

GUIDE TO CANCER EARLY DIAGNOSIS



Guide to cancer early diagnosis

ISBN 978-92-4-151194-0

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Cataloguing-in-Publication (CIP) data. CIP data are available at <http://apps.who.int/iris>.

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Printed by the WHO Document Production Services, Geneva, Switzerland

Design and layout: Inís Communication – www.iniscommunication.com

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CONTENTS

Foreword.....	1
Acknowledgments.....	2
Abbreviations and acronyms.....	3
1 Introduction and scope.....	4
Introduction.....	4
Components of comprehensive cancer control.....	5
Scope of the guide.....	7
2 Understanding early diagnosis.....	8
Defining early diagnosis and screening.....	8
Assessing capacity for early diagnosis.....	11
Impact of early diagnosis.....	12
3 Achieving early diagnosis.....	13
Steps of early diagnosis.....	13
Delays and barriers.....	16
Interventions to strengthen early diagnosis.....	22
Developing a monitoring and evaluation framework.....	31
4 Conclusion.....	33
Key messages.....	34
References.....	35

FOREWORD

The cancer burden continues to grow globally, exerting tremendous physical, emotional and financial strain on individuals, families, communities and health systems. Many health systems in low- and middle-income countries are least prepared to manage this burden, and large numbers of cancer patients globally do not have access to timely, high-quality diagnosis or treatment. The consequence is avoidable suffering and deaths from cancer.

Solutions exist. Cancer, when identified early, is more likely to respond to effective treatment, resulting in a greater probability of surviving as well as less morbid and less expensive treatment. The value of detecting cancer early is clear, and significant improvements can be made in the lives of cancer patients.

There are two distinct strategies that promote early detection, and health planners must understand their difference, relevance to particular cancer types, system requirements and impact to develop the most effective programmes. Early diagnosis identifies symptomatic cancer cases at the earliest possible stage compared to screening that seeks asymptomatic cancer or pre-cancerous lesions in a target population without symptoms.

Improving early diagnosis capacity is an important strategy to cancer control in all settings, strengthening health systems and providing universal health coverage. It is founded on core principles in delivering clinical services that include community empowerment and engagement, improving health literacy, access to primary care, diagnostic capacity including pathology, strong referral mechanisms, coordination and accessing timely treatment. Effective cancer care requires that these services are accessible, well coordinated and provided without delay.

This guide is intended to support programme managers in cancer control by clarifying the concept of early diagnosis and helping users to operationalize early diagnosis programmes. Implementing the elements of this guide will depend on the local context. There is no single approach that fits all situations thus necessary adaptations are required.

Action is needed urgently to reduce premature mortality from noncommunicable diseases (NCDs), including cancer, and to achieve targets in the Global Action Plan for the Prevention and Control of NCDs 2013–2020 and the United Nations Sustainable Development Goals. In all countries, the desire to detect cancer early means that governments must address barriers to timely cancer diagnosis and to high-quality cancer care. By identifying appropriate strategic investments in cancer control, we can achieve these targets and reduce the burden of cancer globally.

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ACKNOWLEDGMENTS

This WHO *Guide to cancer early diagnosis* was produced under the overall direction of Etienne Krug and Cherian Varghese from the Department for Management of Noncommunicable Diseases, Disability, Violence and Injury Prevention (NVI), WHO, Geneva, Switzerland.

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A first working draft of the report was peer reviewed at a meeting in Geneva, Switzerland, on 2–3 December 2015 with the following participants: Otis Brawley, Nathalie Broutet, Hugo De Vuyst, Ophira Ginsburg, André Ilbawi, Etienne Krug, Khunying Kobchitt Limpaphayom, Anthony Miller, Groesbeck Parham, Paul Pinsky, Cherian Varghese and the Centers for Disease Control and Prevention Office of International Cancer Control.

Contributions in the form of literature reviews and input came from the International Agency for Research on Cancer and the United States National Cancer Institute.

Valuable input in the form of contributions, peer reviews and suggestions was provided by: Benjamin O. Anderson, Shannon Barkley, Partha Basu, Rebekah Thomas Bosco, Ann Chao, Melanie Cowan, Jean-Marie Dangou, Hugo De Vuyst, Gampo Dorji, Tim Eden, Ibtihal Fadhil, Alison Harvey, Deborah Ilaboya, Silvana Luciani, Gemma Lyons, Joyce Nato, Jayasuriya Navaratne, Paul Pinsky, Liang Qu, Kunnambath Ramadas, Leanne Riley, Rengaswamy Sankaranarayanan, Mona Saraiya, Nereo Segnan, Hai Rim Shin, Slim Slama, Lisa Stevens, Richard Sullivan, Julie Torode, Ted Trimble and Adriana Velazquez-Berumen.

This guide was developed with financial contributions from the United States National Cancer Institute (grant number 5 U01 AI108543-04).

ABBREVIATIONS AND ACRONYMS

HPV	human papilloma virus
IARC	International Agency for Research on Cancer
LMIC	low- and middle-income country
NCCP	national cancer control plan
NCD	noncommunicable disease
VIA	visual inspection with acetic acid
WHO	World Health Organization
WHO PEN	WHO Package of Essential Noncommunicable Disease Interventions

1

INTRODUCTION AND SCOPE

INTRODUCTION

Each year, more than 14 million people are diagnosed with cancer, the majority of whom live in low- and middle-income countries (LMICs) (1). In 2015, 8.8 million died from cancer, representing one in six deaths globally (2). The number of deaths due to cancer in LMICs exceeds those due to HIV/AIDS, tuberculosis and malaria combined (2).

Approximately two thirds of global cancer deaths are in less developed countries, where case fatality rates are higher due to late-stage presentation and less accessible treatment (1,3). The consequences of delays in care and advanced cancer are dire – the likelihood of death and disability from cancer increases significantly as cancer progresses. It is therefore critical to identify barriers to timely diagnosis and treatment and to implement programmes that provide access to care for all (4).

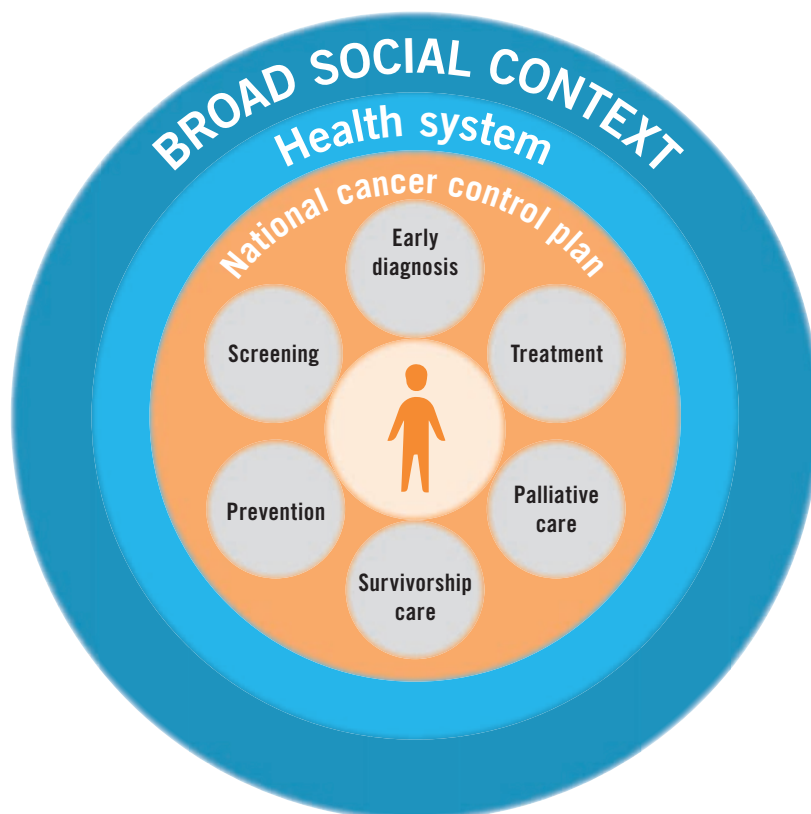
The core components of cancer control have been described previously in the WHO *Cancer control: knowledge into action* series. The *Early detection* module describes the two approaches that enable timely diagnosis and treatment of cancer: (i) early diagnosis, that is the recognition of symptomatic cancer in patients; and (ii) screening, which is the identification of asymptomatic disease in an apparently healthy target population (5). This guide further explores the importance of early diagnosis in comprehensive cancer control. Understanding the role of early diagnosis enables health planners to effectively select and implement programmes that provide a population with the benefits of finding cancer as early as possible: improved outcomes and effective utilization of resources.

To reduce premature mortality from NCDs and achieve target 3.4 of the 2030 United Nations Sustainable Development Goals, as well as the global target specified in the World Health Organization (WHO) Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020, comprehensive cancer control must be effectively implemented. Universal access to prompt early diagnosis and accessible treatment for cancer are critical (4).

COMPONENTS OF COMPREHENSIVE CANCER CONTROL

Cancer is a group of heterogeneous diseases that can affect almost any part of the body and has many anatomic and molecular subtypes, each requiring specific diagnostic and management strategies. Comprehensive cancer control consists of core components – prevention, early diagnosis and screening, treatment, palliative care and survivorship care – that should be addressed in detail by a national cancer control plan (NCCP), evaluated through a robust monitoring mechanism that critically includes cancer registries and is founded on integrated, people-centred care (**Figure 1**) (6,7). Cancer control is a complex undertaking that is successful only when the health system has capacity and capability in all of these core domains and when investments are effectively prioritized.

Figure 1. Comprehensive cancer control



Source: Adapted from WHO 2002 (7).

Prevention is the most cost-effective public health strategy in NCD control (8). Effective interventions to successfully prevent some cancers exist, but have not been fully implemented. Tobacco control remains a high priority as articulated in the WHO Framework Convention on Tobacco Control. Vaccination against human papillomavirus (HPV) and vaccination against hepatitis B virus are very cost-effective interventions for cervical and liver cancer prevention, respectively (4). Strategies to address other risk factors, including physical inactivity, obesity, harmful use of alcohol, indoor and outdoor air pollution and exposure to known occupational and environmental carcinogens need multisectoral action and prioritization.

However, prevention alone is not enough. Millions of people globally will still develop cancer because not all cancers are preventable, causes of cancer are multifactorial and existing prevention strategies do not reach entire populations. Accordingly, diagnosis and treatment should be available, and the early identification of cancer should be prioritized. Detecting cancer at its early stages enables treatment that is generally more effective, less complex and less expensive.

Palliative and supportive care is essential in comprehensive cancer control, and providing access to pain relief is an international legal obligation (9). Survivorship programmes should also be provided and include management of long-term toxicities, continuing supportive services and monitoring for recurrence.

When considering comprehensive cancer control, it is important to note that strategies differ between cancer types. Accordingly, the health system requirements, impact and costs vary significantly depending on the particular cancer and the services offered. Early diagnosis, for example, is most effective for cancers that can be identified at an early stage and treated effectively. Understanding the effectiveness and cost of interventions for common cancer types is critical when prioritizing strategies in an NCCP. The Global Action Plan for the Prevention and Control of NCDs 2013–2020 provides a list of suggested cost-effective policies and interventions for the prevention and control of cancer that can be implemented at all resource levels (4).

SCOPE OF THE GUIDE

This guide is designed to help policy-makers and programme managers understand cancer early diagnosis, how to establish or strengthen services and how it is different from cancer screening. When applied in the local context, this information can help in programme planning and implementation to address delays in cancer diagnosis and late-stage presentation, a common obstacle to effective cancer control.

Detecting cancer early requires an accurate understanding of current barriers to and delays in care. Once known, effective programmes can be prioritized and resources allocated in a cost-sensitive manner. The information contained in this guide should be used to facilitate health planning and improve timely diagnosis and access to treatment, framed within the context of comprehensive cancer control.



2

UNDERSTANDING EARLY DIAGNOSIS

DEFINING EARLY DIAGNOSIS AND SCREENING

Early diagnosis is defined as the early identification of cancer in patients who have symptoms of the disease. This contrasts with cancer screening that seeks to identify unrecognized (pre-clinical) cancer or pre-cancerous lesions in an apparently healthy target population (5). Cancer early diagnosis and screening are both important components of comprehensive cancer control, but are fundamentally different in resource and infrastructure requirements, impact and cost.

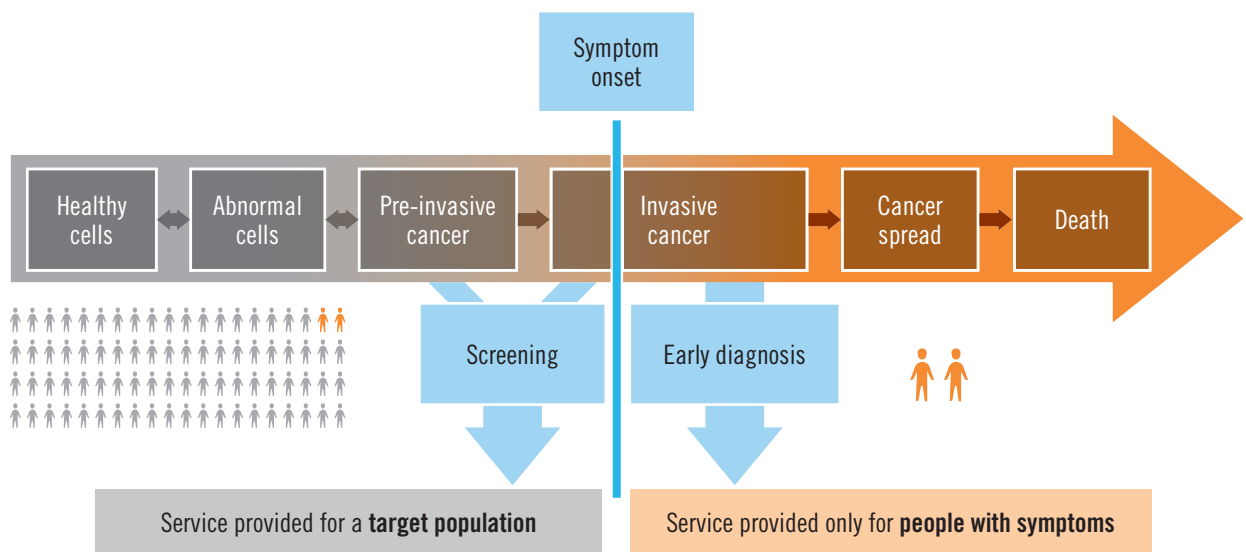
The focus of cancer early diagnosis is people who have symptoms and signs consistent with cancer. The objective is to identify the disease at the earliest possible opportunity and link to diagnosis and treatment without delay. When done promptly, cancer may be detected at a potentially curable stage, improving survival and quality of life. There are three steps to early diagnosis:

- Step 1: awareness of cancer symptoms and accessing care;
- Step 2: clinical evaluation, diagnosis and staging; and
- Step 3: access to treatment, including pain relief.



In contrast, screening aims to identify unrecognized cancer or its precursor lesions in an apparently healthy, asymptomatic population by means of tests (e.g. HPV assay), examinations (e.g. VIA visual inspection with acetic acid), imaging (e.g. mammography) or other procedures that can be applied rapidly and accessed widely by the target population. Screening differs from early diagnosis in that an entire target population is evaluated for unrecognized cancer or precancer and the majority of individuals tested will not have the tested disease (**Figure 2**).

Figure 2. Distinguishing screening from early diagnosis according to symptom onset



Screening should be viewed as a process not as administering a particular test, examination or procedure. The screening process includes a system of informing and inviting the target population to participate; administering the screening test; following-up with test results and referral for further testing among those with abnormal test results; and ensuring timely pathologic diagnosis, staging and access to effective treatment with routine evaluation to improve the process (**Table 1**) (10). A screening programme encompasses the process from invitation to treatment and requires planning, coordination and monitoring and evaluation.

When discussing the availability and/or use of a testing modality for early diagnosis and screening, it is important to distinguish its use as a diagnostic test (early diagnosis) or as a screening test. For example, for a patient who has developed a breast lump, a mammogram functions as a diagnostic test in cancer early diagnosis. Alternatively, mammography might be used as part of a breast cancer screening programme for a target population who generally do not have symptoms.

An evidence-informed assessment of current capacity and potential harms versus benefits must be performed before introducing or scaling a programme for cancer early diagnosis or screening.

Table 1. Key elements of early diagnosis and screening

Parameter	Early diagnosis	Screening programme
Volume of participants	Limited to those with symptoms suspicious for cancer	Entire target population (can be 50–100 times higher number of participants than early diagnosis)
Test	Diagnostic tests only for those with symptoms	Screening test for an entire target population AND diagnostic test for those who screen positive ^a
Health system requirements	Facilities and human resources for timely clinical diagnosis, pathology, radiology, staging, access to prompt treatment	Health system requirements for early diagnosis AND significant additional resources for inviting and testing an entire target population AND additional diagnostic tests for all people who screen positive with recall mechanism AND systematic evaluation
Training and human resource needs	Health-care providers to identify symptoms and signs of early cancer and diagnose, stage and treat cancer	Providers needed for early diagnosis AND additional providers, pathologists and/or biomedical laboratory scientists to perform test and interpret results
Public awareness	Attention to signs and symptoms to obtain prompt medical evaluation	Attention to signs and symptoms of cancer AND participation in screening programme
Follow-up care	Referral mechanisms to ensure treatment is accessible and affordable	Complex process that includes call–recall mechanism and counselling Increased responsibility for screening programme to ensure follow-up care of screen positive participants Increased risk of loss to follow-up
Potential benefits	Reduction in stage of disease at diagnosis When linked to treatment reduction in mortality generally evident in three to five years	Potential reduction in incidence in target population if precursor detected and treated by screening (e.g. cervical and colorectal cancers) Reduction in stage of disease at diagnosis in target population (generally earlier stage than early diagnosis) Reduction in mortality when screening delivered effectively and linked to treatment, but not for many years (often >10 years)
Potential for harm	Low: testing limited to only those who have signs and symptoms	Potentially high as test applied to an entire target population ^b Generally, most who screen positive will not have cancer or precancerous abnormalities, but require additional tests and procedures that can potentially lead to complications, psychological distress and utilization of resources Some may be overdiagnosed and overtreated
Applicability and current scientific evidence	Accepted core component of health services to improve timely diagnosis of cancer Relevant for all settings, especially those with weaker health systems	Benefits documented in high-resource settings for limited number of cancers (e.g. cervical, breast) Evidence of harms and significant costs in high-income countries Benefits and harms in LMICs not well established except for cervical cancer screening ^c

^a Screen-and-treat approach for pre-invasive cervical cancer does not require a separate diagnostic test for abnormal cells.

^b Extent of harm depends on the type of cancer screened and quality of the cancer screening programme.

^c Decision to introduce cancer screening programmes should be based on a careful assessment of disease burden, current health system capacity and available infrastructure, competing health priorities and resource requirement. For example, given the resource requirements and complexities, breast cancer screening with mammography is not recommended in countries with weak health systems (11).

Similar resources and building blocks are needed for both early diagnosis and screening programmes, and effective early diagnosis provides the foundation for comprehensive cancer control. Ensuring that there is sufficient capacity for early diagnosis and treatment is critical before planning to initiate or expand screening services. This approach allows for maximal efficiency and greater equity in services, providing access to care for individuals with cancer, particularly in low-resource settings.

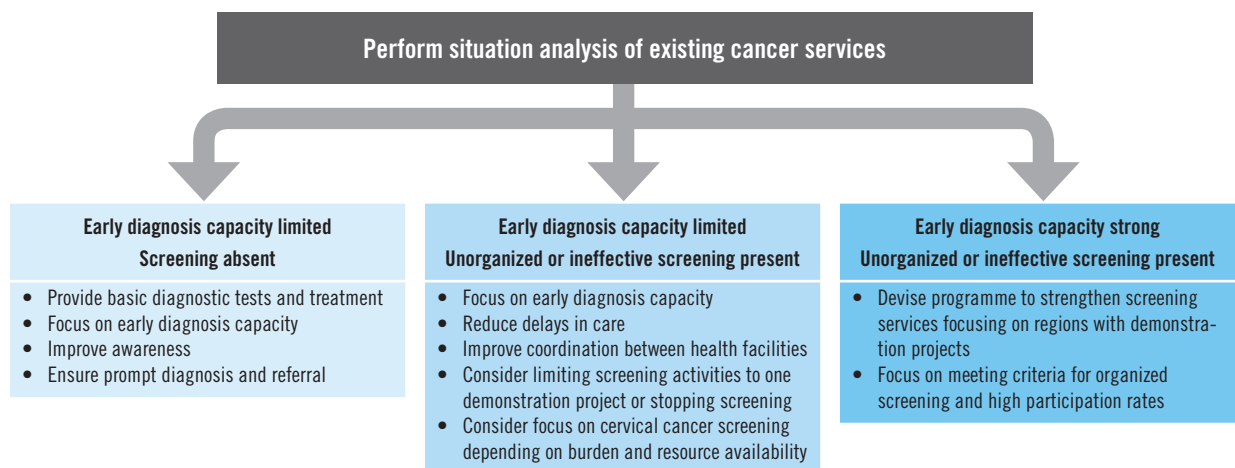
Additionally, barriers to early diagnosis are generally analogous to those in the cancer screening process and include limited access to diagnostic tests and pathology; poor follow-up and coordination; inaccessible high-quality, timely treatment; and financial obstacles. Policies and programmes to overcome these barriers should focus on improving early diagnosis, prior to implementing cancer screening when possible.

ASSESSING CAPACITY FOR EARLY DIAGNOSIS

A situation analysis should be performed prior to planning or scaling-up early diagnosis or screening programmes. The assessment can include effectiveness and costs of current cancer control strategies, current population coverage of services, obstacles to care including delays, financial protection and quality of care. Wherever possible, data should be analysed by sex, geographic location, ethnicity and socioeconomic status to identify inequities that can be redressed when planning and allocating resources.

The situation analysis can identify gaps in services and inform policy decisions based on accurate resource availability (12). If current capacity for early diagnosis is limited, then prioritizing cancer screening will generally not be impactful (Figure 3). The overall status of early diagnosis and screening programmes can be assessed in the distribution

Figure 3. Planning early diagnosis and screening according to current capacity



Note: Countries with weak health systems or low resources are likely to have limited early diagnosis capacity and absent or ineffective national screening programmes.

of cancer stage at diagnosis and trends over time. For example, a region that has high incidence rates of advanced cancers is likely to have limited early diagnosis capacity.

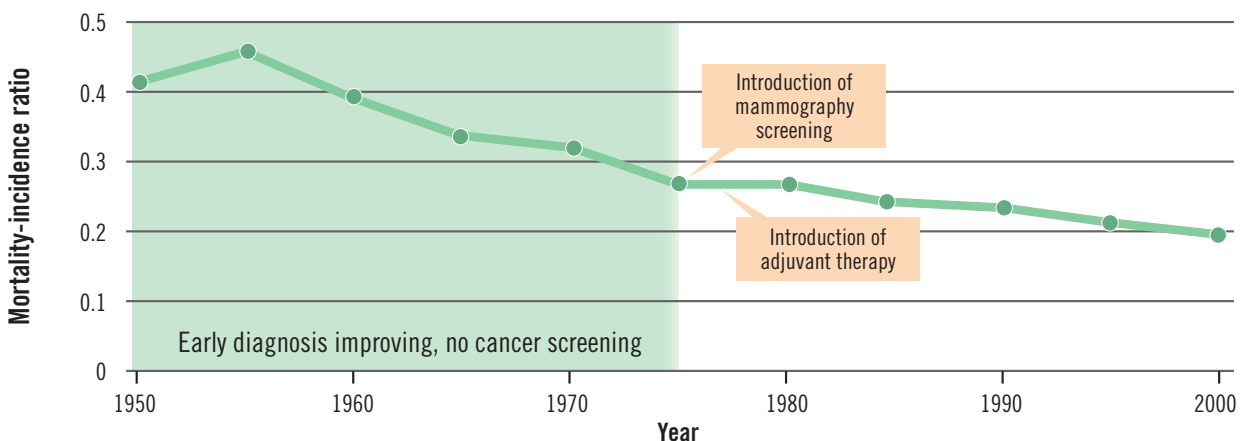
IMPACT OF EARLY DIAGNOSIS

There is consistent evidence that the early diagnosis of cancer, combined with accessible, affordable effective treatment, results in improvements in both the stage of cancer at presentation and mortality from cancer (7,13). In the United Kingdom of Great Britain and Northern Ireland, over 50% of the decrease in breast cancer mortality in women under age 65 was due to improved early diagnosis and the provision of effective treatment (14). Similar improvements in breast cancer mortality were seen in other countries prior to the introduction of screening because of improved early diagnosis (Figure 4) (15).

It is also well established that reducing delays in care can have a significant impact on improving outcomes. In one study, patients who experienced a short delay (<3 months) experienced an absolute 7% greater likelihood of survival from breast cancer compared with those who had moderate delays (3–6 months) in care (16,17). This magnitude in survival benefit was similar or greater than the benefit achieved by chemotherapy (16).

While improving early diagnosis generally improves outcomes, not all cancer types benefit equally. Cancers that are common, that can be diagnosed at early stages from signs and symptoms and for which early treatment is known to improve the outcome are generally those that benefit most from early diagnosis (5). Examples include breast, cervical, colorectal and oral cancers.

Figure 4. Example of early diagnosis impact from the United States



Notes: Impact of improved awareness on reduction in breast cancer mortality in the United States as measured by the mortality-to-incidence ratio. A high mortality-to-incidence ratio is a general estimate that a high proportion of people diagnosed with cancer are dying from it. Before the introduction of mammography and adjuvant therapy, there was a significant improvement in breast cancer survival due to early diagnosis.

Source: Shulman et al. 2010 (15).

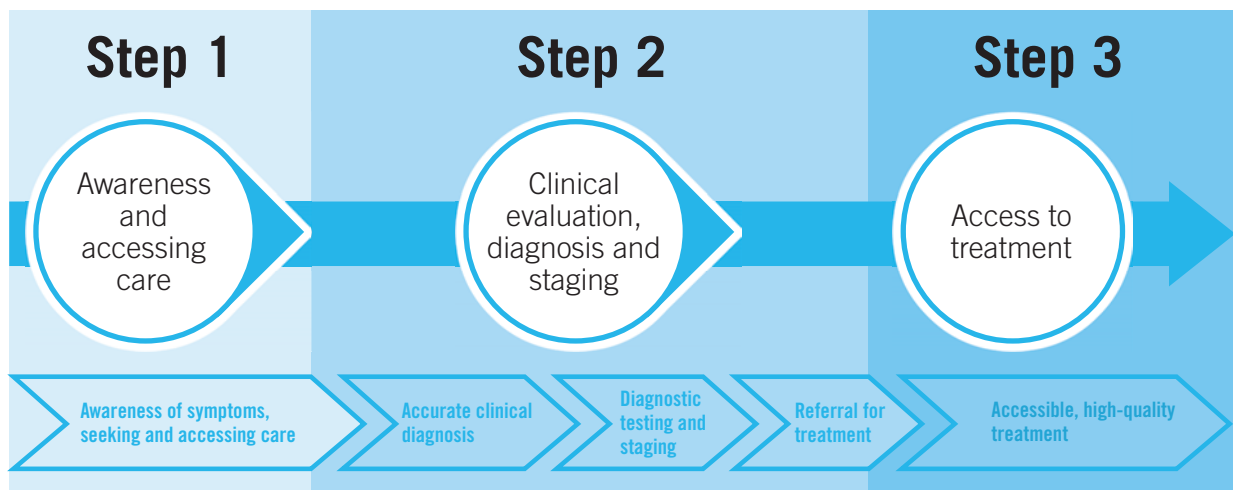
3

ACHIEVING EARLY DIAGNOSIS

STEPS OF EARLY DIAGNOSIS

There are three key steps to cancer early diagnosis (**Figure 5**). These steps correspond with the standard patient-initiated health-seeking pathway across diseases: awareness and health-seeking, diagnosis and initiating treatment. While various terms have been used to describe the early diagnosis steps, consistent terminology is important to communicate findings and promote standards across different settings (**Table 2**) (18–21).

Figure 5. Essential elements of cancer early diagnosis



Step 1: Awareness and accessing care

The first step, “awareness and accessing care” consists of two key components: (i) symptom appraisal (period from detecting a bodily change to perceiving a reason to discuss the symptoms with a health-care practitioner); and (ii) health-seeking behaviour (period from perceiving a need to discuss the symptoms with a health-care practitioner to reaching the health facility for an assessment).

Patients must be aware of specific cancer symptoms, understand the urgency of these symptoms, overcome fear or stigma associated with cancer and be able to access primary care. Thus, awareness has to be translated into appropriate health-seeking behaviour, and the health care they seek has to be accessible, affordable and culturally and gender appropriate.

Step 2: Clinical evaluation, diagnosis and staging

The second step, “clinical evaluation, diagnosis and staging” can be classified into three components: accurate clinical diagnosis; diagnostic testing and staging; and referral for treatment. This step is also known as the diagnostic interval (**Table 2**).

This interval begins with an evaluation by the health-care provider at the initial entry point to the health system to establish if cancer may be present. The health-care provider must have an appropriate index of suspicion, clinical skills and resources to make an accurate clinical diagnosis. Then, patients with suspicious findings for cancer should receive diagnostic tests (that may include imaging or laboratory tests), pathological confirmation and staging studies at an appropriate diagnostic facility.

Pathologic diagnosis is made by assessing cells for the presence of cancerous changes and is critical before starting cancer treatment. Tests or procedures performed to obtain cells for analysis may include blood tests, fine needle aspiration, core needle biopsy, endoscopy with biopsy, radiology-directed biopsy or surgical biopsy. Definitive evidence of cancer should be documented before proceeding with staging or treatment.

Once a diagnosis of cancer has been confirmed, the patient should receive staging examinations. The objective of staging is to assess whether and to where cancer may have spread. Staging can be based on clinical findings, radiology, surgical findings or a combination of strategies. Accurate staging is essential for effective cancer treatment – a person with metastatic (or distant) cancer requires different treatment than a person with localized cancer. Appropriate staging tests and treatment should be based on accepted protocols.



Throughout the diagnostic interval, results of diagnostic tests must be communicated to the patient. If confirmed to be cancer, a timely referral for treatment is made to a centre capable of delivering safe, effective treatment across the range of modalities needed. Cancer diagnosis requires access to different services and facilities that must be integrated and coordinated through established referral mechanisms (6).

Step 3: Access to treatment

In the third step, “access to treatment”, the patient with cancer needs to be able to access high-quality, affordable treatment in a timely manner. Effective management of cancer requires a multi-disciplinary approach and the development of a treatment plan that is documented and informed by a team of trained providers. The goal is to ensure that as many patients as possible initiate treatment within one month of the diagnosis being confirmed (5).

The three steps of early diagnosis, from symptom onset to initiation of treatment should generally be less than 90 days to reduce delays in care, avoid loss to follow-up and optimize the effectiveness of treatment (5). The exact target duration may vary between health system capacity and cancer type. In all settings, however, it is important that cancer care is delivered in a time-sensitive manner.

Table 2. Steps in cancer early diagnosis: components and delays

Step of early diagnosis ^a	Component ^a	Potential delays ^b
Awareness and accessing care (patient interval)^c	Population aware about symptoms (appraisal interval) Patients with symptoms seek and access health care (health-seeking interval)	Access delay ^e
Clinical evaluation, diagnosis and staging (diagnostic interval)	Accurate clinical diagnosis (doctor interval) Diagnostic testing and staging Referral for treatment	Diagnostic delay ^d
Access to treatment (treatment interval)	Treatment timely, accessible, affordable, acceptable and high quality	Treatment delay ^e

^a Sample terms are used to designate various intervals within early diagnosis steps.

^b The term “delay” is used to highlight a prolonged period of time within each step or component. Alternate terminology has been used to describe delays within each step and component of early diagnosis.

^c Access delay has also been called patient delay. The term patient delay should be avoided because it suggests the cause of the delay is patient-related. In reality, there may be other contributing factors (such as societal or gender norms, economic factors, access barriers).

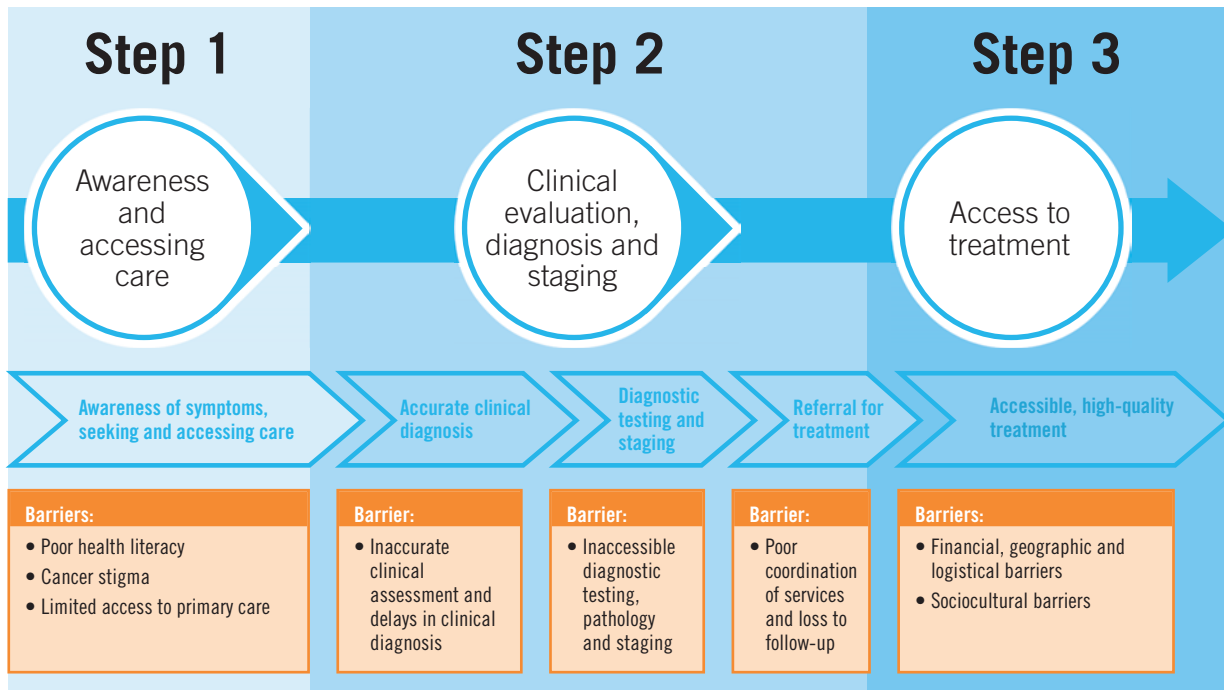
^d Diagnostic delay can also be referred to as system or provider delay.

^e Treatment delay can also encompass abandonment or discontinuation of treatment.

DELAYS AND BARRIERS

Delays in timely diagnosis and accessing treatment can occur at multiple steps (Figure 6).

Figure 6. Common barriers to early diagnosis



Step 1: Awareness and accessing care

The consequences of delaying presentation due to low cancer awareness or inability to access care are that cancer symptoms generally progress to become more severe and disease more advanced. This can also result in the development of acute, emergency symptoms. If cancer symptoms progress to become more severe, then individuals may ultimately seek care through an emergency route rather than primary care services, which results in worse overall outcomes (22,23).

Poor health literacy

Health literacy comprises the skills that determine the motivation and ability of individuals to receive, gain access to and use information that is culturally and linguistically appropriate to promote and maintain good health (24). Lack of awareness about cancer symptoms is common and can result in a prolonged symptom appraisal interval and significant delays in seeking care. This is particularly relevant to cancers with vague symptoms and to childhood cancers (Box 1).

Cancer stigma

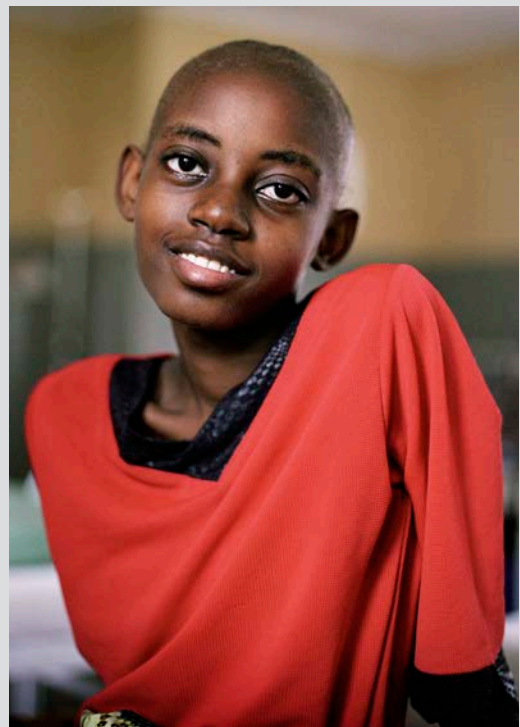
Cancer as a diagnosis and cause of death may not be known in some settings. Where cancer is known, fearful and fatalistic beliefs are common. Cancer stigma is a sense of devaluation by individuals or communities related to cancer patients (24). Other societal norms – that are social, cultural, gender based or linked to the legal and regulatory environment – also impact health-seeking behaviour. Patients may be embarrassed about the symptoms or fear the financial or personal impact of receiving care for cancer.

Limited access to primary care

Access to primary care is critical for early diagnosis by enabling a timely diagnosis. Barriers to seeking primary care may be related to financial constraints, geographic/transportation obstacles, time-poverty and inflexible working conditions, non-availability of services, sociocultural or gender-related factors, compounded by generally lower health literacy and higher levels of cancer stigma. Certain groups within a population may be less likely to be able to access primary care services, particularly those from lower socioeconomic groups, those with lower-level education, people with disabilities, indigenous populations or other socially excluded groups (6,26,27). As a result, these groups are most likely to present with emergency symptoms when cancer has already grown and often spread.

Box 1. Barriers to early diagnosis of paediatric cancers

Children with cancer symptoms are particularly vulnerable to delays in diagnosis and treatment due to disease- and patient-related factors, including potential inability to communicate symptoms, limited awareness, heterogeneous and non-specific symptoms commonly overlapping with benign conditions, and relative infrequency. It is important that early diagnosis is promoted among parents, the community and health providers through empowerment, education and health system capacity. Further highlighting the importance of early diagnosis, childhood cancers are generally not preventable. When caught early, the majority can be effectively treated, resulting in high cure rates. While the principles of early diagnosis are consistent for paediatric and adult cancers, implementation strategies differ (25).



Delay in seeking primary care may also be due to fear about the financial consequences of diagnosis and treatment, including indirect costs such as lost wages or unemployment (28). Culturally or gender insensitive health-care services can further deter patients from seeking care. For example, women presenting with symptoms related to breast or cervical cancer may avoid clinical assessment because of the absence of a trained female health-care practitioner to do their clinical assessment.

Step 2: Clinical evaluation, diagnosis and staging

The diagnostic interval may occur at one or multiple levels of care, depending on the site of initial presentation and requires coordination among services including pathology and radiology. Delays can arise at multiple points during this diagnostic interval and are generally known as diagnostic delays.

Inaccurate clinical assessment and delays in clinical diagnosis

A cancer patient can enter the health system from many points – e.g. primary care, reproductive health, traditional healers, emergency centre, mental health, HIV care, dental care – and patient encounters with health-care providers can result in delays in care when they lack diagnostic capacity or are isolated from the health system.

Identifying patients with suspicion of cancer can be a challenging task in the ambulatory or emergency setting. Cancer signs and symptoms can be vague, non-specific or difficult to detect. In general, a significant percentage of patients who present with symptoms suspicious for cancer will be found to have a different cause of those symptoms – that is, they will not have cancer (19). Additionally, primary care providers may see only a limited number of patients for each cancer type. Finally, health-care providers may lack physical exam skills or have insufficient time to assess suspicious cancer symptoms, such as an inability to properly perform a clinical breast exam for a breast lump. These factors can lead to misdiagnosis and delayed detection.

A larger percentage of countries do not have programmes or guidelines to strengthen the early identification of common cancers at the primary care level. For example, less than 50% of surveyed countries have clinical pathways to facilitate the early diagnosis of colon or prostate cancer in primary care (29).

Inaccessible diagnostic testing, pathology and staging

Barriers to or harms from diagnostic tests and pathology can range from inaccessible or unavailable services to overusing tests, depending on resource availability. In all settings, the quality of diagnostic tests and pathology is critical. An inaccurate diagnosis of cancer can result in harmful, inappropriate and unnecessary care.

Certain basic devices are required and are critical to effective cancer diagnosis and treatment, described in *WHO List of Priority Medical Devices for Cancer Management* (30). Priority diagnostic technologies are generally less accessible in low-resource settings (3). There are also potential harms from overuse and overreliance on diagnostic tests including more expensive care, exposure to harmful ionizing radiation and overdiagnosis and overtreatment (31).

Diagnostic imaging can increase the diagnostic certainty but does not confirm the presence of cancer. An accurate pathologic diagnosis is critical. However, there are significant gaps in current pathology services. In 2015, approximately 35% of low-income countries reported that pathology services were generally available in the public sector compared to more than 95% of high-income countries (29).

Poor coordination and loss to follow-up

The facility where a clinical diagnosis is made may be different from where the biopsy is obtained, pathology reviewed and/or staging performed. Delays in cancer diagnosis may arise due to poor follow-up, lack of referral pathways and fragmented health services. Less than 50% of low- and lower-middle-income countries currently have clearly defined referral systems for suspected cancer from primary care to secondary and tertiary care (29).

As the number of providers involved and the number of diagnostic steps increase, there are greater risks of miscommunication and lack of follow-up of important results (6). The greater the number of facilities that patients need to visit for cancer diagnosis and treatment, the greater the burden placed on individuals and families to overcome financial and geographic barriers and the greater the risk of duplicated services. Poor communication between providers (e.g. communication between the primary care team and specialist, communication with the pathologist for diagnosis confirmation) and administrative barriers to accessing treatment facilities also contribute to delays in cancer diagnosis and treatment. The absence of unique patient identifiers or reliable health information systems worsens communication among providers, facilities and patients (32).

Step 3: Access to treatment

Promoting early identification of cancer in the absence of appropriate access to treatment is not only ineffective, but is also unethical. A significant percentage of patients who receive a cancer diagnosis do not initiate or complete treatment due to various barriers that can include an inability to afford care or fear of financial catastrophe, geographic barriers and anxiety about cancer treatment (33–35).

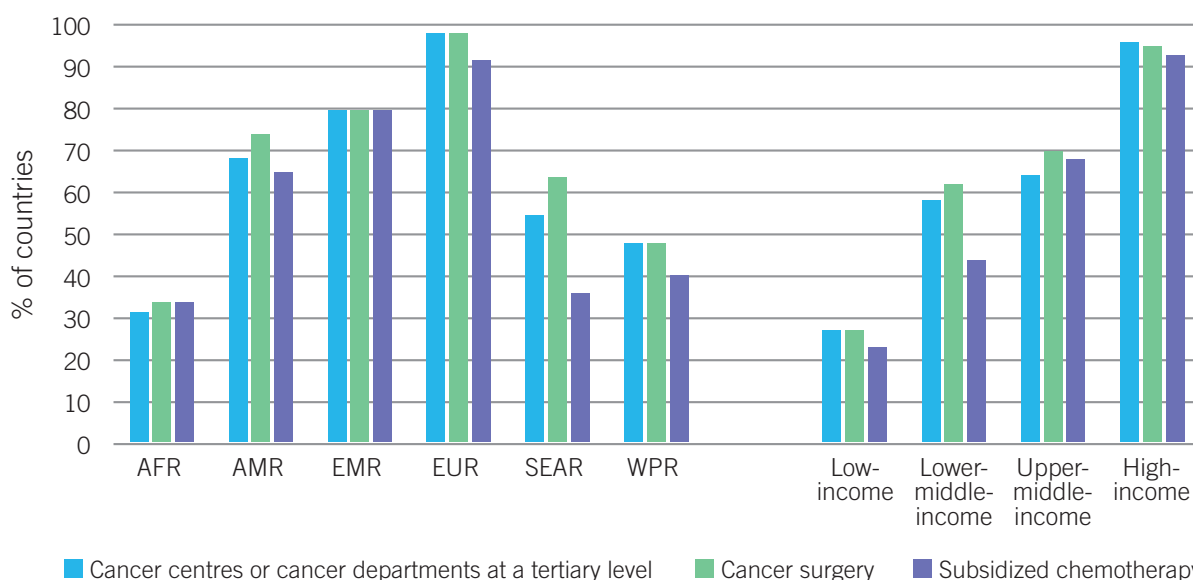
Financial, geographic and logistical barriers

Basic cancer treatment consists of one or a combination of treatment modalities, including surgery, systemic therapy and radiotherapy. In a significant number of countries, basic treatment services are unavailable (**Figure 7**) (29).

Fear of financial catastrophe is also a major cause of non-attendance for diagnosis, delay and abandonment of treatment among patients with early cancer symptoms. Out-of-pocket expenses can be significant for direct and/or indirect costs (e.g. meals, transportation, loss of earnings) (33–35). Impoverished or low socioeconomic status populations are at the highest risk of not receiving treatment for cancer. In some settings, as much as 50% of cancer patients forego treatment due to the inability to pay for care (36,37).

Patients may have to travel long distances to access a facility capable of providing cancer treatment, and longer travel distance has been associated with late presentation (38). Indirect, out-of-pocket costs and the time required to seek and navigate care can be burdensome and function as disincentives to accessing timely, affordable treatment.

Figure 7. Percentage of countries with access to cancer treatment services in the public sector, by WHO region and World Bank income group



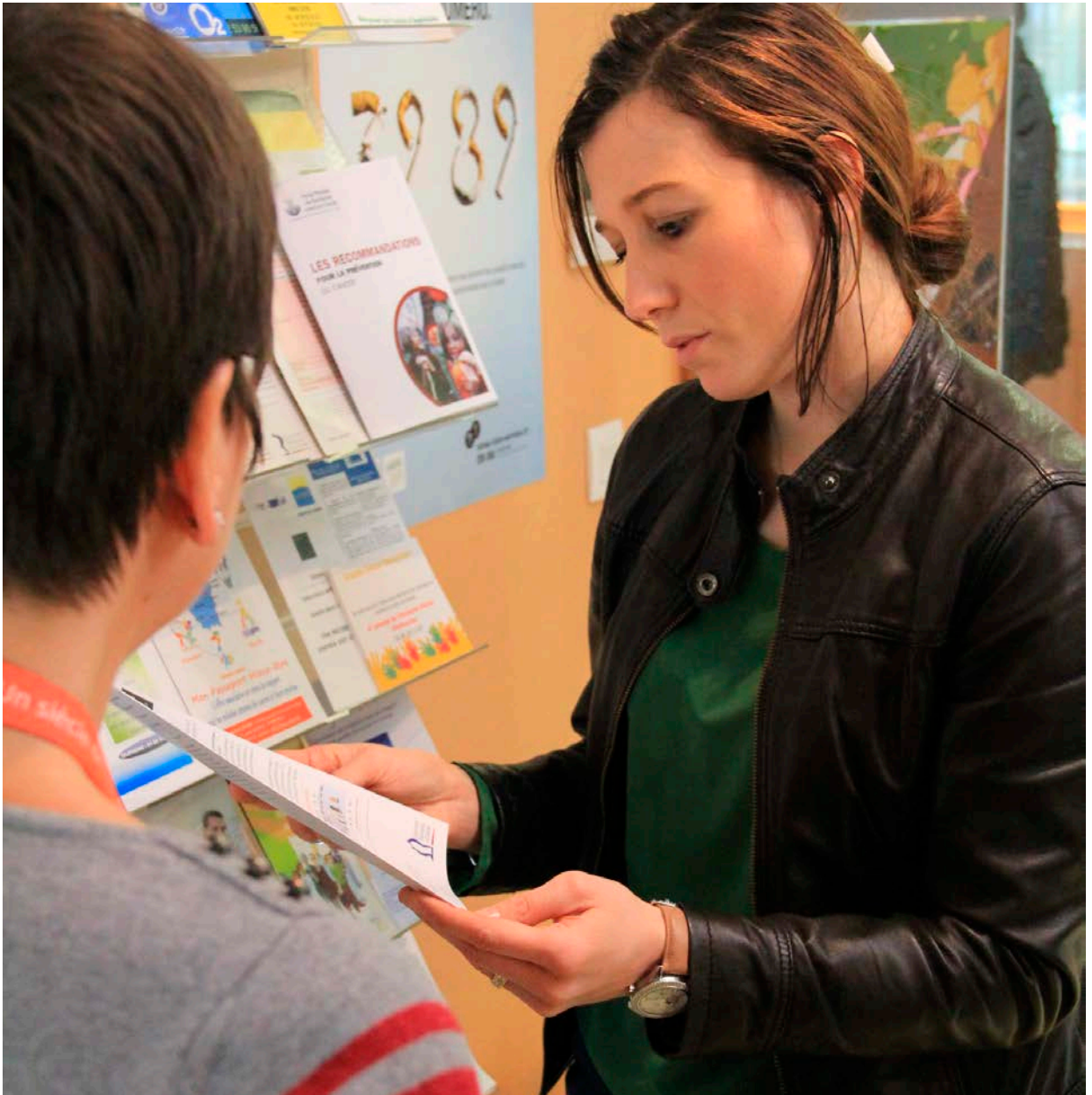
AFR, African Region; AMR, Region of the Americas; SEAR, South-East Asia Region; EUR, European Region; EMR, Eastern Mediterranean Region; WPR, Western Pacific Region

Note: The results are from 177 Member States that responded to the survey. “Don’t know” responses were included in the subset of countries for which these services are not available.

Source: Data and graph based on 2015 WHO NCD Country Capacity Survey (29).

Sociocultural barriers

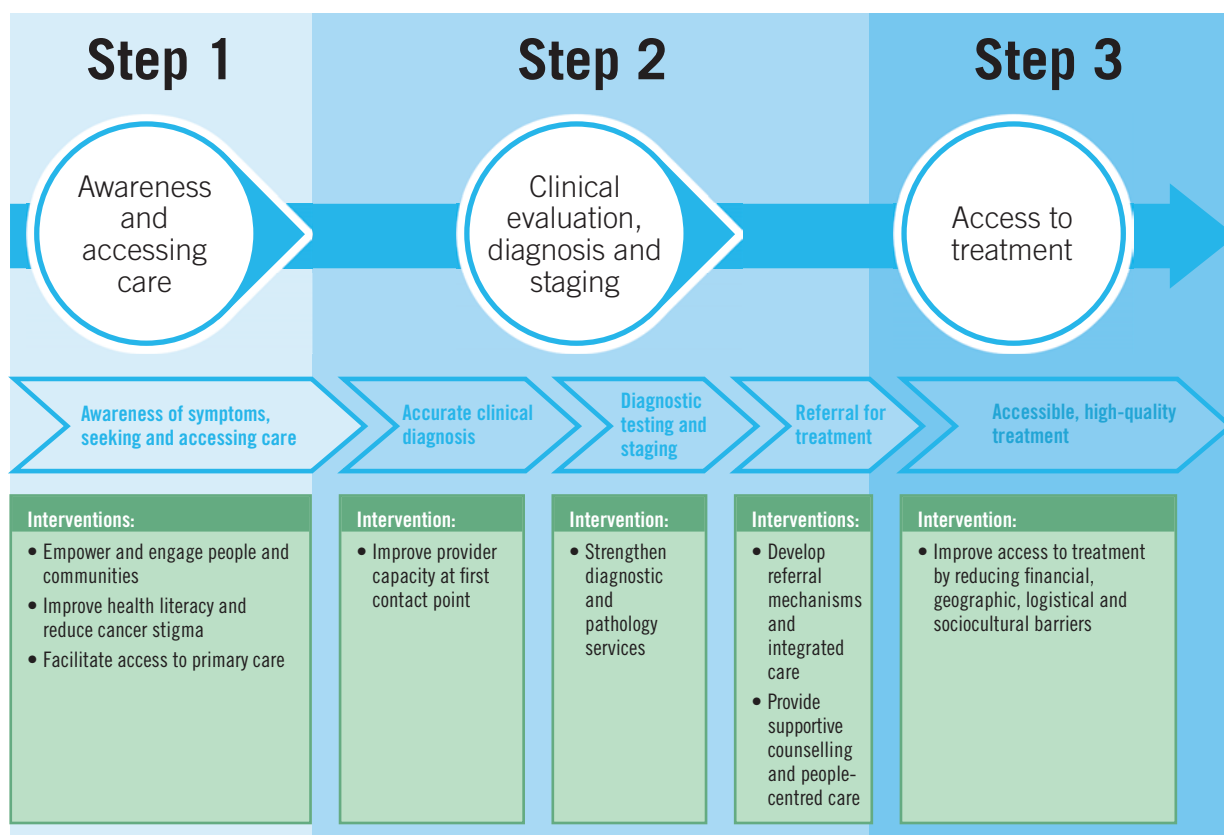
Patients may inaccurately believe cancer is incurable or associate cancer treatment with death or pain, resulting in delays in or not pursuing care. The morbidity of cancer treatment may trigger fears of alienation from a person's family or community. This can be compounded by poor communication between patients and providers and inaccurate perceptions of cancer treatment. Misconceptions can be exacerbated by differences in religion, gender, class and belief systems between the patient and the health-care team (39). In addition, patients may not understand or not be given clear instructions on the recommended facility and time for evaluation at the treatment facility.



INTERVENTIONS TO STRENGTHEN EARLY DIAGNOSIS

Improving cancer early diagnosis requires an accurate understanding of current capacity that can be achieved through a situation analysis and then strengthening capacity at multiple points within the health system. Results from the situation analysis can assist with the development of strategic priorities to address the common barriers. Because there are often multiple barriers across the system, improving early diagnosis requires health system investment at all facility levels and across WHO health system building blocks – health workforce, access to priority technologies, health financing, health information systems, leadership and governance and service delivery – according to local capacity (**Figure 8**).

Figure 8. Potential interventions to strengthen to early diagnosis



Leadership and governance to improve access to care

Leadership and governance in cancer control involve development and implementation of strategic frameworks combined with effective oversight, coalition-building and multisectoral engagement, regulation, resource allocation, attention to system design and accountability. NCCPs should include early diagnosis guidelines, referral

mechanisms, minimum standards of care, roles and responsibilities of available human resources and quality control mechanisms. Careful consideration should be made for how distribution of resources impacts access and equity (7). Accreditation and standards can improve the availability and readiness of key interventions at each level of the health system. Similarly, multisectoral action through effective partnership can facilitate early diagnosis and promote access to cancer care (40).

Step 1: Awareness and access to care

Empower and engage people and communities

Empowering and engaging people and communities enable timely clinical presentation by improving health literacy, reducing stigma and facilitating access to care. Important objectives of engaging with communities are to improve knowledge and awareness of cancer, to listen to what they report as their major barriers to seeking earlier diagnosis for cancer symptoms and to use their knowledge to develop solutions. Feedback from the community can include the location of services, opening times of health facilities, costs of care, provider behaviour or addressing other practical issues such as transport.

Improve health literacy and reduce cancer stigma

Specific strategies to improve health literacy and reduce stigma depend on predominant sources of information and can include printed media, radio, television, social media and other online tools. Interventions used to promote public awareness about cancer should be culturally appropriate and consistent at all levels of the health system. Key messages include awareness of “alarm” or “red flag” symptoms that may represent cancer, how to seek evaluation for these symptoms and awareness that timely evaluation and treatment can increase the likelihood of a cure. Awareness of highly predictive cancer symptoms includes knowing how to self-identify changes and to understand that specific symptoms may represent cancer without excessive fear or denial (**Table 3**).

Table 3. Common symptoms and signs that may be due to cancer^a

Site of cancer	Common symptoms
Breast	Lump in the breast, asymmetry, skin retraction, recent nipple retraction, blood stained nipple discharge, eczematous changes in areola
Cervix	Post-coital bleeding, excessive vaginal discharge
Colon and rectum	Change in bowel habits, unexplained weight loss, anaemia, blood in the stool (rectal cancer)
Oral cavity	White lesions (leukoplakia) or red lesions (erythroplakia), growth or ulceration in mouth
Naso-pharynx	Nosebleed, permanent blocked nose, deafness, nodes in upper part of the neck
Larynx	Persistent hoarseness of voice
Stomach	Upper abdominal pain, recent onset of indigestion, weight loss
Skin melanoma	Brown lesion that is growing with irregular borders or areas of patchy colouration that may itch or bleed
Other skin cancers	Lesion or sore on skin that does not heal
Urinary bladder	Pain, frequent and uneasy urination, blood in urine
Prostate	Difficulty (long time) in urination, frequent nocturnal urination
Retinoblastoma	White spot in the pupil, convergent strabismus (in a child)
Testis	Swelling of one testicle (asymmetry)

^a These common symptoms may be due to cancer or due to a different medical condition. People with these symptoms should seek medical attention without delay.

Source: Adapted from WHO 2007 (5).

Mass media are an important platform for awareness raising, although messaging strategies need to be carefully designed and tested to reach population groups most in need (17). Social networks can also be used to improve health-seeking behaviour and health literacy (41). Cancer survivors and advocates play an important role in reducing stigma and promoting public awareness that cancer can be a curable disease, and can be paired with the professional community for further leveraging (12).

Community health workers and civil society can help improve public awareness and facilitate health-seeking at local health centres. A pilot study of early diagnosis in Malaysia engaged community nurses to hold health educational talks. The result was a reduction in stage III and IV breast cancer from 60% to 35% and cervical cancer from 60% to 26% over a four year-period (42).

Facilitate access to primary care

Health education and community mobilization can ensure populations engage with the health sector. Addressing determinants of health and obstacles to primary care



can have additional beneficial effects in reducing cancer delays, improving equity, increasing adherence to diagnosis and treatment and improving overall health participation (35). Public awareness about cancer should not only include symptom awareness but also counselling on how and where to present for care, with consideration for facility capacity, accessibility and direct and indirect costs.

Step 2: Clinical evaluation, diagnosis and staging

Improve provider capacity at first contact point

The primary care level has an important role in cancer control that includes education and health literacy in cancer prevention, early identification of cancer, diagnostic tests, counselling and care after diagnosis and follow-up care after treatment, including palliative and supportive care (19). Providers in the primary care setting play an important role in cancer and NCD prevention and control. Additional cancer-related interventions include: (i) counselling on risk reduction such as behavioural modification (e.g. smoking cessation); (ii) discussing cancer control initiatives such as vaccination and screening programmes; and (iii) informing on cancer-related symptoms.

Improving capacity at the primary care level or first contact point in the health system can result in more effective and timely cancer diagnosis (**Table 4**). Providers should receive appropriate knowledge and clinical assessment skills through pre-service education and continuing professional development. For example, in low-resource settings, the WHO Package of Essential Noncommunicable Disease Interventions (WHO PEN) for primary health care can be used to improve practitioner awareness of symptoms and signs of breast and cervical cancer (43).

Table 4. Sample interventions to improve early diagnosis capacity at the primary care level

Building capacity in primary care	Impact
Develop protocols for clinical assessment (e.g. WHO PEN) Sensitize providers to cancer signs/symptoms	Improve diagnostic accuracy
Ensure sufficient time to evaluate patient Train practitioners in how to diagnose cancer including use of medical devices	Facilitate enabling factors for accurate diagnosis and appropriate referral to specialized cancer care Reduce risk of loss to follow-up
Promote clear communication between provider and patient	Reduce risk of loss to follow-up
Establish clear referral mechanisms	Reduce delays in care

Cancer symptoms can be non-specific, yet it is important that any “red flag” symptoms are recognized by providers and investigated further. Factors that enable primary care providers to diagnose cancer include allowing sufficient time to assess individual patients, ensuring availability of diagnostic tools (e.g. cancer-specific risk tables linked to clinical pathways) and providing guidance and options when referral is appropriate. Care protocols should be developed and utilized to avoid unnecessary health expenditures such as expensive diagnostic or staging studies for localized cancer.

Strengthen diagnostic and pathology services

Basic cancer diagnostic tests such as ultrasound, X-ray, cytology and biopsy capability should be available at the secondary care level, and also available at the primary care level where resources permit, to successfully implement cancer early diagnosis programmes (44). *WHO List of Priority Medical Devices for Cancer Management* presents a tiered approach; basic high-impact, low-cost technologies should be prioritized (30). Diagnostic algorithms should be developed according to available resources and provider capacity and coordinated between facilities. In many LMICs, significant additional investment in pathology is also required (29). Quality assurance mechanisms should also be developed to ensure that diagnostic and pathology services are accurate, that the appropriate standards are employed and that results are communicated in a timely manner.

Develop referral mechanisms and integrated care

The health system architecture required to provide core cancer services varies by setting and cancer type. In some regions and for certain cancers, clinical and pathologic diagnosis can be provided during an initial clinic visit. Other settings and some cancer types require multiple referrals to complete cancer diagnosis, staging and initiate treatment. The overall goal is to minimize delays in care and provide integrated,

people-centred care through: (i) coordinated, efficient referral systems that facilitate access, improve communication and reduce unnecessary visits; (ii) linking primary care and outpatient specialty care to advanced diagnostic and treatment services; and (iii) effective communication between patients, families and providers, encouraging patient participation and shared decision making.

The types of services provided at the secondary and tertiary care levels depend on health system organization (**Figure 9**). The package of services in various facilities should be documented and known to health planners and providers to enable timely referral and prompt diagnosis. Referral and counter-referral guidelines should be established to deliver time-sensitive services without fragmentation or duplication and be readily available at all levels, developed according to provider and facility capacity. A direct link should be developed between primary care facilities and higher levels of care by establishing criteria for referral and counter-referral and improving information transfer between providers (e.g. pathology unit and primary care provider).

A medical records system should be available at all levels of care, allowing providers to properly document diagnostic and staging information, management plans and status at each follow-up visit (45). Interventions can be designed to improve coordination between providers and patients, such as tumour boards, multi-disciplinary review or an integrated electronic medical record system. To avoid duplication of tests

Figure 9. Sample organization of cancer interventions by care level

Community engagement and empowerment	Primary care level	Secondary care level	Tertiary care level
<p>Key functions</p> <ul style="list-style-type: none"> • Cancer awareness • Community leaders and cancer advocates engagement • Addressing cancer stigma • Facilitating health-seeking behaviour • Identification of barriers to accessing care 	<p>Diagnosis</p> <ul style="list-style-type: none"> • Recognition of cancer signs and symptoms • Appropriate clinical evaluation • Early referral of suspicious cases <p>Treatment</p> <ul style="list-style-type: none"> • Basic procedures (e.g. cryotherapy) • Patient education and rehabilitation <p>Additional functions</p> <ul style="list-style-type: none"> • Health education, counselling • Coordination of services across facilities • Supportive, palliative and survivorship care 	<p>Diagnosis</p> <ul style="list-style-type: none"> • Cytology, biopsy, routine histopathology • X-ray, ultrasound, endoscopy <p>Treatment</p> <ul style="list-style-type: none"> • Moderately complex surgery • Outpatient chemotherapy <p>Additional functions</p> <ul style="list-style-type: none"> • Coordinating with primary and tertiary care levels • Supportive, palliative and survivorship care 	<p>Diagnosis</p> <ul style="list-style-type: none"> • Cytology, biopsy, histopathology, prognostic markers, immunochemistry • X-ray, ultrasound, endoscopy, computerized tomography <p>Treatment</p> <ul style="list-style-type: none"> • Radiotherapy • Complex surgery • Chemotherapy • Rehabilitation <p>Additional functions</p> <ul style="list-style-type: none"> • Communication with primary and secondary care levels, counter-referrals • Supportive palliative and survivorship care

Note: Organization of cancer interventions depends on local capacity.

Source: Adapted from WHO 2008 (44).

and fragmentation of care, when possible, all staging should be done at the facility with the requisite staging and treatment capacity.

Routine post-treatment follow-up after discharge from a higher level of care may be available at the primary care level (such as suture removal). Survivorship care, including surveillance for recurrence and sequelae from treatment, may be provided at various care levels and should be coordinated with the patient's treatment team of primary and specialized providers. Patients with metastatic disease who are not candidates for treatment or who have completed treatment at a higher-level facility may receive palliative care services at, or coordinated by, an adequately equipped primary care facility (46).

Provide supportive counselling and people-centred care

A preliminary diagnosis of cancer can be overwhelming for the patient. Therefore, when discussing cancer diagnosis plans, efforts should be made to include the patient's social support system, such as relatives and friends, according to patient preferences. A second encounter may be required to ensure the patient understands the situation and next steps. Communication during the diagnostic interval should include an accurate estimate of the likelihood of cancer and, in some settings, treatment options and potential outcomes. Clear steps to the next level of care should be provided to minimize losses to follow-up due to inadequate information about the way forward. To further reduce this risk, staff could contact patients with cancer at predesignated intervals (47). Similarly, there should be a mechanism for patients to



communicate with a health worker or patient navigator if they have difficulty navigating the referral system (48).

Biopsy results should be conveyed to patients in a timely manner, and in a way that is both comprehensible and compassionate, no matter the diagnosis (33). When counselling patients regarding their biopsy results, the provider should explain what was done and why, describe any abnormalities if present and agree on next steps and a follow-up visit, if appropriate. The patient (and accompanying family members or friends per patient preference) should be encouraged to ask questions; if the practitioner does not know the answers, then someone should be provided who does know them. Finally, patients should be invited to return if any questions or concerns arise. This type of encounter has the potential to significantly improve adherence with treatment recommendations (47).

Facilities can utilize a variety of mechanisms to communicate with patients about when to return for the results from their biopsy. Options include scheduled follow-ups, engaging community health workers or patient navigators and/or mobile phones (e.g. text messaging, phone calls) (48,49).

Step 3: Accessing treatment

Improve access to treatment by reducing financial, geographic, logistical and sociocultural barriers

Basic, high-impact, low-cost cancer diagnosis and treatment services should be prioritized, while reducing direct and indirect out-of-pocket payments that limit access to care. To mitigate the risk of catastrophic expenses, out-of-pocket expenditures can be reduced through schemes such as insurance prepayment, conditional cash transfers and vouchers (50).

Limited availability of cancer treatment modalities including advanced surgical procedures, systemic therapy and radiotherapy often result in long waiting lists at centralized facilities offering these services. Appropriate planning is required to ensure that services are not centralized in a manner that exacerbates geographic barriers and results in higher indirect costs for a larger percentage of the population. Finally, sociocultural barriers to treatment can be overcome by improving communication with patients and families, as locally appropriate (**Table 5**). Effective counselling and strong media messaging on the value of cancer treatment can facilitate adherence to treatment plans (51).

Table 5. Summary of common barriers and potential solutions to early diagnosis

Early diagnosis step		Common barriers	Potential solutions
Step 1: Awareness and accessing care	Awareness of symptoms	Poor health literacy	Empower and engage people and community Improve health literacy
	Seeking and accessing care	Cancer stigma	Reduce cancer stigma
		Limited access to primary care	Facilitate access to primary care
Step 2: Clinical evaluation, diagnosis and staging	Accurate clinical diagnosis	Inaccurate clinical assessment and delays in clinical diagnosis	Improve provider capacity at first contact point
	Diagnostic testing and staging	Inaccessible diagnostic testing, pathology and staging	Strengthen diagnostic and pathology services
	Referral for treatment	Poor coordination of services and loss to follow-up	Develop referral mechanisms and integrated care
Provide supportive counselling and people-centred care			
Step 3: Access to treatment	Accessible, high-quality treatment	Financial, geographic and logistical barriers	Improve access to treatment by reducing financial, geographic, logistical and sociocultural barriers
		Sociocultural barriers	

DEVELOPING A MONITORING AND EVALUATION FRAMEWORK

A robust monitoring and evaluation framework is critical to improve cancer early diagnosis services. Indicators can be collected at the community, facility and/or national levels and focus on structure, input, process or outcome measures (**Table 6**). The core indicators for early diagnosis are: (i) duration of patient, diagnostic and treatment intervals (**Table 2**); and (ii) stage distribution at disease diagnosis. Targets should be developed based on a valid, current situation analysis focusing on prioritized metrics and according to the national and local context. Wherever possible, data should be analysed by sex, geographic location, ethnicity and socioeconomic status to allow inequalities in cancer care to be detected and addressed.

A system for monitoring and evaluation is needed at the facility, community and national levels. At health facilities, quality should be monitored to assess for any delays in care, incomplete referrals, adherence to guidelines or adverse events monitoring and learning systems. Monitoring of outcomes should incorporate continuous quality improvement that links data with improved service delivery by feeding back performance to providers. Monitoring should extend beyond data entry and include serial audits to identify ways that care might be improved. Data generated from assessments must direct decision-making for planners, managers and providers based on identified deficits. Robust health information systems at the facility level can assist with evaluation of integrated services by documenting the status of the patient to identify delays in or obstacles to care. This may be organized through a hospital-based cancer registry, oriented toward improving quality of care for individual cancer patients, facility planning and service delivery (52).

At the community level, a regular survey of a small sample of patients (minimum of 100 patients per cancer, recruited at various cancer facilities across the country) can also provide data on core process indicators such as duration of each early diagnosis interval. This evaluation, when performed regularly (e.g. at least every five to six years), can assess progress and direct programme planning. Cancer advocates and patients are an important source of feedback and an asset to improve quality through focus groups.

Population-based cancer registries are important at the national and subnational levels for collecting cancer data and in order to compute incidence and mortality rates among residents of a well-defined geographic region. Data are also needed to track the accessibility and quality of care, timeliness of referral and coordination between levels of care and budgeting of resources. Participation in and support of a population-based cancer registry benefits not only the community, but also national and international cancer control programmes (53).

Table 6. Examples of suggested indicators for monitoring early diagnosis programmes

Early diagnosis step	Indicator type	Indicator	Target ^a
Step 1: Awareness and accessing care	Structure	Policy agreed upon for education of cancer symptoms	Available
	Process	People aware of warning symptoms for cancer	>80%
	Outcome	Cancers detected on examinations or by tests (identified in outpatient, non-emergency setting rather than on emergency presentation)	>30%
Step 2: Clinical evaluation, diagnosis and staging	Structure	Policies and regulations include diagnosis as a key component of NCCPs	Available
	Structure	Funding and service delivery models established in NCCPs to support provision of cancer diagnosis for all patients with curable cancers	Available
	Structure	Network of health workers across the different levels of care trained to refer patients without delay or to provide good diagnostic services	Accreditation available
	Structure	Educational courses that provide: <ul style="list-style-type: none"> i. Core knowledge and skills to health-care professionals regarding referral of cancer cases ii. Expert knowledge and skills to selected health-care professionals on providing diagnosis and treatment services at the secondary and tertiary levels, as needed iii. Undergraduate oncology education to health-care professionals focusing on awareness of early signs and symptoms of common detectable cancers iv. Education to patients and family caregivers 	Available
	Process	Number of cases detected early where patients get timely confirmation of diagnosis	Within 1 month of referral date
	Process	Number and type of trained health-care professionals at the secondary and tertiary levels of care qualified to provide diagnosis according to established standards	Defined according to patient load and country capacity
	Process	Proportion of patients whose cancers are detected early who get timely diagnosis	>80% diagnosed within 1 month
Step 3: Accessing timely treatment	Process	Proportion of patients with diagnosed curable cancer who get timely treatment	>80% initiated treatment within 1 month
	Process	Proportion of patients and caregivers receiving relevant education	>80%
	Process	Proportion of curable cancer patients who abandon or do not complete treatment, by age, gender and socioeconomic group	<10%
	Structure	Network of caregivers across different levels of care trained to provide good treatment services	Accreditation available
Multiple steps/comprehensive	Outcome	Proportion of cancer patients diagnosed in early stages	>70%

^a Targets need to be set depending on collection and review of local baseline data.

Note: Bolded indicators should be prioritized.

Sources: Adapted from WHO 2002 (7), WHO 2007 (5) and WHO 2008 (44).

4

CONCLUSION

Delayed diagnosis and inability to access treatment contribute significantly to cancer morbidity and mortality globally. Solutions must be oriented around a comprehensive health system response and service integration, prioritizing high-impact and cost-sensitive interventions.

Early diagnosis improves cancer outcomes by providing the greatest likelihood of successful treatment, at lower cost and with less complex interventions. The principles to achieve early diagnosis are relevant at all resource levels and include increasing cancer awareness and health participation; promoting accurate clinical evaluation, pathologic diagnosis and staging; and improving access to care. These programmatic investments are particularly important where disparities are the most profound and to provide access to cancer care for all.

A cancer death is a tragedy to a family and community with enormous repercussions. By developing effective strategies to identify cancer early, lives can be saved and the personal, societal and economic costs of cancer care reduced.



KEY MESSAGES

1. Delays in cancer care are common, resulting in lower likelihood of survival, greater morbidity from treatment and higher costs of care. Late-stage presentation and inability to access care are particularly common in LMICs, resulting in avoidable deaths and disability from cancer.
2. Early diagnosis strategies improve cancer outcomes by providing care at the earliest possible stage, offering treatment that is more effective, less costly and less complex. Early diagnosis is an important public health strategy in all settings.
3. Cancer screening is a distinct and more complex public health strategy that mandates additional resources, infrastructure and coordination compared to early diagnosis.
4. To strengthen capacity for early diagnosis, a situation analysis should be performed to identify barriers and deficits in services and prioritize interventions.
5. There are three steps to early diagnosis that must be achieved in a time-sensitive manner and coordinated: (i) awareness and accessing care; (ii) clinical evaluation, diagnosis and staging; and (iii) access to treatment.
6. A coordinated approach to building early diagnosis capacity should include empowerment and engagement linked to integrated, people-centred services at all levels of care.
7. Building capacity in diagnostic assessment, pathology and tests as well as improving referral mechanisms and establishing care pathways between facilities can overcome common barriers to timely diagnosis.
8. Financial, geographic, logistical and sociocultural barriers must be considered and addressed as per national context to improve access to timely cancer treatment.
9. A robust monitoring and evaluation system is critical to identify gaps in early diagnosis, assess programme performance and improve cancer services.

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ISBN 978-92-4-151194-0



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