lung cancers. Even though survival does not equal cure, these encouraging developments reflect the progress made in the fight against cancer, and they offer hope to patients and their families.

However, pressure on services threatens to make care inaccessible to those who need it. Action is needed now to avert a major crisis. The challenge we currently face is that Europe's growing cancer care needs are outpacing the growth of the healthcare workforce. According to estimates from the European Commission, the number of cancer diagnoses in the EU and European Free Trade Association countries is projected to increase by 21% in 2040[3], while the total healthcare workforce is expected to grow by only 5%[4]. This imbalance could lead to a shortage of 4.1 million healthcare workers in Europe by 2030[4]. Addressing this issue requires a coordinated effort from policymakers, healthcare providers, and other stakeholders to ensure that patients have access to quality cancer care.

Figure 1
Europe five year survival rate across cancer type is showing positive trends in the last two decades[2]

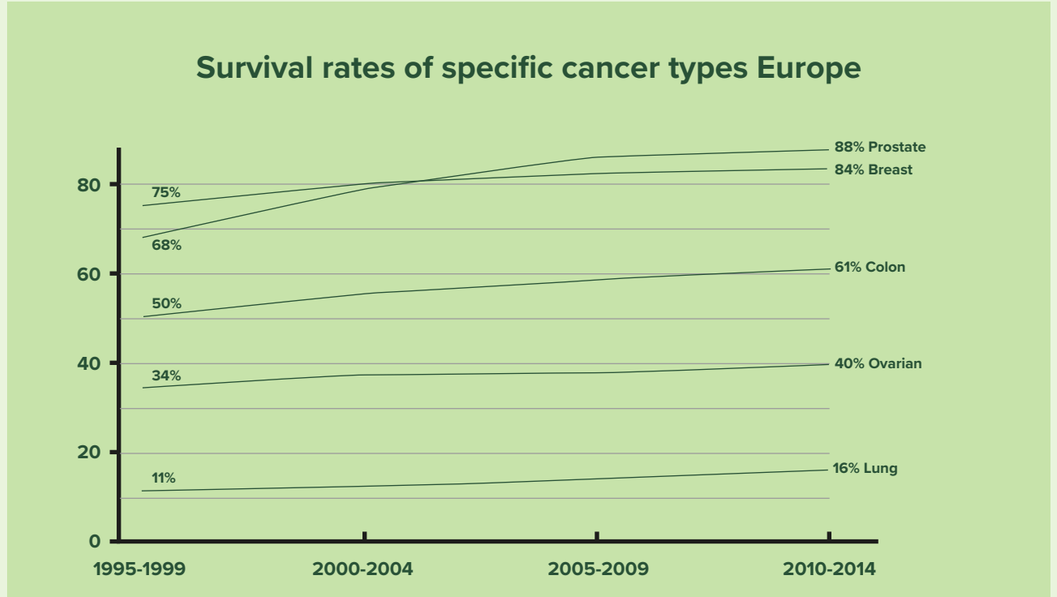
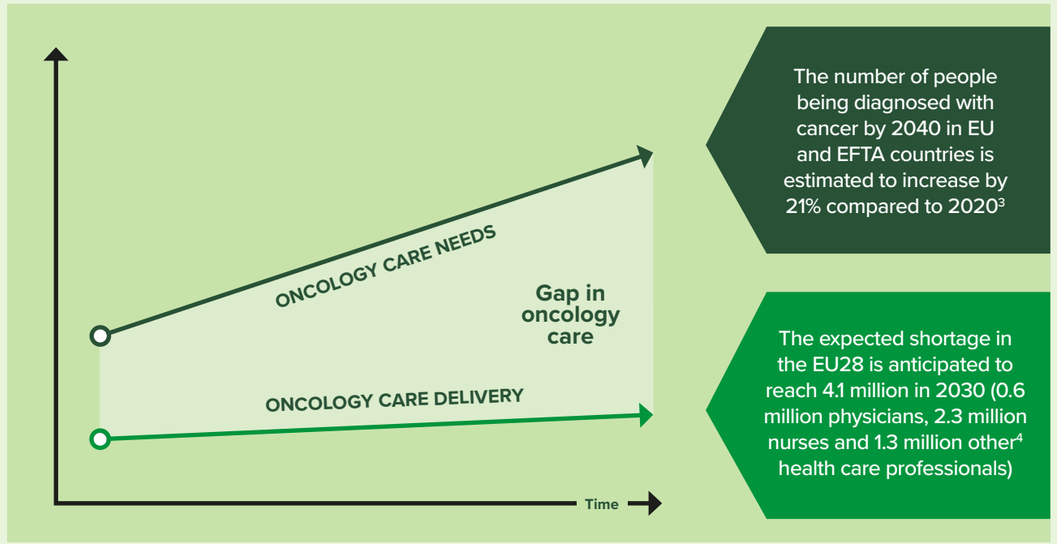


Figure 2
Oncology care needs are growing faster than the growth of the healthcare workforce



There are three root causes driving the gap between Europeans' care needs and the capacity of oncology care systems to deliver:

1 More cases driven by a growing, ageing and less healthy population

The European population is, in general, both growing and ageing. Most countries in Europe have seen an increase in life-expectancy over the last 20-30 years[5]. As cancer is a disease of old-age, it is considered the primary risk factor for the majority of tumors.

These factors have contributed to an **approximate 50%** rise in cancer incidence over the past two decades, and this trend is projected to continue[6]. New oncology cases in Europe are expected to rise from 4.4M (2.68M in the EU27) in 2020 to 5.33M (3.24M in the EU27) by 2040.[7]

2 Productivity in healthcare is not increasing in contrast to other industries

Evidence suggests healthcare productivity isn't increasing compared to other industries. For example in the Netherlands, productivity has declined by 1 to 3% since 2010[8]. Innovations improved care quality but not output per worker, leading to more effort needed for each patient. This challenge isn't unique to the Netherlands; Canada and the US face it too.

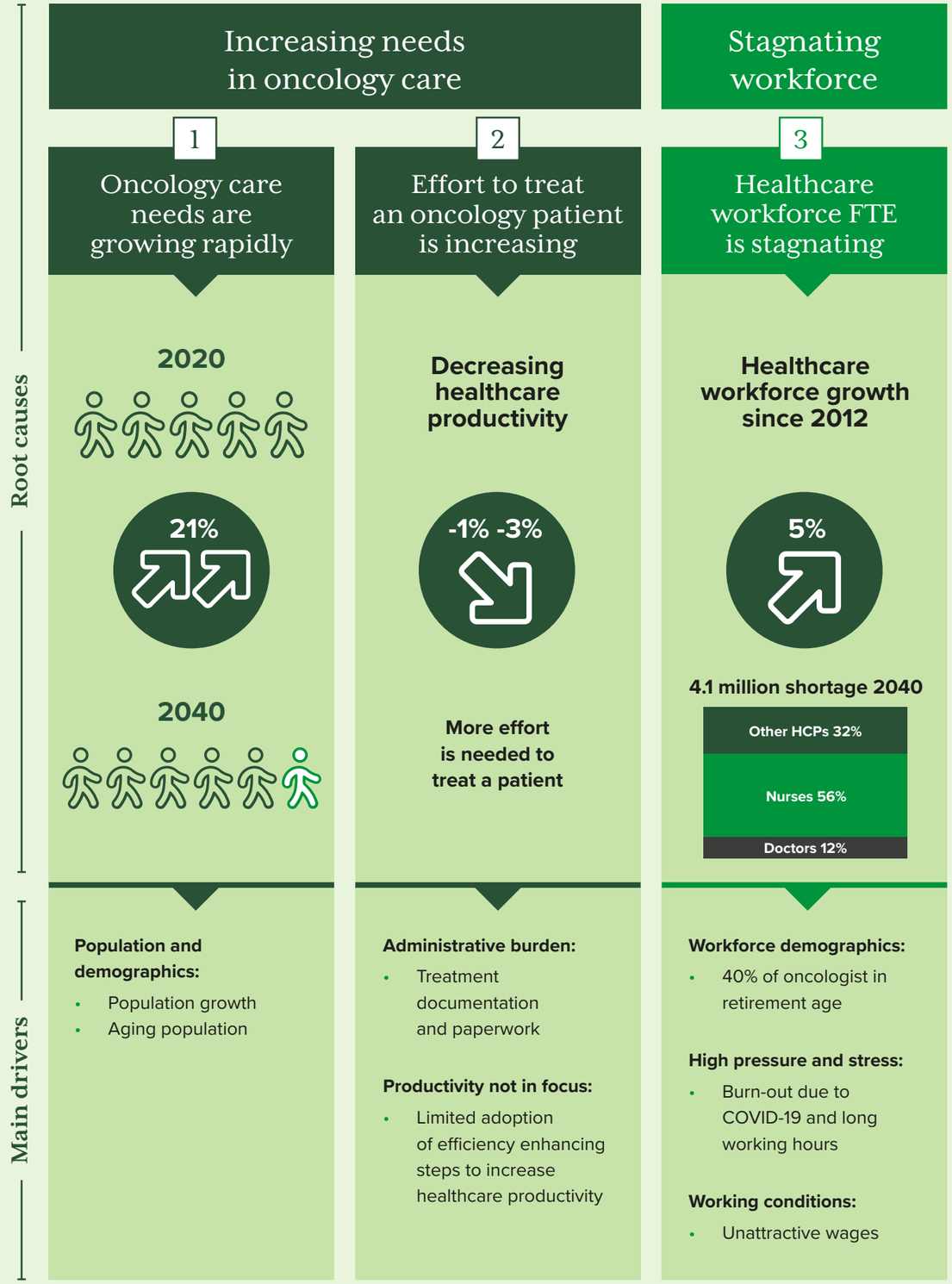
One hypothesis is increased administrative burden. HCPs spend two days a week, 40% of their time, on paperwork. About 50% of physicians feel others could handle 11% of their tasks, and 7% see 31% as unreasonable[9]. A recent study found that for each patient visit, physicians spend about 16 minutes editing, updating and maintaining EHRs[10]. It is important to recognise that every administrative task, whether necessary or not, reduces healthcare professionals time for their patients.

3 The healthcare workforce is not growing as fast as demand for oncology care

While the healthcare workforce is growing slightly in most countries, it is not keeping pace with the growth in demand for oncology care. This is especially true of nurses.

There is expected to be a shortfall of 4.1 million healthcare professionals (600,000 physicians, 2.3 million nurses and 1.3 other healthcare professionals) by 2030 across the EU28[4]. While, as mentioned above, cancer incidence is increasing and the time spent to treat each patient is increasing, the number of oncologists has grown by just 5% since 2012[11].

This shortage is due to a combination of an ageing workforce (40% of oncologists are approaching retirement age), a high level of burnout and stress due to long working hours - and the effects of the COVID-19 pandemic - and poor working conditions and pay[12]. In some cases, nurses are being asked to do triple the amount of work they used to in order to meet the needs of the hospital, which is highly likely to exacerbate workplace stress and burnout, and increase the likelihood of healthcare workers leaving the profession[13].



The effects of the COVID-19 pandemic

Though the challenges facing oncology care both existed and had been identified before the onset of the global COVID-19 pandemic in 2020, the latter has worsened the situation in several ways.

Firstly, delayed screenings and treatments, such as for surgeries, radiation therapy and chemotherapy, due to a lack of capacity in hospitals, has resulted in a backlog of cancer cases and diagnoses at a later stage consequently. Treating late stage cancer compared to early stage is associated with worse outcomes and increased healthcare resource use [14].

Secondly, to safeguard against COVID-19 infection, healthcare practitioners were required to wear Personal Protective Equipment (PPE), such as masks and gowns, while additional precautions had to be taken to protect fragile patients from nosocomial infections, which were more likely during the pandemic. As such the effort and time required to treat each patient increased substantially – thus reducing the capacity of healthcare systems.

Finally, healthcare workers were on the frontline of the COVID-19 pandemic, and so had a high risk of infection. This meant that at any one time there were a significant number of infected individuals who were unable to work. This led to greater pressure on the remaining workforce – who were asked to work longer and harder – which in turn led to increased burnout rates[15].

> “We need to be clear on one fact: our healthcare systems are moving towards a collapse, and we need to do something. Workforce topic is key here. Only if we increase our workforce numbers or change the way we work we will be able to cope with growing waiting lists and pressured workforce.”
>
> Quote from Oncology Hospital Board member during Sounding Board

An unsustainable situation

The trends described above put tremendous, unsustainable pressure on every stakeholder in oncology.

Patients face delayed diagnoses and treatment, which is associated with decreased health outcomes since the disease will be more advanced.

Healthcare workers are expected to treat more patients and face an increased administrative load. This means oncologists and nurses spend less time with patients and have less time for professional development. This situation will affect their mental health and their ability to stay abreast with the latest scientific developments which could otherwise optimise patient treatment.

Healthcare providers face staff shortages and more complex oncology care, which will lead to a drop in healthcare quality.

Interviews with hospital board members has led us to estimate a 15% staff shortfall across European hospitals, laboratories, radiology departments and operating theatres.

The shortage of radiologists is already impacting patient care. For example, the UK’s Royal College of Radiologists has reported delays for patients starting chemotherapy or radiotherapy in about half of the country’s cancer care centres.

The Marwood Group consultancy has found that the problem is not limited to the UK; the number of radiologists per 100,000 people in Portugal, Spain and Switzerland are all insufficient according to its report. “Across the EU, there is a growing shortage of radiologists,” Marwood said, “with only an average of 12.8 radiologists for every 100,000 population.” [16]

Keeping cancer care sustainable: a holistic approach and comprehensive actions

The three main challenges to oncology care mentioned above require urgent, comprehensive actions guided by a holistic approach.

Challenge 1: Oncology care needs are growing rapidly

Reducing demand for cancer care services requires a continuous, multifaceted strategy involving prevention, early detection and effective treatment.

Challenge 2: Effort to treat an oncology patient is increasing

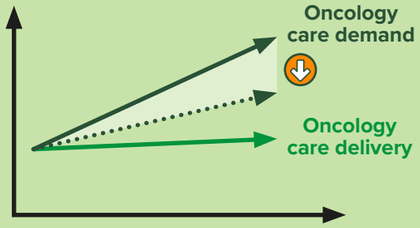
Increasing the efficiency of oncology care is essential for improving patient outcomes, reducing healthcare costs and elevating the overall quality of care.

Challenge 3: Healthcare workforce FTE is stagnating

Increasing retention of healthcare workers while also increasing the number of oncology professionals is critical if we are to meet the growing demand for cancer care.

Oncology care needs are growing rapidly

Decrease oncology demand



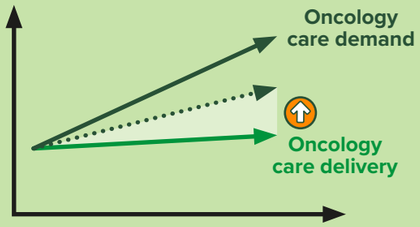
1

Reduce the size of the pie

Reducing oncology demand requires a multifaceted and continuous approach, including prevention, early detection, and effective treatment of cancer

FTE per oncology patient is increasing

Increase care efficiency



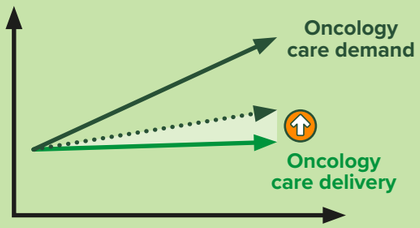
2

Increase efficiency

Increasing oncology care efficiency is essential to improving patient outcomes, reducing healthcare costs, and enhancing the overall quality of care

Healthcare workforce FTE is stagnating

Retain healthcare workforce



3

Retain care workers

Increasing the number of oncology professionals and retaining the healthcare workforce is critical to meeting the growing demand for cancer care

Europe's healthcare systems are taking the challenge seriously. The EU's Beating Cancer Plan proposes a series of measures for cancer prevention, increasing healthcare system resilience and addressing inequalities in access to cancer care. Other initiatives, including the European Health Data Space, have the potential to make systems more efficient. Additionally, given the strain placed on healthcare systems during the pandemic, there is a new general focus on wellbeing to reduce general demand for healthcare interventions.

EFPIA is not alone in identifying or establishing how to tackle these challenges. Patient and professional organisations including All.Can, EONS, EAHP and ECO are also looking at impactful innovations which, when adopted at scale, would work in tandem with the solutions we are proposing.

Through smart investments in innovation, healthcare decision makers can create a new path which reduces oncology demand, ensures efficiency in cancer care and drives sustainable, equitable resource use to promote better outcomes for patients and professionals. But much more can – and must – be done. Europe should prioritise the uptake of innovation in all its forms: investment in research, digital health, access to screening and new approaches to care delivery. There must be a determination to consider and implement any change which can improve health outcomes, patient experiences and efficiencies.

	Decrease oncology demand	Increase care efficiency	Retain healthcare workforce
EU Institutional initiatives	EUROPE'S BEATING CANCER PLAN LET'S STRIVE FOR MORE	TASX	BeWell. ROUTE HWF Characteristics of medical deserts and approaches to mitigate them: a scoping review

2. Innovation as a solution

Empowering the oncology healthcare workforce through innovation

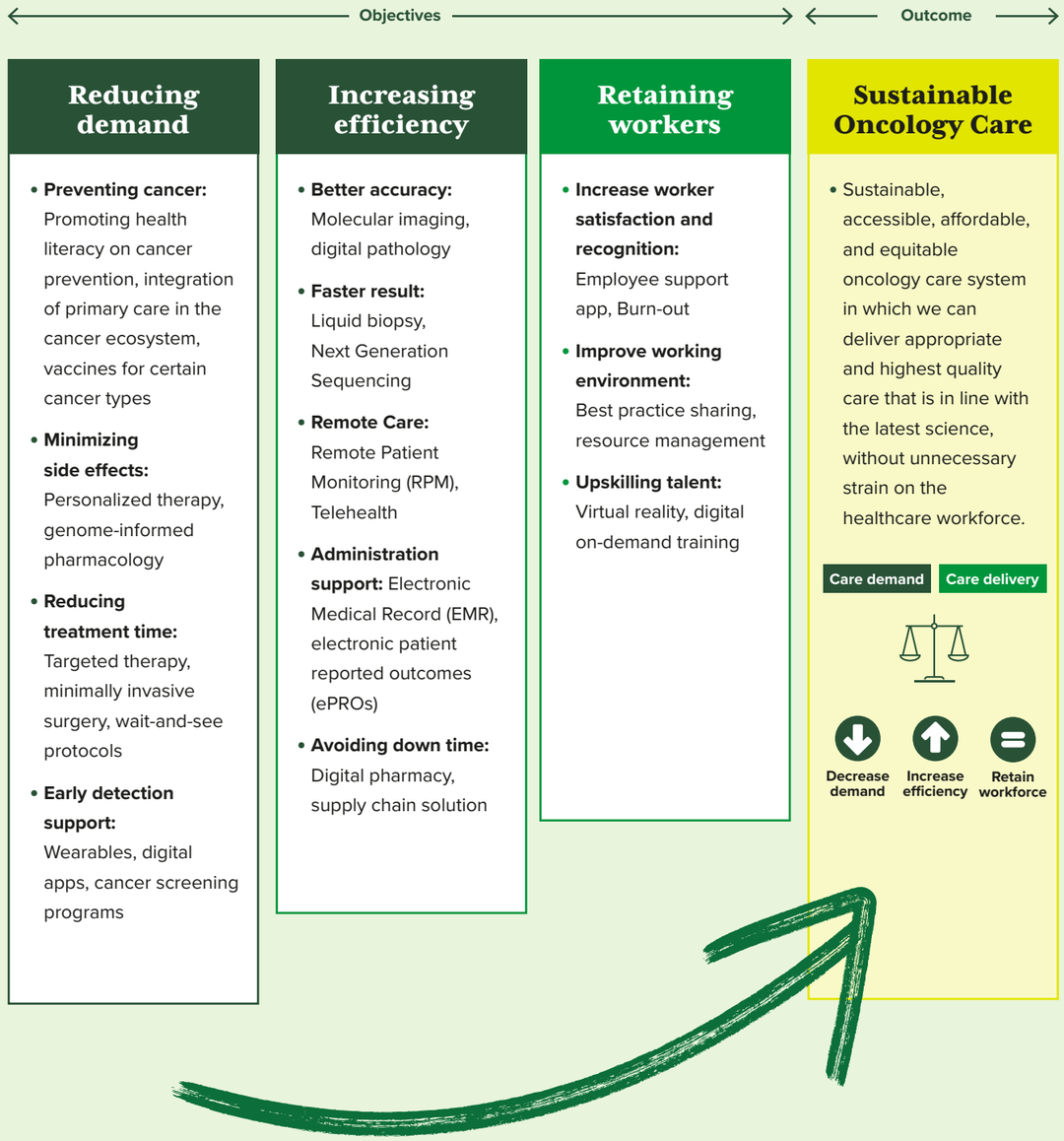
In this chapter, we illustrate how different innovations in care delivery can help address the healthcare workforce challenge. We identified 10 deep dives, and then selected four in which we have estimated the quantitative impact on efficiency, by measuring the freeing up of full time equivalents (FTE), which enables the healthcare workforce to refocus activities in line with patient needs.

Innovation opportunity

The workforce challenge facing cancer care across Europe is serious. But we believe innovation in healthcare offers exciting possibilities to address the chronic shortage of healthcare professionals in order to create a sustainable, accessible, affordable, equitable and balanced system in which we can deliver appropriate and highest quality care that is in line with the latest science, without putting unnecessary strain on the healthcare workforce.

By reducing demand, increasing efficiency, and retaining care workers, care innovation provides a significant opportunity to reduce the widening gap between oncology care needs and delivery

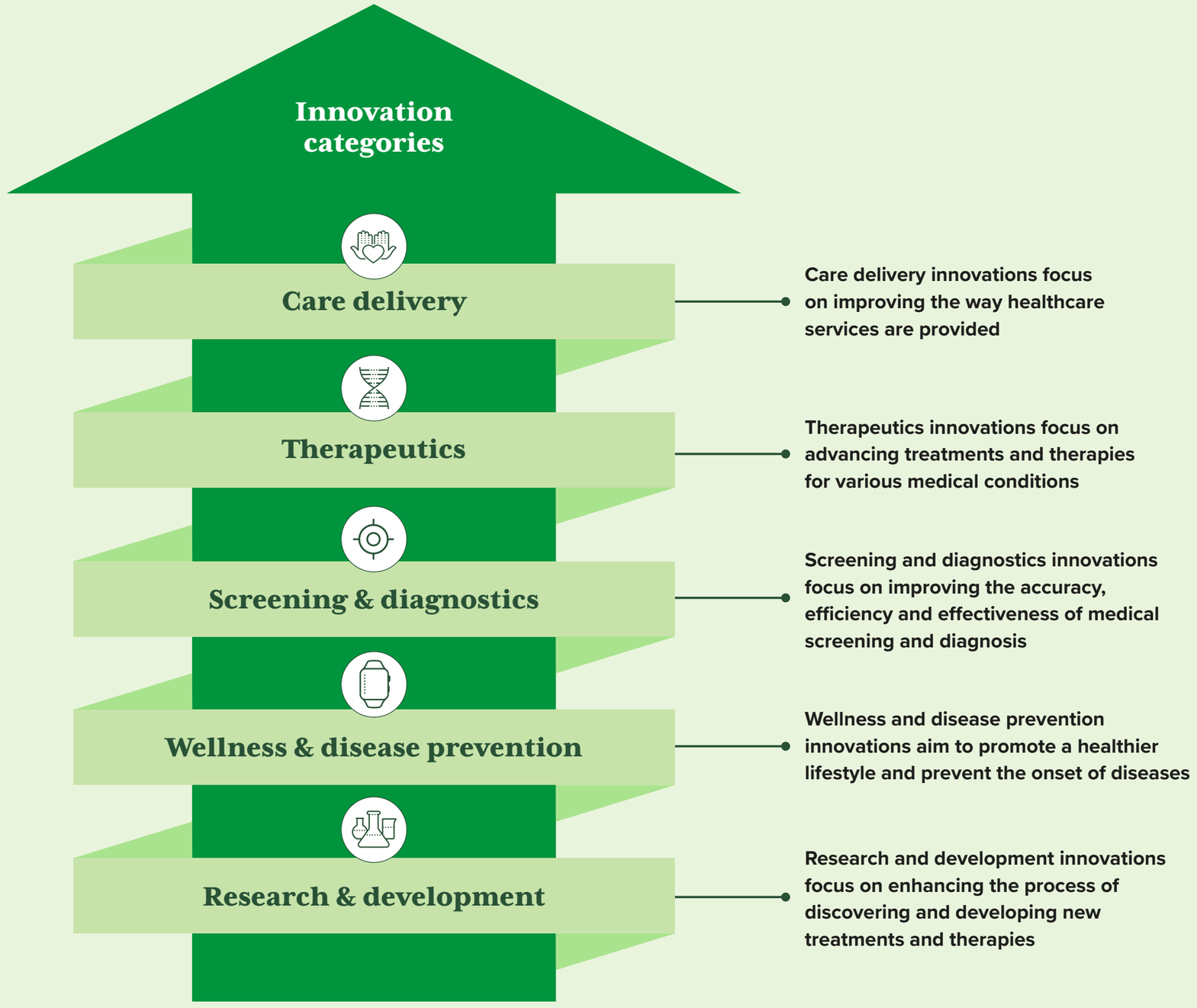
Sustainable oncology care system is a system in which the care we need to deliver is in balance with the care we can deliver – innovation can support this



Defining innovation

Healthcare innovation refers to the implementation of new ideas, approaches, technologies, and practices that aim to improve the delivery of healthcare services and outcomes. It involves identifying and solving healthcare challenges and needs, finding new and effective ways to prevent, diagnose and treat diseases, and improving access to healthcare services. Innovation in healthcare has the potential to transform the healthcare industry by improving patient outcomes and quality of life. It leads to the development of new treatments and cures, enhances patient safety, improves patient experience, increases efficiency, and reduces costs.

In our research we consider five key healthcare innovation categories covering the whole healthcare value chain.



1. Care delivery

Care delivery innovations focus on improving the way healthcare services are provided. Some notable examples include:

Clinic Decision Support: Utilizing technology and data analytics to support healthcare professionals in making informed clinical decisions

Digital Therapies: Using digital platforms and applications to deliver therapeutic interventions, such as cognitive behavioral therapy for mental health conditions

Electronic Medical Records (EMR): Improve healthcare data exchange to enhance accessibility and coordination of care

Telehealth and Remote Monitoring: Leveraging technology to enable remote consultations and monitoring of patients' health conditions, improving access to care and reducing hospital visits

Care organisation: organise care to ensure optimal use of resources ie. to patient home or other non-hospital care insitutions

2. Therapeutics

Therapeutic innovations focus on advancing treatments and therapies for various medical conditions. Some notable examples include:

DNA Editing: Utilizing gene-editing technologies to modify a patient's DNA for therapeutic purposes

RNA Applications: Developing RNA-based therapies for diseases such as cancer and genetic disorders

Cell Therapy: Using living cells, such as stem cells, to treat and cure diseases

Biologics: Developing therapeutic agents derived from living organisms, including antibody-drug conjugates with cytotoxic and radio-isotope payloads

Cancer Vaccines: Cancer vaccines hold great promise to reduce the burden of cancer especially for those with viral etiology

3. Screening & diagnostics

Screening and diagnostic innovations focus on improving the accuracy, efficiency and effectiveness of medical screening and diagnosis. Some notable examples include:

Imaging Technologies: Advancing conventional and molecular imaging techniques, such as X-rays, computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography (PET)

Personalized Biopsies: Tailoring biopsy procedures to individual patients, considering specific genetic and molecular characteristics

Self-screening: Allowing individuals to monitor and assess their health status in the comfort of their own home, reducing pressure on the healthcare system

4. Wellness & disease prevention

Wellness and disease prevention innovations aim to promote a healthier lifestyle and prevent the onset of diseases. Some notable examples include:

Meditation & Fitness Tools: Providing digital platforms and tools to support meditation practices and encourage physical fitness

Public Health Improvements: Implementing community-wide interventions, policies, and campaigns to improve public health and prevent diseases

Disease Prevention Tools: Developing technological solutions, such as wearable devices and mobile apps, to help individuals prevent and manage chronic diseases

Health literacy: Improve the degree to which individuals have the ability to find, understand, and use information and services to inform health-related decisions and actions for themselves and others

5. Research & development

Research and development innovations focus on enhancing the process of discovering and developing new treatments and therapies. Some notable examples include:

Patient Engagement: Involving patients in the research process, allowing them to contribute their experiences and perspectives to improve the development of healthcare solutions

AI and Machine Learning in Drug Discovery: Leveraging artificial intelligence and machine learning algorithms to expedite drug discovery and development processes

Siteless Trials: Conducting clinical trials remotely, utilizing digital tools and patient-generated data

R&D organisation and collaboration: Shortening the lines between universities and hospitals, improving communication between clinicians and academia, facilitating proof-of-concept research to create the possibility for the researchers to demonstrate their ideas in practice

Innovation case approach

During our study, we identified 44 examples of healthcare innovations, from which we created a shortlist of 15 cases, based on their impact and feasibility. This shortlist was then further reduced to 10 cases selected for a deep dive, and we quantified the impact on healthcare workers in four cases.

We used a 4-step approach to identify and analyze EU healthcare innovations that have the potential to address healthcare workforce challenges.

1. Identify healthcare Innovations

Together with a multi stakeholder group consisting of more than 20 stakeholders from the cancer community, including patients, healthcare policymakers, leading physicians, healthcare providers and payers, we identified 44 innovation cases that positively contribute to advancements in healthcare.

2. Select 10 healthcare innovations

The 44 innovations were evaluated based on impact and feasibility narrowing the list down to 10 cases ensuring a balanced representation across five innovation categories.

3. Summarize 10 Cases

A comprehensive summary of each of the 10 selected innovation cases was prepared. This included a description of the innovation, its key features and benefits, and relevant case studies or evidence supporting its effectiveness.

4. Estimate quantitative impact

Four out of the 10 cases were chosen for a quantitative impact assessment. Based on existing data and assumptions we estimate the positive impact each case has on creating efficiencies in healthcare.

Summarizing the benefit of innovation cases

The summaries below illustrate how 10 promising innovations provide significant value in reducing healthcare workforce shortages.. Additional information for each case can be found in the appendix.

1. Huma Remote Patient Monitoring (RPM) - Shifting the treatment from traditional setting

Huma supports hospitals in providing access to care beyond traditional settings. It reduces demand[1] for hospital beds, clinics and other services by allowing patients to be treated at home by nurses. As well as taking on clinical tasks, nurses can empower and encourage patients to take ownership of their own treatment[17].

2. Umberto I University hospital - Hematology care pathway optimization

In 2008, haematologists at Policlinic Umberto I university hospital in Rome developed a care pathway which allows for continuity of care between the hospital and a person's home, building a pathway to ensure continuity of care for people with blood cancer. This innovation is reducing the hospital workforces' workload by shifting care delivery to the patients' home[18].

3. Cancer immunotherapy, using checkpoint inhibitors

Immune-checkpoint inhibitors (ICIs) have become a cornerstone of cancer therapy, benefiting nearly half of metastatic cancer patients in developed countries[19,20]. ICIs currently approved target the cytotoxic T-lymphocyte–associated protein 4 (CTLA-4), programmed cell death receptor 1 (PD-1), or programmed cell death ligand 1 (PD-L1) and work by preventing immune evasion from cancer cells[21].

The use of ICIs is expanding, especially in combination therapies and through the discovery of novel therapeutics[22,23].

Personalised approaches, such as pre-treatment diagnostics, genetic and biomarker analysis, are improving patient selection, enhancing treatment efficacy and safety[24,25]. Continued research aims to refine treatment strategies, further minimize side effects, and extend benefits to more cancer types and enhance access at the global level[26].

4. Qure AI - Machine learning for early detection of cancer

Qure.ai is a startup deploying artificial intelligence (AI) assistance and deep learning technology for medical imaging diagnostics. By automating repetitive tasks, it reduces radiologist and oncologist workload while improving early diagnosis rates and, therefore, preventing late-stage disease[27].

5. ColoAlert - Self detecting colorectal cancer

ColoAlert is a self-testing method to detect bleeding and non-bleeding colorectal tumors through tumor DNA analysis. As well as providing a less invasive testing method which can be performed outside traditional hospital environments, it offers better early detection than current fecal testing standards[28].

6. Prehabilitation - Reducing the impact of surgery

Prehabilitation is a comprehensive program for cancer patients before surgery, incorporating exercise, nutrition, and emotional support. It aims to optimize their physical and mental health, enabling quicker postoperative recovery, reduced complications, and improved overall well-being during the cancer treatment journey[29].

7. Skin Vision - Software for early detection of melanoma

SkinVision is an application for self-screening of moles. This innovation supports individuals — especially those in remote areas — to recognize skin cancers early without visiting a dermatologist. This innovation delivers another layer of skin cancer screening, reducing dermatologist workload[30].

8. Embracing carers - Empower & support carers with knowledge and networks

Embracing Carers is a global initiative focused on recognizing and raising awareness for the crucial role of informal carers. In collaboration with global carer organizations, solutions are developed that empower carers with the right support

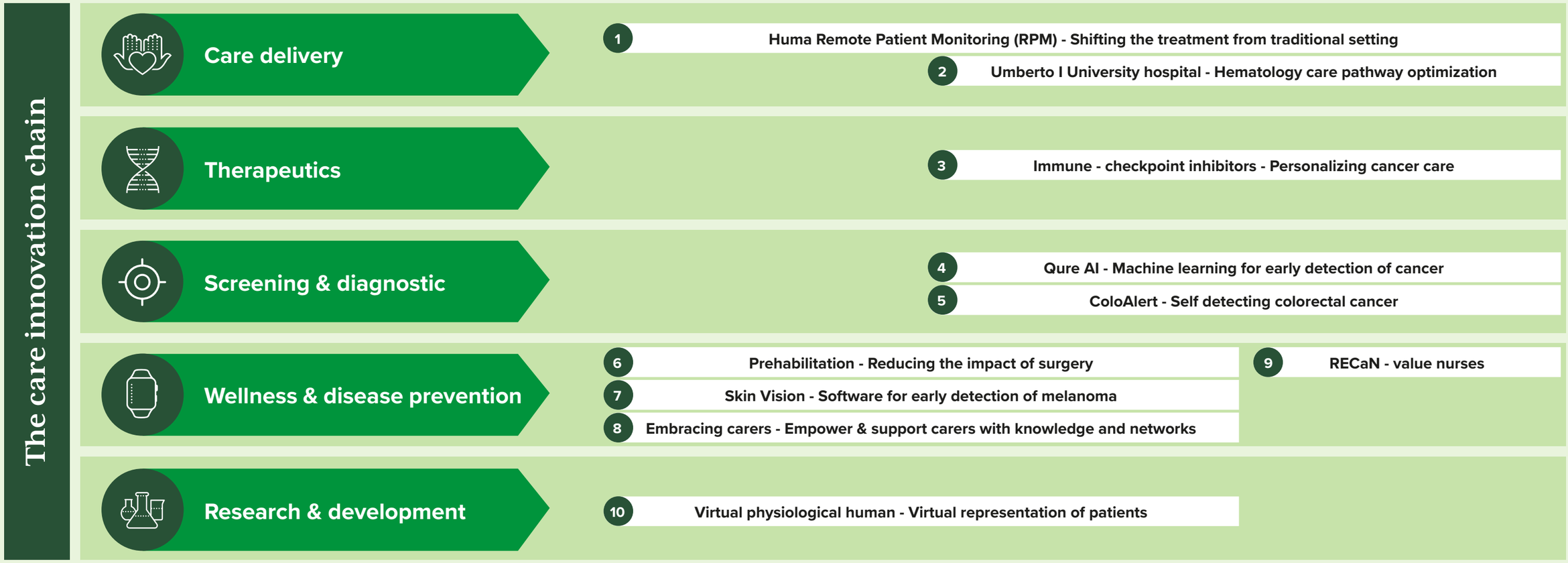
and information they need to become true partners for doctors and nurses in delivering excellent cancer care[23].

9. RECaN - Value nurses

Recognizing European Cancer Nursing (RECaN) is a project led by the European Oncology Nursing Society (EONS) and supported by the European Cancer Organization. It aims to increase recognition for the value and contribution of cancer nursing across Europe. The program aims to reduce the high turnover and burnout rate by offering cancer nurses support, training and acknowledgement[32].

10. Virtual physiological human - Virtual representation of patients

The Virtual Physiological Human aims to create a virtual representation of the human body by integrating diverse data sources and fostering interdisciplinary collaboration among researchers, clinicians, and industry professionals. It enables the simulation and testing of treatment strategies, allowing for more efficient and personalized approaches to oncology research and care which can reduce the burden on healthcare professionals and optimize patient outcomes[33].



Estimating the quantitative impact of select cases

We selected 4 cases based on their scalability potential to estimate the quantitative impact on reducing healthcare workload. These cases are:

- Huma - Remote Patient Monitoring (RPM)
- Qure.ai - Artificial intelligence for imaging diagnostic
- SkinVision app-based skin cancer detection
- Colo Alert blood-based cancer screening

For each case we identified a relevant application in a selected country. We zoomed in on a specific patient population, a specific use case in the treatment pathway, and a specific stakeholder in the workforce who will benefit from the innovation. We then triangulated different data sources and assumptions to reach a high level estimate on healthcare workload reduction (FTE).

As can be seen from the detailed information, all these cases offer significant FTE savings ranging from 168 to 1.014 FTE. In practice this means that all these cases have the potential to reduce healthcare workforce workload , allowing time to be spent on other patient related tasks or other patients who would otherwise be on a waiting list.

Estimated efficiency potential of 4 innovation cases when embedded in a specific country

	Remote Patient Monitoring	AI in lung cancer	Skin cancer self-detection	Colon cancer self-detection
Innovation	Shifting treatment to patient's home	Transforming cancer diagnostic with advance AI technology	Empowering patients to detect skin cancer via mobile apps	Revolutionizing early cancer detection with a single blood test
Potential	**Estimated efficiency in Germany 339 FTE**	**Estimated efficiency in Italy 1.014 FTE**	**Estimated efficiency in Italy 264 FTE**	**Estimated efficiency in UK 168 FTE**
Driver	• Reducing hospital care demand by reducing Length of Stay (LoS) • Increasing manpower efficiency by automating patient monitoring with RPM	• Reducing oncology demand in the long run, due to its ability in early detection of cancer • Reducing frequency of repetitive tasks, which frees up radiologist time	• Reducing oncology demand in the long run, due to its ability in early detection of cancer • Reducing unnecessary hospital visit, primarily via elimination of benign case assessment • Improving patient outcomes via earlier detection of cancer. Early detection and timely treatment reduces the number of advanced cases and therefore the burden on the workforce	
Value	Freed up capacity to e.g. 1) focus on patient related tasks and patients who would be on waiting lists, 2) read up on latest clinical science to improve patient care, or 3) identify opportunities to improve hospital care processes			

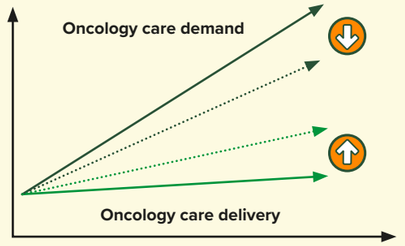
Huma - Remote Patient Monitoring (RPM)

Shortening the post surgery length of stay for colorectal cancer (CRC) patients through RPM has the potential to significantly lighten nurse workload

RPM can reduce duration of stay by shifting the recovery process to patient's home, without reducing care quality as healthcare professionals will be able to monitor patients at a distance. As such, this innovation has the potential to greatly reduce healthcare workforce workload, especially from nurses, when applied in post surgery setting. We illustrate this by estimating the potential to reduce healthcare workforce workload when applying RPM to colorectal cancer surgery in Germany.

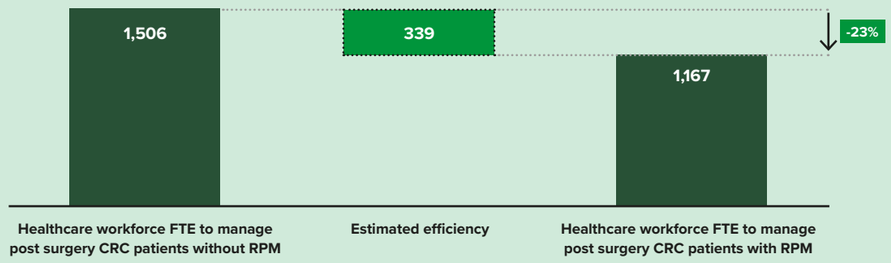
In 2019, over 58,000 people have been diagnosed with late stage colorectal cancer[34], of which 80% will be eligible for surgery[35]. These patients will recover in the hospital for 11 days after surgery according to German healthcare insurance data[36]. According to HUMA's website, RPM could shorten the length of stay by ~53%[37]. Taking a conservative assumption that 25% of patients will not be eligeble for RPM, this ~30% reduction in length of stay would result in an FTE saving saving of 339 FTE in Germany per year. This FTE saving is concentrated in nurse personel and will allow them to shift attention to other value adding activities.

Innovation impact



- Reducing hospital care demand by reducing Length of Stay (LoS)
- Increasing manpower efficiency by automating patient monitoring with RPM

Estimated savings generated by the innovation (in FTE)



Please find detailed assumptions and quantifications in the appendix

Qure.ai - Artificial intelligence for imaging diagnostic

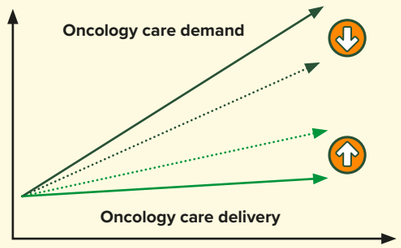
The application of Artificial Intelligence (AI) in lung cancer screening has the potential to reduce radiologist workload by 15%

Artifical Intelligence has many applications across multiple industries, including healthcare. The ability of AI to analyse information can unburden healthcare workers tremendously. One area in which we see a lot of development is in analysing diagnostic imaging. AI has the potential to increase efficiency and accuracy and could be a key tool in the future toolbox of radiologists[38].

We estimate the potential impact of AI used on low dose Computed Tomography (CT) image analysis by quantifying a potential use case of Qure.AI for lung cancer screening in Italy. Smoking is a well established cause of lung cancer and international screening guidelines recommend annual screening of smoking population over 45 years of age[39] For Italy this would mean screening and analysing 7.5 million low dose CT scans a year. Supporting radiologists analyse the results through AI would create an estimate efficiency in the process of roughly 17%. In this specific application the 17% would translate into 1,014 FTE of radiologist time saved each year.

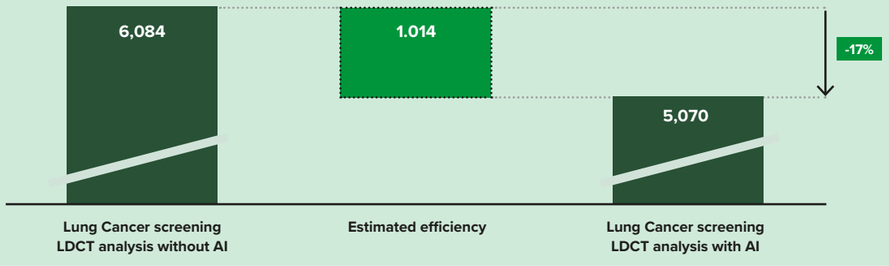
On top of creating efficiencies, Qure.AI's algorithm is able to predict lung cancer 6 years out. Identifying cancer early will enable better and less resource intensive treatment compared to late stage disease[40]

Innovation impact



- Reduced oncology demand in the long run, due to its ability in early detection of cancer
- Reducing frequency of repetitive tasks, which frees up radiologist time
- AI could accurately predict whether a person will develop lung cancer in the next year 86% to 94% of the time

Estimated savings generated by the innovation (in FTE)



Please find detailed assumptions and quantifications in the appendix

SkinVision - Self-screening tests

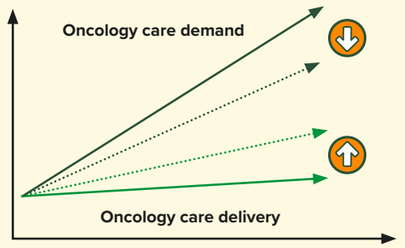
SkinVision reducing unnecessary visit to general practitioner or dermatologist and empowering early detection of skin cancer through advanced home image analysis

Self screening technologies lower the barriers for people to screen for malignant cancers. Self screening reduces burden on the healthcare workforce, as it takes place in the convenience of the persons house, and has the potential to detect cancer early. Treating cancer early is associated with better outcomes and lower resource use.

We estimate the potential impact of applying self screening technologies for identifying melanoma in Germany. An example of this is the mobile phone application SkinVision. SkinVision allows users to take a picture of suspicious moles after which an intelligent algorithm provides advice on whether or not the person should visit a GP or specialist for a second opinion. Our estimation focuses on reduction in the healthcare workload from mole screenings that could have been done by a self screening tool rather than a healthcare professional.

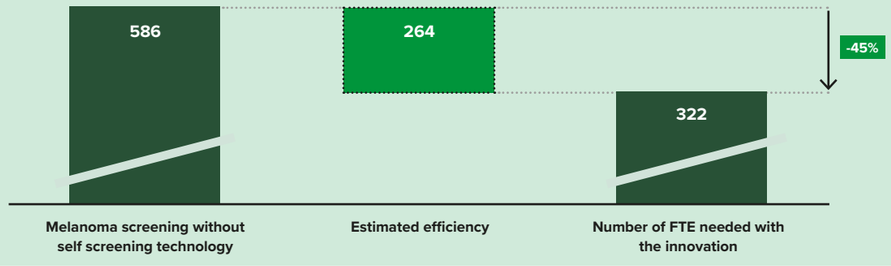
According to the European Skin Cancer Foundation, there are 6.5 millions of skin cancer screening performed in Germany[41]. These screenings take approximately 10 minutes. Assuming that 50% of these cases could be done through self screening and that 10% would require a second opinion would result in 264 FTE of the healthcare workforce saved in Germany per year.

Innovation impact



- Reducing oncology demand in the long run, due to its ability in early detection of cancer
- Reducing unnecessary hospital visit, primarily via elimination of benign case assessment
- Improving patient outcomes via earlier detection of cancer. Early detection and timely treatment reduces the number of advanced cases and therefore the burden on the workforce

Estimated savings generated by the innovation (in FTE)



Please find detailed assumptions and quantifications in the appendix

ColoAlert - Remote diagnostics

Reduce the overuse of colonoscopy and unnecessary visit to hospital using self- diagnostic ColoAlert

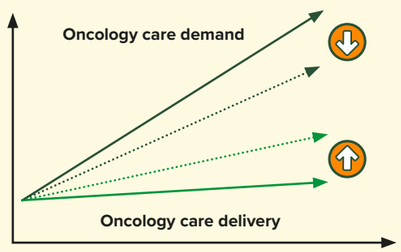
Colonoscopies are the golden standard for colorectal cancer screening and diagnosis. However, it is associated with inconvenience for patients and relatively high healthcare resource use. It takes approximately 2 hours, and multiple healthcare workers are involved.

ColoAlert provides a convenient self screening test. It detects specific DNA biomarkers associated with colorectal cancer and can identify cancerous or precancerous conditions with high sensitivity and specificity in the comfort of a patient's home. We estimate healthcare workforce savings in a hypothetical case in which ColoAlert is the golden standard for colorectal cancer screening in the UK.

In the UK around 900.000 colonoscopies are performed each year of which ~70% are to diagnose colorectal cancer[42].

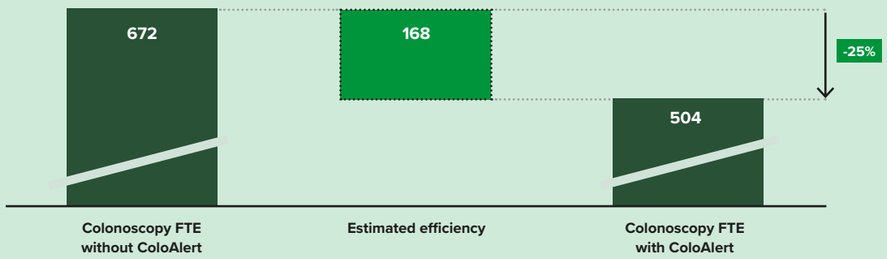
Assuming a 75% time saving when implementing ColoAlert this would result in a total of 25% FTE saving across all colonoscopies in the UK per year. Which translated to 168 FTE.

Innovation impact



- Reducing oncology demand in the long run, due to its ability in early detection of cancer
- Reducing unnecessary hospital visit, primarily via elimination of benign case assessment/intervention
- Improving patient outcomes via earlier detection of cancer. Early detection and timely treatment reduces the number of advanced cases and therefore the burden on the workforce

Estimated savings generated by the innovation (in FTE)



Please find detailed assumptions and quantifications in the appendix

These innovation cases are a sub-selection of 44 cases that have a positive impact on one or more of the three root causes we outlined in chapter one.

The longlist of 44 innovation cases has been carefully curated in collaboration with a multi stakeholder group consisting of more than 20 stakeholders from the cancer community, including patients, healthcare policymakers, leading physicians, healthcare providers and payers. The detailed list as wel ass details of the impact estimates can be found in the appendix.

This shows that there are multiple opportunities to alleviate healthcare workforce shortages through innovation and that we can create significant efficiencies in care by adopting innovation at scale.

These numbers are still far away from closing the workforce shortage gap of 4.1 million care workers by 2030[4]. However, we must realise that these numbers are based on a subset of innovations, and a subset of applications in oncology. There are many additional applications of these technologies and many other technologies that have the potential to increase efficiency of care.

These efficiencies can be used to refocus the attention of healthcare professionals towards delivery of high quality care for patients who would otherwise be on waiting lists. We believe continued innovation and adoption at scale are key to ensuring a sustainable and equitable oncology care system, now and in the future.

3. Call to action

Innovation at scale to transform cancer care

Innovation at scale is the cure for cancer care. We outline our call to action for European policy makers to set the right conditions for innovation to flourish in Europe. In addition, we call upon local decision makers to undertake immediate implementation of efficiency realising innovations. We highlight several hurdles and solutions, including practical examples, to enable local adoption at scale.

Realizing the EU Mission on Cancer by 2030 will require the rethinking of how we deliver care

The EU's Mission for 2030 aims to improve the lives of more than 30 million people across the continent through prevention, cure and for those affected by cancer—including the families of people with cancer—to live longer and better[43].

However, there are serious obstacles to improving European Cancer Care which will make delivering the objectives of either the Mission on Cancer or the Beating Cancer Plan challenging. The shortage of healthcare professionals across the EU is expected to reach 4.1 million people putting serious pressure on sustainability of care[4]. If we are to achieve the EU's goals for cancer care in 2030, we will need to do things differently. We will need to innovate.

Unlocking the potential of innovation at scale.

In Chapter one, we identified three critical challenges facing European cancer care:

- Rapidly increasing demand for oncology care
- The increased effort required per patient
- Stagnated growth of the healthcare workforce

In Chapter two, we showed examples - 10 case studies and four impact estimates - of innovative programs across the EU which are delivering savings, improved patient outcomes and more efficient use of cancer care professionals and resources to address all these challenges. We believe that adopting these innovations at scale throughout Europe will help keep cancer care sustainable and drive us towards successful realisation of the EU Cancer mission.

There are, however, several barriers at regional and local level to the adoption of innovation at scale, and to unlocking its potential to mitigate healthcare workforce challenges.

If we are to meet the challenges facing cancer care in Europe we will need to act now while preparing for the future. As such, our call to action to local and regional decision makers is twofold: 1) create the right conditions at the EU level to allow healthcare innovation to flourish in the future, 2) while implementing efficiency realizing innovations at the local level now. In our 2022 research, we identified 5-key building blocks to create an innovation friendly Europe. We continue advocating for these changes to foster a sustainable oncology healthcare system powered by innovation. In parallel, we have identified several proven innovations that drive efficiency in care. Implementing these initiatives at scale now would alleviate pressure on overburdened healthcare systems in the short term. That means regional and national health authorities, hospitals and other stakeholders should act locally by immediately implementing innovations.

"Adopt efficiency realizing innovation at local level now, while we set the right EU conditions for Innovation to flourish in the future"

Call to action 1:
Put five key building blocks in place to allow innovation to flourish in Europe

In the long term, we ask European Union and national policymakers to work together to establish the right conditions for healthcare innovation to flourish and drive a cancer care system which is truly sustainable and equitable for the decades to come.

We have identified five key building blocks we believe policymakers should adopt to facilitate innovation at scale and allow health innovation to flourish across the continent.

1. **Cancer care policies** should reflect the long-term ambition to continue to put patients and outcomes first. This can be achieved through a focus on innovation and sustainability rather than cost containment.

2. **Long-term funding programs, instruments and initiatives** at European and national level can ensure the investment required to make the fundamental changes needed in cancer care.

3. **Robust data and analytics** on patient needs, outcomes, experiences, costs and efficiency must be made available to healthcare decision makers and innovators so they can facilitate evidence-based decision-making regarding the implementation of innovations.

4. **Cancer care reimbursement** should be redirected from its current focus on short-term volume to a longer-term focus on value, efficiency, and sustainability.

5. **Innovation networks** should be created to allow the sharing of best practices and ensure a clear progression pathway towards wider implementation.

Call to action 2:
Adopt proven efficiency-realising innovations now to start mitigating healthcare workforce shortages immediately

Our case studies, deep dives and savings estimates – described in the previous chapter – have revealed three proven care concepts which have a potentially significant benefit in addressing workforce shortages:

1. **Remote patient monitoring** to facilitate fewer hospital admissions and earlier discharge.

2. **AI image analysis** improves the accuracy and speed of diagnoses, while requiring less intervention from scarce specialist physicians.

3. **Self-screening tools** reduce screening time and can identify disease earlier, resulting in a lower resource burden when compared to late-stage treatment.

We believe implementing these innovations now will help mitigate workforce shortages by creating efficiencies in care. These efficiencies would allow healthcare professionals to refocus attention on value adding activities that are currently under pressure. We call upon local decision makers to implement these innovations now. However, we do realize that there are several local hurdles that prevent this implementation. Our research has highlighted the 5 main hurdles and identifies 5 Success factors to bridge these hurdles. In addition, we looked at practical examples in other areas of healthcare in which similar hurdles have been addressed, ultimately providing a roadmap to implementing efficiency realising innovation.

1. Efficiency objectives & incentives

Hurdle: The activity-based financing models which are typical in current healthcare models incentivise volume over outcomes or efficiency. This means that while a healthcare system benefits from efficiency, an individual hospital does not.

Success factor: By adding efficiency as a healthcare objective alongside the delivery of high-quality care, policymakers can align hospital incentives and rewards with efficiency goals.

Practical examples: Hospitals can be rewarded financially for improving their efficiency by introducing smart contracting in healthcare. For example, in the Netherlands the focus on ”appropriate care” means examining what care is not necessary, or which can take place outside the hospital environment[44].

2. Sustainable financing & reimbursement

Hurdle: Innovation is usually paired with investment, with an expectation of benefits in the future. Current subsidies are typically available for a pilot or development phase projects, with little help available for wider commercial implementation and scaling, which is necessary to achieve a new standard of care. This hampers innovation adoption at scale in the current system.

Success factor: Establish National implementation budgets to fund the implementation of care innovations which drive efficiency. These funds could serve as a bridge to ultimately full reimbursement of innovations that have proven benefit in the real-world setting.

Practical examples:

- The UK has established a national cancer drug fund to ensure access to promising innovation by providing interim funding[45]. Though this fund was criticised by some as merely a temporary fix, it could offer a short-term solution to bridge funding until structural reimbursement of innovation is fully implemented.
- The European Commission’s Recovery and Resilience fund providing financial support to Member states for implementation of reforms[46].
- Reimbursement: German DiGA pathway supports prescription and reimbursement of digital therapies[47].

3. Implementation & training support

Hurdle: Healthcare staffing pressures mean there is limited capacity to implement novel processes. In addition, new skills (which must be acquired either through hiring or training) are often required to implement new innovations and technologies. In other words, there is limited time to innovate and find better ways to do things differently, which keeps us stuck in the same unsustainable system.

Success factor: Dedicated national teams or local hospital task forces could be established to reduce the burden on the workforce by implementing innovations and delivering the training required to make use of them.

Practical examples: Specialist implementation consultants can focus on embedding innovation as efficiently as possible while minimizing the effort required from individual HCPs. Using "learning in the flow of work"[48] principles will allow healthcare professionals to prioritise patients as they learn new skills and processes.

4. Data to support continuous improvement

Hurdle: The healthcare sector in general is lagging in terms of adopting IT systems. Most hospitals and national systems lack the measurement tools they need to quantify efficiency gains or improvements in outcomes generated by innovations.

Success factor: Each country should agree on national efficiency metrics and establish a measurement system to quantify the impact of innovations, to be used as a basis forr ongoing assessment and continuous improvement.

Practical examples: Several hospitals, including the Santeon group in the Netherlands and Germany's Martini Klinik have adopted Value Based Health Care[49]. This encompasses the measure and improve principle and the use of data to continuously improve the care delivery. They place their plain focus on quality of care and look at outcomes that are relevant for patients. This same approach could also be used to look at efficiency metrics.

5: Adoption at scale

Hurdle: There is a lack of structured cross-country initiatives focused on identifying and communicating beneficial innovations. There is no national guidance to encourage the uptake of innovations.

Success factor: Define a clear progression pathway for the broad implementation of innovations. These should be supported by national and/or regional guidelines and learning networks, as well as initiatives to increase health literacy.

Practical examples: Oncological societies allow the sharing of the latest scientific advances in cancer care[50]. We would suggest it can also be used to share best practice innovations. The European Network of Comprehensive Cancer Centres[51] could also play an important role in scaling innovation.

Let's make this happen

Together, we believe these call to actions will create a healthier, more dynamic environment. An environment in which patients, citizens and society maintain access to high-quality cancer care while upholding equal access and supporting ongoing scientific advancements.

They will make it simpler and more cost-effective for healthcare providers to adopt new innovations and initiatives like those described. In turn, this will improve outcomes and access for cancer patients, while improving quality of work for healthcare professionals and those around the patient.

They will make it easier for governments to balance financial constraints with their responsibility to provide advanced, effective healthcare, and they will help make that care more environmentally responsible.

We believe the time has come to take a fresh look at cancer care. We believe in the power of innovation and collaboration to transform cancer care for the benefit of all.

List of abbreviations

AI	Artificial Intelligence
ALAN	Acute Leukemia Advocates Network
CDK 4/6	Cyclin-Dependent Kinase 4/6
COVID-19	Coronavirus Disease - 19
CT	Computed Tomography
DG CNECT	Directorate-General for Communications Networks, Content and Technology
DiGA	Digitale Gesundheitsanwendungen
DNA	Deoxyribonucleic Acid
EHR	Electronic Health Record
ECO	Economic Cooperation Organization
EAHP	European Association for Hospital Pharmacists
EHA	European Hematology Association
EONS	European Oncology Nursing Society
EOP	EFPIA Oncology Platform
EFTA	European Free Trade Association
EFPIA	European Federation of Pharmaceutical Industries and Associations
EMR	Electronic Medical Record
ePROs	Electronic Patient Reported Outcomes
EU	European Union
EUREGHA	European Regional and Local Health Authorities
FTE	Full-Time Equivalent
HCP	Healthcare Professional
IT	Information Technology
LoS	Length of Stay
MRI	Magnetic Resonance Imaging
NL	Netherlands
PACS	Picture Archiving and Communication System
PD1	Programmed Death Protein 1
PET	Positron Emission Tomography
PPE	Personal Protective Equipment
R&D	Research and Development
RECaN	Recognizing European Cancer Nursing
RNA	Ribonucleic Acid
RPM	Remote Patient Monitoring
UK	United Kingdom

List of contributors

The following organisations contributed to this report by providing inputs, discussing report set-up and findings during European multi-stakeholder Sounding Board meetings, and/or reviewing the final report.

Disclaimer: this publication is the result of a multi-stakeholder collaboration but does not necessarily reflect the views of individual organisations or people involved.

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The joint development of this report was initiated by the EFPIA Oncology Platform (EOP). The EOP is a collaboration of 21 companies from the research-based pharmaceutical industry in Europe, launched in 2016 with the vision that every patient in Europe has access to the cancer care they need:

AbbVie	Lilly
Amgen	Novartis
Astellas	Menarini
AstraZeneca	MSD
Bayer	Merck
Boehringher Ingelheim	Pfizer
Bristol-Myers Squibb	Roche
Daiichi Sankyo	Sanofi
GSK	Servier
Ipsen	Takeda
Johnson&Johnson	

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Annex

Case deep dives

This next section includes deep dive summaries of the 10 innovation case studies. These deep dives illustrate the challenge this innovation addresses and how it positively affects the health care workforce challenge

Case impact estimations

This next section includes impact estimates of 4 innovation cases. These estimates quantify the potential FTE efficiency assuming it was fully adopted in a specific country. The estimates are based on limited available data and should be considered ballpark figures.

Case long list

This section includes all the relevant innovation cases that were identified in collaboration with the Sounding Board and EOP. Based on this list we collaboratively selected 10 cases to represent in this report

Case deep dives

This next section includes deep dive summaries of the 10 innovation case studies.

These deep dives illustrate the challenge this innovation addresses and how it positively affects the health care workforce challenge

Shifting care from traditional setting into the patient home (hospital at home) with Huma's RPM (Remote Patient Monitoring) platform

Innovation Name

HUMA

Innovation description

London based company, founded in 2011, with 500+ employees and operates in 20+ countries

About the innovation

Huma is providing **RPM solution** to **support healthcare providers** by **providing access to care, outside of a traditional setting**

Stakeholder involved

Healthcare workers, hospitals and patients

Technology

Care delivery: Web based portal and mobile application

About the innovation

WHY:
Situation and challenge

- Inpatient stay requires regular monitoring by nurses and occupies hospital beds, in some cases patients are only there for monitoring and not for treatment. This monitoring can lead to increased waiting times and additional workload for healthcare professionals

WHAT:
Innovation opportunity

- Shifting the monitoring task from healthcare workforce to the patient and the care location from hospital to patient's home by leveraging Remote Patient Monitoring technology

HOW:
How does innovation address this challenge?

- 'Hospital at home' is a technology that collects real-world patient data remotely and connects patients with the clinical teams
- This enables greater access to care from any location and improves efficiency for both clinician and patients

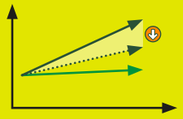
Adoption hurdles

- **Adoption:** Doctor and nurse training to use the software
- **Funding:** Set-up cost for the hospital

Generated impact

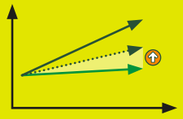
- This platform can almost **double clinical capacity and reduce readmission rates by >30%**[17]
- This innovation is **reducing 53% - 62% of the treatment time** at the hospital[17]

Decrease oncology demand



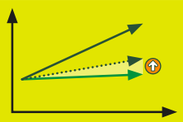
Decrease care demand by reducing unnecessary activities in hospital

Increase care efficiency



Increase efficiency by monitoring multiple patients online at home

Retain healthcare workforce



Reduction of workload potentially reduces work burden and stress

Scalability

- HUMA is a scalable solution that can be implemented in all hospitals across Europe since it is a web based portal that does not require additional hardware and can be accessed through every computer

Geographical Scope

Global

Improved patient Pathway

Pre-habilitation & Treatment → Rehabilitation & Palliation

Leveraging AI (Artificial Intelligence) assistance and deep learning technology for medical imaging diagnostics

Innovation Name

qure.ai

Innovation description

qure.ai is founded in 2016 with series A funding from Sequoia capital

About the innovation

Qure.ai is an AI solution provider to automated interpretation of radiology imaging with compliance certifications

Stakeholder involved

Radiologist, oncologist, patient, hospitals

Technology

Screening & diagnostic

About the innovation

WHY:
Situation and challenge

- Although significant advances have been made in the management of NSCLC, between 10% and 20% of patients with early-stage NSCLC and approximately 66% of patients with advanced NSCLC have disease progression or die within five years of treatment[52]. It is key to early detect it

WHAT:
Innovation opportunity

- Early detection of malignant nodules can improve survival rates significantly[53]. Qure.ai has a solutions that are used for screening high-risk population and increasing the chances for findings of malignant nodules

HOW:
How does innovation address this challenge?

- AI technology could distinguish lung lesions from complex anatomical structures on chest CTs
- qCT-Lung empowers lung cancer screening programs and facilitates opportunistic screening by detecting malignant lesions using AI

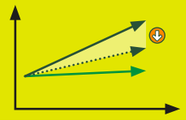
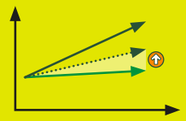
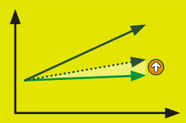
Adoption hurdles

- **Adoption:** Doctor and nurse training to use the software
- **Funding:** Set-up cost for the hospital

Generated impact

Potential

- AI could **accurately predict** whether a person will develop lung cancer in the next year **86% to 94% of the time**[54].
- Study conducted by Qure.ai demonstrated a **17% improvement in sensitivity when using AI to interpret chest X-rays**, compared to radiologist readings[55].

Decrease oncology demand		Earlier detection of oncology shifts treatment from late to early stage cancer which is less labour intensive
Increase care efficiency		Reduction of time required to review oncology scans
Retain healthcare workforce		No direct impact

Scalability

- Qure AI is software based application which can be installed as an add on within existing PACS system in hospital, therefore it is easily applicable all across the hospital in European countries.

Geographical Scope

Global

Improved patient Pathway

Prevention & Early detection → Diagnosis

Embracing carers the unsung hero and the backbone of oncology care

Innovation Name

embracing carers

Innovation description

Established in 2012 Embracing Carers is a global initiative led by Merck, it is focused on recognizing and raising awareness of the crucial role of informal carers and develops solutions collaboratively with global carer organizations.

Stakeholder involved

Patient's carers

Technology

Wellness & disease prevention

About the innovation

WHY:
Situation and challenge

- Many family (unpaid) carers are in need of care themselves and feel unseen and unsupported by society.
- Carers are often so focused on the responsibility of caring for others that they have little time or thought for themselves.

WHAT:
Innovation opportunity

- Embracing Carers™, a global initiative led by Merck, is focused on recognizing and raising awareness of the crucial role of informal carers and develops solutions collaboratively with global carer organizations.

HOW:
How does innovation address this challenge?

- Knowledgeable and skilful carers are a great asset for the healthcare system. By empowering carers, it would increase the patient outcome and help carers to become an independent partner of healthcare workforce by minimizing needed action for the patient.

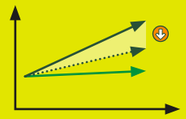
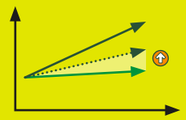
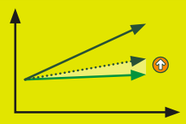
Adoption hurdles

- Increasing awareness and campaign

Generated impact

Potential

- **Decreasing Emotional Burden:**
  89% of carers put the needs of the person they are caring for above their on[31]
- **Minimize the financial burden:**
  71% of carers are concerned that they will not be able to afford provide proper care[31]
- **Enable access to user friendly information:**
  68% of carers need guidance on how to use the tools to complete their caregiving duties[31]

Decrease oncology demand		No direct impact
Increase care efficiency		Increasing knowledge and awareness for informal care givers could reduce burden of care workforce
Retain healthcare workforce		An increase in informal care can relieve pressure on formal carers

Scalability

- This innovation is replicable across Europe and currently operates globally.

Geographical Scope

Global

Improved patient Pathway

Pre-habilitation & Treatment → Rehabilitation & Palliation

Combination of advanced biomarker analysis and tailored immunotherapy that shows promise

Innovation Name

Immune- Checkpoint Inhibitors (ICIs)

Innovation description

Immune checkpoint inhibitors are drugs that unleash the immune system to fight cancer by blocking proteins that inhibit immune responses. This innovation addresses oncology workforce shortages by enhancing treatment effectiveness, reducing patient reliance on scarce oncologists, and improving overall cancer care access.

Stakeholder involved

Pharmaceutical companies, oncologist, cancer patients

Technology

Treatment (Immunotherapy)

About the innovation

WHY:
Situation and challenge

- The discovery of immune checkpoint proteins such as PD-1/ PDL-1 and CTLA-4 represents a significant breakthrough in the field of cancer immunotherapy. These immune checkpoint proteins have been utilized successfully in patients with metastatic melanoma, renal cell carcinoma, head and neck cancers and non-small lung cancer [21].

WHAT:
Innovation opportunity

- The immune system is the core defense against cancer development and progression. ICIs are drugs that unleash the body's immune system to fight cancer. They block proteins like PD-1 or PD-L1, which tumors use to evade immune detection. By inhibiting these proteins, ICIs allow immune cells, particularly T cells, to recognize and attack cancer cells more effectively[22].

HOW:
How does innovation address this challenge?

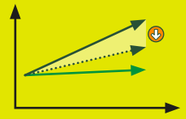
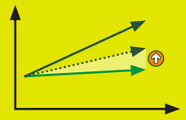
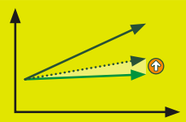
- ICIs work by blocking inhibitory pathways of T-cell activation, leading to an immune response directed against tumors56. At present, six immune checkpoint inhibitors (ICIs) are approved by the FDA for use in a variety of solid tumors, and one hematological malignancy (Hodgkin lymphoma)[24].

Adoption hurdles

- Treatment cost and adverse effect of the therapy may pose a barrier to access and only a minority of patients experience a clinically meaningful response[24].

Generated impact

- Checkpoint inhibitor therapy has dramatically improved outcomes e.g. in melanoma.
- The estimated percentages of patients who are eligible for and who respond to checkpoint inhibitor drugs are increasing from 1.54% (95% CI, 1.51% - 1.57%) in 2011 to 43.63% (95% CI, 43.51% - 43.75%) in 2018[21].

Decrease oncology demand		Checkpoint inhibitors therapy has long lasting response resulting a reduction of recurring therapy
Increase care efficiency		Checkpoint inhibitor therapy therapy could be administered in ambulatory setting, avoiding hospital admittance
Retain healthcare workforce		No direct impact

Scalability

- Despite all of the beauty, scaling up ICIs therapy is not an easy task. Limited access due to high cost of therapy will be a major issue, and different reaction of each individuals toward the therapy would hinder the scalability of the therapy.

Geographical Scope

Global

Improved patient Pathway

Pre-habilitation & Treatment

Software for early detection of melanoma

Innovation Name

SkinVision

Innovation description

SkinVision is founded in 2011 and based in Amsterdam, Netherland.

About the innovation

SkinVision is an awareness and tracking solution that supports individuals with the early recognition of skin cancer. Skin Vision received CE marks in 2014.

Stakeholder involved

Dermatologist, patients

Technology

Wellness & disease prevention (mobile apps)

About the innovation

WHY:
Situation and challenge

- Diagnosing melanoma is challenging due to its atypical presentations and variety of sub-types. Other benign skin conditions can mimic the clinical features of melanoma leading to diagnostic confusion.
- Limited access to dermatologist in certain regions or healthcare systems leading to delayed in diagnosis resulting to poorer outcomes.

WHAT:
Innovation opportunity

- This innovation helps patient to self-diagnosed skin cancer using their mobile phones with the help of AI technology and refer them to the right dermatologist before it is too late.

HOW:
How does innovation address this challenge?

- Dermatologist time is saved, because the apps is screening high number of low-probability patients
- Reducing patient burden by increasing confidence in their skin conditions, due to the easiness of usage and ubiquitous accessibility.

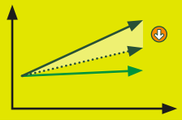
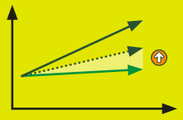
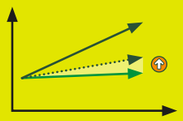
Adoption hurdles

- Placing SkinVision as the golden standard in melanoma screening
- Getting approval for reimbursement by the payors

Generated impact

Potential

- Only ~1% of skin cancer screening is actually a skin cancer case[55]. This innovation could significantly reduce dermatologist working load by adding an additional layer of cancer screening test.

Decrease oncology demand		Early detection of melanoma improves the outcome, and preventing prolonged and recurring therapy
Increase care efficiency		Dermatologist only needs to see high-probable patient which already screened by the apps
Retain healthcare workforce		No direct impact

Scalability

- SkinVision could detect variety of skin conditions melanoma, squamous cell carcinoma, basal cell carcinoma and precancerous actinic keratosis and it could be expanded to cover even broader scope of skin conditions.
- Huge scalability potential as almost everyone has and can use a smart phone.

Geographical Scope

Global

Improved patient Pathway

Prevention & Early detection → Diagnosis

Self detecting colorectal cancer

Innovation Name

COLOALERT

Innovation description

ColoAlert is a self-testing method to detect bleeding and non-bleeding colorectal tumours. The test is done through tumour DNA analysis and thus offers a better early detection than current standard using fecal occult blood tests.

Stakeholder involved

Pathologist, patients

About the innovation

WHY:
Situation and challenge

- The current screening options for colorectal cancers are colonoscopy which is considered as an invasive procedure and Occult blood test (Fecal Immunochemical Test) which might miss early-stage colorectal cancer and non-bleeding colorectal cancer.

WHAT:
Innovation opportunity

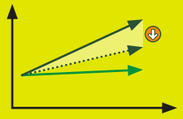
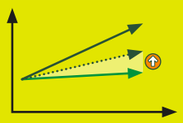
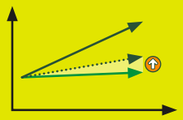
- ColorAlert is offering a non-invasive early detection of colorectal cancer with a sensitivity of 85% and a specificity of 92% through tumour DNA analysis that can be done at home by the patient.

HOW:
How does innovation address this challenge?

- Current colorectal cancer screening is normally performed in elderly patient and patient with symptoms only. With this innovation an alternative for early detection and less invasive screening for colorectal cancer with high accuracy.

Generated impact

- 71% of colorectal cancer are diagnosed at the late-stage with 14% of survival rate[35]. This innovation could increase early diagnosis rate and survival rate of colorectal patient.
- Compared with traditional occult blood test, ColoAlert could prevent miss diagnosis in non-bleeding tumours which represent in 37% of cases[28].

Decrease oncology demand		Early detection of colorectal cancer improving outcome, and preventing prolonged and recurring therapy
Increase care efficiency		Adding first layer of diagnostic in colorectal cancer, avoiding unnecessary colonoscopy procedure
Retain healthcare workforce		No direct impact

Scalability

- Considering the simple application, ColoAlert is highly scalable and extremely beneficial to increase early diagnostic especially in remote area.

Technology

Screening
and diagnostic

Adoption hurdles

- Getting reimbursed by the payor

Geographical Scope

Germany

Improved patient Pathway

Prevention & Early detection → Diagnosis

Virtual representation of patients, real-world systems & processes

Innovation Name

VPH2018

Innovation description

The VPH Institute is an international non-profit organisation incorporated in Belgium and a member of EDITH (Ecosystem Digital Twins in Healthcare)

Stakeholder involved

Researcher, doctors

About the innovation

WHY:
Situation and challenge

- Biomedical research and clinical practice are struggling to cope with the growing complexity of the disease. Fragmented patient data, e.g. clinical imaging and medical information is adding the complexity to simulate an outcome of certain treatment or medication.

WHAT:
Innovation opportunity

- Using VPH technologies, it is possible to capture all the fragmented information and knowledges into predictive and personalised models that will make possible the investigation of the human body as a whole.

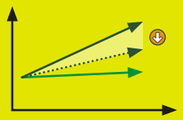
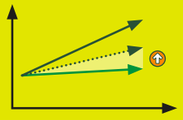
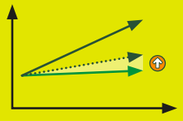
HOW:
How does innovation address this challenge?

- By creating in-silico models of physiology or pathology of the patient, it will help physician to predict the progression of cancer disease and measure the outcome of certain treatment
- This innovation can also measure the performance of a new device or a new drug, and contribute to designing better and more targeted clinical trial.
- The models could also be given to the patient to help them manage their own health and disease.

Generated impact

Potential

- This innovation is opening the possibility to share resources and observations formed by institutions and organizations, creating disparate and integrated computer models of the mechanical, physical and biochemical functions of a living human body with diverse applications including clinical decision support, disease modelling, drug development, medical device design, education, personalized healthcare, public health, rehabilitation, and preclinical testing.

Decrease oncology demand		No direct impact
Increase care efficiency		Increasing the accuracy of oncology treatment, and predicting the outcome of a therapy
Retain healthcare workforce		No direct impact

Technology

Research & development, therapy

Adoption hurdles

- Computational complexity, and data integration due to the diversity of data formats, standards, and privacy concerns

Geographical Scope

Europe

Improved patient Pathway

Diagnosis → Pre-habilitation & Treatment

Improving cancer outcome beyond hospital

Innovation Name

Prehabilitation programme

Innovation description

Preoperative rehabilitation, prehabilitation or prehab, is a form of healthcare intervention that takes place before a medical or surgical intervention with the aim to reduce side effects and complications, and enhance recovery.

Stakeholder involved

Patients, Physiotherapist

Technology

Wellness & disease prevention

About the innovation

WHY:
Situation and challenge

- People with cancer are vulnerable and at higher risk of post-surgery complications, such as breathing difficulties, heart issues, pain and reduced mobility. Some patients require more intensive care or readmittance to hospital

WHAT:
Innovation opportunity

- This care process innovation helps patient to recover faster by improving the psychological status of the patient prior to the surgery without the involvement of healthcare workforce at the hospital

HOW:
How does innovation address this challenge?

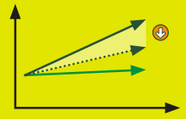
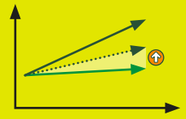
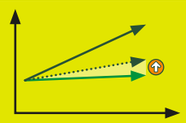
- Prehabilitation is an innovative program which supports cancer patients, to get a better outcome beyond clinical spectrum. This campaign also boost the spirit and psychologically motivates cancer patient to conquer their cancer disease

Adoption hurdles

- Initial investment in training facility and proper training as physiotherapist

Generated impact

- A study in colorectal cancer patients shows prehabilitation training could reduce complication rate from 26.5% to 11.9% and reducing median hospital stay from 8 to 4 days. Furthermore, it could avoid anastomotic leakage from 8.0% to 2.5% and reducing the need for intensive post-operative care from 1 in 12 patients to 1 in 40 patients[57].

Decrease oncology demand		Wesfit could reduce complication rate and reduce the number of readmittance in hospital
Increase care efficiency		Accelerating healing post-surgical healing process resulting reduction of average length of stay
Retain healthcare workforce		No direct impact

Scalability

- The effectiveness of prehabilitation programme is proven positive and there are several clinics in Europe offering this service, e.g. Maxima Medical Center in Netherland, WesFit in UK and PRIME DC clinic in Germany

Geographical Scope

UK, Italy, Germany, Netherland

Improved patient Pathway

Pre-habilitation & Treatment → Rehabilitation & Palliation

Recognising European Cancer Nursing

Innovation Name

Innovation description

Recognising European Cancer Nursing (RECaN) is a project led by the European Oncology Nursing Society (EONS) and supported by the European Cancer Organisation to increase recognition of the value and contribution of cancer nursing across Europe.

Stakeholder involved

Nursus

Technology

Wellness and disease prevention

About the innovation

WHY:
Situation and challenge

- Nurses work on the frontlines, providing 24/7 care to patients, monitoring their condition, administering medications, performing procedures, and offering emotional support. However, their work often goes unnoticed or taken for granted.

WHAT:
Innovation opportunity

- Cancer nurses play a central role in caring for individuals diagnosed and living with cancer, initiative such as RECaN is urgently needed to ensure that nurses are having satisfaction with what they are doing.

HOW:
How does innovation address this challenge?

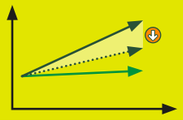
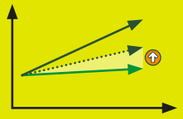
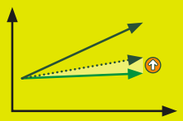
- RECaN overall goal is to increase recognition of the value and contribution of cancer nursing across Europe. It also supports nurses to get training on expert cancer nursing skills, clinical leadership, and management roles, and job advocacy.

Adoption hurdles

- Changing the view of the policy maker to improve the condition of nurses

Generated impact

- High turnover rate and burn-out are still the main challenges, especially during the pandemic. In some countries, over 80% of nurses reported some form of psychological distress caused by the pandemic[32]. This innovation should help improve the situation and retain the healthcare workforce.

Decrease oncology demand		No direct impact
Increase care efficiency		No direct impact
Retain healthcare workforce		Acknowledging and empowering healthcare workforce with training and supports on various topics

Scalability

- RECaN project is an important milestone for cancer nurses in Europe. We see the urgent need and necessity for policy maker to support the cancer nurses across the globe.

Geographical Scope

Europe

Improved patient Pathway

Pre-habilitation & Treatment → Rehabilitation & Palliation

A pathway to ensure continuity of care for people with blood cancer

Innovation Name

UMBERTO I
POLICLINICO DI ROMA

Innovation description

In 2008, hematologist at Policlinico Umberto I university hospital in Rome developed a care pathway which allows for continuity of care between the hospital and a person's home.

Stakeholder involved

Nurses, doctors, psychologist

Innovation category

Care delivery

About the innovation

WHY:
Situation and challenge

- The treatment of blood cancer can be intricate and demanding, forcing many individuals into continuous visits to hospital and endure extensive commuting between the hospital. This situation is challenging for cancer patient and at the same time increase the likelihood of nosocomial infection.

WHAT:
Innovation opportunity

- A care pathway to improve continuity of care between the hospital and home for people with blood cancer, focusing on reducing unnecessary hospital visit and allow home-based care delivered by healthcare professional.

HOW:
How does innovation address this challenge?

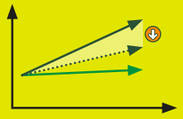
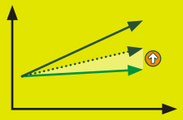
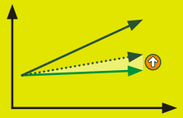
- This innovation is reducing the workload of healthcare work-force in hospital by shifting the care delivery to patient home
- The cost of integrated care pathway at home is lower than hospital-based care and increase patient satisfaction
- Following the success of the care pathway, they plan to implement telemedicine as one of their services so they can reach more people with blood cancer. As the number of people using this service grows, the team also hopes to recruit more doctors & nurses who specialise in haematology

Adoption hurdles

- Setup and training of domiciliary care team to deliver the treatment outside the hospital

Generated impact

- This innovation has a potential to be implemented in other oncology indications, increasing the service offering of the domiciliary care team
- Bigger outcome could be achieved when this innovation is combined with advance technology such as AI, RPM or Telemedicine

Decrease oncology demand		No direct impact
Increase care efficiency		Domiciliary care team taking care of the maintenance of patient, reducing unnecessary hospital visit
Retain healthcare workforce		Increasing healthcare workforce satisfaction, and offering other option to work outside the hospital

Scalability

- In a full-scale implementation, this innovation could completely remove hospital involvement in maintaining blood cancer patient. The domiciliary care team could handle all the demand, and hospital will only be taking care the high-risk and critically ill patient

Geographical Scope

Italy

Improved patient Pathway

Pre-habilitation & Treatment → Rehabilitation & Palliation

Case impact estimations

This next section includes impact estimates of 4 innovation cases.

These estimates quantify the potential FTE efficiency assuming it was fully adopted in a specific country. The estimates are based on limited available data and should be considered ballpark figures.

Shortening average length of stay using Remote Patient Monitoring (RPM) in oncology patient to reduce the healthcare workforce burden inside the hospital

HUMA

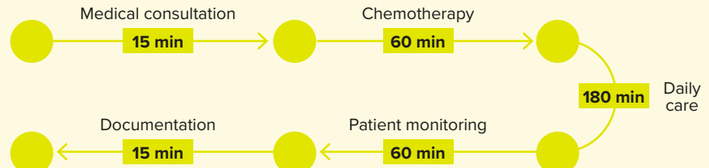
Context

- **Early Detection and Intervention:** RPM allows healthcare providers to continuously monitor oncology patients outside the hospital setting, enabling early detection of potential complications or changes in their health status.
- **Timely Management and Support:** With RPM, healthcare professionals can proactively manage patients' symptoms, medication adherence, and treatment side effects remotely which increasing the efficiency in resource allocation, enabling healthcare professionals to focus on critical cases while still ensuring that patients receive the necessary support and care from a distance.

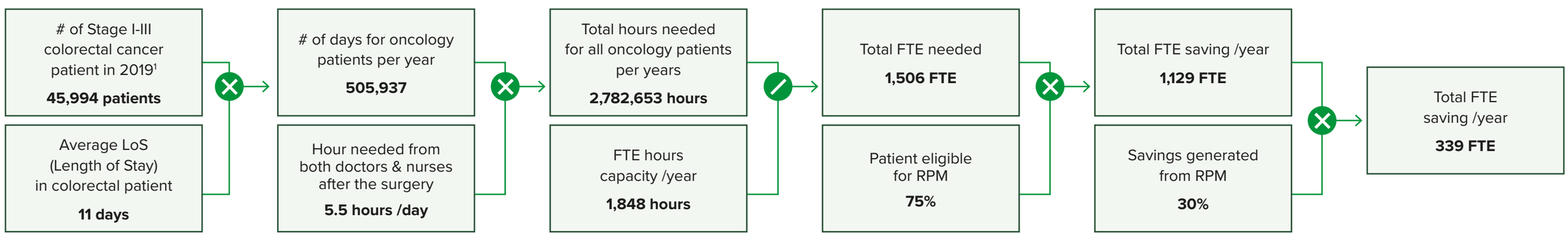
Selected case

- **Continuous Monitoring and increase convenience:** Colorectal patients undergoing treatment or in postoperative recovery can benefit from remote patient monitoring, as it allows for continuous monitoring of their vital signs, symptoms, and recovery progress and eliminates the need for frequent hospital visits for routine.
- **Improved Compliance and Self-management:** RPM empowers colorectal patients to actively participate in their own care and promotes patient engagement, enhances compliance with treatment plans, and encourages self-management, leading to better overall outcomes in colorectal care.

Assumption

Median LoS (Length of Stay) per oncology patient **11 days**	• In 2019 there are 58,967 colorectal patients in Germany[34]. Approximately, 22% of CRCs are metastatic at initial diagnosis and excluded on the calculation[35].
LoS of patient with RPM **7 days**	• According to insurance company data, the average length of stay for colorectal cancer is in Germany 11.1 days[36] In this case study, we are assuming RPM could shortened the LoS to 7 days.
Hour needed from both doctors & nurses to take care of the patient **5.5 hours /day**	
FTE hours capacity /year **1848 hours**	• **FTE / year** = Working day – annual leave – public holiday (8h/day * 5 days/week * 52 weeks) – (20d * 8h) – (9d * 8h) **1 FTE = 1848 hours**
Savings generated from RPM apps **30%**	• **Assumptions:** 75% of the patients post colorectal surgery are eligible for early discharge and suitable to continue the treatment using RPM technology, RPM could reduce LoS by 30%.

Saving potential of healthcare workforce (mixture of doctors and nurses) in colorectal cancer, Germany



Qure.Ai supports radiologist in lung cancer screening up to ~17%, by automatize malignant nodule detection using Artificial Intelligence in CT scan

Context

- **Advanced imaging analysis:** AI technology can identify subtle patterns and abnormalities that may indicate the presence of lung cancer, even in its early stages when it may be difficult to detect visually.
- **Early detection and improved outcomes:** Early detection is crucial for successful treatment outcomes, as it allows for timely intervention and potentially more effective treatment options.
- **Reduced diagnostic burden:** Lung cancer diagnosis can be challenging and time-consuming for healthcare professionals This can help streamline the diagnostic process, reduce the burden on healthcare providers, and ensure that potential cases of lung cancer are not missed.

Selected case

Screening | Diagnostic | Treatment | Follow-up

- The selected case focuses on early-stage lung cancer screening in smoker in Italy
- AI technology could replace the interpreting task from radiologist and deliver faster result

Assumption

Lung cancer screening population **32.45 million**	• The population of Italy in 2020 is 59.44 million[58] with 54.6% of them are above 45 years old. Assumption: lung cancer screening age is > 45 years old
Smoking rate in Italy **23.1%**	• According to macrotrends.net the smoking rate in Italy in 2020 is 23.1%[59]
Annual screening	• The international recommendation is annual screening with low dose CT[39]
Total time required for low-dose CT **1.5 hours**	• **Assumption:** Average time needed per patient consisting diagnostic and consultation, therapeutic procedure, hospitality and other activities delivered by doctors, nurses and other medical support staff Preparation 20 min → Anamneses 20 min → 15 min Other task → LDCT-Procedure 20 min → Interpreting result 15 min
Saving potential with Qure AI **16,67%**	• Qure AI is replacing the interpretation task done by radiologist in the LDCT (Low-Dose Computed Tomography) procedure (15 min / 90 min) x 100%

Radiologist saving potential in lung cancer screening, Italy

# Lung cancer screening population **32.45 million**	Smoker population in Italy (2020) **7.5 million**	#of screening/ year **7.5 million**	#of hours required **11.24 million hours**	FTE needed to screened all lung cancer cases **6,084 FTE**	Potential saving **1,014 FTE**
Smoking rate in Italy (2020) **23.1%**	Annual screening with low-dose CT **1x / year**	Time required for low-dose CT **1.5 hour**	FTE hours capacity /year **1,848 hours**[1]	Potential saving using AI technology **16,67%**	

SkinVision reducing unnecessary visit to GP or dermatologist and empowering early detection of skin cancer through advanced image analysis

Context

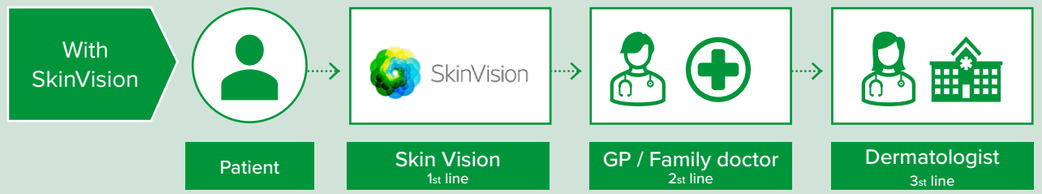
- **Early Detection:** SkinVision empowers individuals to perform regular self-examinations and detect potential signs of skin cancer at an early stage. Early detection is crucial in the fight against skin cancer, as it increases the chances of successful treatment and improves patient outcomes.
- **Accessible and Convenient:** This innovation provides a user-friendly mobile application that allows individuals to perform skin checks conveniently from their own homes. By providing an accessible and convenient tool, It helps bridge the gap between individuals and healthcare providers, facilitating early intervention and reducing barriers to timely skin cancer detection.

Assumption

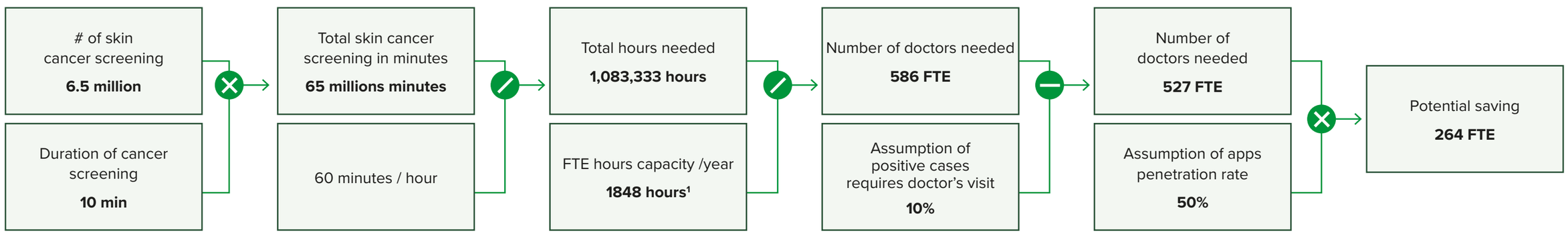
# of skin cancer screening **6.5 millions**	According to the European Skin Cancer Foundation, there are 6.5 millions of skin cancer screening performed in Germany[41]
Duration of cancer screening **10 min**	Screenings take approximately 10 minutes, including completing the paperwork and getting your skin checked[60]
Cases screened by the apps **50%**	Assuming penetration barrier such as technology burden, generation gap, and membership payment.

Selected case

- SkinVision is adding additional layer in skin cancer screening and reducing unnecessary visit to dermatologist



Saving potential of skin cancer screening, Germany



ColoAlert is delivering an easier access in detecting colorectal cancer through DNA analysis with faster time to diagnosis and better comfort for the patients

COLOALERT

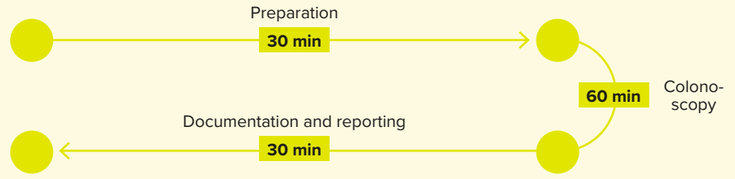
Context

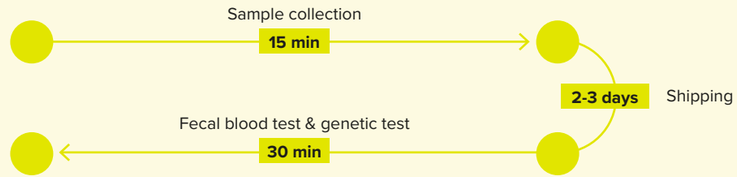
- **More accuracy and less invasive:** By utilizing advanced biomarker analysis, this test can provide more accurate and reliable results compared to FOBT (Fecal Occult Blood Test). It detects specific biomarkers associated with colorectal cancer and can identify cancerous or precancerous conditions with higher sensitivity and specificity.
- **Easy and convenient:** ColoAlert, as a non-invasive self-detection system, offers a less invasive approach compared to colonoscopy.

Selected case

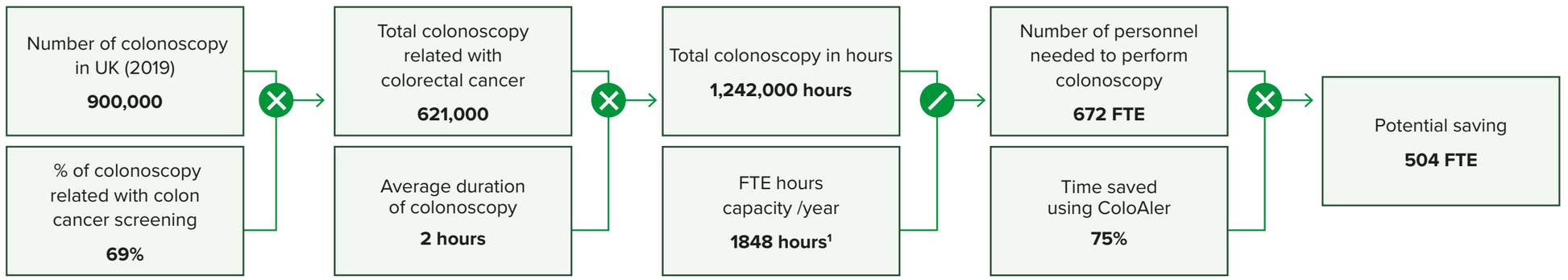
- The aim of this case study is not to replace colonoscopy as the golden standard for colorectal screening and diagnosis but to reduce the overuse of colonoscopy and adds another layer in screening diagnostic with ColoAlert.

Assumption

Number of colonoscopy in UK (2019) **900,000**	• According to topdoctors.co.uk each year around 900,000 colonoscopies are performed in the UK (all indications)[42].
% of colonoscopy related with colon cancer screening **69%**	• Some of colonoscopy is NOT related with colorectal cancer, the colonoscopy which related with colorectal cancer is approximately 69%[61]
Duration of colonoscopy **2 hours**	
Time saved using ColoAlert **75 %**	• ColoAlert test requires 30 minutes of healthcare workforce time compare with 2 hours of colonoscopy.



Saving potential of self-detection stool for colorectal screening, United Kingdom



Case long list

This section includes all the relevant innovation cases that were identified in collaboration with the Sounding Board and EOP.

Based on this list we collaboratively selected 10 cases to represent in this report

#	Organization	Name of the innovation	Innovation description	Addressed root cause			Geo. coverage	Source
				Demand	Efficiency	Workers		
1	All.Can	Efficiency hub	• All.Can efficiency hub is a means to share the best practices across the cancer community by collecting as many examples as possible on how to improve efficiency in cancer care. • This innovation aims to increase efficiency in oncology care by helping both patients and healthcare workers providing the best-practice examples readily accessible and to encourage others to replicate them.		✓	✓	Global	Link
2		PRIAS Project	• PRIAS (Prostate Cancer Research International Active Surveillance) is active surveillance method which aim to prevent overtreatment of prostate cancer by closely monitoring men with low-risk prostate cancer without them having to undergo cancer treatment. • This innovation is preventing unnecessary oncology demand and increase efficiency of prostate cancer treatment.	✓	✓		Europe	Link
3		Eurocarers cancer toolkit	• Is a toolkit to support and guide informal carers for people with cancer, the toolkit outlines the different phases of cancer and includes advice on coping with caregiving, maintaining a good level of wellbeing, and balancing caregiving with work including country specific information sheets outlining carers' rights. • This innovation empowers carer and reduce healthcare workers tasks.			✓	Europe	Link
4		PROCHE	• PROCHE (Programme d'Optimisation du Circuit des Chimiothérapies) improved the chemotherapy process for patients by assessing possible side effects of treatment, and adjusting treatment plans before patients arrived for their next appointment. • This procedure shortened the length of hospital sessions, reduced drug wastage, improved patient symptoms and reduced healthcare costs[1].		✓	✓	France	Link

#	Organization	Name of the innovation	Innovation description	Addressed root cause			Geo. coverage	Source
				Demand	Efficiency	Workers		
5	All.Can	Multidisciplinary cancer care	• Cancer care involves many different healthcare professionals, and miscommunication can impact the quality of care people receive. The Belgian government runs a funding scheme to encourage the use of MDT meetings in cancer care and healthcare professionals can claim reimbursement for attending or organising MDT meetings. • This innovation improve the quality of healthcare and at the same time empowers healthcare professional.		✓	✓	Belgium	Link
6		The WesFit prehabilitation programme	• Many people with cancer have surgery as part of their treatment. While these procedures are safe and effective, they do carry a risk of complications. • WesFit aims to reduce the impact of surgery through exercise and psychological support and it was found to improve people's physical fitness ahead of surgery and shortened their post-operative hospital stay.		✓	✓	United Kingdom	Link
7		The ICOnnecta't tool	• Woman living with breast cancer may experience emotional distress, but access to psychological support is often limited. To address this issue, a team at the Institut Català d'Oncologia (ICO) developed ICOnnecta't, an eHealth cancer care tool that includes online educational materials, interactive forums and group therapy. • This innovation improves wellbeing and increase the quality of life.	✓			Spain	Link
8		Systemic anti-cancer therapy (SACT)	• Real-world data collected beyond the clinical trial setting are important for understanding how cancer treatments perform in routine clinical practice. Systemic anti-cancer therapies (SACTs), including chemotherapy, are provided across the English National Health Service (NHS) and this data collection can help improve the effectiveness and efficiency of cancer care.	✓	✓		United Kingdom	Link

#	Organization	Name of the innovation	Innovation description	Addressed root cause			Geo. coverage	Source
				Demand	Efficiency	Workers		
9	All.Can	Acute diagnostic oncology clinics	• In England, when people present in primary care with non-specific or vague symptoms that may be indicative of cancer, such as fatigue or unintentional weight loss, they often face significant delays to diagnosis. A hospital in London launched an advanced diagnostic oncology clinic, where people can be seen by a multidisciplinary team within 5 days of referral from a GP. • Earlier diagnosis delivers positive impacts and better outcome for patients.	✓	✓	✓	United Kingdom	Link
10		eRAPID innovation for side effect self-reporting	• People receiving chemotherapy can experience unpleasant side effects and less likely to report side effects when they are not hospitalised. An MDT in Leeds, England, has developed a system called electronic patient self-Reporting of Adverse events: Patient Information aDvice (eRAPID), which allows people to report any side effects and get advice on self-management. • This innovation helps patient to become more independent and secure.	✓	✓		United Kingdom	Link
11		A pathway to ensure continuity of care for people with blood cancer	• Blood cancer patients are mostly treated as outpatients and spend large amounts of time travelling to and from the hospital. At a hospital in Rome, Italy, clinicians developed a care pathway which allows for continuity of care between the hospital and a person's home. • Haematologists at the hospital refer people with blood cancer to the pathway, enabling them to receive multidisciplinary care at home.	✓	✓	✓	Italy	Link
12		Radiotherapy mask	• Children and young people undergoing radiotherapy for brain, head or neck cancer have to wear a special mask, which keeps them fixed to a bed to prevent movement. This can be a frightening experience, resulting in some children being given a general anaesthetic before every treatment. • In England, a play specialist works closely with children and young people to design personalised masks that reduce radiotherapy-related anxiety and help them feel more in control of their treatment experience.		✓	✓	United Kingdom	Link

#	Organization	Name of the innovation	Innovation description	Addressed root cause			Geo. coverage	Source
				Demand	Efficiency	Workers		
13		Integrating complementary therapies into cancer care pathways	• Many people with cancer use complementary therapies alongside conventional anticancer treatments to alleviate side effects and cope with the stress of treatment. This can be dangerous if the person's care team are not aware of the treatments they are receiving. • In Tuscany, Italy, a hospital established an integrative oncology clinic, run by an oncologist and a doctor with expertise in complementary medicine, where people with cancer can receive complementary therapies as part of their wider care plan.	✓	✓		Italy	Link
14	All.Can	National chemotherapy eLibrary	• Many different chemotherapy regimens are used to treat cancer. As people with cancer are often treated at different centres throughout their care pathway, discrepancies in regimens can lead to confusion and risk patient safety. • With this innovation physicians have access to the best practice of chemotherapy regimen and improve the outcome for the patient.		✓	✓	Sweden	Link
15		DNA-Med	• Precision medicine for metastatic prostate cancer requires specialist expertise and resources, which are typically found in larger cities and centres of excellence • DNA-Med improves access to precision medicine and supports clinical decision-making based on real-world data		✓	✓	Germany	Link
16		The Swedish Cancer Registers	• PA detailed understanding of cancer burden at a population level is important for cancer control efforts aimed at reducing the incidence, morbidity and mortality of cancer. • In Sweden, all healthcare providers are required to register new cancer cases in the Swedish Cancer Register (SCR) and the data is used to improve cancer outcome and update clinical guideline.		✓		Sweden	Link

#	Organization	Name of the innovation	Innovation description	Addressed root cause			Geo. coverage	Source
				Demand	Efficiency	Workers		
17	CancerLinQ	Cancer Linq	• Collecting and merging information from EHRs can be difficult due to incompatible EHR systems and inconsistent data across oncology practices. • This innovation collects and summarises RWD directly from EHRs and other sources in real time (i.e. a rapid learning health system) and functions as a quality-monitoring tool for clinical practice and a research database.		✓		Global	Link
18	Choosing Wisely An initiative of the ABIM Foundation	Choosing wisely	• The Choosing Wisely campaign focuses on specific inefficiency within oncology care by creating “do not do” lists for cancer care to prevent medical overuse practices across cancer care. • This campaign reduce the use of tests and treatments that offer little to no benefit for patients (low-value healthcare practices).	✓	✓		Global	Link
19	Sharing Progress in Cancer Care	AI in Cancer Care Educational Project	• When managing serious, possibly life-threatening, diseases, physicians are constantly faced with essential aspects of decision-making • This projects aims to understand the development of knowledge and competences on integration of AI in Cancer Care Continuum: from diagnosis to clinical decision-making.		✓		Europe	Link
20	moovcare By Sivan	Moovcare	• Routine follow-up care for lung cancer patients often involves clinical assessments every 3–6 months. However, these standardised intervals may leave relapsing patients without medical input for weeks between appointments. • Researchers in France developed a web-based algorithm to processed these symptom & automatically emailed oncologists for signs of a potential relapse.	✓	✓		France	Link

#	Organization	Name of the innovation	Innovation description	Addressed root cause			Geo. coverage	Source
				Demand	Efficiency	Workers		
21	HUMA	Huma	• Huma is Remote Patient Monitoring (RPM) solution to support healthcare providers by providing access to care, outside of a traditional setting and empowering patients to better manage their own health.	✓	✓	✓	Global	Link
22	EDITH	Edith (Virtual Human Twin)	• Virtual Human Twin (VHT) is a patient specific virtual representation of real world systems or processes, that is built on data-driven or knowledge driven predictive computer models, and that can be used as a clinical decision-support system, a personal health forecasting tool or as a tool for the development and personalisation of medical product.	✓			Global	Link
23	pacmed	Pacmed critical	• Pacmed critical is a clinical decision support system for ICU (Intensive Care Units), it provides clinicians with AI-based decision support that helps them to make best use of ICU capacity. • This innovation helps physician to get objective medical decisions and handle steeply rising demand of care.		✓	✓	Netherland	Link
24	SkinVision	Skin Vision	• Skin vision is a melanoma prevention and detection tool in a form of mobile apps to check and track mole and spot on the skin. It is simple to use and helping patient to get accurate and simple skin cancer detection without having to visit dermatologist.	✓	✓	✓	Global	Link

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25	aiforia® AI for image analysis	Telepathology	• Aiforia equips pathologists and scientists in preclinical and clinical labs with deep-learning artificial intelligence software for translating images into discoveries, decisions, and diagnoses • This innovation improves the efficiency and precision of medical image analysis beyond current capabilities, from oncology to neuroscience		✓	✓	Global	Link
26	tracify	Tracify (Digital pharmacy)	• Managing continuous supply in a hospital is complex and resource heavy activity, with digital pharmacy it allows pharmacists to manage patient workflow, anticipate drug orders and guarantee deliveries for the patients by digitizing the hospital retrocession process to systematically and ensure the availability of treatments • This innovation automatize the process and ease the working load of hospital personnel		✓	✓	France	Link
27	Sciensus	Cancer care at home	• Starting cancer treatment can sometimes feel daunting and patient needs a certainty and experience partner for their chronic therapy. Sciencsus is a provider of cancer treatments such as chemotherapy at home • With this service the therapy at hospital could be transferred to patient home and reduce the working load in hospital.	✓	✓	✓	Europe	Link
28	ONCONAUTI SCIENZA DEL RITORNO AL BENESSERE	Onconauti	• A supportive network for cancer patients and families, fostering community through shared experiences and encouragement. It offers evidence-based treatments, including job reintegration based on scientific guidelines • Onconauti Association conducts research and provides evidence-based programs, including consulting, training, and rehabilitation, to aid workers and employers in managing job reintegration after cancer treatment, considering medical challenges and work disability		✓	✓	Italy	Link

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				Demand	Efficiency	Workers		
29		Care Across (Personalised support service)	• Care across is a personalised support services for cancer patients and provide specific information such as meal plan, treatment side effect, and exercise plan. • The research recommendations could improve quality of life, while strengthening the relationship between the patient and their medical team.		✓	✓	Europe	Link
30		Embracing carers	• Embracing carers mission is to understand the challenges that carers face around the world, so that action can be taken to increase recognition and support, because carers are often so focused on the responsibility of caring for others that they have little time or thought for themselves. • This innovation empowers carer and reduce healthcare workers tasks.		✓	✓	Global	Link
31		Net4care	• Net4Care is an initiative aimed at establishing a Comprehensive Cancer Care Network in Southern and Eastern Europe and initiated by Roche. • It connects experts from oncological institutes and build strong network driven by the shared goal to improve access to innovative prevention, diagnosis, treatment and care approaches for cancer patients.		✓	✓	Europe	Link
32		RECaN (Recognising European Cancer Nursing)	• RECaN is a major project led by the European Oncology Nursing Society (EONS) and supported by the European Cancer Organisation. • The overall goal is to increase recognition of the value and contribution of cancer nursing across Europe – focusing on expert cancer nursing skills, research, education, clinical leadership, strategy and management roles, advocacy, and policy development.			✓	Europe	Link

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				Demand	Efficiency	Workers		
33	máxima mc	Maxima Medical Centre	• Maxima medical centre offers a pre-habilitation for colorectal cancer patient. Study shows that physical fitness is improving the long-term outcomes of post-surgical recovery. • This innovation could reduce the Length of Stay (LoS) in hospital.		✓	✓	Netherland	Link
34	CMR SURGICAL	CMR surgical	• There are still a big discrepancies between countries in oncology delivery due to specialist availabilities and existing resources. With a portable minimal invasive robotic surgical device, will enabling surgeons to perform surgical procedures virtually • This innovation device could potentially give access to cancer patient in remote area and increase the efficiency in oncology delivery.		✓		Global	Link
35	dkfz.	Tobacco free campaign	• In Europe, an estimated 1·65 million lung cancer cases (21·2%, 19·8% in men and 23·2% in women) could be prevented over a 20-year period with the highest-level implementation of tobacco control policies. • The German cancer research center (DKFZ) is building 2040 Germany tobacco free strategy campaign to reduce lung cancer.	✓			Germany	Link
36	qure.ai	Qure AI	• Qure.ai is an AI solution provider that implement deep learning technology to provide automated interpretation of radiology exams like X-rays, CTs and Ultrasound scan for radiologist. • This innovation adds the accuracy of diagnostic and at the same time save the time needed to diagnose an early stage lung cancer.		✓		Global	Link

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				Demand	Efficiency	Workers		
37	Pharmaceutical products	**PD1 inhibitor (Melanoma)**	• PD-1 is a protein found on T cells that helps keep the body's immune responses in check. When PD-1 is bound to another protein called PD-L1, it helps keep T cells from killing other cells, including cancer cells • Some anticancer drugs, called immune checkpoint inhibitors, are used to block PD-1. When this protein is blocked, the "brakes" on the immune system are released and the ability of T cells to kill cancer cells is increase.	✓	✓	✓	Global	Link
38	Pharmaceutical products	**RET inhibitor (Non-small cell lung cancer)**	• RET inhibitors are targeted therapies that act on tumors with activating alterations in the RET proto-oncogene, such as point mutations or fusions • RET rearrangements are observed in 1–2% of non-small-cell lung cancer (NSCLC) patients and result in the constitutive activation of downstream pathways normally implied in cell proliferation, growth, differentiation and survival.	✓			Global	Link
39	Pharmaceutical products	**CDK4/6 Inhibitors (Breast cancer)**	• CDK4/6 inhibitors are a class of medicines used to treat certain types of hormone receptor-positive, HER2-negative breast cancer that has spread to other parts of the body • The drugs work by interrupting these proteins in order to slow or even stop the cancer cells from growing.	✓			Global	Link
40	Pharmaceutical products	**HPV Vaccine (Cervical cancer)**	• HPV vaccine is a vaccine that helps protect the body against infection with certain types of human papillomavirus (HPV). HPV infection can cause abnormal tissue growth, such as warts, and other changes to cells. Infection for a long time with certain types of HPV can cause cancers of the cervi. • HPV vaccination is preventing cancer-causing infections and precancers. HPV infections and cervical precancers.	✓	✓		Global	Link

#	Organization	Name of the innovation	Innovation description	Addressed root cause			Geo. coverage	Source
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41	COLOALERT	ColoAlert	• Most of colorectal cancer are diagnosed at an advanced stage and requires surgery or chemotherapy with a low probability of survival. ColoAlert is a stool test that detects bleeding and non-bleeding tumours through tumour DNA analysis and offers a better early detection than fecal occult blood tests • This is improving the diagnostic time and reduce the workload of oncologist.	✓	✓		Germany	Link
42	Galleri® Multi-cancer early detection	MCED (Multi-cancer early detection)	• MCED is a test that identify a signal shared across more than 50 types of cancer through a simple blood draw. Many of these cancers are not commonly screened for today and otherwise may go unnoticed before symptoms appear • This innovation is reducing healthcare workforce working load significantly and increase the comfort for patients.	✓	✓		Europe	Link
43	PRIME-DC TAGESKLINIK	PRIME-DC (Prähabilitative integrativmedizinische Tagesklinik)	• A clinic that employs a comprehensive approach, addressing physical, emotional, social, and spiritual aspects of cancer care. A multidisciplinary team of HCP tailoring treatments to individual needs, offering integrative therapies for enhanced well-being • Weekly participation in an integrative medical day clinic involving light physical activities, stress coping techniques, and guidance on evidence-based natural remedies to alleviate chemotherapy side effects or tumour symptoms		✓	✓	Germany	Link
44	istituto oncologico romagnolo	PRIME center	• The PRIME Center in Italy offers a versatile approach to cancer care, supporting patients during therapies, aiding recovery, and promoting prevention. It repurposes an old school building to provide integrative medical services, well-being programs, and multidisciplinary education for patients, students, citizens, and professionals • Services include integrative therapies, research participation, wellness courses, corporate welfare, and disease prevention initiatives, emphasizing overall well-being and support		✓	✓	Italy	Link

Innovation can make cancer care more sustainable. And there is a critical need to make cancer care more sustainable.

Today, more than five patients are diagnosed with cancer every minute in Europe. The number of cancer patients continues to rise, setting cancer to become the leading cause of death in the EU by 2035. In addition, by 2030, the expected healthcare shortage will be 4.1 million.

The rising number of cancer diagnoses and increasing shortage of healthcare workers puts pressure on the health workforce, which in turn negatively affects patients and cancer outcomes. We need to adress this increasing gap now.

This report shows how innovation is the key to redesigning cancer care. Innovation holds the potential to reduce oncology demand, increase care efficiency, and retain healthcare workers to ensure our healthcare system is able to deliver the care that we need to deliver. Only by redesigning the way in which we deliver cancer care, we can allow for ongoing advances in patient outcomes, continued improvements in long-term affordability of and equal access to quality care.

We believe the time has come to take a fresh look at cancer care. We believe in the power of innovation and collaboration to transform cancer care for the benefit of all.

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